THE REPUBLIC OF UGANDA

Kiryandongo District

Hazard, Risk and Vulnerability Profile

2016

Acknowledgement

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

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

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

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My appreciation also goes to Kiryandongo District Team.
The entire body of stakeholders who in one way or another yielded valuable ideas and time to support the completion of this exercise.

Hon. Hilary O. Onek
Minister for Relief, Disaster Preparedness and Refugees

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LIST OF ACRONYMS

DDMC	District Disaster Management Committee
DEM	Digital Elevation Model
DLG	District Local Government
DRM	Disaster Risk Management
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 overlie 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 Kiryandongo District was a combination of spatial modeling using adaptive, sensitivity and exposure spatial layers 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; preliminary spatial analysis, and hazard prone areas' base maps were generated using Spatial Multi-Criteria Analysis (SMCA) was done in a GIS environment (ArcGIS 10.3).

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, 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.

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.

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 I.

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. 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 lightning, ecological or Biological hazards including crop pests and diseases, livestock pests and diseases, human disease outbreaks, vermin and wildlife animal attacks and invasive species and human induced or technological hazards including bush fires, road accidents land conflicts.

General findings from the participatory assessment indicated that identifying hazards, risks and vulnerable communities is important in the planning process to know which areas require agent attention to address vulnerability. It was also noted that hazard and disaster management should be mainstreamed with a special policy regarding preparedness at all the levels at the district departments to the lower local governments in order to effectively respond to these hazards. Finally, with these hazards profiled it is possible to approach Development partners to assist in intervening or supporting the district in putting up mitigation measures.

1.0 INTRODUCTION

1.1 Background

Uganda has over the past years experienced frequent disasters that ranges from drought, 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 shifting the disaster management paradigm from the traditional emergency response focus towards 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 risk 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.

Since 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 subcounty level of each district.The analytical approach to identify risk and vulnerability to hazards in the pilot sub-regions visited of Rwenzori andTeso,was improved in subsequent sub-regions.

1.2 Objectives of the study

1.2.1 Main Objective of the study

The main objectives of this study was to develop the District Hazard, Risk and Vulnerability Profiles for Kiryandongo District in mid Central Uganda.

1.2.2 Specific objectives

The study had the following specific objectives

i. Collect and analyse field data generated using GIS in close collaboration and coordination with OPM in the targeted 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 study had the following scope of work and deliverables that have been achieved by the consultant;

i. Collection of field data using GIS in close collaboration and coordination with OPM in the target 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. Perform 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. Complete all the district Hazard, Risk and Vulnerability Profiles in the time frame provided;

iv. Submit for printing soft copies of the complete HRV profiles and maps for all the 10 districts by the end of the duration assigned to this activity;

v. Generate and submit shape files 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 semi-arid 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."

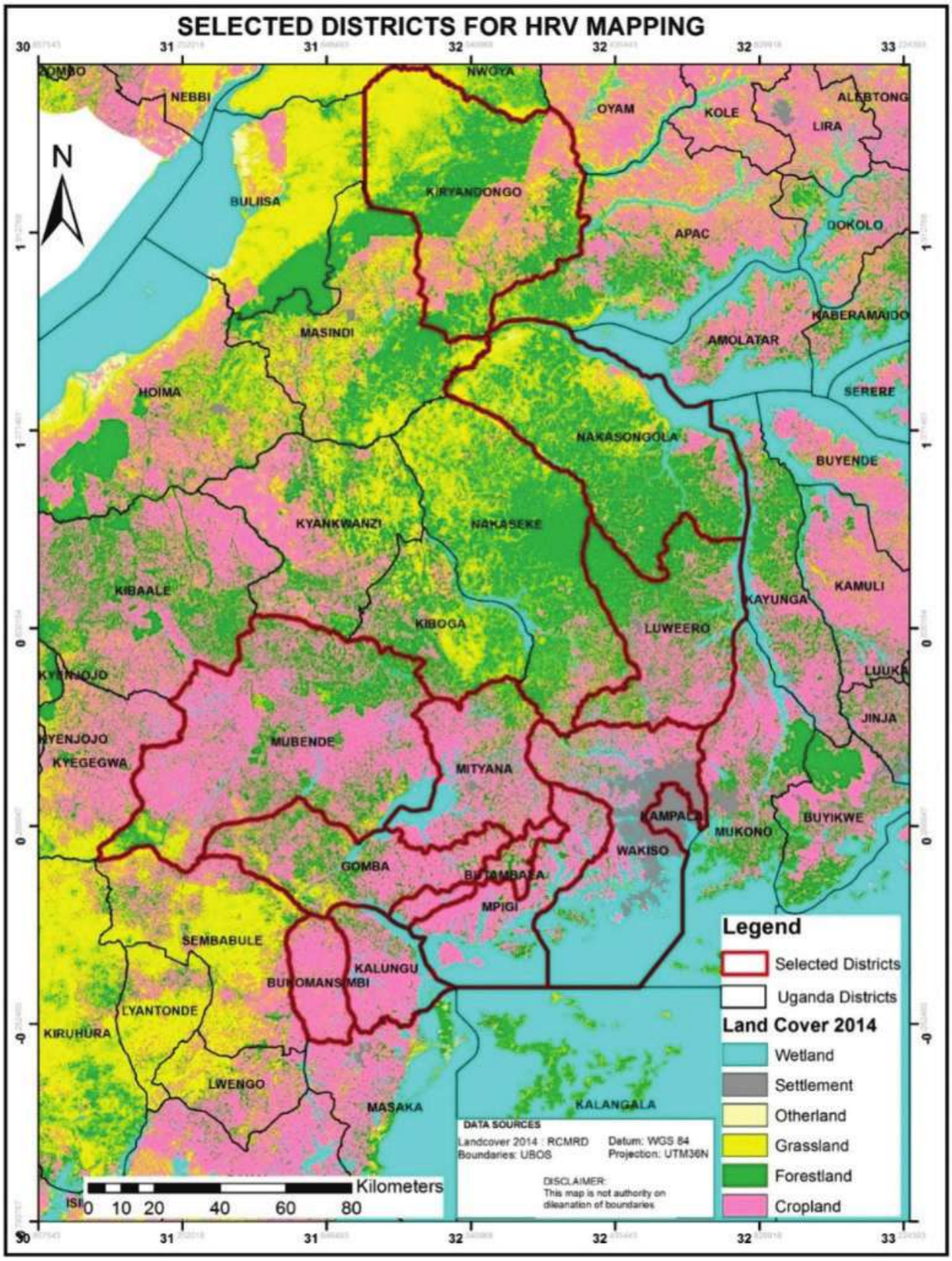

Figure 1: Location of the study area

2.0 Overview of Kiryandongo District

Kiryandongo District is located in the Mid-western part of Uganda, with its headquarters 218 Km away from Kampala. It borders Nwoya District in the North, Oyam in the North East, Apac in the East, Nakasongola in the South- East, Masindi in the South and South West, and Buliisa in the North West. The District is at an average altitude of 1295 meters above sea level, situated between 1^0 22' and 2^0 20' North of the Equator, longitude 31^0 22' and 32^0 23' East of Greenwich. Kiryandongo District covers an area of 3,621 Sq. Kms most of which is arable land. Kiryandongo district has an area of 3,624.1km², with a perimeter of 478 Km. Victoria Nile borders the district in the North, West and South East.

