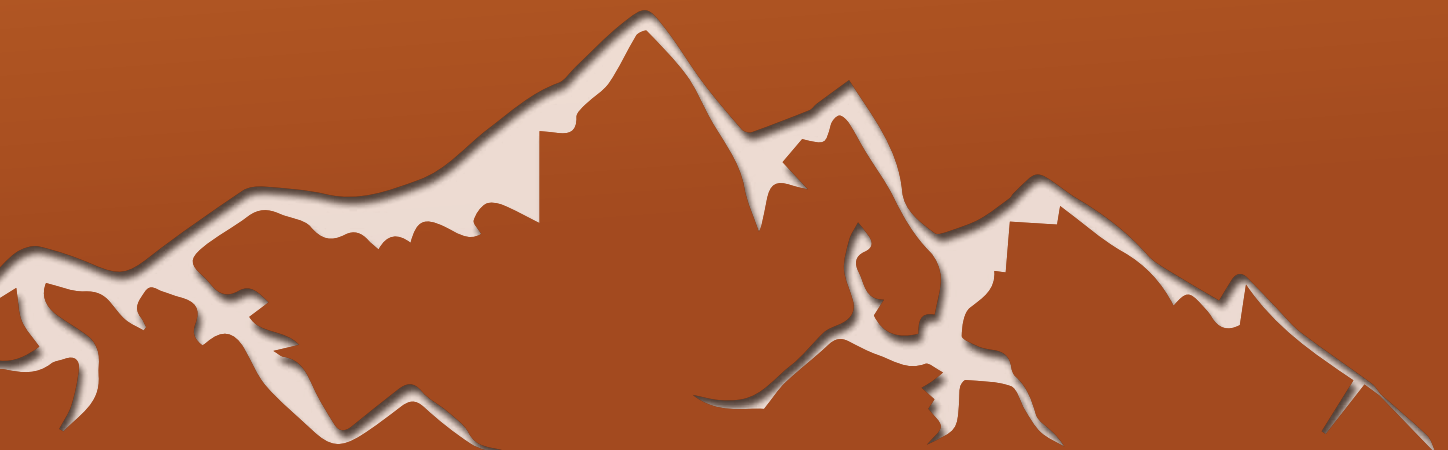




THE REPUBLIC OF UGANDA

District Multi-hazard, Risk and Vulnerability Profile for Isingiro District



Acknowledgement

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3. Mbarara District: Mr. Tumwesigye Robert Ag. District Agriculture Officer, Mr. Katungye Francis – District Probation Officer, Mr. Lubega Kazooba – Senior Health Educator.
4. Rubirizi District: Mr. Murungi Ritah – Ag. District Natural Resources Officer, Yeyambe Steven – Forest Ranger, Mr. Tinkamanyire Jonan – Physical Planner, Mr. Tumushabe Nelson – Lands Officer, Mr. Kabandize Nicholas – Student on Intern (Natural Resources Department).
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Hon. Hilary O. Onek

Minister for Relief, Disaster Preparedness and Management

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List of Acronyms

DDMC	District Disaster Management Committee
DEM	Digital Elevation Model
DLG	District Local Government
DRM	Disaster Risk Management
DWD	Directorate of Water Development
DWRM	Directorate of Water Resources Management
ENSO	El Niño Southern Oscillation
FGD	Focus Group Discussion
GIS	Geographical Information Systems
HRV	Hazard Risk Vulnerability
KII	Key Interview Informant
MWE	Ministry of Water and Environment
NCCP	National Climate Change Policy
OPM	Office of the Prime Minister
PGIS	Participatory GIS
SMCA	Spatial Multi-criteria Analysis
STRM	Shuttle Radar Topography Mission
UBOS	Uganda Bureau of Statistics
UNDP	United Nations Development Program
UTM	Universal Transverse Mercator
WGS	World Geodetic System

Definition of Key Concepts

Climate change: Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer).

Drought: The phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems.

El Niño: El Niño, in its original sense, is warm water current that periodically flows along the coast of Ecuador and Peru, disrupting the local fishery. This oceanic event is associated with a fluctuation of the inter tropical surface pressure pattern and circulation in the Indian and Pacific Oceans, called the Southern Oscillation. This coupled atmosphere-ocean phenomenon is collectively known as El Niño Southern Oscillation, or ENSO. During an El Niño event, the prevailing trade winds weaken and the equatorial countercurrent strengthens, causing warm surface waters in the Indonesian area to flow eastward to overlies the cold waters of the Peru Current. This event has great impact on the wind, sea surface temperature, and precipitation patterns in the tropical Pacific. It has climatic effects throughout the Pacific region and in many other parts of the world. The opposite of an El Niño event is called La Niña.

Flood: An overflowing of a large amount of water beyond its normal confines.

Food insecurity: A situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life. It may be caused by the unavailability of food, insufficient purchasing power, inappropriate distribution, or inadequate use of food at the household level. Food insecurity may be chronic, seasonal, or transitory.

Impact: Consequences of climate change on natural and human systems.

Risk: The result of the interaction of physically defined hazards with the properties of the exposed systems i.e., their sensitivity or vulnerability.

Susceptibility: The degree to which a system is vulnerable to, or unable to cope with, adverse effects of climate change, including climate variability and extremes.

Semi-arid: Ecosystems that have more than 250 mm precipitation per year but are not highly productive; usually classified as rangelands.

Vulnerability: The degree of loss to a given element at risk or set of elements at risk resulting from the occurrence of a natural phenomenon of a given magnitude and expressed on a scale from 0 (no damage) to 1 (total damage)" (UNDRO, 1991) or it can be understood as the conditions determined by physical, social, economic and environmental factors or

processes, which increase the susceptibility of community to the impact of hazards “(UN-ISDR 2009)

Also Vulnerability can be referred to as the potential to suffer harm or loss, related to the capacity to anticipate a hazard, cope with it, resist it and recover from its impact. Both vulnerability and its antithesis, resilience, are determined by physical, environmental, social, economic, political, cultural and institutional factors” (J.Birkmann, 2006)

Hazard: A physically defined source of potential harm, or a situation with a potential for causing harm, in terms of human injury; damage to health, property, the environment, and other things of value; or some combination of these (UNISDR, 2009).

EXECUTIVE SUMMARY

The multi-hazard vulnerability profile outputs from this assessment for the five districts (Isingiro, Kamwenge, Mbarara, Rubirizi and Sheema) was a combination of spatial modeling using socio-ecological spatial layers, socio-economic, and meteorological data etc.) and information captured from District Key Informant interviews and sub-county FGDs using a participatory approach. The level of vulnerability was assessed at sub-county participatory engagements and integrated with the spatial modeling in the GIS environment. The methodology included five main procedures i.e.

Preliminary spatial analysis

Hazard prone areas' base maps were generated using GIS environment (ArcGIS 10.1).

Stakeholder engagements

Stake holder engagements were carried out in close collaboration with OPM's DRM team and the district disaster management focal persons with the aim of identifying the various hazards ranging from drought, to floods, landslides, human and animal disease, pests, animal attacks, earthquakes, fires, conflicts etc. Hazard, risk and vulnerability assessment was done using a stack of methods including participatory approaches such as Participatory GIS (PGIS), Focus Group Discussions (FGDs), key informant interviews, transect drives as well as spatial and non-spatial modelling. Key informant interviews and Focus Group Discussions were guided by a checklist (Appendix 1 and 2). Key Informant Interviews for District officers included: Districts Natural Resources Officers, Environment Officers, Wetland Officers, Forest Officers, Production and Marketing Officers, Veterinary Officers, Health Inspectors. At sub-county level Key informants for this assessment included: Sub-county and parish chiefs, community Development mobilizers and health workers.

Participatory GIS

Using Participatory GIS (PGIS), local communities were involved in identifying specific hazards prone areas on the Hazard base maps. This was done during the FGDs and participants were requested through a participatory process to develop a community hazard profile map.

Geo-referencing and ground-truthing

Ground-truthing and geo-referencing was done using a handheld Spectra precision Global Positioning System (GPS) unit, model: Mobile Mapper 20 set in WGS 1984 Datum. The entities captured included: hazard location, (Sub-county and parish), extent of the hazard, height above sea level, slope position, topography, neighboring land use among others. Hazard hot spots, potential and susceptible areas were classified using a participatory approach on a scale of "not reported/ not prone", "low", "medium" and "high", consistent with the methodology specified in Annex 3.

Data analysis and integration in GIS

Data analysis and spatial modeling by integrating spatial layers and non-spatial attribute captured from FGDs and KIIs to generate final HRV maps at Sub-county level.

Data verification and validation

In collaboration with OPM, a five days regional data verification and validation workshop was organized by UNDP in Mbarara Municipality as a central place within the region. This involved key district DDMC focal persons for the purpose of creating local/district ownership of the profiles.

Multi-hazards experienced in the districts were classified as:

- Geomorphological or Geological hazards including landslides, rock falls, soil erosion and earth quakes.
- Climatological or Meteorological hazards including floods, drought, hailstorms, strong winds and lightening

- Ecological or Biological hazards including crop pests and diseases, livestock pests and diseases, human disease outbreaks, vermin and wildlife animal attacks and invasive species.
- Human induced or Technological hazards including bush fires, road accidents land conflicts.

General findings from the participatory assessment indicated that all the five district have over the past two decades increasingly experienced hazards including landslides, rock falls, soil erosion, floods, drought, hailstorms, strong winds, lightening, crop pests and diseases, livestock pests and diseases, human disease outbreaks, vermin, wildlife animal attacks, invasive species, bush fires, road accidents and land conflicts putting livelihoods at increased risk. Drought and flooding were identified as most serious problem in Isingiro, Kamwenge, Sheema and Mbarara districts with almost all sub-counties being vulnerable to the hazards. This could be due to the location of the districts in cattle corridor which as associated with prominent dry spells and droughts, but the area is also relatively flat with slope percentage rise (0-2) which is very prone to flooding in case of heavy rains. Landslides, rock falls and soil erosion were identified as most serious problem in Rubirizi districts with almost all sub-counties being vulnerable to the hazard except the rift valley flat plains.

The limited adaptive capacity (and or/resilience) and high sensitivity of households and communities in the districts increase their vulnerability to hazard exposure necessitating urgent external support. To counteract vulnerability at community, local government and national levels should be a threefold effort hinged on:

- Reducing the impact of the hazard where possible through mitigation, prediction, warning and preparedness;
- Building capacities to withstand and cope with the hazards and risks;
- Tackling the root causes of the vulnerability such as poverty, poor governance, discrimination, inequality and inadequate access to resources and livelihood opportunities.

The following recommended policy actions targeting vulnerability reduction include:

- Improved enforcement of policies aimed at enhancing sustainable environmental health.
- Quickly review the animal diseases control act because of low penalties given to defaulters.
- Establishment of systems to motivate support of political leaders toward government initiatives and programmes aimed at disaster risk reduction.
- Increased awareness campaigns aimed at sensitizing farmers/communities on disaster risk reduction initiatives and practices.
- Revival of disaster committees at the district levels
- Periodic maintenance of feeder roads to reduce on traffic accidents
- Relocation of communities in the affected areas in the district by government
- Promotion of drought and disease resistant crop seeds
- Increase funding in the disaster and environmental departments
- Removal taxes on the importation of lightening conductors
- Support establishment of disaster early warning systems
- Increase funding and staff to monitor wetland degradation and non-genuine agro-inputs
- Improve the communication channel between the disaster department and local Communities
- Office of the prime minister should decentralize their activities at the district level
- Tree planting along road reserves
- Fund and equip recruited extension works
- Government should allocate funds aimed at disaster preparedness and management at district levels
- Removal of taxes on the importation of lightening conductors
- Support establishment of a disaster risk early warning systems

CHAPTER ONE

INTRODUCTION

1.1 Background

Uganda has over the past years experienced frequent disasters that range from drought, to floods, landslides, human and animal disease, pests, animal attacks, earthquakes, fires, conflicts and other hazards which in many instances resulted in deaths, property damage and losses of livelihood. With the increasing negative effects of hazards that accompany population growth, development and climate change, public awareness and proactive engagement of the whole spectrum of stakeholders in disaster risk reduction, are becoming critical.

The Government of Uganda is moving the disaster management paradigm from the traditional emergency response focus toward one of prevention and preparedness. Contributing to the evidence base for Disaster and Climate Risk Reduction action, the Government of Uganda is compiling a national atlas of hazard, risk and vulnerability conditions in the country to encourage mainstreaming of disaster and climate risk management in development planning and contingency planning at national and local levels.

From 2013 UNDP has been supporting the Office of the Prime Minister to develop district hazard risk and vulnerability profiles in the sub-regions of Rwenzori, Karamoja, Teso, Lango, Acholi and West Nile covering 42 districts. During the exercise above, local government officials and community members actively participated in the data collection and analysis. The data collected was used to generate hazard risk and vulnerability maps and profiles. Validation workshops were held in close collaboration with ministries, district local government (DLG), development partners, agencies and academic/research institutions. The developed maps show the geographical distribution of hazards and vulnerabilities up to sub-county level of each district. The analytical approach to identify risk and vulnerability to hazards in the pilot sub-regions visited of Rwenzori and Teso was improved in subsequent sub-regions.

This inception report details methodological approach for HRV profiling and mapping for 5 districts in Western Uganda in response to a call by UNDP to engage an Individual Consultant to facilitate the process. The districts under consideration include Isingiro, Kamwenge, Mbarara, Rubirizi and Sheema.

1.2 Objectives of the study

The following main and specific objectives of the study are indicted:

1.2.1 Main objective

The main objective of the study is to develop District Hazard, Risk and Vulnerability Profiles for Isingiro, Kamwenge, Mbarara, Rubirizi and Sheema Districts in Western Uganda (Figure 1).

1.2.3 Specific Objectives

In fulfilling the above mentioned main objective the following are specific objectives as expected:

- i. Collect and analyse field data generated using GIS in close collaboration and coordination with OPM in Isingiro, Kamwenge, Mbarara, Rubirizi and Sheema districts.
- ii. Develop district specific multi hazard risk and Vulnerability profiles using a standard methodology.
- iii. Preserve the spatial data to enable use of the maps for future information.
- iv. Produce age and sex disaggregated data in the HRV maps.

1.3 Scope of Work and Deliverables

The consultant understands that UNDP through the Project “Strengthening Capacities for DRM and Resilience Building” will contract the following work:

- i. Collection of field data using GIS in close collaboration and coordination with OPM Isingiro, Kamwenge, Mbarara, Rubirizi and Sheema districts and quantify them through a participatory approach on a scale of “not reported”, “low”, “medium” and “high”, consistent with the methodology specified in Annex 3.
- ii. Analysis of field data and review the quality of each hazard map which should be accompanied by a narrative that lists relevant events of their occurrence. Implications of hazards in terms of their effects on stakeholders with the vulnerability analysis summarizing the distribution of hazards in the district and exposure to multiple hazards in sub-counties.
- iii. Compilation of the entire district multi hazard, risk and vulnerability HRV Profiles in the time frame provided.
- iv. Generating complete HRV profiles and maps and developing a database for all the GIS data for all the districts visited showing disaggregated hazard risk and vulnerability profiles to OPM and UNDP.

1.4 Justification

The government recognizes climate change as a big problem in Uganda. The draft National Climate Change Policy (NCCP) notes that the average temperature in semiarid climates is rising and that there has been an average temperature increase of 0.28°C per decade in the country between 1960 and 2010. It also notes that rainfall patterns are changing with floods and landslides on the rise and are increasing in intensity, while droughts are increasing, and now significantly affect water resources, and agriculture (MWE, 2012). The National Policy for Disaster Preparedness and Management (Section 4.1.1) requires the Office of the Prime Minister to “Carry out vulnerability assessment, hazard and risk mapping of the whole country and update the data annually”. UNDP’s DRM project 2015 Annual Work Plan; Activity 4.1 is “Conduct national hazard, risk and vulnerability (HRV) assessment including sex and age disaggregated data and preparation of district profiles.”

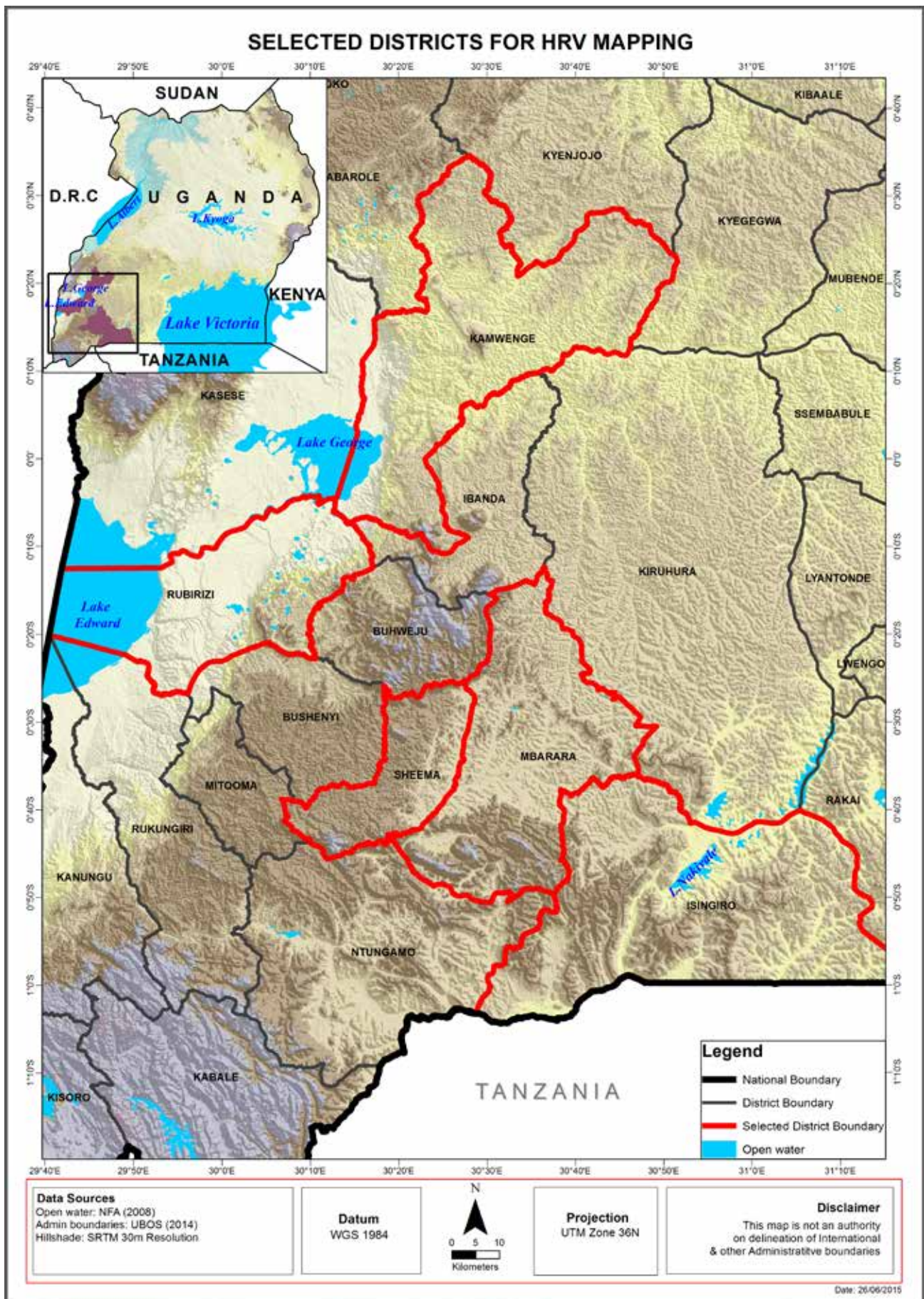


Figure 1: Location of Study Area

1.5 Structure of the Report

This Report is organized into six chapters: Chapter 1 provides Introduction on the assignment. Chapter 2 elaborates on the overview and the Multi-hazard, Risks and Vulnerability profiles of Isingiro district.