Kiryandongo District is made up of one county called Kibanda county, four Sub counties namely Kiryandongo with four parishes of Kikuube, Kichwabugingo, kitwara and kyankende; Kigumba with three parishes of Mboira, Kiigya and Kigumba I; Masindi Port with two parishes of Kaduku and Waibango and Mutunda with three parishes of Diima, Kakwokwo and Nyamahasa. The district has one town board of Karuma and three town councils of Kiryandongo with two wards of Northern and Southern; Bweyale with three wards of Central, Northern and Southern as well as Kigumba with three wards A, B and C. In total the District has 211 gazetted villages. It has a population of 268,188 people basing on estimates of the 2014 population and Housing census.

2.1 Geology

The District is generally a plateau land with an altitude of 1,295 meters on average above sea level. Undulating hills with some pronounced high points are located in some localities in the District. One of these high points is Kaduku in Kigumba Sub County. The land in the Murchison Falls conservation area which lies in the North and North West of Kiryandongo District is flat.

In terms of mineral resources, the status of mineral resources in the District is currently being established through exploration to determine the mineral potentials of the District. The progress has so far yielded promising results where some minerals including nickel, platinum, chromium and iron ore have been found but awaiting confirmation through tests. PEARL company has been engaged in this mineral exploration venture in the District. Soil type patterns in Kiryandongo are more or less uniform throughout the district. Sandy loam soils predominate with clay loam in Kitwara Parish. Sandy soils are more pronounced in Masindi Port Sub-County.

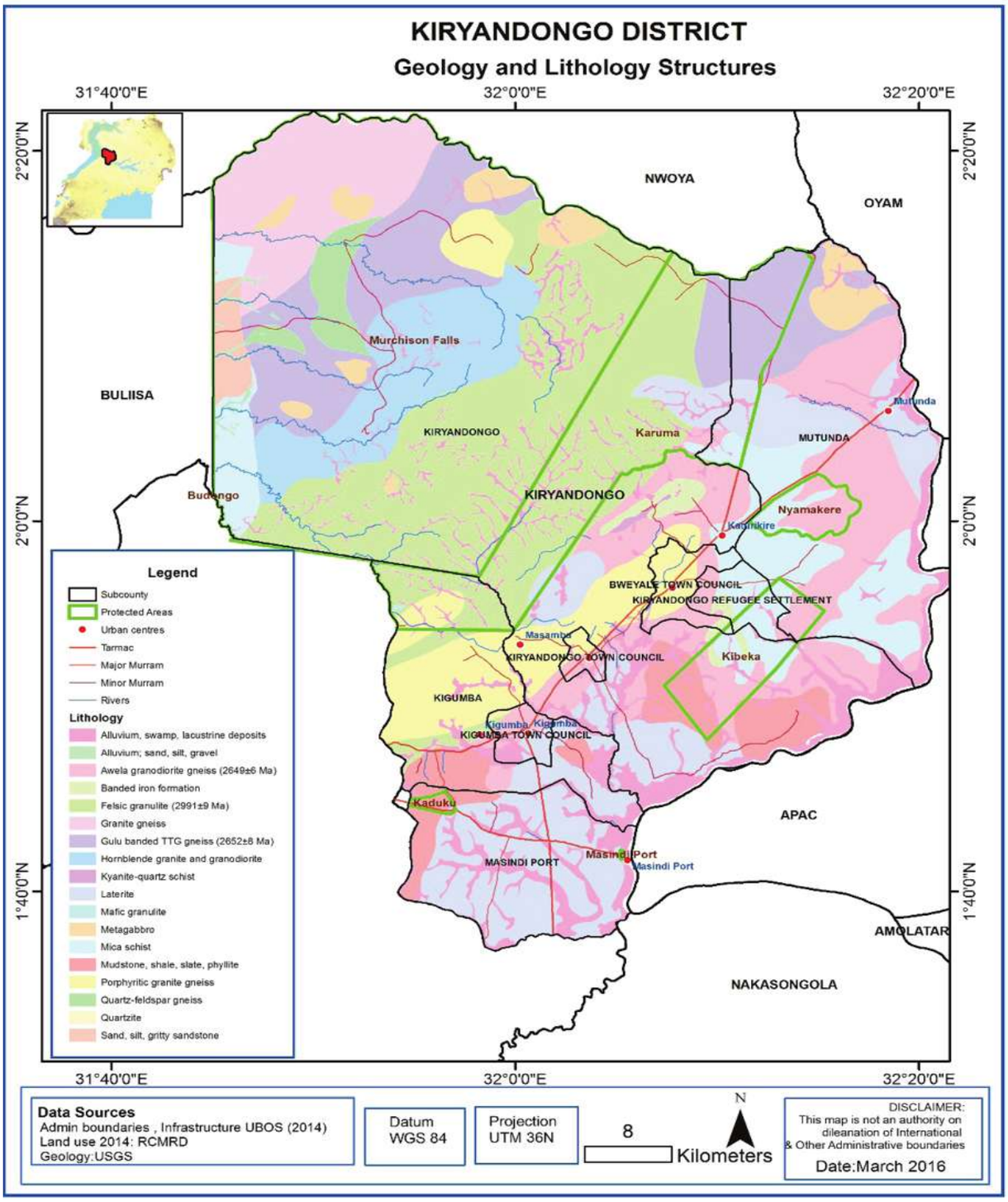

Figure 2: Geology and Lithology of Kiryandongo district

2.2 Vegetation and Landuse stratification

Kiryandongo District covers an area of 3,621 Square. Kilometers most of which is arable land. The natural vegetation of Kiryandongo comprises of savanna woodland including dry and humid Savannah with elephant grass prolific in some areas. This type of vegetation provides a diverse habitat for a variety of birds and animals. Existing wetlands have been identified most being seasonal and they support a diversity of plant, animal and plant species. They are facing degradation especially from agriculture and settlement hence the need for restoration. The land in the North and North West of Kiryandongo District, is a protected area of Murchison Falls conservation area