CHAPTER TWO

ISINGIRO DISTRICT MULTI-HAZARD, RISKS AND VULNERABILITY PROFILE

2.1.0 Overview of Isingiro District

Isingiro District is a district in Western Uganda. Like most Ugandan districts, it is named after its main municipal, administrative and commercial center of Isingiro, the location of the district headquarters. Isingiro District is bordered by Kiruhura District to the north, Rakai District to the east, the Republic of Tanzania to the south, Ntungamo District to the west, and Mbarara District to the northwest (Figure 2). Isingiro, the 'chief town' of the district, is located approximately 35 kilometers by road, southeast of the city of Mbarara, the main metropolitan area in Ankole sub-region. The coordinates of the district are: 0° 50'S, 30° 50'E. Isingiro District has 14 sub-counties and 3 Town councils, about 96 parishes each with a number of villages ranging between 5- 20 villages. The following Sub-counties in Isingiro District: Birere, Endinzi, Kabingo, Kabuyanda, Kashumba, Kikagate, Masha, Mbaare, Ngarama, Nyakitunda, Nyamuyanja, Ruborogota, Rugaga and Rushaha. The Town councils include: Isingiro, Kaberebere and Kabuyanda Town Councils.

2.1.1 Geomorphology

Isingiro District lies between altitude of 1200m-1810 m.a.s.l. Areas west of the district around Nyakitunda, Nyamuyanja, Ngarama, Kabingo and Kabuyanda hills having the highest altitudes up to 1810m towards Mbarara and Ntungamo district border. The low altitudes are along areas east of the district around Endiizi, Rushasha sub-counties bordering with Rakai district and the lowest being at the main Lake Nakivale water body in Rugaga sub-county (Figure 2).

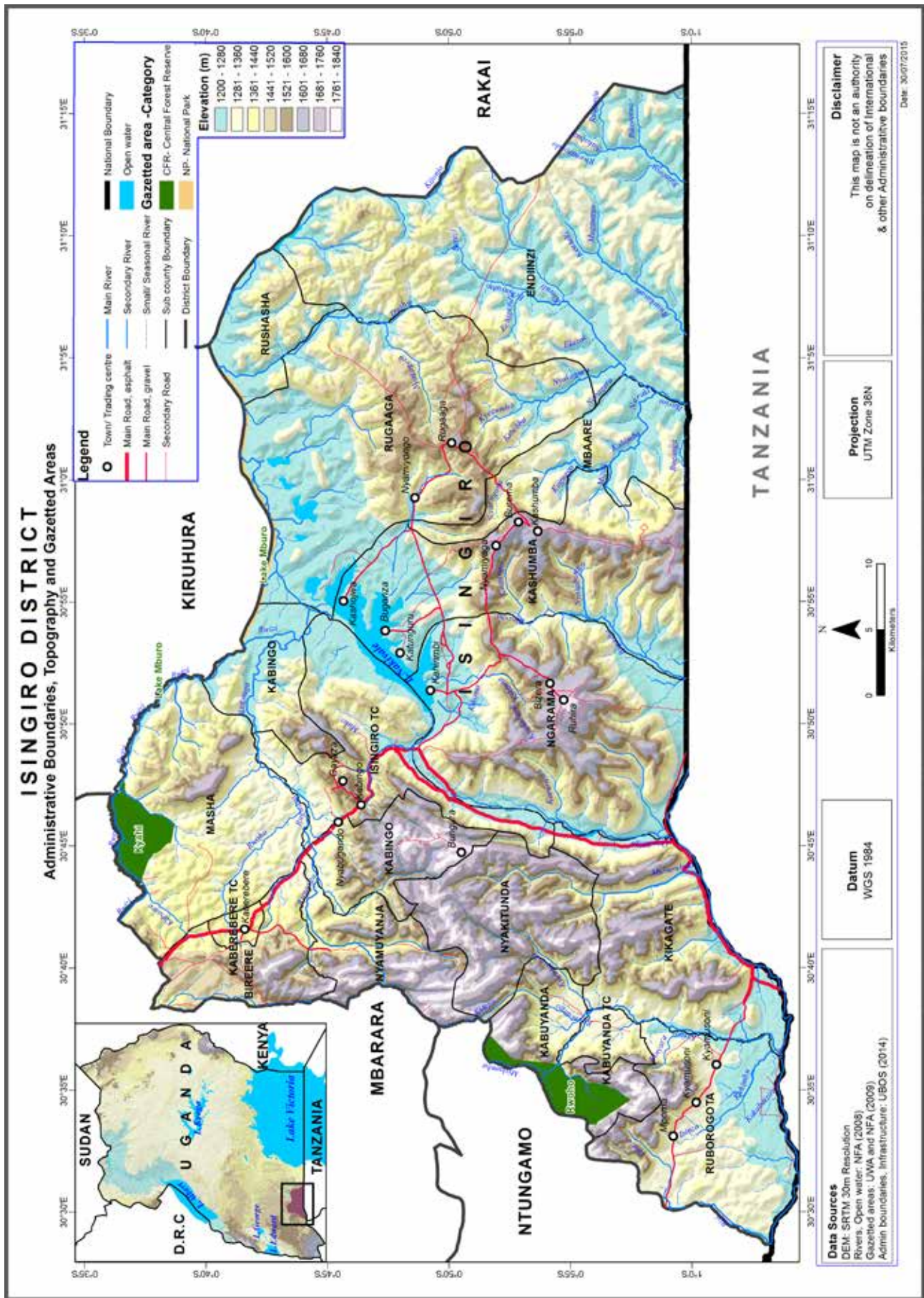


Figure 2: Administrative Units and Geomorphology of Isingiro District

2.1.2 Geology

From the geological mapping undertaken by the Geological Surveys and mines (2012), indicate that areas west of the district (around Nyakitunda, Nyamuyanja, Kabyunda sub-counties) are dominated by mudstone, shale and phyllites with oncolite and stromatolite rock patches. Lower areas occupied by Lake Nakivale catchment system are predominantly papyrus swamp with flood plain mud. Mid areas of the district especially the Ngarama hills are dominated by quartzitic sandstones and laterites. Areas farther east towards the border with Rakai district and National border with Tanzania are occupied by mica schist with quartzitic interbeds especially in Endiizi sub-county. Some patches of Alluvium lacustrine deposits form the Masha areas especially along the Rwizi River catchment system (Figure 3).

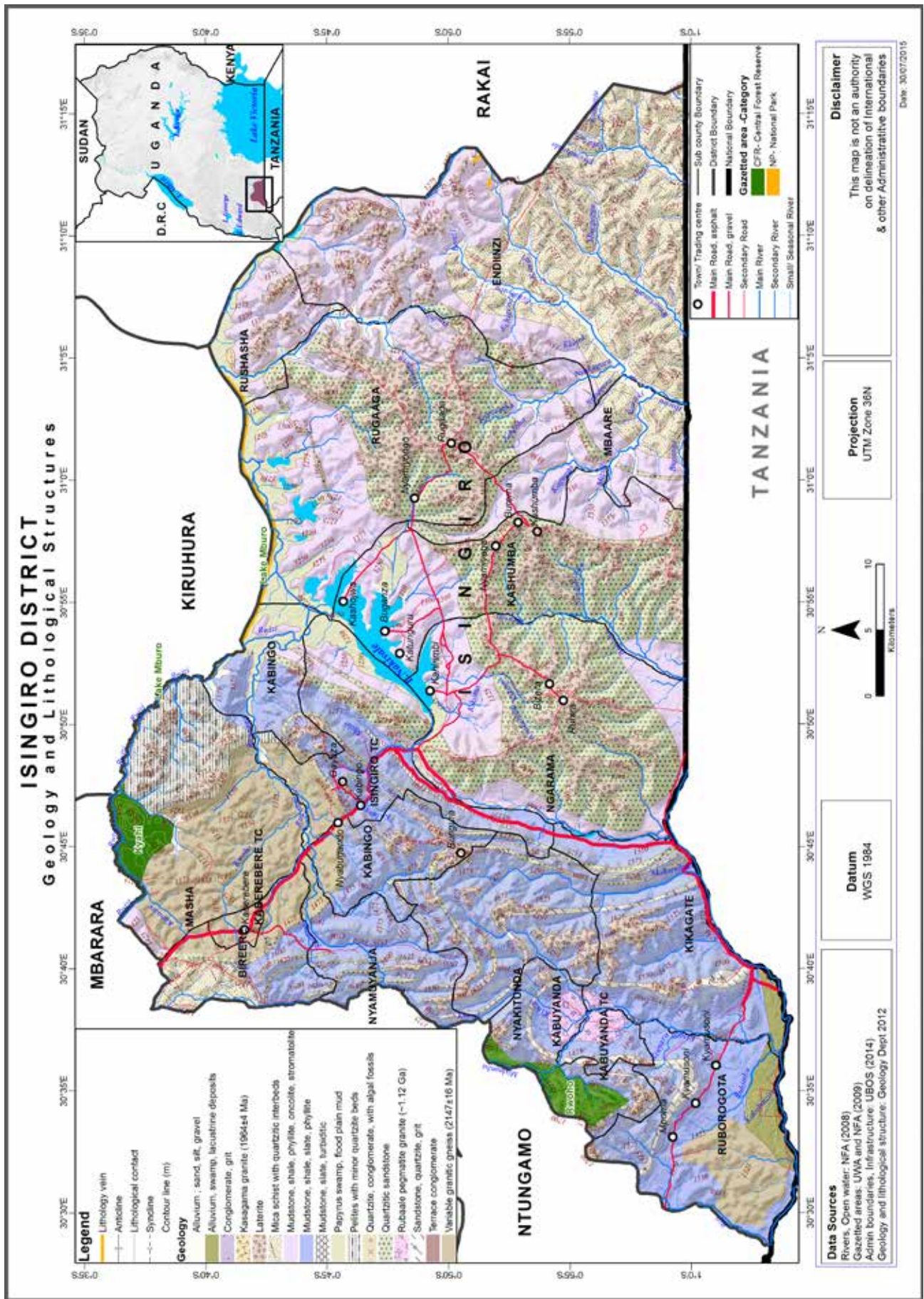


Figure 3: Geology and Lithological structures of Isingiro District

2.1.3 Vegetation and Land use stratification

An important imperative in understanding the spatial determinants of hazard and risks is the spatial and temporal extent of land use and land cover of a given location. Biggest area of Isingiro district is covered by subsistence farmland especially in the sub-counties of Nyakitunda, Nyamuyanja, Kaberebere Town Council, Bireere, Mbaare, Endiizi and Rugaaga. Grasslands and bushlands occupy hills of Ngarama and relatively lower areas of Masha, Kabingo, Rugaaga and Rushasha especially adjacent to Lake Nakivale. Wetlands exist along Rwizi river in Rugaaga and Rushasha sub-counties and also along the prominent Oruchinga wetland system stretching from Ngarama to Isingiro Town council. Some areas are built up especially in Isingiro Town council, Kaberebere Town council and Kikagate Town Board. The district is endowed with protected areas ie. Rwoho and Kyahi central forest reserves in Kabuyanda and Masha sub-counties respectively. The district also borders with Lake Mbuho National Park to the north bordering with Kiruhura district (Figure 4)

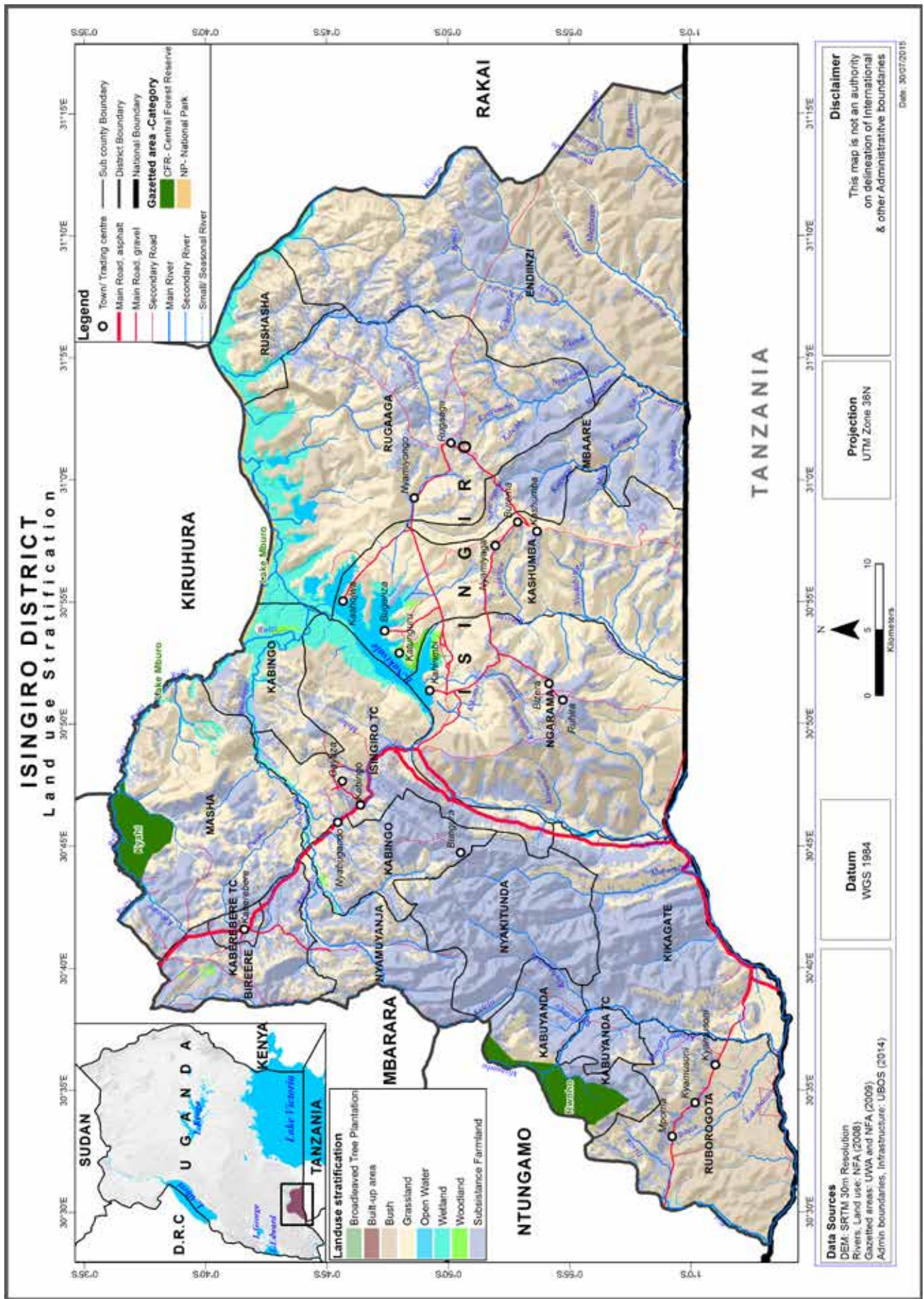


Figure 4: Land use stratification of Isingiro District

2.1.4 Temperature and Humidity

Isingiro District lies 0.6° south of the equator. The region experiences small annual variation in air temperatures; and the climate may be described as generally hot and humid, with average monthly temperatures varying between 27°C and 31°C. The temperature maximum are consistently above 30°C and sometimes reach 38°C. Average minimum temperatures are relatively consistent and vary between 16°C and 18°C in the hilly areas of Nyakitunda, Nyamuyanja, Ngarama, Kabingo and Kabuyanda sub-counties. The relative humidity is higher during rain seasons with maximum levels prevalent in May. The lowest humidity levels occur in dry seasons with minimum levels occurring in December and January. The average monthly humidity is between 60% and 80%.

2.1.5 Wind

The long-term wind speed records from the East African Meteorological Department (1975) indicate average annual wind speeds of 3 knots and 5 knots at 0600 hours and 1200 hours, for Mbarara. The wind speed values indicated, therefore, represent conditions of moderate to strong or turbulent conditions. The average number of calms experienced in the area, are indicated to be experienced for 99days at 0600 hours, and 27 days at 1200 hours, respectively, at Mbarara. The general conclusion from these climatic figures is that for most of the year, Isingiro experiences moderate to strong and gusty winds, increasing in the afternoon.

2.1.6 Rainfall

Total Annual Rainfall received by Isingiro District ranges between 966mm - 1380mm per annum. Lowest rainfall amounts are experienced near Mbarara district border in Bireere sub-county with about 966mm per annum and highest annual rainfall of 1,380 mm near Rakai district border and National border with Tanzania in Endiizi sub-county (Figure 5).

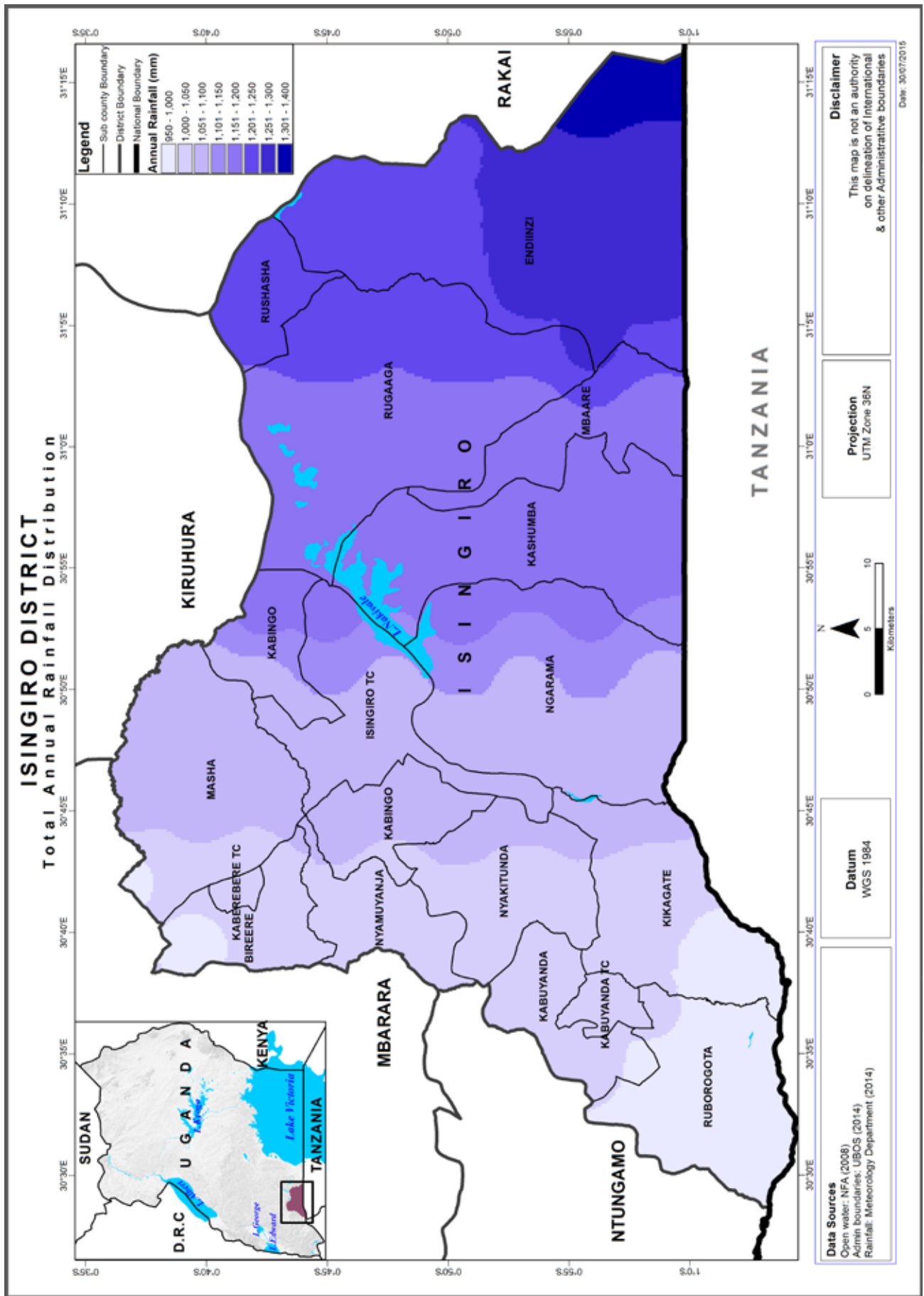


Figure 5: Annual Rainfall of Isingiro District

2.1.7 Hydrology

Isingiro District lies in the Lake Victoria basin sharing both River Kagera and River Rwizi catchments. Numerous permanent and seasonal rivers pour into River Kagera including Kitezo, Muhurubuki and Oruchinga. Other main river system is the Rwizi river catchment with a number of tributaries the major one being Rugaaga. Lake Nakivale occupies the northern flat areas of the district being shared by five sub-counties i.e. Kabingo, Isingiro Town council, Ngarama, Kashumba and Rugaaga.

These major rivers (River Kagera and River Rwizi) and Lake Nakivale are supplied by a network of numerous secondary rivers as well as seasonal rivers that provide significant amounts of surface water to supplement the ground water resources. Ground water resources exist in a number of locations, the hydrology of which is undoubtedly influenced by a number of environmental conditions including geology, rainfall and the existence of small open water bodies and rivers. Generally mid parts of the district around Kabingo, Isingiro Town council, Ngarama, Kashumba and Rugaaga sub-counties are poorly drained and flood prone. The major wetland systems include Oruchinga stretching from Ngarama to Isingiro Town council, Bigasha wetland forming border between Ngarama and Kashumba, Ikariro wetland system located south of the district in Endiizi sub-county bordering with Tanzania, and the greater Rwizi River- Lake Nakivale wetland system that forms Lake Nakivale Ramsar site (Figure 4).

2.1.8 Population

The census data by UBOS 2014 indicate the total population of Isingiro district as 492,116 with the biggest percentage as rural residents (493985 (89%)) and the remaining percentage are urban residents (52831 (11%). Gender distribution was indicated to be Males -237549 (48%) and Females -254567 (52%). About 99% (488327) of the population form the household population and only 1% (3789) is Non-household. Kashumba sub-county was indicated with the biggest population with Nakivale refugee settlement alone with 57168 and the rest of the sub-county having 21883. On the other hand, Kaberebere Town council was indicated with the least population (6785) (Figure 6). Table 1 shows the population distribution per sub-county for the different gender.

Table 1: Population Distribution in Isingiro District

<i>Sub-County</i>	HOUSEHOLDS		POPULATION		
	<i>Number</i>	<i>Average Size</i>	<i>Males</i>	<i>Females</i>	<i>Total</i>
Bireere	4792	4.4	10330	10985	21315
Endiinzi	4686	5.0	11561	11964	23525
Isingiro Town council	7402	5.0	15929	17090	33019
Kaberebere Town council	1579	3.9	3333	3452	6785
Kabingo	4498	4.9	10503	11401	21904
Kabuyanda	4361	4.9	10048	11277	21325
Kabuyanda Town council	3569	4.5	7732	8593	16325
Kashumba	4407	5.0	10733	11150	21883
Kikagate	10453	4.8	23806	26591	50397
Masha	5633	4.6	13366	13700	27066
Mbaare	6844	5.0	16979	17543	34522
Nakivale	12437	4.6	28019	29149	57168
Ngarama	7028	5.0	17144	18415	35559
Nyakitunda	8750	4.8	19607	22209	41816
Nyamuyanja	3390	4.6	7518	8302	15820
Ruborogota	3696	4.8	8450	9139	17589
Rugaaga	6828	4.8	16051	16948	32999
Rushasha	2617	5.0	6440	6659	13099

Source: UBOS Census 2014

2.1.9 Economic Activities

Agriculture is the mainstay of the district economy of Isingiro District. Nearly 90% of the households are engaged in Subsistence agriculture with the major crops being banana, sweet bananas, maize, sweet potatoes, Irish potatoes, beans, cassava and vegetables. A considerable number of the population is involved in livestock production especially rearing cattle and goats (https://en.wikipedia.org/wiki/Isingiro_District).

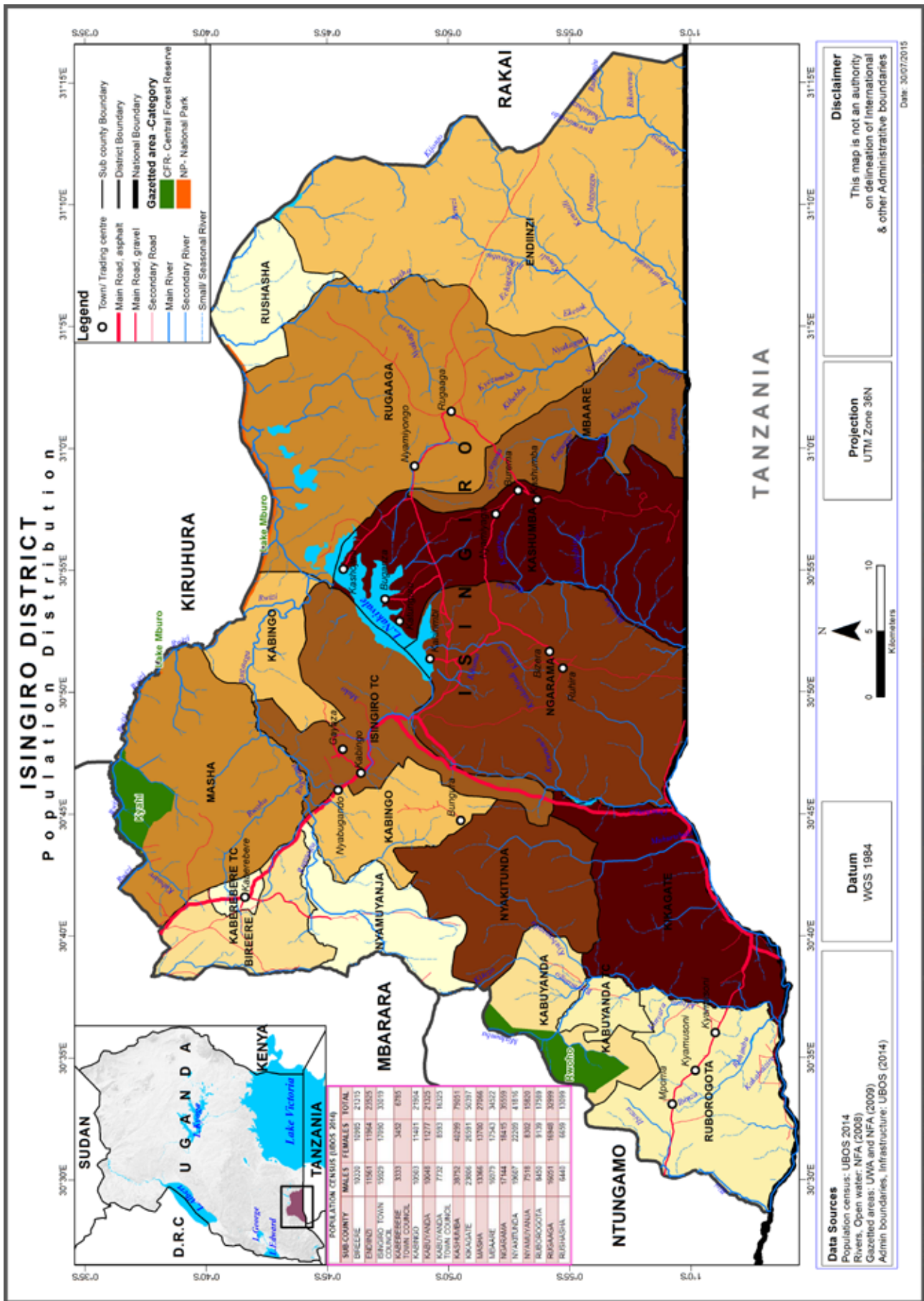


Figure 6: Population Distribution of Isingiro District

2.2.0 METHODOLOGY

2.2.1 Collection and analysis of field data using GIS

2.2.1.1 Preliminary spatial analysis

Hazard prone areas' base maps were generated basing on several numerical models and guidelines using existing environmental and socio-ecological spatial layers, socio-economic data, and meteorological data, etc.) in a GIS environment (ArcGIS 10.1).

2.2.1.2 Stakeholder engagements and developing survey instruments

Stake holder engagements were carried out in close collaboration with OPM's DRM team and the district disaster management focal persons with the aim of identifying the various hazards ranging from drought, to floods, landslides, human and animal disease, pests, animal attacks, earthquakes, fires, conflicts etc. Hazard, risk and vulnerability assessment was done using a stack of methods including participatory approaches such as Participatory GIS (PGIS), Focus Group Discussions (FGDs), Key informant interviews; transect drives as well as spatial and non-spatial modelling. Key informant interviews and Focus Group Discussions were guided by a checklist (Appendix 1 and 2). Key Informant Interviews for District officers included: Districts Natural Resources Officers, Environment Officers, Wetland Officers, Forest Officers, Production and Marketing Officers, Veterinary Officers, Health Inspectors. At sub-county level Key informants for this assessment included: Sub-county and parish chiefs, community Development mobilizers and health workers.

Focus Group Discussions were carried out in at least five purposively selected sub-counties that were ranked with highest vulnerability. FGDs were conducted with utmost consideration to the various gender categories (women, men) with respect to age groups since hazards affect both men and women though in different perspectives irrespective of age. Five FGDs comprising of average 12 respondents (crop farmers, local leaders, nursing officers, police officers and cattle keepers) were conducted in Ruborogota Sub-county (UTM, 228851; 9890163), Kikagate Sub-county (UTM, 238681; 9884900), Endinzi Sub-county (UTM, 293844; 9904115), Ngarama Sub-county (UTM, 261330; 9898307) and Isingiro Town Council (UTM, 256405; 9907689). Each Parish of the selected Sub-counties was represented by at least one participant and the selection of participants was engendered. This allowed for comprehensive representation as well as provision of detailed and verifiable information.

Focus Group discussions and Key Informant Interviews will be transcribed in the field for purposes of input into the NVIVO software for qualitative data analysis. Case stories and photographs will also be documented and captured respectfully. In order to produce age and sex disaggregated data, results from FGDs and KIIs will be integrated with the district population census data. This will also be input in the multi hazard, risk and vulnerability profile maps.

2.2.1.3 Participatory GIS

Using Participatory GIS (PGIS), local communities were involved in identifying specific hazards prone areas on the Hazard base maps. This was done during the FGDs and participants were requested through a participatory process to develop a community hazard profile map.

2.2.1.4 Geo-referencing and ground-truthing

The identified hazard hotspots in the community profile maps were ground-truthed and geo-referenced using a handheld Spectra precision Global Positioning System (GPS) unit, model: MobileMapper 20 set in WGS 1984 Datum. The entities captured included: hazard location, (Sub-county and parish), extent of the hazard, height above sea level, slope position, topography, neighboring land use among others (Appendix III). Hazard hot spots, potential and susceptible areas will be classified using a participatory approach on a scale of “not occur”, “low”, “medium” and “high”, consistent with the methodology specified in Annex 3. This information generated through a participatory and transect approach was used to validate modelled hazard, risk and vulnerability status of the district. The spatial extent of a hazard event was established through modelling and a participatory validation undertaken.

2.2.2 Develop District Specific Multi-Hazard Risk and Vulnerability Profiles

2.2.2.1 Data analysis and integration

From the verification of the Hazard prone areas base maps developed basing on several numerical models and guidelines for existing environmental and socio-ecological spatial layers .Final HRV maps will be generated in the GIS environment for each district up to sub-county level and parish level where possible. This is because at a small scale such as at sub-county level, the population could be facing as many hazards as can be listed and so it becomes inappropriate to do the profiling at that small scale. For each of the 5 target districts, specific hazard, risk and vulnerability profiles will be analyzed, discussed and presented in the report and maps.

2.2.2.2 Data verification and validation

In collaboration with OPM, a five days regional data verification and validation workshop was organized by UNDP in Mbarara Municipality as a central place within the region. This involved key district DDMC focal persons for the purpose of creating local/district ownership of the profiles.

2.2.3 Preserve the Spatial data to enable future use of Maps

Once the HRV profiles report and maps have been verified and validated, a final HRV profiles inventory and geo-database will be prepared containing all GIS data and submitted in various file formats to enable use of the maps for future information.

2.3.0 RESULTS FROM MULTI-HAZARD RISK, VULNERABILITY MAPPING

2.3.1 Multi-Hazards

A hazard, and the resultant disaster can have different origins: natural (geological, Hydro-meteorological and biological) or induced by human processes (environmental degradation and technological hazards). Hazards can be single, sequential or combined in their origin and effects. Each hazard is characterized by its location, intensity, frequency, probability, duration, area of extent, speed of onset, spatial dispersion and temporal spacing (Cees, 2009).

In the case of Isingiro district, hazards were classified following main controlling factors:

- i. Geomorphological or Geological hazards including landslides, rock falls, soil erosion and earth quakes.
- ii. Climatological or Meteorological hazards including floods, drought, hailstorms, strong winds and lightening
- iii. Ecological or Biological hazards including crop pests and diseases, livestock pests and diseases, human epidemic diseases, vermin and wildlife animal attacks and invasive species.
- iv. Human induced or Technological hazards including bush fires, road accidents land conflicts.

2.3.2 GEOMORPHOLOGICAL OR GEOLOGICAL HAZARDS

2.3.2.1 Landslides, rock falls and soil erosion

Multi-hazard, risk and vulnerability assessment was done through participatory approaches and Key Informant interviews held with the Isingiro District Natural Resources Officer, Environment Officer and Physical planner. FDG discussions were held in Ruborogota Sub-county (UTM, 228851; 9890163), Kikagate Sub-county (UTM, 238681; 9884900), Endinzi Sub-county (UTM, 293844; 9904115), Ngarama Sub-county (UTM, 261330; 9898307) and Isingiro Town Council (UTM, 256405; 9907689). Results from the Participatory assessment indicated that soil erosion is the most prominent hazard during rainy seasons. It was reported that soil erosion has greatly contributed to loss of nutrients in the soil. This has reduced crop yield especially for maize and beans. Soil erosion also leaves banana stumps hanging. The most affected sub-counties were indicated as Nyamuyanja, Nyakitunda, Rugaaga, Ngarama, Kabuyanda and Kikagate. This information was integrated with the spatial modelling using socio-ecological spatial data i.e. generated from Soil texture (data for National Agricultural Research Laboratories – Kawanda (NARL) 2014, Rainfall (Meteorology Department 2014), Digital Elevation Model (DEM), SLOPE, ASPECT (30m resolution data from SRTM Shuttle Radar Topography Mission (SRTM)). Figure 7 shows areas vulnerable to landslides, rock falls and soil erosion as well as hot spots where landslides, rock falls and soil erosion have occurred in the past 20 years.