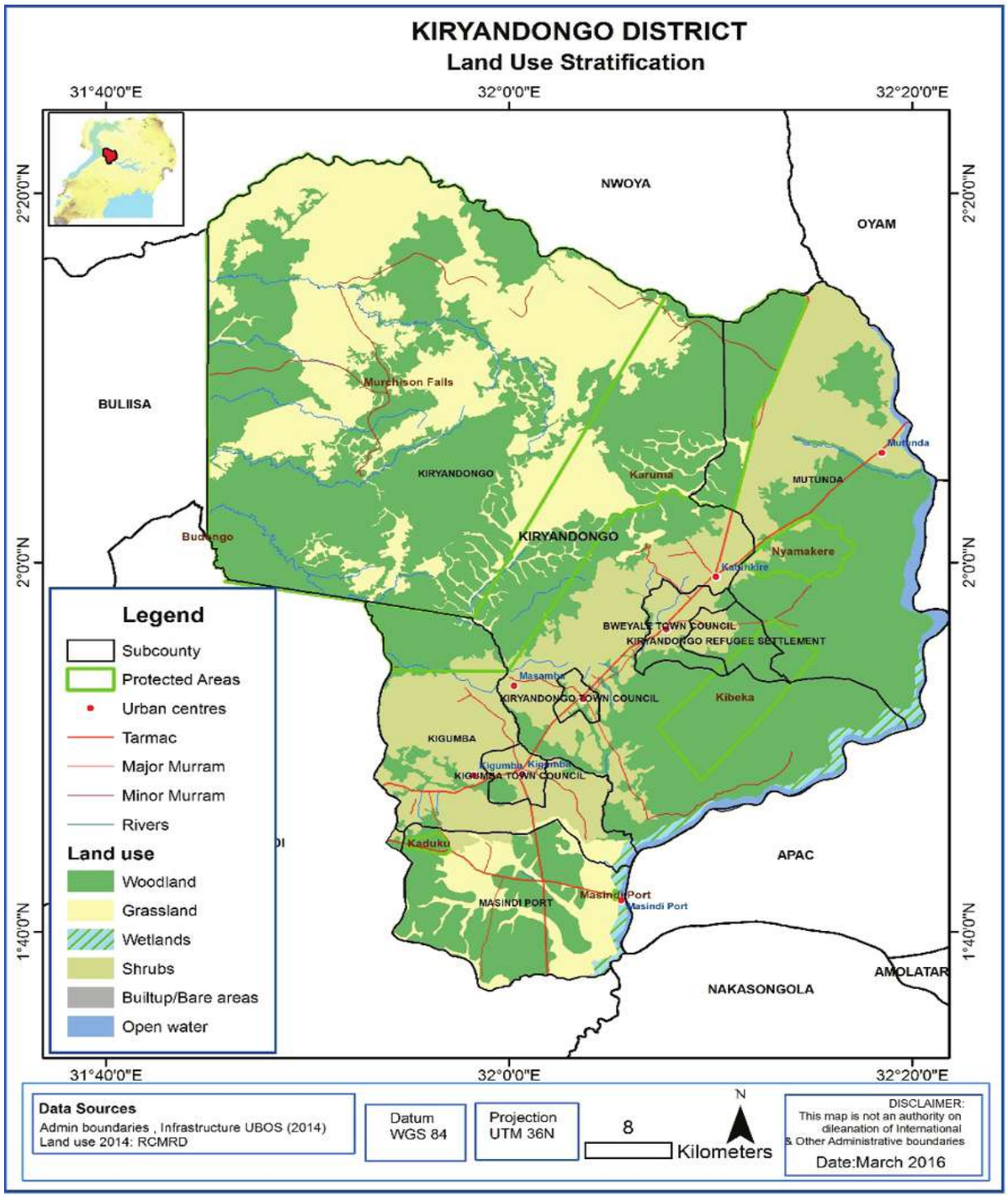

Figure 3: Land use of Kiryandongo district

2.3 Climatic Conditions

In terms of climate, Kiryandongo District is endowed with favorable climate conditions and has a bimodal rainfall pattern. The District receives an annual long-term average rainfall of 1200mm. The highest rainfall is normally received in March – May and August –November. The District enjoys favourable weather conditions coupled with good soil fertility making it suitable for agricultural production. Based on the amount of rainfall received, the District can be divided into three major climatic zones. Medium rainfall zones: These are areas with total amount of rainfall ranging between 800mm – 1000mm per annum. Areas which fall under this zone include Kigumba and Kiryandongo sub counties as well as part of Mutunda Sub County. Lower rainfall zones: These are areas which receive less than 800mm of rainfall per annum. Localities in Masindi Port Sub County receive this rainfall amount. However, the district lacks a meteorological department and necessary instruments to measure rainfall received in the district which makes it difficult to determine monthly rainfall statistics and to accumulate time series so as to enable measurement of rainfall trend.

2.4 Population and Demographic Characteristics

The 1991 Uganda national census estimated the district population at about 83,405. According to the 2002 national census, that population had increased to about 187,700. In 2012, the population of Kiryandongo District was estimated at about 317,500. A new national census for August 2014 population and Housing census estimates the population at 268,188 people of which 123,541 people are males and 134,647 people are females (UBOS, 2014). The population density stands at 74 persons per square km. Percentage of population below poverty line is at 30% compared to the national performance which is at 24% (UBOS, 2013).

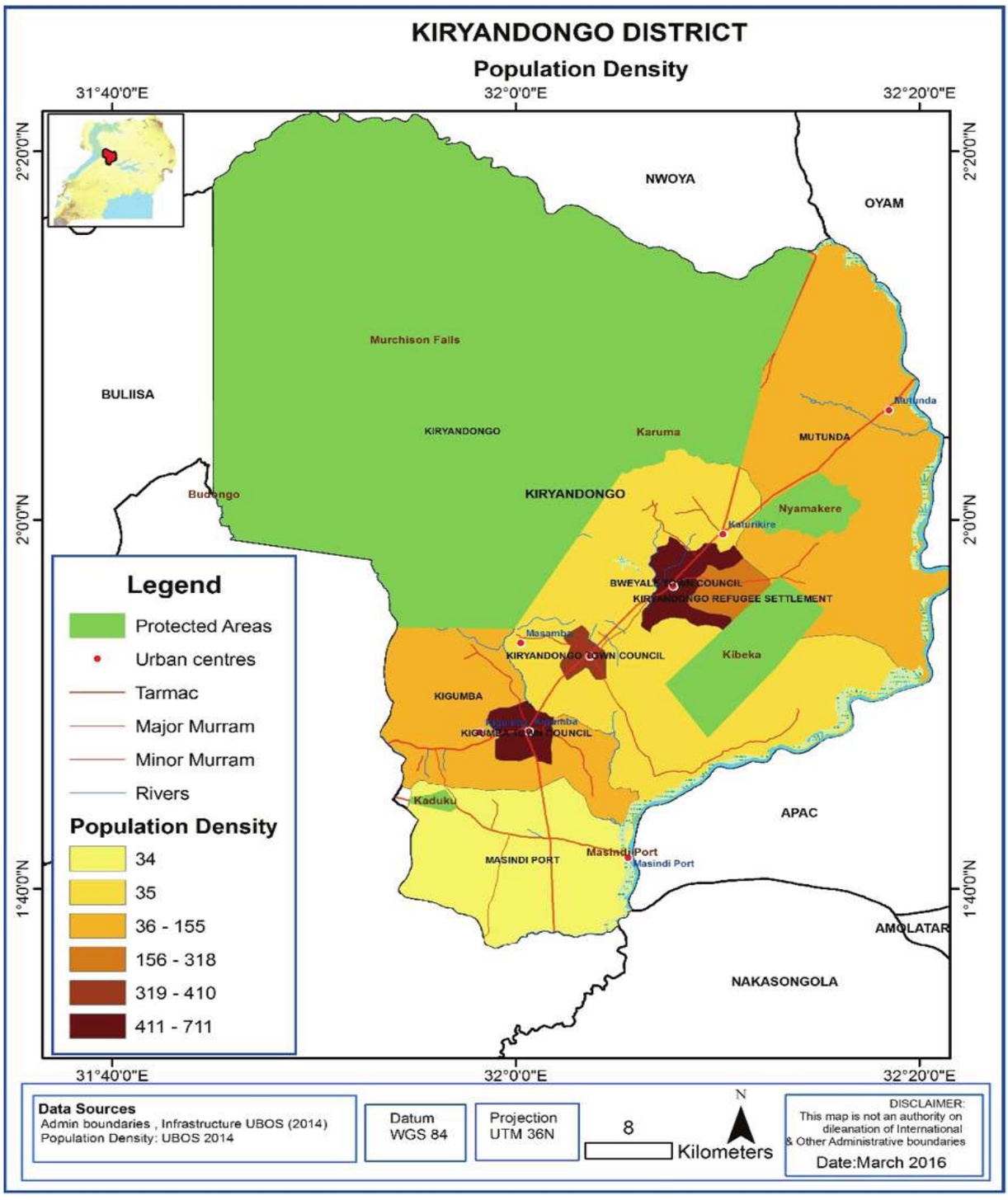

Figure 4: Population Density of Kiryandongo district

2.5 Economic activity

Major Economic activity is agriculture. Agricultural activities carried out in medium rainfall zones include maize, cassava, sunflower, cotton and tobacco production. This has contributed to improved household incomes enabling the population to sustain their livelihoods. On the other hand the major activities carried out in low rainfall zones include pastoralism, fishing and cotton growing.

3.0 METHODOLOGY

3.1 Preliminary spatial analysis

Hazard prone areas' base maps were generated using Spatial Multi-Criteria Analysis (SMCA) basing on several numerical models and guidelines using existing environmental and 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.) in a GIS environment (ArcGIS 10.2).

3.2 Stakeholder engagements and developing survey instruments

Stakeholder 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 (Annex II). 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 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.

Focus Group discussions and Key Informant Interviews were transcribed in the field for data collection. Case stories and photographs were documented and captured. In order to produce age and sex disaggregated data, results from FGDs and KIIs were integrated with the district population census data. This was also included into the multi hazard, risk and vulnerability profile maps.

3.3 Participatory mapping

The consultant worked in close collaboration and coordination with OPM in the target district to ensure that key DRR committee participate in joint mapping of hazards in the district.

The aim of the participatory mapping was to answer the following objectives:

i. Engage district and sub-district DRR stakeholders in tapping indigenous knowledge and experiences with regards to hazards

ii. Identify natural hazards caused by climatic variables e.g. floods, drought, landslides, wild fires etc and other hazards caused by humans e.g. natural resource conflicts

iii. Jointly map out individual district hazards in a higher resolution preferably at parish administrative level. The mapping looked to answer questions on: Areas affected, types, causes, impacts, interventions and possible policy recommendation. This was done using flip charts, already prepared base maps, tables and thematic discussions, where the consultant will guide the participants in the mapping process

iv. Jointly rank the hazards' risk level in order of impact. The impact/risk as defined by IPCC will focus highly on the economic as well as physical exposure subjected by individual hazards on population/communities in the districts.

v. Risk levels of hazards were also be mapped out jointly based on frequency of occurrence. The consultant will rank and map out the magnitude and impact of the hazard on a scale of: not reported, low, medium, high. This will help inform the hazard hotspots.

In order to achieve the above stated objective, the consultant prepared basemaps for each district showing the sub county boundaries. These basemaps were filled by the communities/ district DRR stakeholders under guidance from the consultant during the participatory mapping forums at district and county level. The following formed part of the discussion questions that helped to thematically direct the participants in hazard risk and vulnerability mapping based on indigenous knowledge/ experience:

i. Which climatic hazard is most manifested in the district and what other hazards exist?

ii. While providing reasons, rank all the hazards in the district in the order of their occurrence and priority

iii. What trends on historical occurrences can be attributed to the aforementioned hazards?

iv. List down/ elaborate on the main contributors to these perceived hazards in the region

v. Which gender (Male / Female) and Age group (children <5, youth (10 - 25), middle aged (30 - 40), old (>60 years) in the societal set-up is the most affected and by what hazard.

vi. Mapping Occurrence :

vii. Which areas within the district experience these hazards (Note : each hazard was mapped separately)

viii. Mapping Risk (Risk is defined by the economic losses or physical exposure e.g death caused or directly attributed to a hazard):

For each hazard occurring in the district please rank each parish within the district on a scale of 1 – 4 in terms of the risk level the parish is exposed to the specific hazard. In this case, risk level : 1 = Not reported, 2= Low, 3= Medium and 4 = High

3.4 Fieldwork and ground truthing verification:

The consultant carried out fieldwork in order to inform 3 key objectives: Source for evidence based on hazards and as informed by the outcome of participatory mapping. An example will be to visit a flooded prone area and get further data from the community including taking real photos of the river beds, dykes, flood plains. Source higher resolution spatial datasets from already existing DRR programs e.g. hazard forecasts and trend datasets, Gather socio- economic setup/ information on communities in this districts e.g. the major land uses and land cover types.