Plate 1: Eroded slopes of Rugaaga hills, Isingiro District

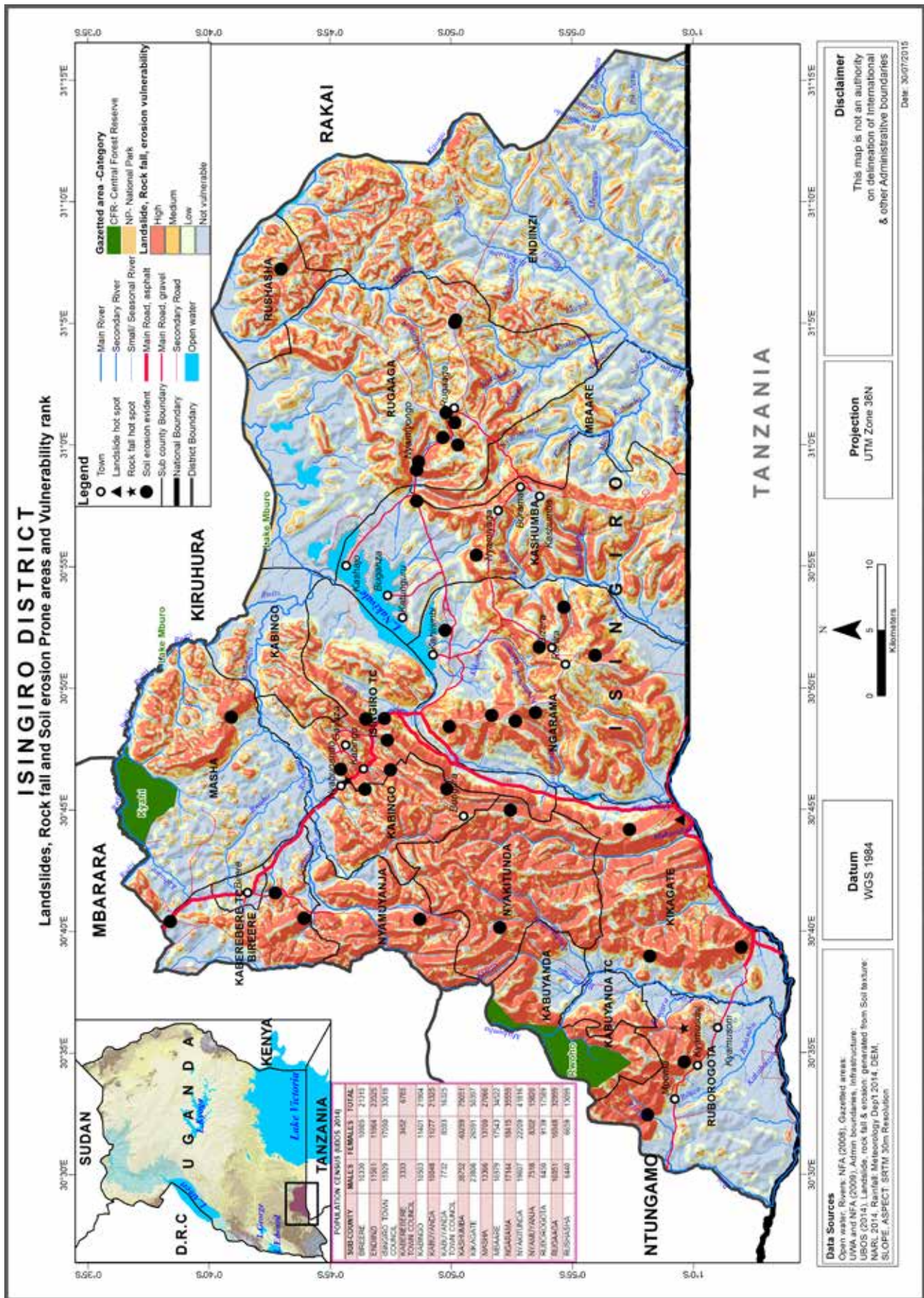


Figure 7: Landslide, Rock fall and Soil erosion prone areas, Isingiro District

2.3.2.2 Earth quakes

The earth quake hazard in Uganda was mapped by the World Health Organization and the US Geological Survey’s Earthquake Program and it was indicated that seismicity of Uganda is dominated by the East Africa rift system. Table 2 below indicates Major earthquake events occurred in Uganda in the recent past 21 years. The earth quake hazard study show that the south western Uganda where Isingiro district is located is subject to a medium hazard, with a horizontal acceleration between 0.8g and 2.4g.

Table 2: Major earthquake events occurred in Uganda in the recent past

Date of occurrence	Epicenter	Magnitude	Socio-economic losses
09 July 1912	Kitgum, close to Aswa Shear zone	6.7	Partial destruction of buildings in northern Uganda
02 October 1929	Toro, Western Rift	5.9	Landslides
18 March 1945	Sembabule (40 km north of Masaka town)	6.0	Five persons died and destruction of some buildings
20 March 1966	Toro, Western rift	6.6	150 people died & over 1300 persons injured; loss of properties worth \$ 1 million
07 September 1990	Lake Victoria, near Kampala	5.0	Destroyed semi-permanent buildings
09 October 1991	Butiaba Port, Lake Albert, Western Rift	5.3	Destroyed semi-permanent buildings
05 February 1994	Kisomoro, Toro, Western Rift	6.2	Eight people died, destruction of property worth \$ 61

Source: World Health Organization and US Geological Survey’s Earthquake Program

Results from the participatory assessment in Isingiro district indicated that at least all the sub-counties of the district experience minor tremors that cause minor cracks on houses. Geological mapping undertaken by the Geological Surveys and mines (2012) indicated that the east part of the district (Endiizi sub-county) has anticlines, synclines and lithological veins which are lines of weakness that could propel the effect of the earth quakes.

2.3.3 CLIMATOLOGICAL OR METEOROLOGICAL HAZARDS

2.3.3.1 Floods

Results from the Participatory assessment indicated that Floods occur in this district during rainy seasons every year washing away peoples' gardens and causing livestock diseases. The most affected sub-counties were indicated as Oruchinga wetland system in Kajaho trading centre in Kikagate sub-county and Isingiro TC, areas around L. Nakivale i.e. Rugaaga, Kashumba, Isingiro TC and Kabingo sub-counties. This information was integrated with the spatial modelling using socio-ecological spatial data i.e. generated from Soil texture (data for National Agricultural Research Laboratories – Kawanda (NARL) 2014, Rainfall (Meteorology Department 2014), Digital Elevation Model (DEM), SLOPE, ASPECT (30m resolution data from SRTM Shuttle Radar Topography Mission (SRTM)). Figure 8 shows areas vulnerable to floods. The map also shows hot spot areas where floods have occurred in the past 20 years



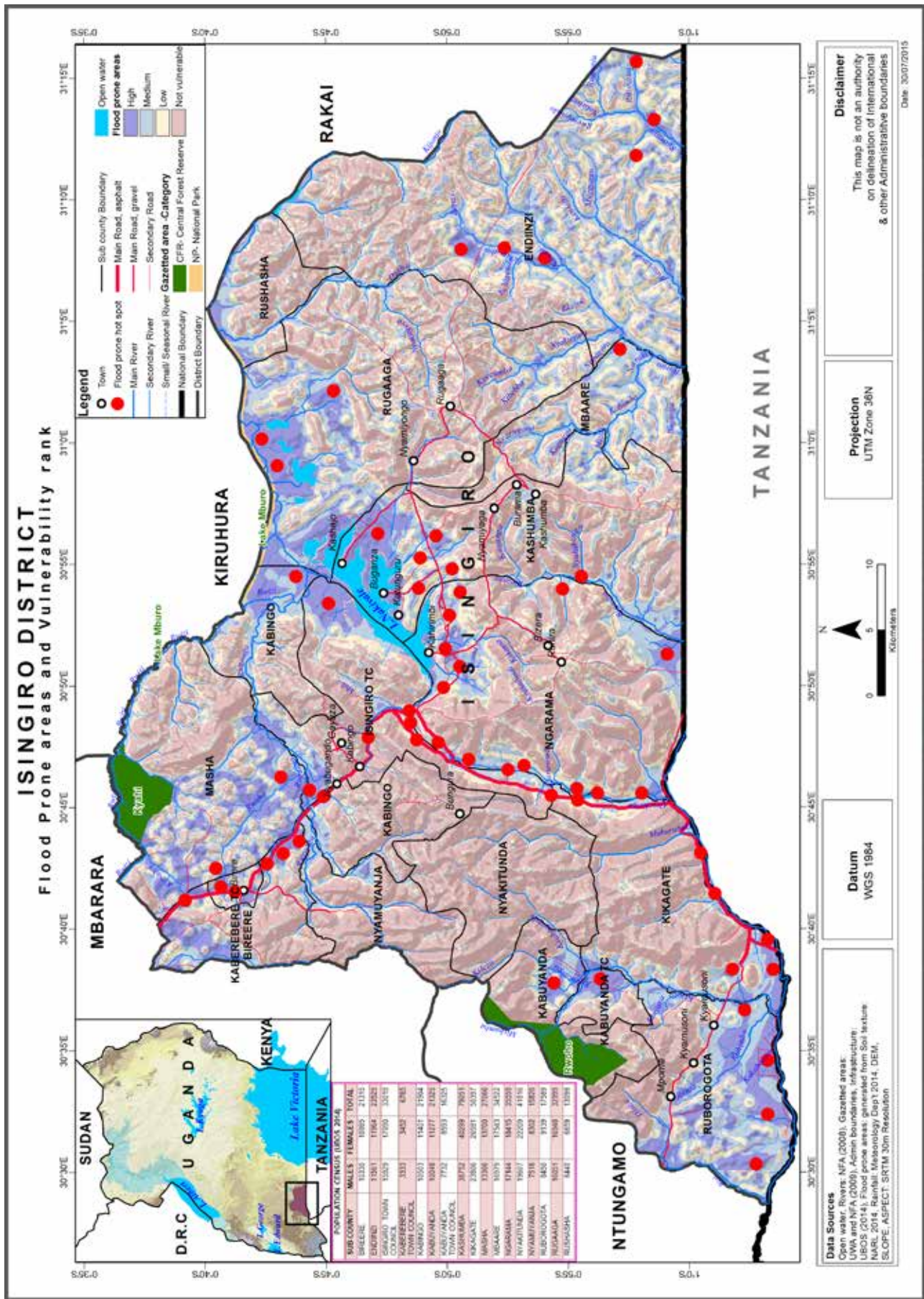


Figure 8: Flood prone areas, Isingiro District

2.3.3.2 Drought

Droughts are experienced in form of prolonged dry days without any rain. The events are seasonal and last at least 5 months between September – December and January to March. Results from the Participatory assessment indicated that drought events have been on the increase in terms of frequency (experienced every rainy season), destructiveness and extent for the past 20 years. The most affected sub-counties were indicated as Kikagate and Masha Rugaaga, Kashumba, Isingoro TC, and Ngarama in order of severity. These have led to famines, scarcity of water, low incomes, increased disease occurrences, reduced pastures and dust pollution. This information was integrated with the spatial modelling using socio-ecological spatial data i.e. generated from Rainfall and Temperature (Meteorology Department 2014) using the WASP index. Figure 9 shows areas vulnerable to drought.

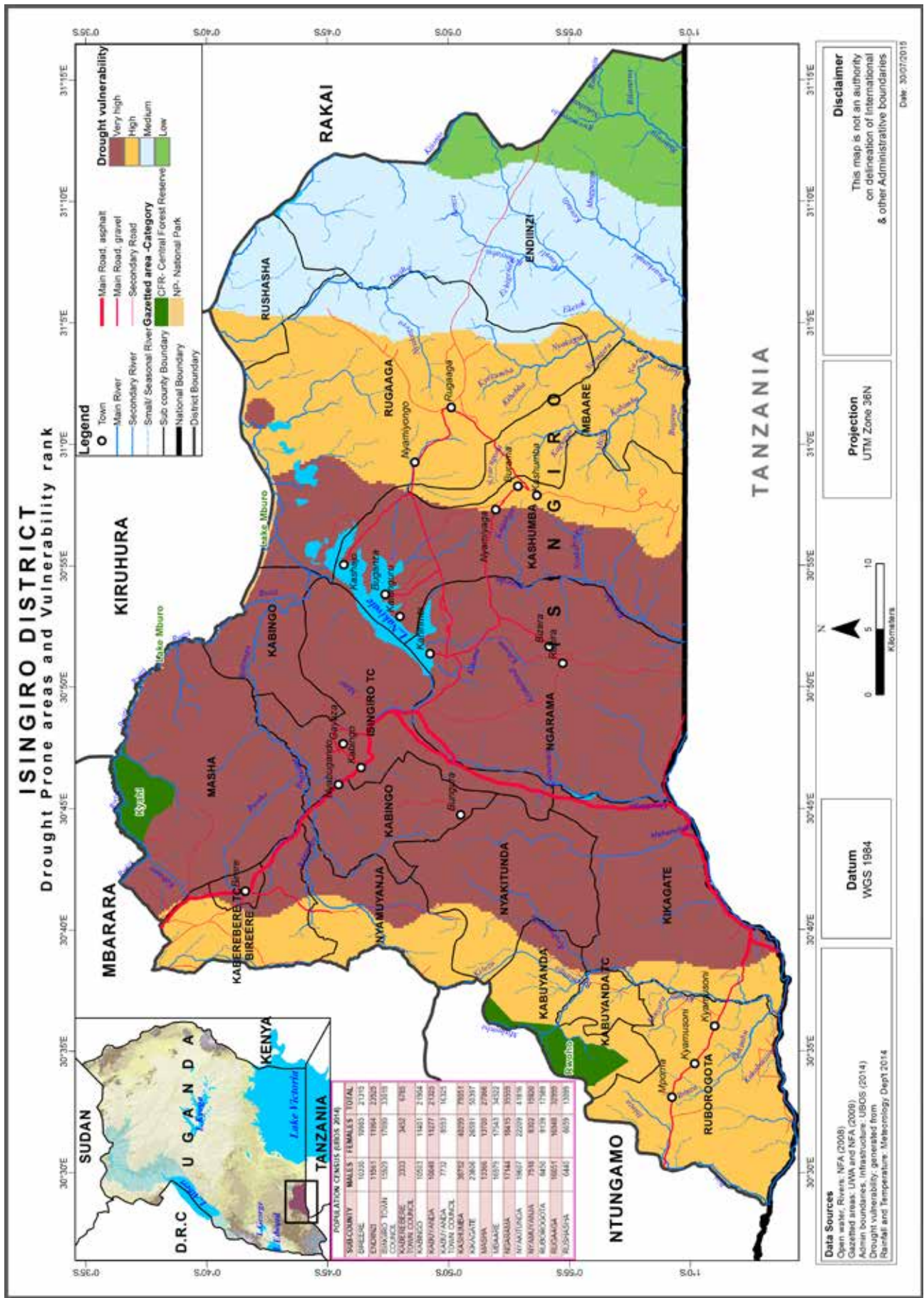


Figure 9: Drought prone areas, Isingiro District

2.3.3.3 Hailstorms

Participants observed that hailstorms have become persistent in the district. The particle size of hails has also increased compared to the past 20 years. Besides, in the 1990s, the prevalence of hailstorms was limited. In the present period; hailstorms are experienced every season with devastation on crops. This devastation causes considerable economic losses across the season particularly if they occur at a critical phonological stage of plant growth such as at flowering of beans. In addition, the rainfall associated with hailstorms often last approximately 2 hours. Participants also observed additional string of impacts arising from hailstorms including: animal deaths, soil erosion as well as destruction of houses and health centre. The most affected sub-counties were indicated as Nyakitunda, Kabingo, Isingiro T.C, Kikagate and Ngarama in order of severity

2.3.3.4 Strong winds

The long-term wind speed records from the East African Meteorological Department (1975) indicate average annual wind speeds of 3 knots and 5 knots at 0600 hours and 1200 hours for Mbarara which is adjacent to Isingiro district. The general conclusion from these climatic figures is that for most of the year, Isingiro experiences moderate to strong and gusty winds. Results from the Participatory assessment indicated that strong winds destroy crops especially in hilly areas causing food insecurity, malnutrition and poverty. The most affected sub-counties were indicated as Nyakitunda, Kabingo, Isingiro T.C, Kikagate and Ngarama in order of severity

2.3.3.5 Lightening

Lightning is a sudden high-voltage discharge of electricity that occurs within a cloud, between clouds, or between a cloud and the ground. The distribution of lightning on Earth is far from uniform. The ideal conditions for producing lightning and associated thunderstorms occur where warm, moist air rises and mixes with cold air above. These conditions occur almost daily in many parts of the Earth and rarely in other areas. Globally, there are about 40 to 50 flashes of lightning every second or nearly 1.4 billion flashes per year. These electrical discharges are powerful and deadly. Each year, lightning strikes kill people, livestock, and wildlife.

From the FGDs conducted in Isingiro district, participants observed an increased evidence of lightning and thunder in the district during heavy rains. They were however non-committal on the possibility of the cause of an increased occurrence of lightening in the area. It was indicated that Nyakitunda, Kabingo, Isingiro T.C, Kikagate and Ngarama are the most affected in order of severity. Figure 10 shows areas vulnerable to Hailstorms, strong winds and lightening.