3.5 GIS modelling analysis

At this stage of the project, hazard delineation and risk mapping was already accomplished and the consultant carried out vulnerability mapping. The consultant used this opportunity to check the quality of each hazard and risk maps and enhance the same through map layering with socio-economic datasets acquired from field work.

The vulnerability mapping was based on the IPCC definition of vulnerability: IPPCC defines vulnerability as “the extent to which climate change may damage or harm a system”. It recognizes that the propensity for harm is not solely a function of the magnitude of the stressor (e.g. exposure to climatic extremes) but also depends on a system’s sensitivity and its ability to adapt to new climatic conditions. In essence, Vulnerability = Exposure + Sensitivity + Adaptive Capacity. The consultant hence developed composites of vulnerability hotspots profiles/ maps at district level by categorizing different GIS layers of the districts separately into the following key classes:

a)-Exposure Layer: This layer will comprise of climatic variables specifically:

i. Long term average precipitation (1984 - 2014)
ii. Long term temperature average (1984 - 2014)
iii. Long term Coefficients of variability for precipitation (1984 - 2014)
iv. Flood Risk (obtained from participatory mapping)
v. SPI based Drought Risk data (Source: GeoClim) as well as drought risk data obtained from participatory mapping)

The consultant used datasets obtained from local meteorological stations (source: Uganda Meteorological Authority) to develop the climatic composite for exposure layer, however in the event where data was lacking , the consultant accessed proxy datasets from satellite observations like the Climate Hazard Group Infra-Red Precipitation and Station rainfall estimates (CHIRPs) datasets which is multi temporal covering over 30 years and at 5kilometer spatial resolution, as well as Temperature data from moderate Imaging Spectro- Radiometer Satellite observations MODIS which has a consistent monthly average temperature estimates from the year 2000 at 250meters resolution.

b) - Sensitivity Layer: Sensitivity explains the magnitude or extent to which the stressors mainly climatic variables (Exposure layer) have on the ecosystem. The GIS layers were used to form the Sensitivity composite that were determined largely by the varying ecosystems, societal and ecological disparities from district to district and this came up from the participatory mapping. Despite this, the consultant envisaged that the following layers will cut across different districts for this layer: land conflicts, environmental degradation, road accidents, lightning, bush fires, landslides, vermins, crop diseases, humn diseases, soil erosion, earth quakes, strong winds and landslides.

c) - Adaptive Capacity Layer: This layer informs on the ability of an ecosystem or community to bounce back from an extreme climatic event (hazard). Again, the GIS layers used to form this layer composite were determined largely by the varying ecosystems, societal and economic disparities from district to district and this was identified during participatory mapping. Despite this, the consultant envisaged that the following layers will cut across different districts for this composite; market access and poverty index.

The final vulnerability hotspots map for each district was developed by summing up the 3 composite layers (exposure, sensitivity and lack of adaptive capacity layers) then dividing by 3. This was then normalized to a scale of 0 – 100 after which the vulnerability hotspot layer were indexed into 4 scores as follows not reported, low, medium, high.

Further GIS data processing and statistical analysis were carried out using statistical package R

Statistics.The consultant assembled and organized all datasets derived from the project into an organized spatial database that is compatible with ArcGIS 10.2.

The normalized rasters for each vulnerability component were summed up using the equal weighted sum and then normalized to generate the exposure, sensitivity and lack of adaptive capacity rasters. The overall vulnerability raster was developed by adding the exposure, sensitivity and adaptive capacity layers and normalizing the output. The maps are represented in vulnerability classes of 1 (not reported), 2 (low), 3 (medium) and 4 (High). The use of equal interval maps with set categories means that areas included in each class vary depending on the underlying statistical distribution of the components. The maps can be used to understand the components of vulnerability in a given location (how each component contributes to the overall score); and to identify areas of relatively higher exposure, sensitivity, lack of adaptive capacity, and overall vulnerability that may require interventions.

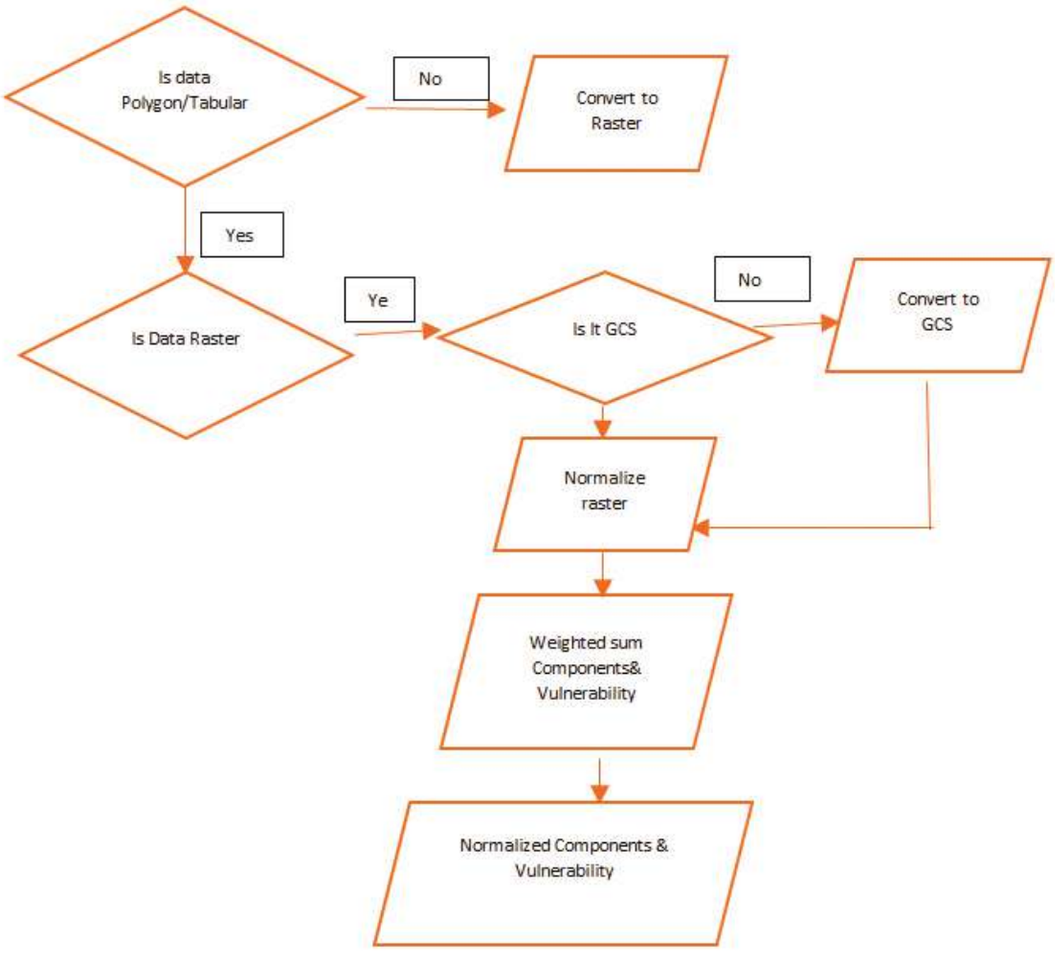

Figure 5: Data conversion work flow

3.6 Regional Stakeholder Workshop for Data verification and validation

In collaboration with OPM, a five days regional data verification and validation workshop was organized by UNDP in Masaka 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.