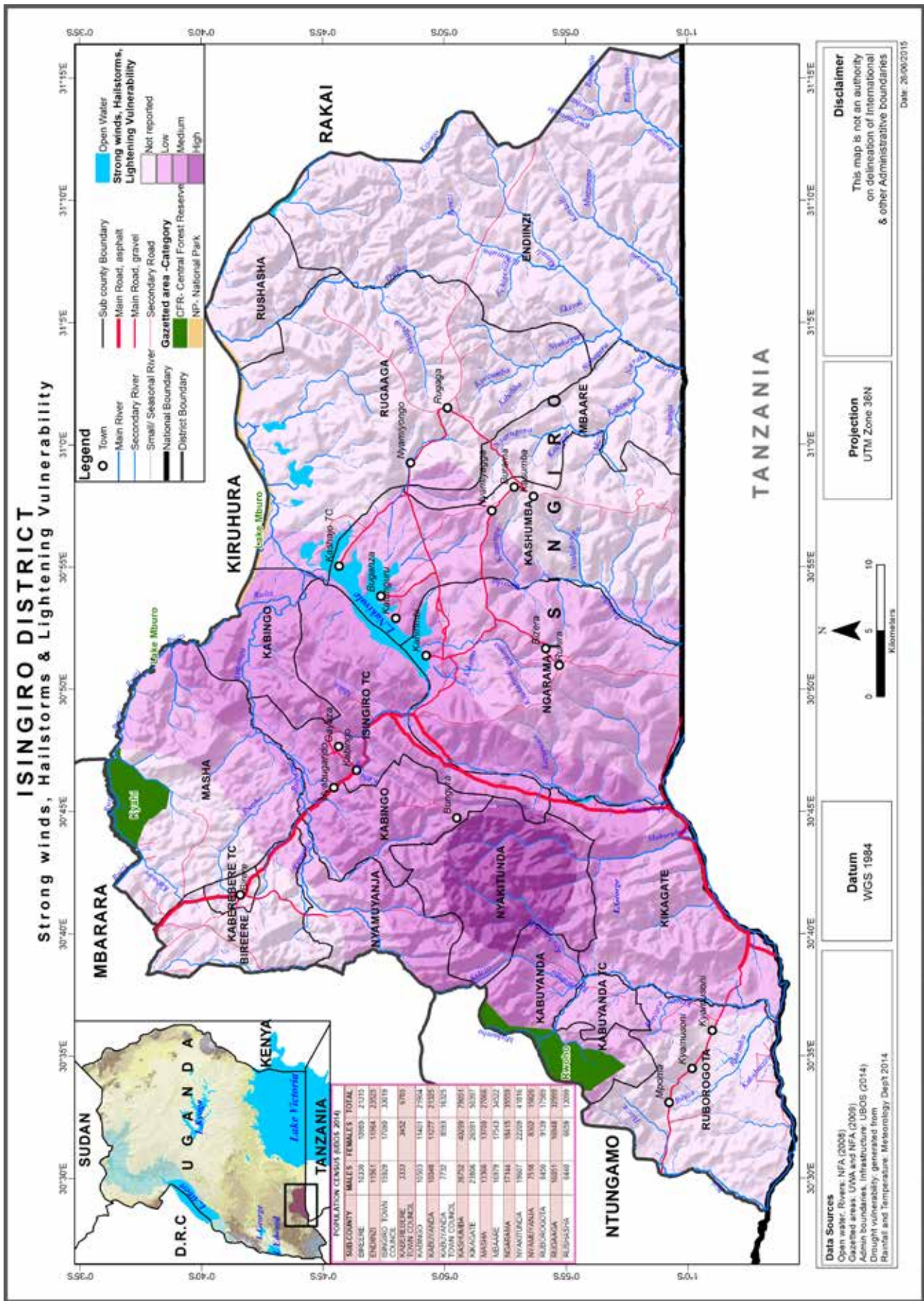


Figure 10: Hailstorms, Strong winds, Lightning prone areas, Isingiro District

2.3.4 ECOLOGICAL OR BIOLOGICAL HAZARDS

2.3.4.1 Crop Pests and Diseases

Participatory assessment through the FDG discussions indicated that; Crop pests and diseases are a serious issue as the district is located in banana-coffee agro-ecological zone. Most affected crops include banana and coffee and the most reported crop disease include: BBW, Coffee wilt, Panama wilt, Cassava mosaic. Most reported crop pests included: Black coffee twig borer, Root mealy bug, aphids in eucalyptus (new attack reported to Ministry of Environment but no response had been made). It was indicated that crop pests and diseases incidences in terms of frequency, destructiveness and extent have been on the increase over the last 20 years. It was indicated that Isingiro TC, Kikagate are the most affected in order of severity. Figure 11 shows areas where crop pests and disease are common and raking.

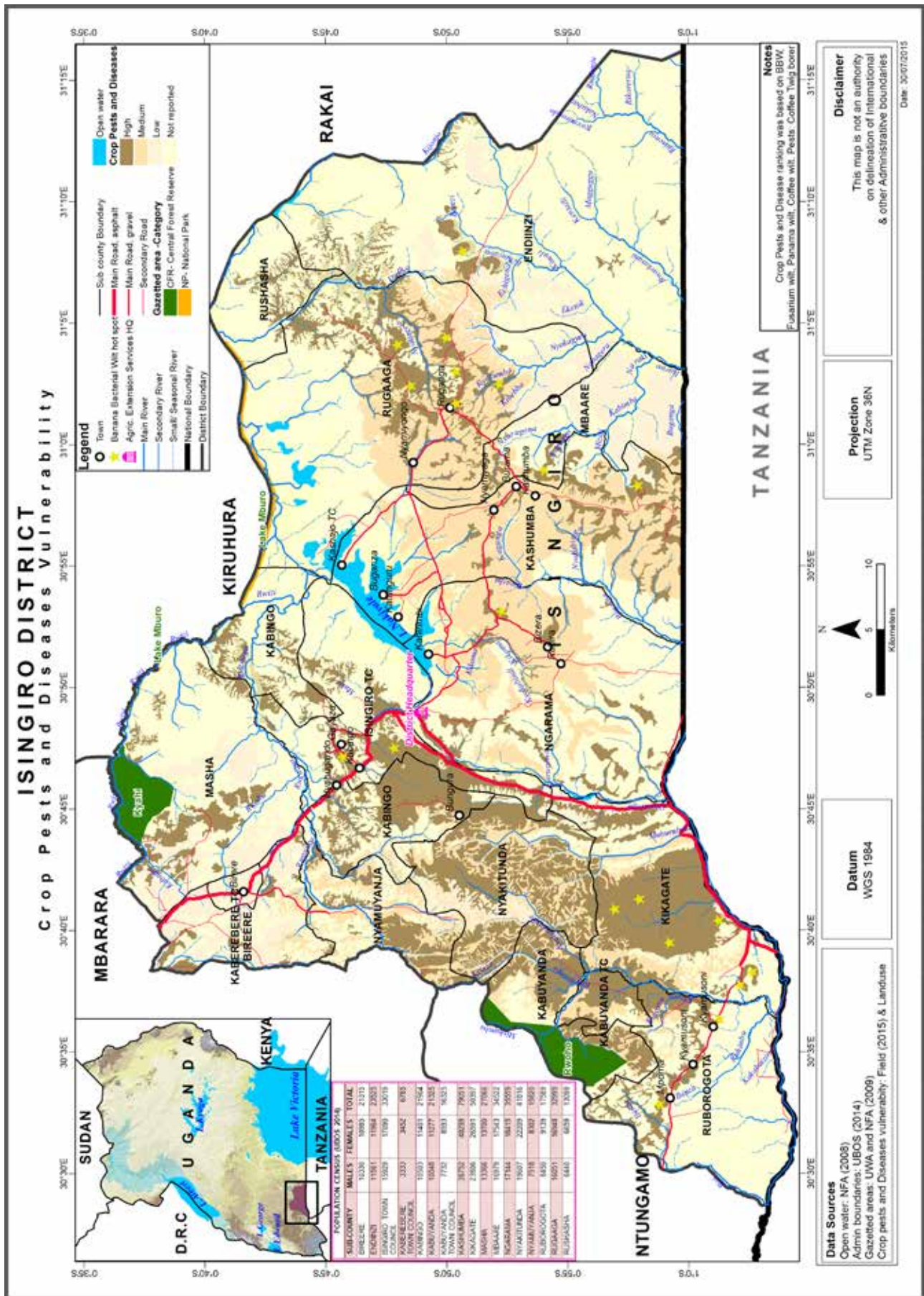


Figure 11: Crop Pests and Diseases Vulnerability Ranking, Isingiro District

2.3.4.2 Livestock Pests and Diseases

Participatory assessment through the FDG discussions indicated that; Livestock pests and diseases are a serious issue as the district is located in cattle corridor and the most affected livestock are cattle and goats. The most reported Livestock pests include: ticks, heart water worms, and biting flies as the major threat for livestock both cattle and small ruminants. Participants were also categorical on the New castle disease, FMD, East Coast fever and Anaplasmosis as diseases of economic importance due to the associated cattle and goats' losses among others. Several measures have been taken by the district authorities including: quarantine, mass immunization and sensitizing farmers on livestock disease outbreaks. It was indicated that almost all sub-counties in the district are affected by Livestock pests and diseases. However sub-counties bordering Tanzania i.e. Kikagate, Ruborogota, Endinzi, Kashumba and Mbaare were identified as most affected in order of severity. Figure 12 shows areas vulnerable to Livestock pests and diseases.

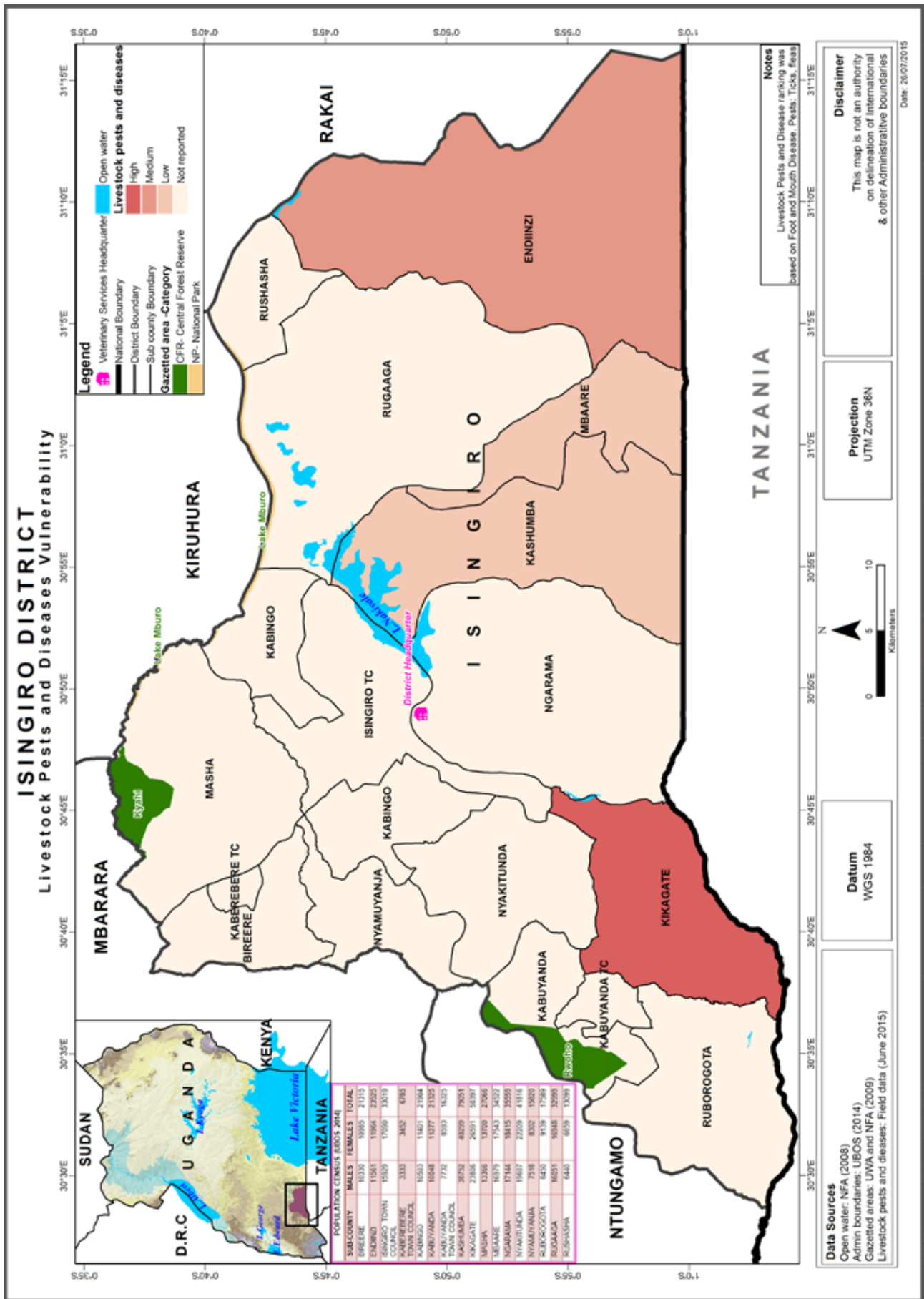


Figure 12: Livestock Pests and Diseases Vulnerability Ranking, Isingiro District

2.3.4.3 Human Diseases outbreaks

Most reported human diseases outbreaks in Isingiro district included: HIV, TB, Brucella, STIs and Malaria. It was indicated that commonest vectors are mosquitoes and fleas. Children were the most vulnerable to malaria. Almost all sub-counties in the district are affected by Human epidemic diseases. HIV rates reported at highest in the Municipality.

2.3.4.4 Vermin and Wild-life Animal Attacks

Isingiro district borders with L. Mburu National Park in the northern direction of the district. Sub-counties bordering with Lake Mburu National Park include: Rugaaga, Kabingo and Masha. The district is also endowed with Lake Nakivale Ramsar site being shared by 4 sub-counties and 1 Town council: Kashumba, Kabingo, Ngarama, Rugaaga and Isingiro Town council. Crop raiding by Vermin such as monkeys, rats, squirrels were also reported for areas neighboring L. Mburu National Park and Incidences of wild-life animal attacks are common around Lake Nakivale Ramsar site

Wild-life animal attacks such as crocodiles in River Kagera were reported in Kikagate Town Board, Katanga, Kyezimbire, Nyakayozo, Ruyanga parishes in Kikagate sub-county. Wild-life animal attacks cause loss of lives especially when people go to the river to fetch water, livestock loss, crop destruction. Other most affected sub-counties include: Kashumba, Kabingo, Ngarama, Rugaaga and Isingiro Town council. These sub-counties are neighboring with both Lake Mburu National Park and Lake Nakivale Ramsar site and wild-life animals such as crocodiles, buffaloes attack the people. However Wild-life animal attacks were reported as least significant problem. Figure 13 shows areas vulnerable to Vermin and Wild-life animal attacks and a few hot spots where Wild-life animal attacks have occurred in the past 10 years.

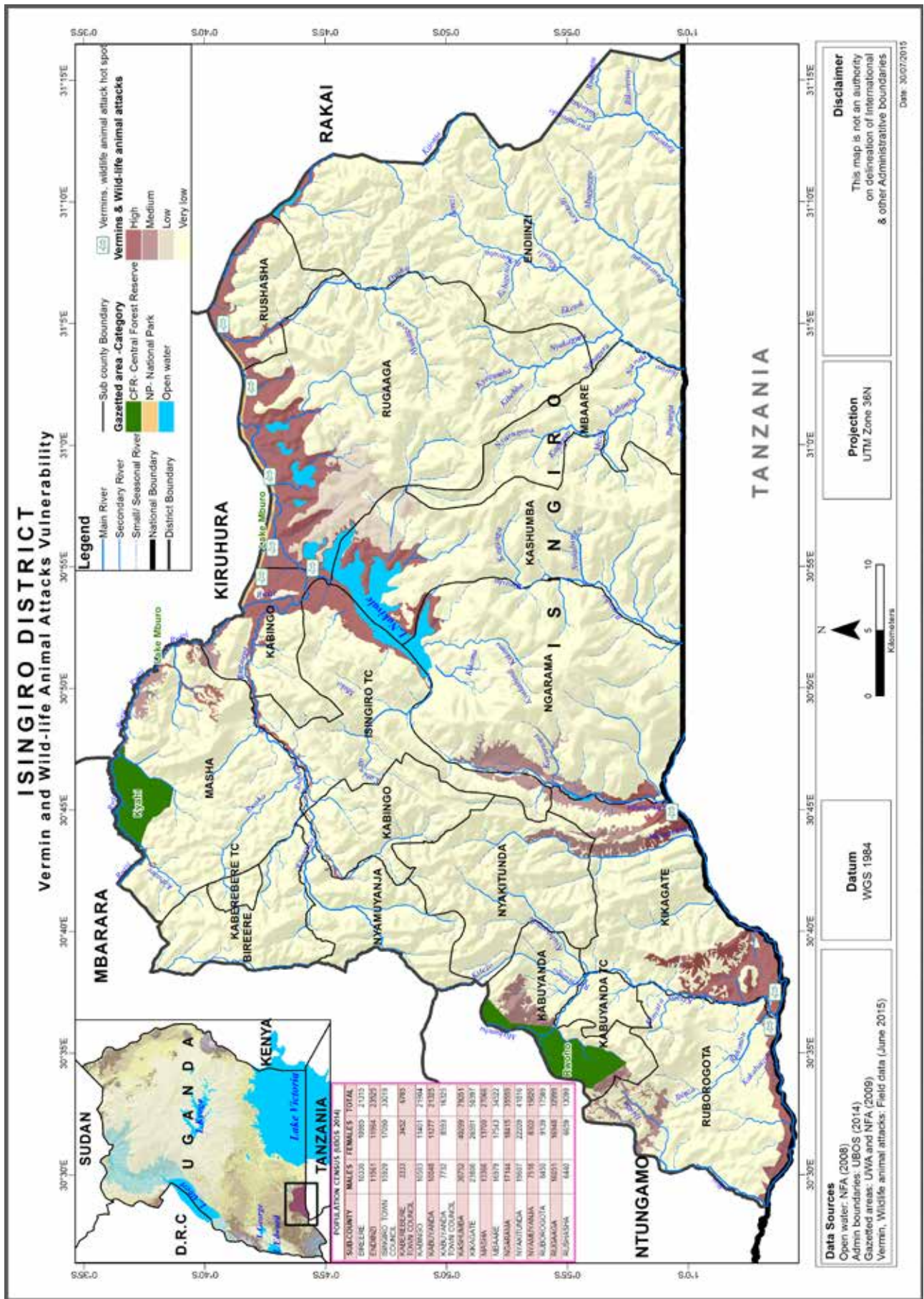


Figure 13: Vermin, Wild-life Animal Attack prone areas and Ranking, Isingiro District

2.3.4.5 Invasive species

Results from the participatory assessment identified *Lantana camara*, *Acacia hockii* and *Paspalum Spp* as some of the most common invasive species present in parts of Isingiro Town Council, and sub-counties such as Endiizi, Rugaaga, Ngarama and Ruborogata (Figure 14). Some of these species are toxic and have led to livestock (cattle) deaths. Invasive species have reduced productivity of farm and pasture lands yet their management is almost impossible at household/ community level due to the high costs involved in their removal. Communities have tried to control these invasive species by bush burning.