4.0 RESULTS FROM MULTI-HAZARD RISK, VULNERABILITY MAPPING

The following hazards were identified in their order of priority and importance.

4.1 Road accidents

The sub counties along the highway are heavily affected by road accidents and are a major threat that needs to be immediately addressed. Hotspots were identified in Kigumba Town Council in Ward A; Kiryandongo Town council in Northern Ward; Bweyale Town council in Central Ward; Kiryandongo in Kichwabugingo; Mutunda in Nyamahasa; and Mutunda in Diima. These places were chosen as hotspots because of the frequency of death and injuries sustained as a result of motor accidents.

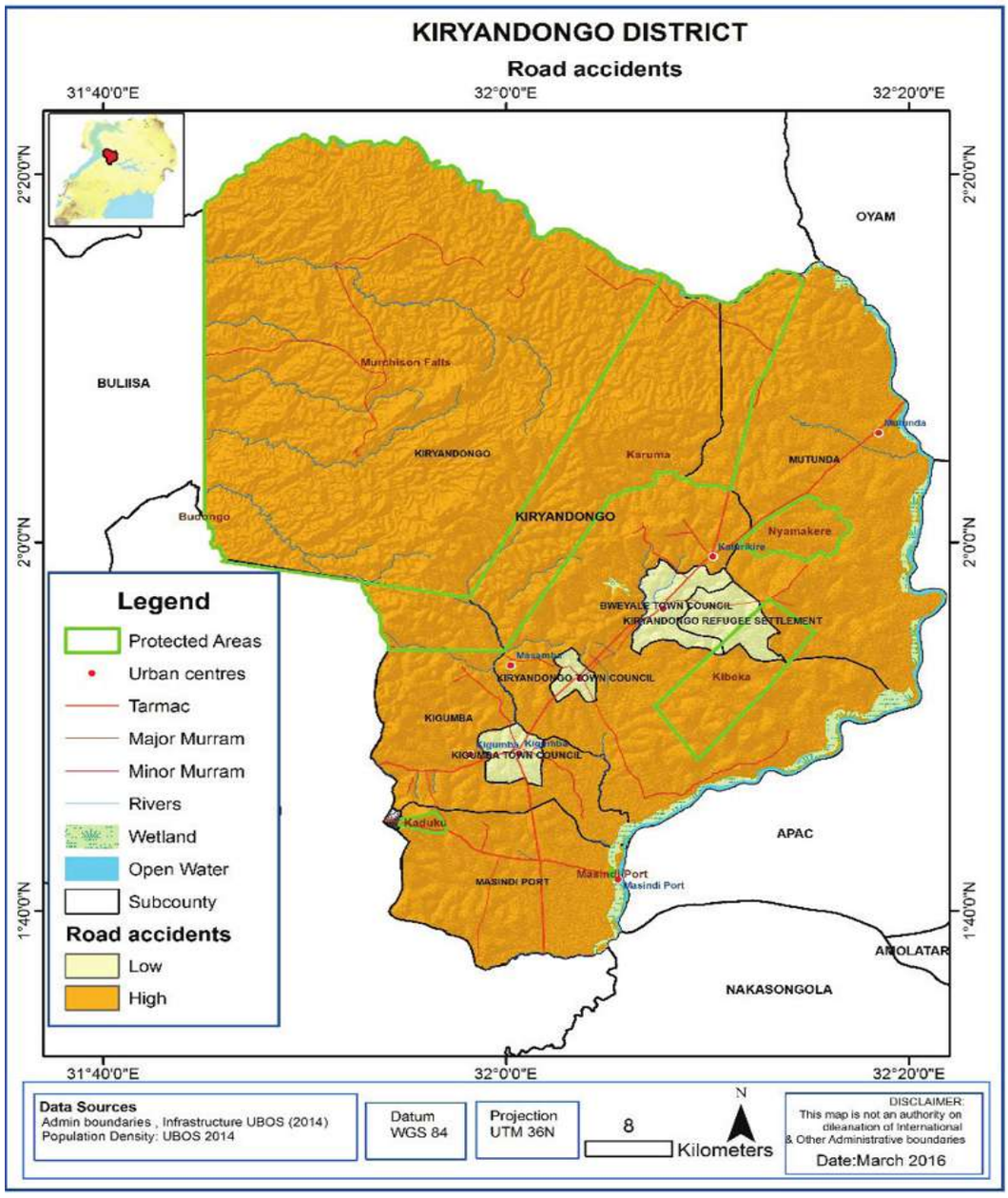

Figure 6: Road accidents of Kiryandongo District

4.2 Drought

Droughts can be severe in Kiryadongo leading to emaciation of cattle. Some people have enclosed farms with wetlands in them which have become a big advantage for adapting to dry spells. Promotion of early maturing crops and drought resistant crops is being encouraged to cope with the dry spells. Masindi Port in Waibango, Mutunda in Kakwokwo and Kiryandongo in Kitwara were identifed as hotspots. This is because crop failure as a result of poor rainfalls is common in these places and Livestock especially cows die as a result of lack of water to drink.