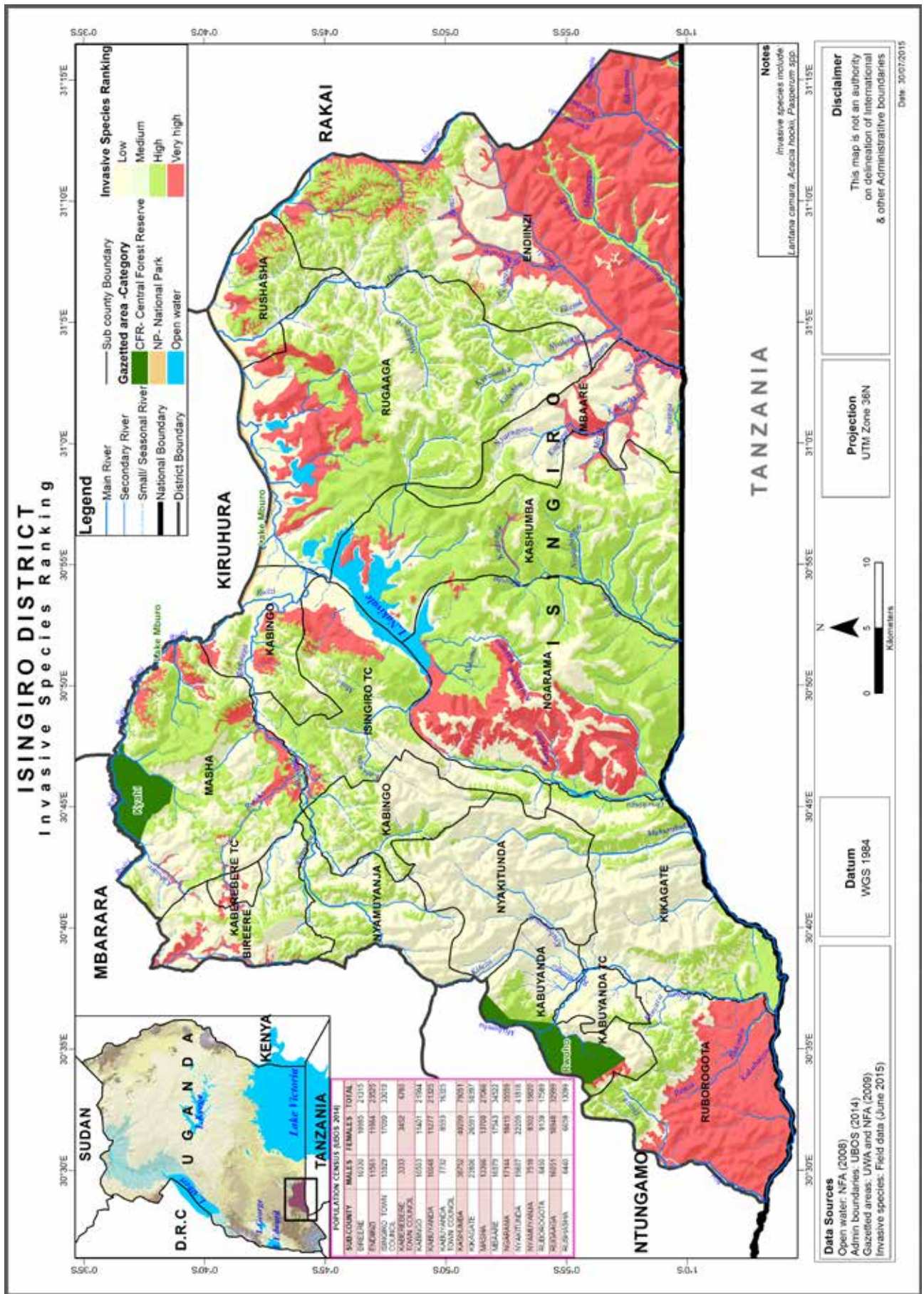


Figure 14: Invasive Species Ranking, Isingiro District

2.3.5 HUMAN INDUCED OR TECHNOLOGICAL HAZARDS

2.3.5.1 Bush fires

Human induced fires are the most experienced especially on hillslopes in Isingiro district. Cattle grazing communities most culprits as they use fires in anticipation that this allows regeneration of forage for their livestock. Most fires are observed during the dry season (5 months from November to March). Bush fires cause burning of adjacent crop gardens, loss of forests tree plantations, increased occurrence of rockslides and soil erosion. Bush fires were reported to be accidental, malicious and intentional however there are less occurrences in Town Councils. Most affected sub-counties on bare hills of especially Kikagate, Nyakitunda, Nyamuyanja, Rugaaga in order of severity. Figure 15 shows areas vulnerable to bush fires. The map also shows hot spot areas where Bush fires had occurred during the field work period (June 2015).



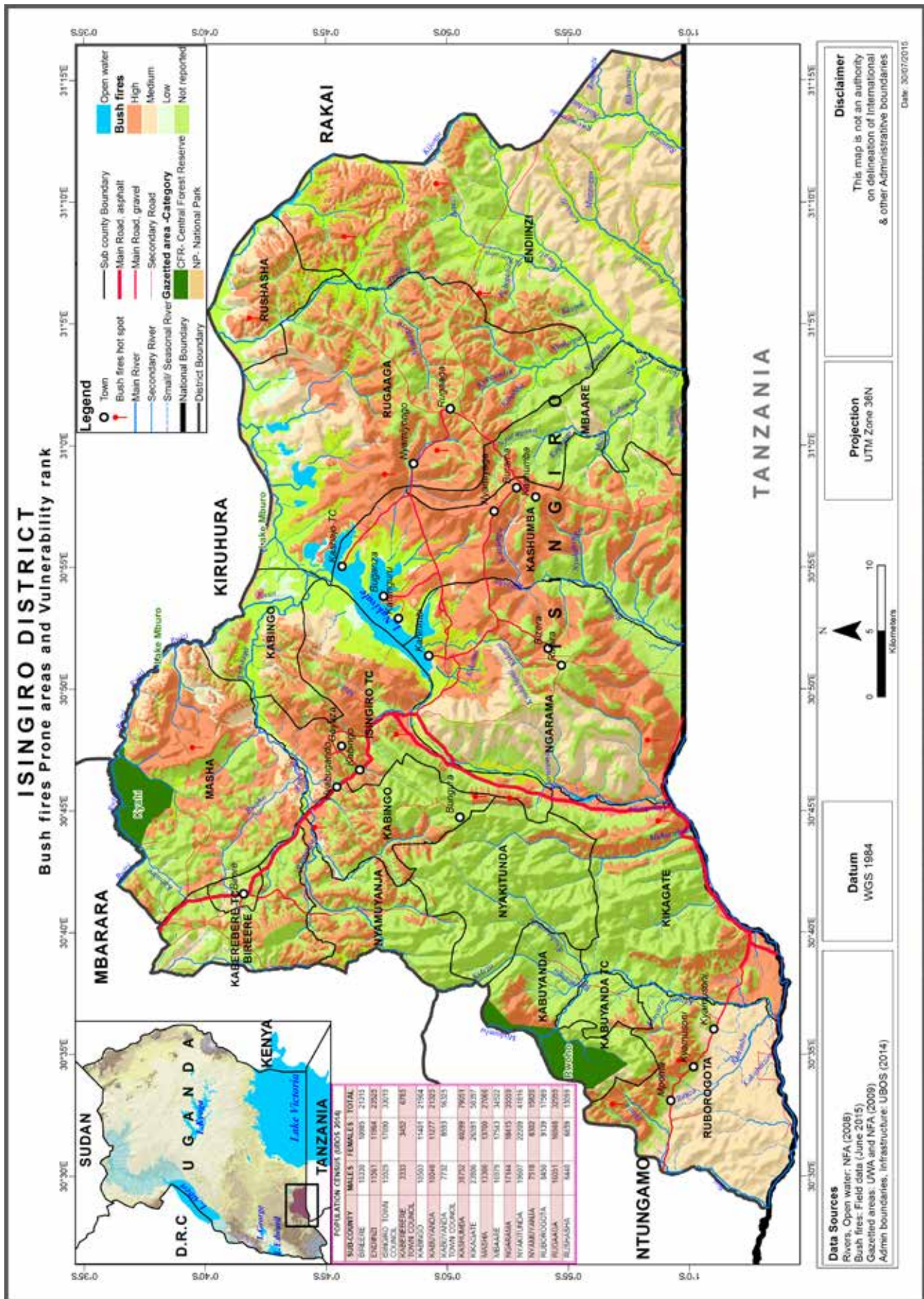


Figure 15: Bush fires prone areas and Ranking, Isingiro District

2.3.5.2 Road Accidents

Some areas of the district experience road accidents including head on collisions, overturning of heavy trucks loaded with food stuffs, fuel trucks, causing loss of lives and property. Causative agents include: over speeding, over loading, Road accidents attribute to banana trucks, corruption from traffic officers, stealing road sign posts and these are missing at critical spots. Vulnerable hot spots with reported incidences were along Mbarara - Kikagate highway (Isingiro road). Figure 16 shows accident prone roads and a few hot spots or black spots where road accidents have occurred in the past 5 years.

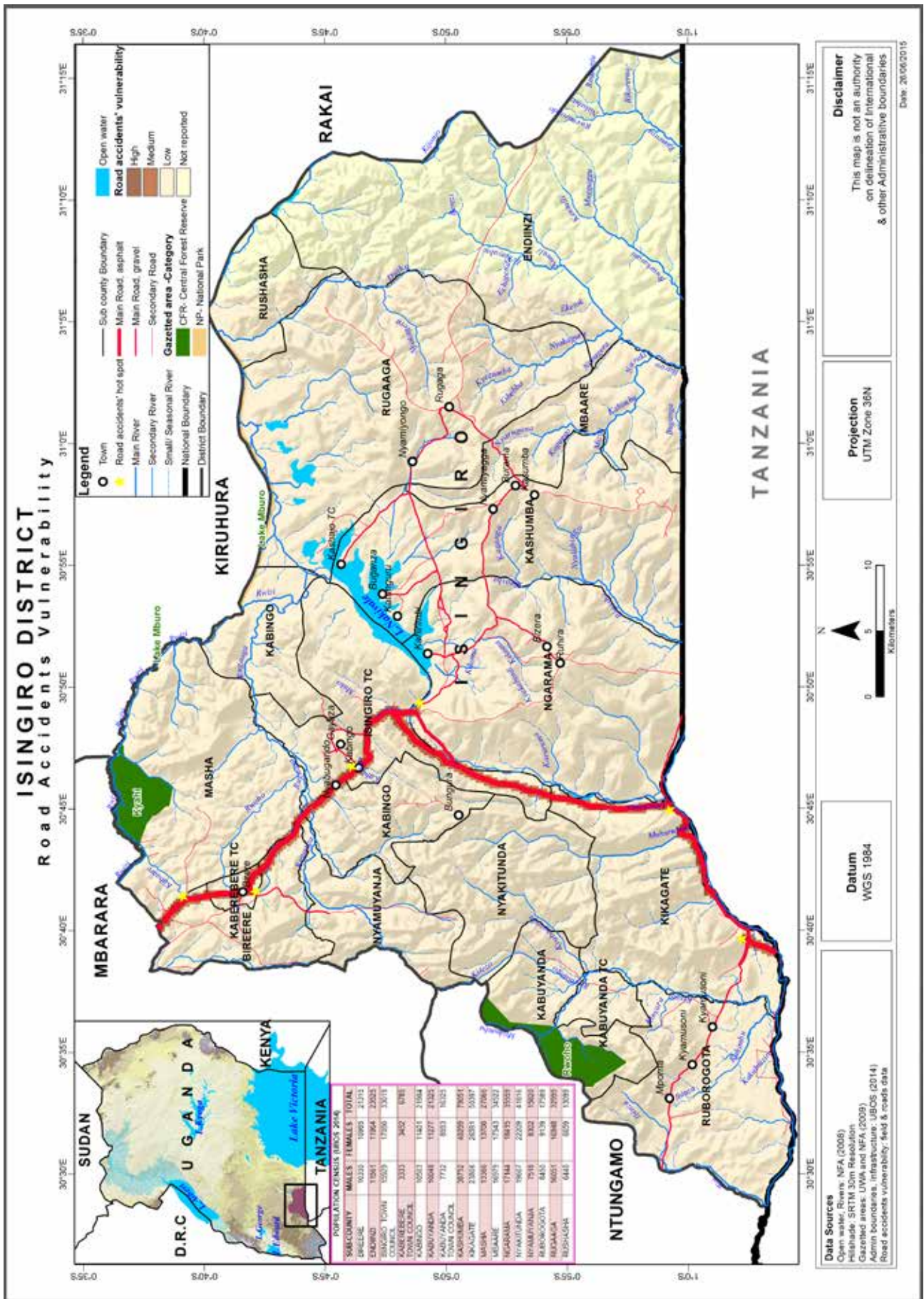


Figure 16: Road Accidents Vulnerability Ranking, Isingiro District

2.3.5.3 Land Conflicts

Land conflicts are rampant in the district ranging from those between households, communities as well as between government and communities. Some conflicts emanate from ownership, boundary to user rights. Results from the participatory assessment indicated that land conflicts have majorly been triggered by increased population growth rates, family misunderstandings, and un-documented land titles among others. Family land wrangles were reported as most common and most of the cases in the District court are land conflict related. Land conflicts are common in areas around Nakivale refugee settlement where people bought settlement land unknowingly and are being displaced by the government due to refugee influx in the area. These are more pronounced in Kashumba, Rugaaga and Ngarama although almost all sub-counties in the district are affected by land conflicts (Figure 17). Extreme cases have resulted into loss of land, human death, and migrations.



Plate 2: Lake Nakivale adjacent to Nakivale Refugee Settlement

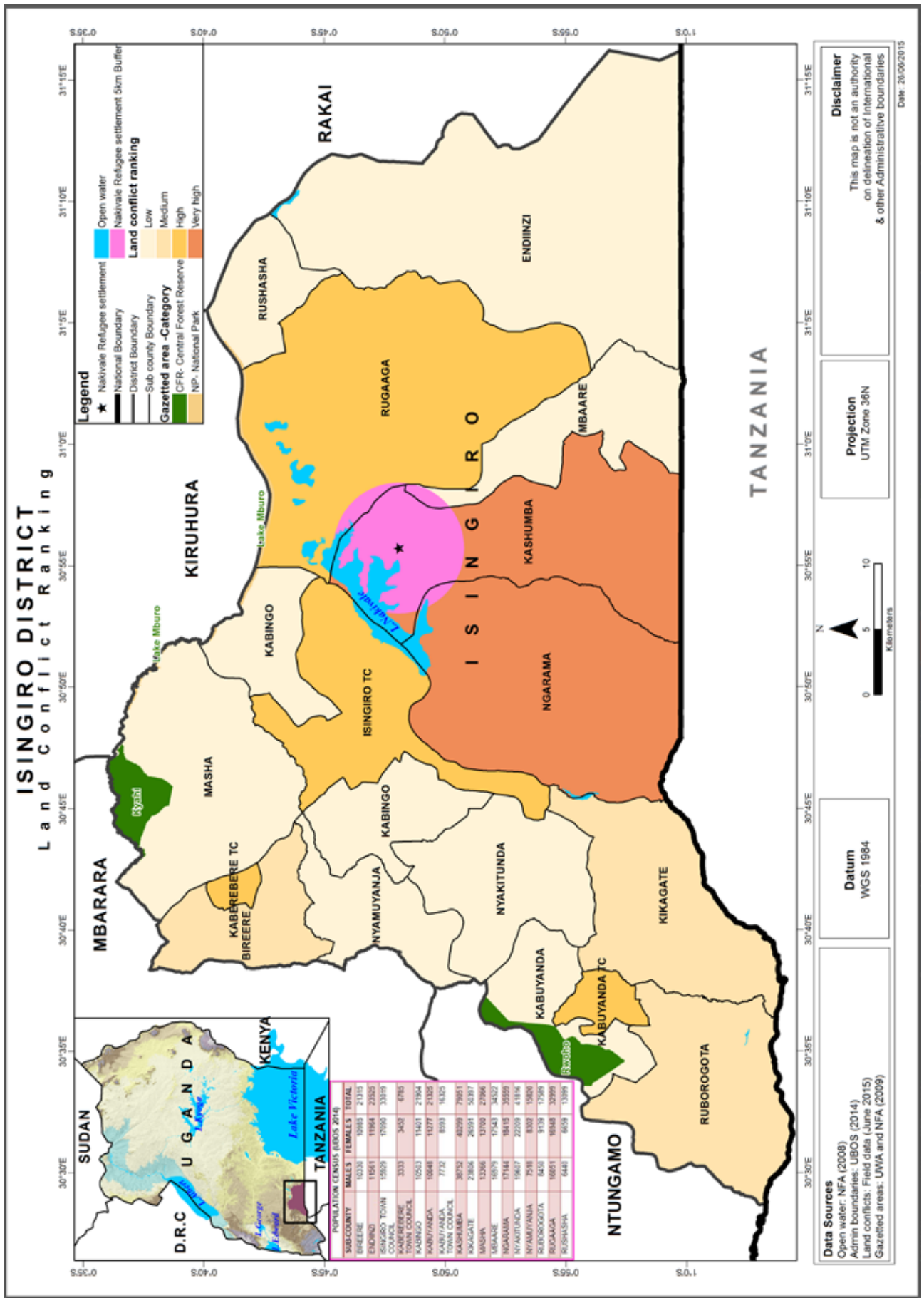
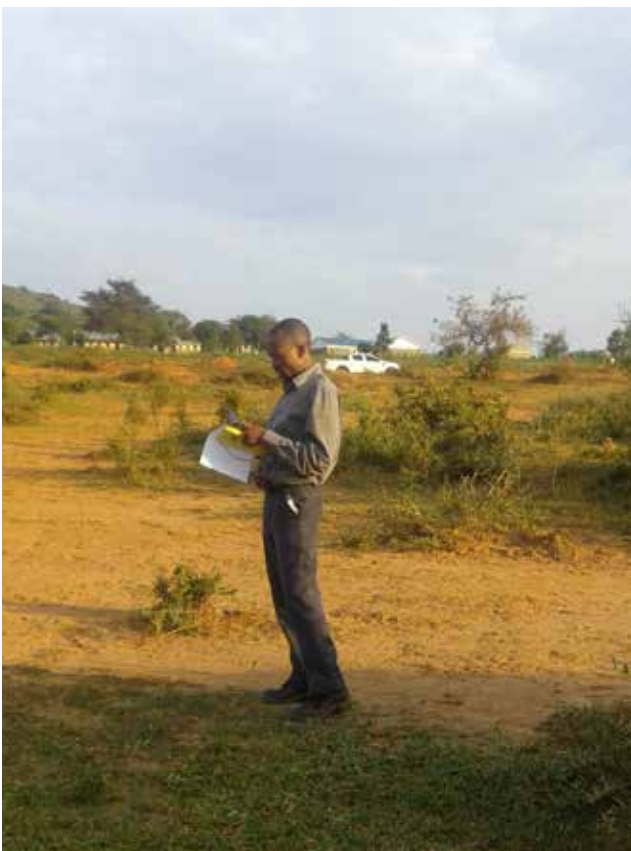


Figure 17: Land conflict Ranking, Isingiro District

2.3.5.4 Environmental Degradation

Environmental degradation such as land and wetland degradation is mainly caused by wetland reclamation for animal grazing and crop production. Results from the participatory assessment indicated incidences of sand mining in Kikagata sub-county causing deaths and degradation, degradation of the River Kagera basin due to Tin mining and conservation challenges of deforestation in the refugee settlement areas. Other reported environmental degradation activities include stone quarrying in Kikagata, brick making in the Oruchinga wetland system and bush burning in the hillslopes. Hotspots for environmental degradation include sub-counties such as Kikagata, Ruborogota, Ngarama, Isingiro Town council where increased siltation rates of rivers and ponds, bare lands due to loss of vegetation; and low crops yields are evident. Figure 18 shows environmental degradation risk areas and a few hot spots where environmental degradation has occurred in the past 10 years.



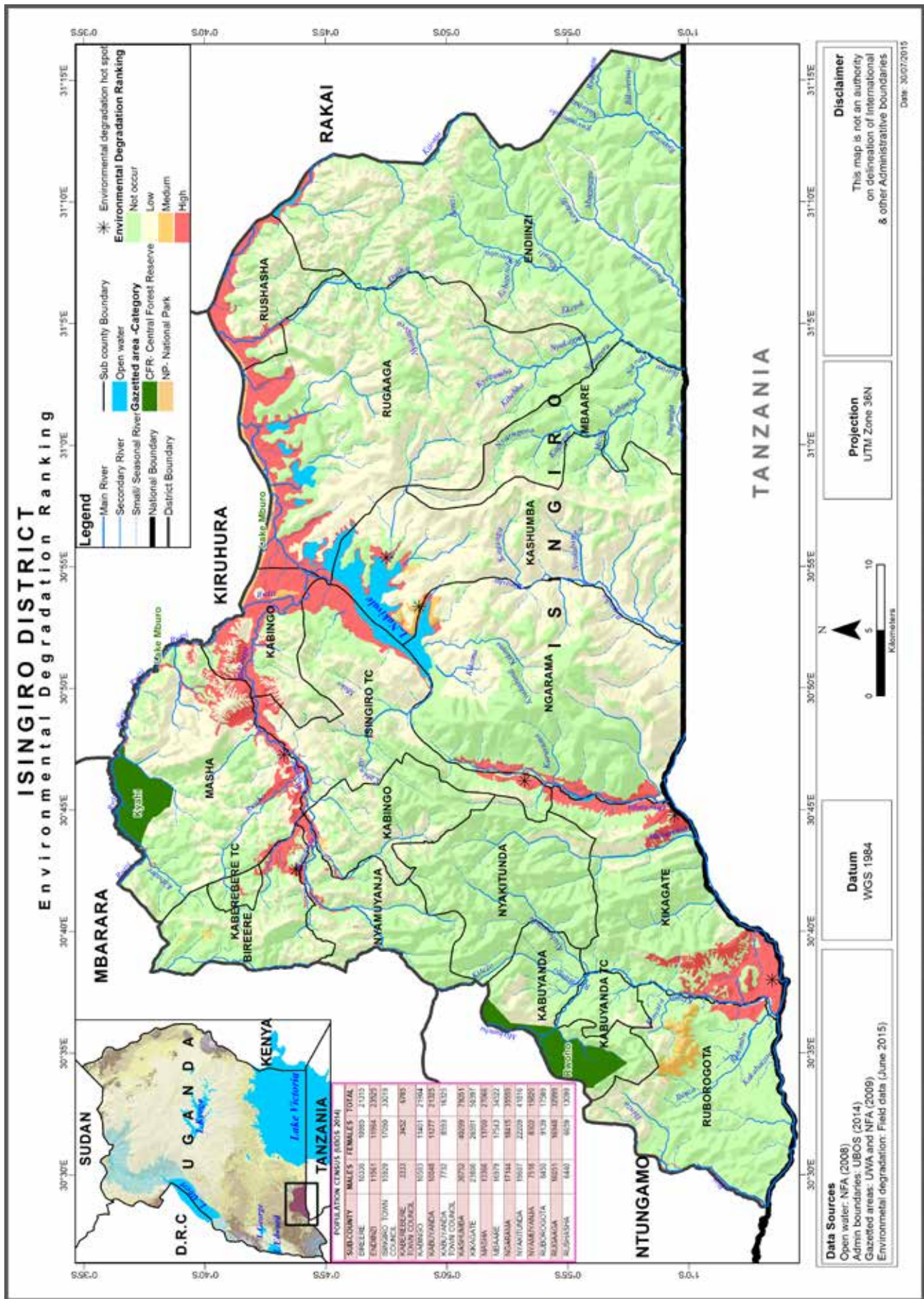


Figure 18: Environmental Degradation Ranking, Isingiro District

2.4 COPING STRATEGIES

A range of coping strategies were indicated by the local communities in response to the various hazards that affect them. The coping strategies identified are broad and interactive often tackling more than one hazard at a time and the focus of the communities towards adaptation actions and processes including social and economic frameworks within which livelihood and mitigation strategies take place; ensuring extremes are buffered irrespective of the direction of climate change and better positioning themselves to better face the adverse impacts and associated effects of geomorphological, climatological, ecological and human induced or technological hazards (Table 3).

Table 3: Coping strategies to the Multi-hazards in Isingiro District

No	Multi-Hazards	Coping strategies
1	Geomorphological or Geological	Landslides, Rock falls and Erosion <ul style="list-style-type: none"> • Migration to safe areas • Terracing/ contour farming • Plant trees to control water movement on hill slopes • Mulching in banana plantations • Plant grass in banana plantations on hill slopes • Removal of stones from banana farmlands
2		Earthquakes and faults <ul style="list-style-type: none"> • No action, communities think the tremors are minor
3	Climatological or Meteorological	Floods <ul style="list-style-type: none"> • Digging up of trenches in the flood plains • Planting trees to control water movement to flood plains • Migration to other areas • Seek for government food aid
4		Drought <ul style="list-style-type: none"> • Leave wetlands as water catchments • Plant trees as climate modifiers • Buy food elsewhere in case of shortage • Buy water from the nearby areas • Food Storage especially dry grains
5		Strong winds, Hailstorms and Lightening <ul style="list-style-type: none"> • Plant trees as wind breakers • Use of stakes against wind in banana plantations • Use of ropes to tire banana against wind • Installation of lightening conductors • Stay indoors during rains • Changing building designs and roof types • Removal of destroyed crops • Request for aid from the Office of the Prime Minister • Installation of lightening conductors on newly constructed schools
6	Ecological or Biological	Crop pests and Diseases <ul style="list-style-type: none"> • Spraying pests • Cutting and burying BBW affected crops • Burning of affected crops • Vigilance
7		Livestock pests and Diseases <ul style="list-style-type: none"> • Spraying pests • Vaccinations • Burying animals that have died from infection • Quarantine
8		Human epidemic Diseases <ul style="list-style-type: none"> • Mass immunisation • Visiting health centres • Use of mosquito nets
9		Vermin and Wild-life animal attacks <ul style="list-style-type: none"> • Guarding the gardens • Poisoning • Hunt and kill • Report to UWA
10	Invasive species <ul style="list-style-type: none"> • Uproot • Cut and burn • Sensitization on Invasive species management 	

11	Human induced or technological	Land conflicts	<ul style="list-style-type: none"> • Community dialogues • Report to court • Migration
12		Bush fires	<ul style="list-style-type: none"> • Stop the fires in case of fire outbreak • Fire lines (may be constructed, cleared grass) • Fire breaks planted along gardens e.g. euphorbia spp. • Vigilance especially in dry seasons where most burning is done
13		Road accidents	<ul style="list-style-type: none"> • Construction of humps • New road has Signage including speed limits • Sensitisation
14		Environmental degradation	<ul style="list-style-type: none"> • Leave wetlands as water catchments • Plant trees as climate modifiers • Sensitization

2.5 VULNERABILITY PROFILES

Vulnerability depends on low capacity to anticipate, cope with and/or recover from a disaster and is unequally distributed in a society. The vulnerability profiles of Isingiro district were assessed based on exposure, susceptibility and adaptive capacity at community (village), parish, sub-county and district levels highlighting their sensitivity to a certain risk or phenomena. Indeed, vulnerability was divided into biophysical (or natural including environmental and physical components) and social (including social and economic components) vulnerability. Whereas the biophysical vulnerability is dependent upon the characteristics of the natural system itself, the socio-economic vulnerability is affected by economic resources, power relationships, institutions or cultural aspects of a social system. Differences in socio-economic vulnerability can often be linked to differences in socio-economic status, where a low status generally means that you are more vulnerable.

Vulnerability was assessed basing on two broad criteria i.e. socio-economic and environmental components of vulnerability. Participatory approach was employed to assess these vulnerability components by characterizing the exposure agents, including hazards, elements at risk and their spatial dimension. Participants also characterized the susceptibility of the district including identification of the potential impacts, the spatial disposition and the coping mechanisms. Participants also identified the resilience dimension at different spatial scales (Table 4).

Table 5 (Vulnerability Profile) shows the relation between hazard intensity (probability) and degree of damage (magnitude of impacts) depicted in the form of hazard intensity classes, and for each class the corresponding degree of damage (severity of impact) is given. It reveals that climatological and meteorological hazards in form of drought and hailstorms predispose the community to high vulnerability state. The occurrence of pests and diseases and lightening, also create a moderate vulnerability profile in the community (Table 5). Table 6 shows the Hazard assessment for Isingiro district.

Table 4: Components of vulnerability in Isingiro District

Vulnerability	Exposure			Susceptibility			Resilience
	Hazards	Elements at Risk	Geographical Scale	Susceptibility	Geographical Scale	Coping strategies	Geographical Scale
	Landslides, Rock falls and Soil erosion	<ul style="list-style-type: none"> - Human and livestock adjacent to hill slopes - Crops on hill slopes - Infrastructure e.g. houses, schools, roads adjacent to hill slopes 	Parish	<ul style="list-style-type: none"> - Loss of lives - Complete crop failure - Destruction of infrastructure e.g. houses, and schools 	Parish	<ul style="list-style-type: none"> -Migration -Sensitization by both government and non-governmental agencies 	Parish
	Earth quakes	<ul style="list-style-type: none"> - Infrastructure e.g. houses, schools 	District	<ul style="list-style-type: none"> - Loss of lives - Destruction of Infrastructure e.g. houses, schools 	District	<ul style="list-style-type: none"> -No much measure so far 	District
	Floods	<ul style="list-style-type: none"> - Livestock adjacent to flood plain - Crops on flood plain - Infrastructure e.g. houses, schools, roads adjacent to flood plain 	Parish	<ul style="list-style-type: none"> - Livestock loss - Destruction of crops - Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain 	Parish	<ul style="list-style-type: none"> -Migration -Sensitization on wetland conservation -Dig trenches 	Parish
	Drought	<ul style="list-style-type: none"> - Livestock - Crops - Human population 	Village	<ul style="list-style-type: none"> - Hunger & poverty - Livestock loss - Crop failure - Shortage of pasture - Shortage of water 	Village	<ul style="list-style-type: none"> -Migration -Sensitization on tree planting -Buy food from elsewhere 	Village
	Hailstorms, strong winds and Lightening	<ul style="list-style-type: none"> - Human and livestock populations - Crops - Infrastructure e.g. houses, schools, health centres 	Parish	<ul style="list-style-type: none"> - Loss of lives - Destruction of crops - Destruction of infrastructure e.g. houses, schools, roads adjacent to flood plain 	Parish		Parish
	Crop Pests and Diseases	<ul style="list-style-type: none"> -Crops 	District	<ul style="list-style-type: none"> - Complete crop failure 	District	<ul style="list-style-type: none"> - Spraying - Cut and bury affected crops -Sensitization on crop disease management 	District
	Livestock Pests and Diseases	<ul style="list-style-type: none"> -Livestock (cattle, goats etc.) 	District	<ul style="list-style-type: none"> - Loss of livestock - Reduced livestock productivity 	District	<ul style="list-style-type: none"> - Vaccination - Bury and burn animals that have died from infection - Quarantine 	District

Socio-economic component	Human Disease outbreaks	- Human Population	District	- Loss of lives	District	- Mass Immunization - Use of mosquito nets	District
	Invasive species	-indigenous species -Animals	District	- Outcompete the indigenous spp., suppress growth of indigenous spp - Loss of indigenous spp. - Complete crop Failure - suppress growth of pasture	District	- Cut and burn -Sensitization on Invasive species management	District
	Bush fires	- Livestock - Crops - Infrastructure e.g. houses, schools	Sub-county	- Loss of livestock - Shortage of pasture - Destruction of crops - Destruction of infrastructure e.g. houses, schools	Sub-county	-Sensitization	Sub-county
	Road accidents	- Human population - Infrastructure adjacent to accident black spots e.g. houses, schools etc.	Sub-county	- Loss of lives - Destruction of vehicles - Destruction of Infrastructure adjacent to accident black spots e.g. houses, schools etc.	Sub-county	-Humps on roads -Signage on speed limits -Sensitization on traffic rules	Sub-county
	Land conflicts	- Human population	Village	-Loss of lives -Family violence and break outs	Village	- Community dialogue - District court in charge of land issues	Village
	Vermin and Wildlife animal attacks	- Human population - Livestock - Crops	Parish	-Loss of lives -Livestock loss -Crop destruction	Parish	- Report to UWA - Guard gardens -Poison -Hunt and kill -Fence water collection points with Wildlife animals	Village
	Environmental degradation	- Human and livestock populations - Crops - Natural vegetation	Sub-county	-Crop failure -Shortage of pasture -Shortage of water -Decline of water quality	Sub-county	-Sensitization on wetland conservation -Sensitization on tree planting -Setting bi-laws	Sub-county

Table 5: Vulnerability Profile for Isingiro District

	PROBABILITY	SEVERITY OF IMPACTS	RELATIVE RISK	VULNERABLE SUB COUNTIES
	<i>Relative likelihood this will occur</i>	<i>Overall Impact (Average)</i>	<i>Probability x Impact Severity</i>	
Hazards	1 = Not occur 2 = Doubtful 3 = Possible 4 = Probable 5 = Inevitable	1 = No impact 2= Low 3=medium 4 = High	0-1= Not Occur 2-10= Low 11-15=Medium 16-20= High	
Floods	5	4	20	Oruchinga wetland system in Kajaho trading centre in Kikagate sub-county and Isingiro TC. Other sub-counties affected around L.Nakivale i.e. Rugaaga, Kashumba, Isingiro TC and Kabingo.
Droughts	5	4	20	Kikagate and Masha Rugaaga, Kashumba, Isingiro TC, and Ngarama are the most affected by drought.
Landslides, Rock falls and Soil erosion	3	2	6	Nyamuyanja, Nyakitunda, Rugaaga, Ngarama, Kabuyanda and Kikagate are the most affected.
Hail storms, strong winds and Lightening	5	4	20	Nyakitunda, Kabingo, Isingiro T.C, Kikagate and Ngarama are the most affected.
Bush fires	3	2	6	Most affected sub-counties on bare hills of Kikagate, Nyakitunda, Nyamuyanja, Rugaaga
Crop pests and diseases	3	4	12	Most affected sub-counties include: Isingiro TC, Kikagate
Livestock pests and diseases	4	3	12	Almost all sub-counties in the district are affected by these Crop pests and diseases. However Most affected sub-counties affected in order of severity: Sub-counties bordering Tanzania, Kikagate, Endinzi, Kashumba and Mbaare were the most affected.

Human Diseases outbreaks	5	2	10	Almost all sub-counties in the district are affected by Human epidemic diseases. HIV rates reported at highest in the Municipality
Land conflicts	5	3	15	Almost all sub-counties in the district are affected by land conflicts. Ngarama, Rugaga and Kashumba were the most affected.
Vermin and Wild-life animal attacks	3	2	6	Kikagate, Rugaga and Kashumba, Rushasha, Ruborogota, Isingiro TC, Kabingo are the most affected.
Earthquakes and faults	3	2	6	Minor tremors occur in all sub-counties of the district.
Road accidents	3	2	6	Vulnerable hot spots along Mbarara – Kikagate highway (Isingiro road)
Environmental degradation	5	2	10	

Note: This table presents relative risk for hazards to which the community was able to attach probability and severity scores

Key for Relative Risk

H	High
M	Medium
L	Low
	Not reported/ Not prone

Table 6: Hazard Risk Assessment

Hazard	Birere	Endlizi	Kabingo	Kabuyanda	Kashumba	Kikagate	Masha	Mbaare	Ngarama	Nyakitunda	Nyamuyanja	Ruborogota	Rugaaga	Rushasha	Isingiro T.C	Kaberebere T.C	Kabuyanda T.C
Floods	L	M	L	L	H	M	M	L	L		L	H	H	M	M	L	M
Drought	L	L	L	L	H	H	H	L	M	L	L	L	H	L	M	L	L
Landslides, Rock falls and Erosion	L	L	L	H	L	H	L	L	M	M	H	L	M	L	L	L	L
Strong winds, Hailstorms and Lightening	L	L	H	L	L	M	L	L	M	H	L	L	L	L	H	L	L
Crop pests and Diseases	M	L	L	L	L	H	L	L	M	L	L	L	M	L	H	M	L
Livestock pests and Diseases	L	H	L	L	H	H	H	M	L	L	L	L	M	L	L	L	L
Human Diseases outbreaks	L	L	L	L	L	H	L	L	L	L	L	L	L	L	H	H	H
Vermin and Wildlife animal attacks	L	L	L	L	M	M	L	L	L	L	L	M	H	M	M	L	L
Land conflicts	L	L	L	L	H	L	L	H	L	L	L	H	L	L	M	M	M
Bush fires	L	L	L	L	L	H	L	L	L	H	M	L	M	L	L	L	L
Environmental degradation	L	L	L	L	L	H	M	L	M	L	L	L	H	M	H	L	L
Earthquakes and faults	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Road accidents	L		L	L	L	H	L		M		L	L	L		H	H	M

Key

H	High
M	Medium
L	Low
	Not reported/ Not prone

2.6 GENERAL CONCLUSIONS AND RECOMMENDATIONS

2.6.1 Conclusions

The multi-hazard vulnerability profile output from this assessment was a combination of spatial modeling using socio-ecological spatial layers (i.e. DEM, Slope, Aspect, Flow Accumulation, Land use, vegetation cover, hydrology, soil types and soil moisture content, population, socio-economic, health facilities, accessibility, and meteorological data etc.) and information captured from District Key Informant interviews and sub-county FGDs using a participatory approach. The level of vulnerability was assessed at sub-county participatory engagements and integrated with the spatial modeling in the GIS environment.