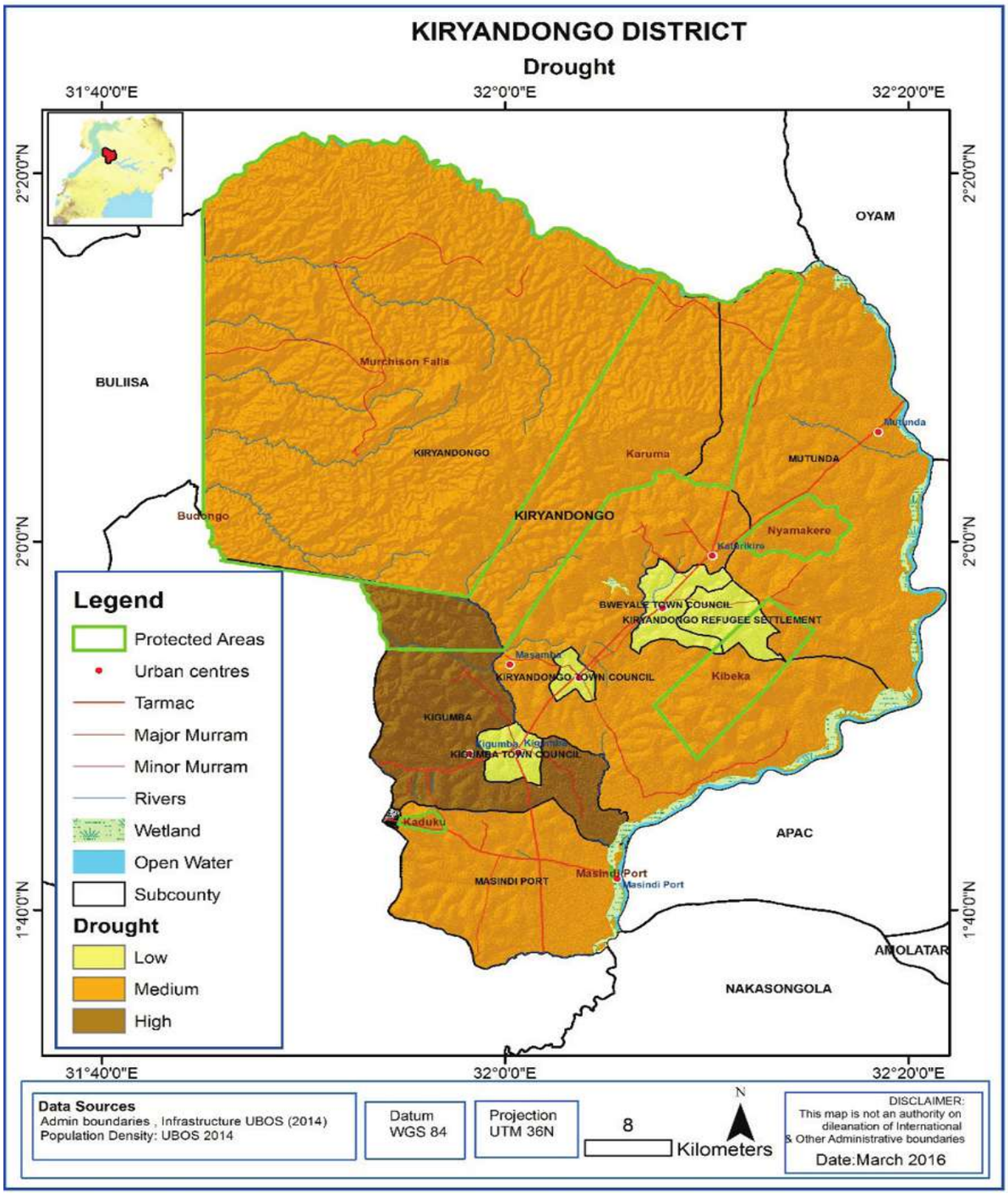

Figure 7: Drought risk map of Kiryandongo District

4.3 Crop pests and diseases

Major crop pests and diseases identified are Maize strike disease, cassava mosaic, bean rot, weevils affecting post-harvest in maize and beans. Giant and stripe loppers affecting cabbages and tomatoes, tomato leaf minors is also causing alot of devastation in Kigumba. Striga parasitic weed in maize is rampant in Kiryadongo, Kigumba and Mutunda sub counties. Banana bacterial wilt, circospola in g-nuts and orange (fungal infection), fruit flies and ultra-nose in fruits. Infections considered of priority are those in Maize, cassava, fruits and vegetables, sun flower virus, beans and G-nuts since they are the main staples and termites in trees. Trainings are being carried out to equip locals with skills such as termite control that are posing a threat to crops and trees. Hotspots were noted in Kiryandongo sub county in Kikube and Kyankende parishes; Kigumba in Kigumba I and Kiigya parishes ; Mutunda in Diima and Nyamahasa parishes.