Results from the participatory assessment indicated that Isingiro district has over the past two decades increasingly experienced hazards including landslides, rock falls, soil erosion, floods, drought, hailstorms, strong winds, lightening, crop pests and diseases, livestock pests and diseases, human disease outbreaks, vermin, wildlife animal attacks, invasive species, bush fires, road accidents and land conflicts putting livelihoods at increased risk. Generally drought and flooding were identified as most serious problem in Isingiro district with almost all sub-counties being vulnerable to the hazards. The limited adaptive capacity (and or/resilience) and high sensitivity of households and communities in Isingiro district increase their vulnerability to hazard exposure necessitating urgent external support.

Hazards experienced in Isingiro district can be classified as:

- i. Geomorphological or Geological hazards including landslides, rock falls, soil erosion and earth quakes.
- ii. Climatological or Meteorological hazards including floods, drought, hailstorms, strong winds and lightening
- iii. Ecological or Biological hazards including crop pests and diseases, livestock pests and diseases, human disease outbreaks, vermin and wildlife animal attacks and invasive species.
- iv. Human induced or Technological hazards including bush fires, road accidents land conflicts.

However, counteracting vulnerability at community, local government and national levels should be a threefold effort hinged on:

- i. Reducing the impact of the hazard where possible through mitigation, prediction, warning and preparedness;
- ii. Building capacities to withstand and cope with the hazards and risks;
- iii. Tackling the root causes of the vulnerability such as poverty, poor governance, discrimination, inequality and inadequate access to resources and livelihood opportunities.

2.6.2 Recommendations

The following recommended policy actions targeting vulnerability reduction include:

- i. Office of the prime minister should decentralize their activities at the district level
- ii. Improve the communication channel between the disaster department and local Communities

- iii. Revival of disaster committees at the district level
- iv. Support establishment of a disaster risk early warning systems
- v. Tree planting along road reserves
- vi. Promotion of drought and disease resistant crop seeds
- vii. Funding and recruitment of extension workers at Sub-county level
- viii. Improved enforcement of policies aimed at enhancing sustainable environmental health.
- ix. Quickly review the animal diseases control act because of low penalties given to defaulters.
- x. Establishment of systems to motivate support of political leaders toward government initiatives and programmes aimed at disaster risk reduction.
- xi. Increased awareness campaigns aimed at sensitizing farmers/communities on disaster risk reduction initiatives and practices.
- xii. Periodic maintenance of feeder roads to reduce on traffic accidents
- xiii. Relocation of communities in the affected areas in the district by government
- xiv. Increase funding and staff to monitor wetland degradation and non-genuine agro-inputs
- xv. Increased importation of lightening arrestors for at least government institutions and facilities.

References

Jorn Birkmann (2006). Measuring Vulnerability to promote Disaster-Resilient Societies: Conceptual Frameworks and Definitions

MWE (2013). Water and Environment Sector Performance Report: Ministry of Water and Environment, Kampala

MWE (2012). Uganda National Climate Change Policy, Ministry of Water and Environment, Kamapla, Final version for approval, 18 July 2012, p.2

UNDP-UNDRO (1991). Mitigation Strategies in Disaster Mitigation UN Disaster Management Training Program

UNISDR (2009). UNISDR Terminology on Disaster Risk Reduction.

APPENDIX I: DATA COLLECTION TOOLS



Plate 3: Key Informant Interview with District Environment Officer in Isingiro District



Plate 4: Key Informant Interview with the Sub-county Chief of Ruborogota



Plate 5: Focus Group Discussion in Ruborogota Sub-county



Plate 6: Focus Group Discussion in Endiinzi Sub-county

**FOCUS GROUP DISCUSSION GUIDE FOR DISTRICT DISASTER RISK MANAGEMENT
FOCAL PERSONS**

Interviewer Team Name(s)	District:	GPS Coordinates	
	Sub- county:	X:	
	Parish:	Y:	
	Village:	Altitude	

No.	Name of Participants	Designation	Contact	Signature

Introduction

- i. You have all been requested to this session because we are interested in learning from you. We appreciate your rich experiences and hope to use them to strengthen service delivery across the district and the country as whole in a bid to improve access to information on Hazards and early warning.
- ii. There is no “right” or “wrong” answers to any of the questions. As a Focus Group Discussion leader, I will try to ask all people here today to take turns speaking. If you have already spoken several times, I may call upon someone who has not said as much. I will also ask people to share their remarks with the group and not just with the person beside them, as we anxious to hear what you have to say.
- iii. This session will be tape recorded so we can keep track of what is said, write it up later for our report. We are not attaching names to what you have to what is said, so whatever you say here will be anonymous and we will not quote you by name.
- iv. I would not like to keep you here long; at most we should be here for 30 minutes- 1 hour.

Section A: Floods, Droughts, Landslides, Crop and Animal Production

- 1. Which crops are majorly grown in your area of jurisdiction?
- 2. Which domestic animals are dominant in your area of jurisdiction?

3. What challenges are faced by farmers in your area of jurisdiction?
4. Have you experienced floods in the past 10 years in your area of jurisdiction?
5. Which villages, parishes or sub-counties have been most affected by floods?
6. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
7. Which crops are majorly affected by floods in your area of jurisdiction?
8. In which way are the crops affected by floods?
9. Which domestic animals are majorly affected by floods in your area of jurisdiction?
10. In which way are the domestic animals affected by floods?
11. Which agricultural practices are being adopted by farmers in a bid to mitigate the above challenges?
12. What are the relevant government's interventions focusing at helping farmers mitigate the challenges mentioned?
13. Have you experienced drought in the past 10 years in your area of jurisdiction?
14. Which villages, parishes or sub-counties have been most affected by drought?
15. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
16. Which crops are majorly affected by drought in your area of jurisdiction?
17. In which way are crops affected by drought?
18. Which domestic animals are majorly affected by drought in your area of jurisdiction?
19. In which way are the domestic animals affected by drought?
20. Which agricultural practices are being adopted by farmers in a bid to mitigate the above challenges?
21. What are the relevant government's interventions focusing at helping farmers mitigate

the challenges mentioned?

22. Have you experienced landslides in the past 10 years in your area of jurisdiction?
23. Which villages, parishes or sub-counties have been most affected by landslide?
24. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
25. Which crops are majorly affected by landslides in your area of jurisdiction?
26. In which way are the crops affected by landslides?
27. Which domestic animals are majorly affected by landslides in your area of jurisdiction?
28. In which way are the domestic animals affected by landslides?
29. Which agricultural practices are being adopted by farmers in a bid to mitigate the above challenges?
30. What are the relevant government's interventions focusing at helping farmers mitigate the challenges mentioned?

Section B: Animal, crop and human disease outbreaks

31. Have you experienced any epidemic animal disease outbreaks in the past 10 years in your area of jurisdiction?
32. Which villages, parishes or sub-counties have been most affected by epidemic animal disease outbreaks?
33. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
34. Specify the epidemic animal disease outbreaks that have majorly affected animals in your area of jurisdiction?
35. Which domestic animals are majorly affected by epidemic animal disease outbreaks in your area of jurisdiction?
36. In which way are the domestic animals affected by epidemic animal disease outbreaks?

37. Which mitigation practices are being adopted by farmers in a bid to mitigate the above epidemic animal disease outbreaks?
38. What are the relevant government's interventions focusing at helping farmers mitigate the epidemic animal disease outbreaks mentioned?
39. Have you experienced any crop pests and disease outbreaks in the past 10 years in your area of jurisdiction?
40. Which villages, parishes or sub-counties have been most affected by epidemic animal disease outbreaks?
41. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
42. Specify the crop pests and disease outbreaks that have majorly affected animals in your area of jurisdiction?
43. Which crops are majorly affected by crop pests and disease outbreaks in your area of jurisdiction?
44. In which way are the crops affected by crop pests and disease outbreaks?
45. Which mitigation practices are being adopted by farmers in a bid to mitigate the above crop pests and disease outbreaks?
46. What are the relevant government's interventions focusing at helping farmers mitigate the crop pests and disease outbreaks mentioned?
47. Have you experienced any epidemic human disease outbreaks in the past 10 years in your area of jurisdiction?
48. Specify the epidemic human disease outbreaks that have majorly affected animals in your area of jurisdiction?
49. In which way are the humans affected by epidemic human disease outbreaks?
50. Which mitigation measures have been adopted by local communities in a bid to mitigate the above epidemic human disease outbreaks?
51. What are the relevant government's interventions focusing at helping local communities mitigate the epidemic human disease outbreaks mentioned?

Section C: Land, wild-life conflicts and Road accidents

- 52.** Have you experienced land conflicts in the past 10 years in your area of jurisdiction?
- 53.** Which villages, parishes or sub-counties have been most affected by land conflicts?
- 54.** As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
- 55.** Which particular villages, parishes or sub-counties have been majorly affected by land conflicts in your area of jurisdiction?
- 56.** What impacts have been caused by land conflicts?
- 57.** To what extent have the land conflicts affected livelihoods of the local communities in your area of jurisdiction?
- 58.** Which conflict resolution measures have been adopted local communities in a bid to mitigate the above challenges?
- 59.** What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
- 60.** Do you have any national park or wildlife reserve in your area of jurisdiction?
- 61.** Have you experienced wildlife attacks in the past 10 years in your area of jurisdiction?
- 62.** Which particular villages, parishes or sub-counties have been majorly affected by wildlife attacks in your area of jurisdiction?
- 63.** As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
- 64.** What impacts have been caused by wildlife attacks?
- 65.** To what extent have the wildlife attacks affected livelihoods of the local communities in your area of jurisdiction?
- 66.** Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?
- 67.** What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

68. Have you experienced Road accidents in the past 20 years in your area of jurisdiction?
69. Which roads have experienced Road accidents?
70. What impacts have been caused by Road accidents?
71. To what extent have the Road accidents affected livelihoods of the local communities in your area of jurisdiction?
72. Which conflict resolution measures have been adopted local communities in a bid to mitigate the above challenges?
73. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

Section D: Hailstorms, lightening, bush fires, earthquakes, faults/ cracks

74. Have you experienced hailstorms or lightening in the past 10 years in your area of jurisdiction?
75. Which villages, parishes or sub-counties have been most affected by hailstorms or lightening?
76. As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
77. What impacts have been caused by hailstorms or lightening?
78. To what extent have the hailstorms or lightening affected livelihoods of the local communities in your area of jurisdiction?
79. Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?
80. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
81. Have you experienced any serious bush fires in the past 10 years in your area of jurisdiction?
82. Which particular villages, parishes or sub-counties have been majorly affected by or lightening in your area of jurisdiction?

- 83.** As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
- 84.** What impacts have been caused by serious bush fires?
- 85.** To what extent have the serious bush fires affected livelihoods of the local communities in your area of jurisdiction?
- 86.** Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?
- 87.** What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
- 88.** Do you have any earth faults or earth cracks as lines of weakness in your area of jurisdiction?
- 89.** Have you experienced any earth quakes in the past 10 years in your area of jurisdiction?
- 90.** Which particular villages, parishes or sub-counties have been majorly affected by earth quakes in your area of jurisdiction?
- 91.** As a way of ranking from Low, Medium, High and Very high, rank the villages, parishes or sub-counties that have been most affected?
- 92.** What impacts have been caused by earth quakes?
- 93.** To what extent have the earth quakes affected livelihoods of the local communities in your area of jurisdiction?
- 94.** Which mitigation measures have been adopted local communities in a bid to mitigate the above challenges?
- 95.** What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

FOCUS GROUP DISCUSSION GUIDE FOR LOCAL COMMUNITIES

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	Parish:	Y:	
	Village:	Altitude	

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- viii. I would not like to keep you here long; at most we should be here for 30 minutes- 1 hour.

Section A: Floods, Droughts, Landslides, Crop and Animal Production

1. Which crops are majorly grown in this community?

2. Which domestic animals are dominant in your community?

3. Have you experienced floods in the past 10 years?
4. Since when did you last experience floods?
5. In a period of 10 years, how often do you experienced floods?
 - i. Monthly...
 - ii. 2 months...
 - iii. 3 months...
 - iv. Quarterly ...
 - v. 6 months...
 - vi. Annually...
 - vii. Others specify...
6. Which crops are majorly affected by floods in your community?
7. In which way are the crops affected by floods in your community?
8. Which domestic animals are majorly affected by floods in your community?
9. In which way are the domestic animals affected by floods in your community?
10. What measures have been taken by the Government to mitigate the effects of floods?
11. Have you experienced drought in the past 10 years?
12. Since when did you last experience drought?
13. In a period of 10 years, how often do you experience drought?
 - i. Monthly...
 - ii. 2 months...
 - iii. 3 months...
 - iv. Quarterly ...
 - v. 6 months...
 - viii. Annually...
 - ix. Others specify...
14. Which crops are majorly affected by drought in your community?
15. In which way are crops affected by drought in your community?
16. Which domestic animals are majorly affected by drought in your community?

17. In which way are the domestic animals affected by drought in your community?
18. What measures have been taken by the Government to mitigate the effects of drought?
19. Have you experienced landslide in the past 10 years?
20. Since when did you last experience landslide?
21. In a period of 10 years, how often do you experience landslide?
- vi. Monthly...
 - vii. 2 months...
 - viii. 3 months...
 - ix. Quarterly ...
 - x. 6 months...
 - x. Annually...
 - xi. Others specify...
22. Which crops are majorly affected by landslide in your community?
23. In which way are crops affected by landslide in your community?
24. Which domestic animals are majorly affected by landslide in your community?
25. In which way are the domestic animals affected by landslide in your community?
26. What measures have been taken by the Government to mitigate the effects of landslide?

Section B: Animal, crop and human disease outbreaks

27. Have you experienced any epidemic animal disease outbreaks in the past 10 years in your community?
28. Specify the epidemic animal disease outbreaks that have majorly affected animals in your community?
29. Which domestic animals are majorly affected by epidemic animal disease outbreaks in your community?
30. In which way are the domestic animals affected by epidemic animal disease outbreaks?
31. Which measures have you adopted to mitigate the above epidemic animal disease outbreaks in your community?

32. What are the relevant government's interventions focusing at helping farmers mitigate the epidemic animal disease outbreaks mentioned?
33. Have you experienced any crop pests and disease outbreaks in the past 10 years in your community?
34. Specify the crop pests and disease outbreaks that have majorly affected animals in your community?
35. Which crops are majorly affected by crop pests and disease outbreaks in your community?
36. In which way are the crops affected by crop pests and disease outbreaks?
37. Which measures have you adopted to mitigate the above crop pests and disease outbreaks in your community?
38. What are the relevant government's interventions focusing at helping farmers mitigate the crop pests and disease outbreaks mentioned?
39. Have you experienced any epidemic human disease outbreaks in the past 10 years in your community?
40. Specify the epidemic human disease outbreaks that have majorly affected animals in your community?
41. In which way are the humans affected by epidemic human disease outbreaks?
42. Which measures have you adopted to mitigate the above epidemic human disease outbreaks?
43. What are the relevant government's interventions focusing at helping local communities mitigate the epidemic human disease outbreaks mentioned?

Section C: Land, wild-life conflicts and Road accidents

44. Have you experienced land conflicts in the past 10 years in your community?
45. Which particular villages, parishes or sub-counties have been majorly affected by land conflicts in your community?
46. What impacts have been caused as result of land conflicts?
47. To what extent have the land conflicts affected livelihoods in your community?

48. Which conflict resolution measures have you adopted to mitigate the above challenges?
49. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
50. Do you have any national park or wildlife reserve in your community?
51. What is the distance of your community from the national park or wildlife reserve?
52. Have you experienced wildlife attacks in the past 10 years in your community?
53. Which particular villages, parishes or sub-counties have been majorly affected by wildlife attacks in your community?
54. What impacts have been caused by wildlife attacks?
55. To what extent have the wildlife attacks affected livelihoods in your community?
56. Which measures have you adopted to mitigate the above challenges?
57. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
58. Have you experienced Road accidents in the past 20 years in your community?
59. Which roads have experienced Road accidents?
60. What impacts have been caused by Road accidents?
61. To what extent have the Road accidents affected livelihoods in your community?
62. Which conflict resolution measures have been adopted local communities in a bid to mitigate the above challenges?
63. What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

Section D: Hailstorms, lightening, bush fires, earthquakes, faults

64. Have you experienced hailstorms or lightening in the past 10 years in your community?

- 65.** Which particular villages, parishes or sub-counties have been majorly affected by hailstorms or lightening in your community?
- 66.** What impacts have been caused by hailstorms or lightening?
- 67.** To what extent have the hailstorms or lightening affected livelihoods in your community?
- 68.** Which measures have you adopted to mitigate the above challenges?
- 69.** What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
- 70.** Have you experienced serious bush fires in the past 10 years in your community?
- 71.** Which particular villages, parishes or sub-counties have been majorly affected by or lightening in your community?
- 72.** What impacts have been caused by serious bush fires?
- 73.** To what extent have the serious bush fires affected livelihoods in your community?
- 74.** Which measures have you adopted to mitigate the above challenges?
- 75.** What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?
- 76.** Do you have any earth faults or earth cracks as lines of weakness in your community?
- 77.** Have you experienced any earth quakes in the past 10 years in your community?
- 78.** Which particular villages, parishes or sub-counties have been majorly affected by earth quakes in your community?
- 79.** What impacts have been caused by earth quakes?
- 80.** To what extent have the earth quakes affected livelihoods in your community?
- 81.** Which measures have you adopted to mitigate the above challenges?
- 82.** What are the relevant government's interventions focusing at helping local communities mitigate the challenges mentioned?

SPATIAL DATA COLLECTION SHEET FOR HAZARD VULNERABILITY AND RISK MAPPING

Observer Name: Date:	District:		Coordinates			
	Sub- county:		X:			
	Parish:		Y:			
	Village:		Altitude			
Slope characterization		Bio-physical characterization		Vegetation characterization		Land use type (tick) Bush Grassland Wetland Tree plantation Natural forest Cropland Built-up area Grazing land Others
Slope degree (e.g 10, 20, ...)		Soil Texture		Veg. cover (%)		
Slope length (m) (e.g 5, 10, ...)		Soil Moisture		Tree cover (%)		
Aspect (e.g N, NE...)		Rainfall		Shrubs cover (%)		
Elevation (e.g high, low...)		Drainage		Grass / Herbs cover (%)		
Slope curvature (e.g concave, covex...)		Temperature		Bare land cover		
Area Description (Susceptibility ranking: landslide, mudslide, erosion, flooding, drought, hailstorms, lightening, cattle disease outbreaks, human disease outbreaks, land conflicts, wildlife conflicts, bush fires, earthquakes, faults/ cracks, pictures, any other sensitive features)						

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