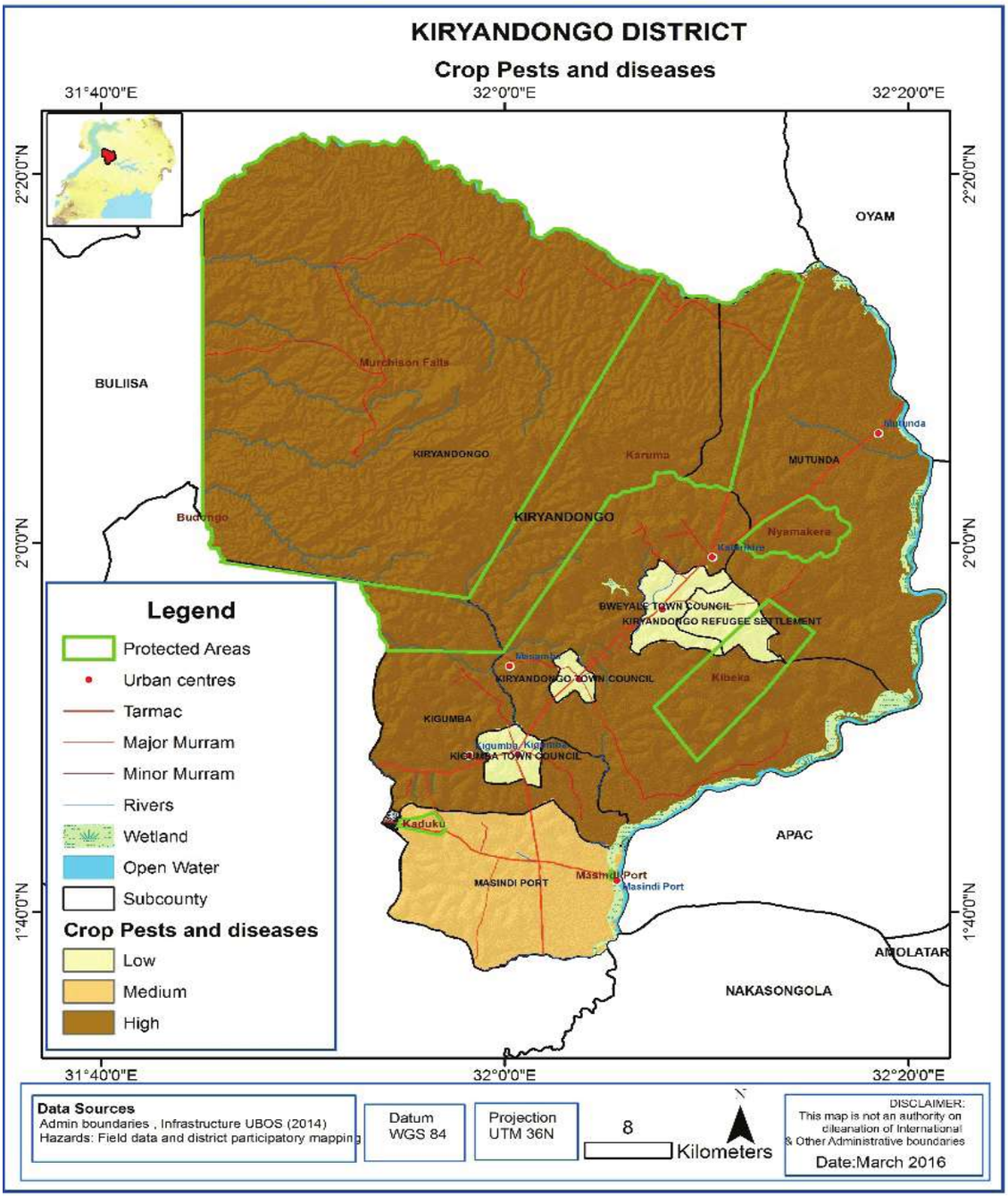

Figure 8: Crop pests and diseases risk map of Kiryandongo District

4.4 Livestock pests and diseases

Foot and mouth disease was noted to be one of the significant livestock diseases in the district as it strikes every 2-3 years with significant economic implications. Tick borne diseases such as East coast fever, anaplasmosis and red water (red urine) were noted to be rampant. Environmental conditions seem to support tick multiplication and also because of acaricides are expensive it has become had to eradicate these diseases. Nagana was also noted to be common because of tse tse infestations on the stripe of Victoria Nile. Afican swine fever is high because communities like rearing pigs and yet their are reservoirs are still present. Other notable diseases are Lumpy skin disease, CBPP and internal worms especially in goats. Bweyale Town council in Adeg'wo Cell; Kiryandongo sub county in all Parishes and Mutunda in Kakwokwo parish were identified as hotspots. This is mainly because of the frequent outbreak of swine fever and other bovine diseases.

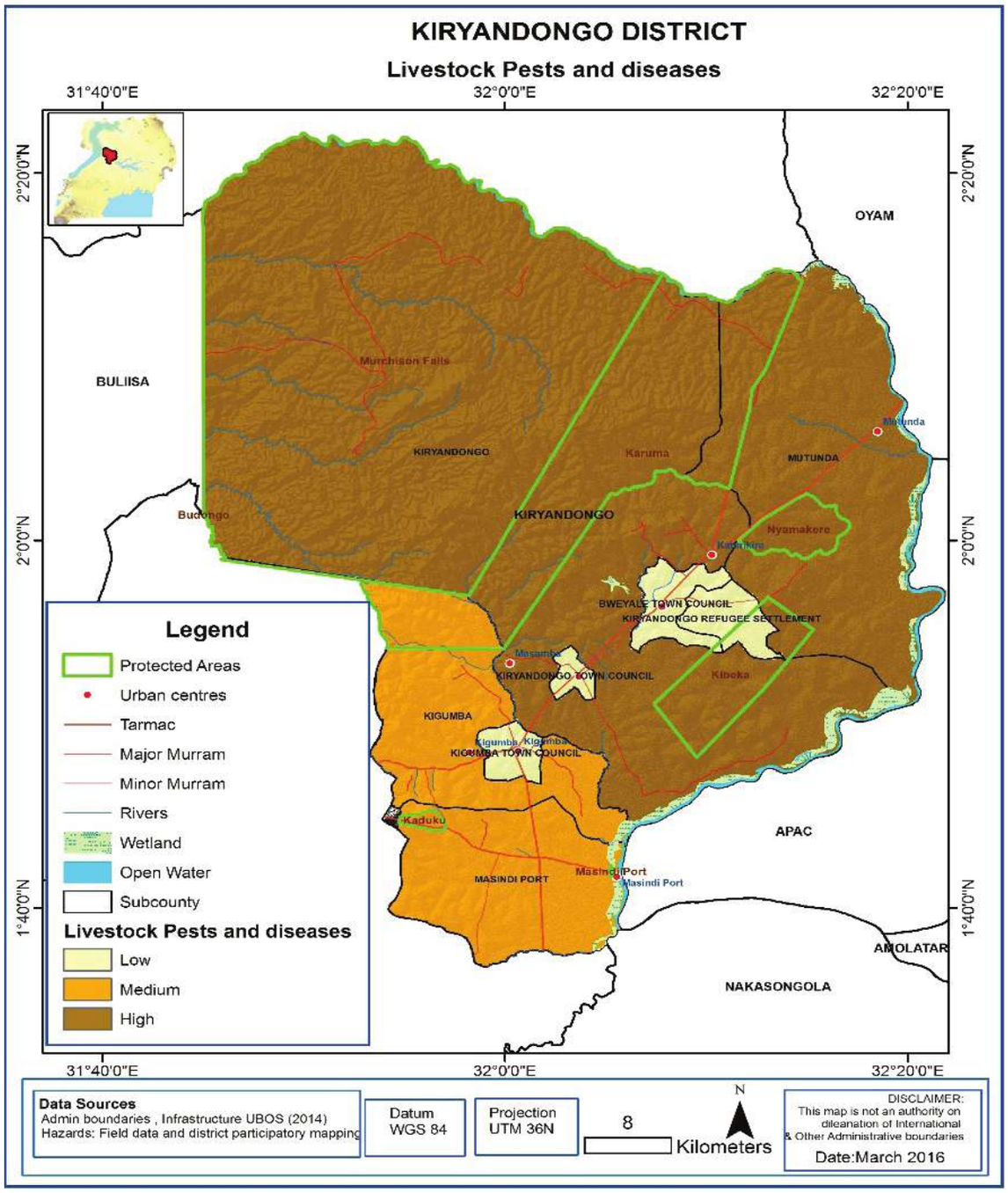

Figure 9: Livestock pests and diseases risk map of Kiryandongo District

4.5 Human disease outbreaks

Malaria is still rampant in the district. HIV&AIDS was also noted to on the increase because of the trucks packing in Karuma, Bweyare and other developments that have come into the area like Karuma dam which have attracted a lot of sex workers. Other diseases such as Tuberchlosis, typhoid, cholera and nodding disease were also noted. Distribution of mosquito nets and anti malarials for villages that are far away from health facilities is being done as a strategy to cub down malaria sickness. Mutunda Sub County in Kakwokwo and Kiryandongo Sub County in Kitwara parish were identified as hotspots. These areas are refugee settlements with frequent disease outbreak such as polio a disease that is considered to be eradicated in the entire country.

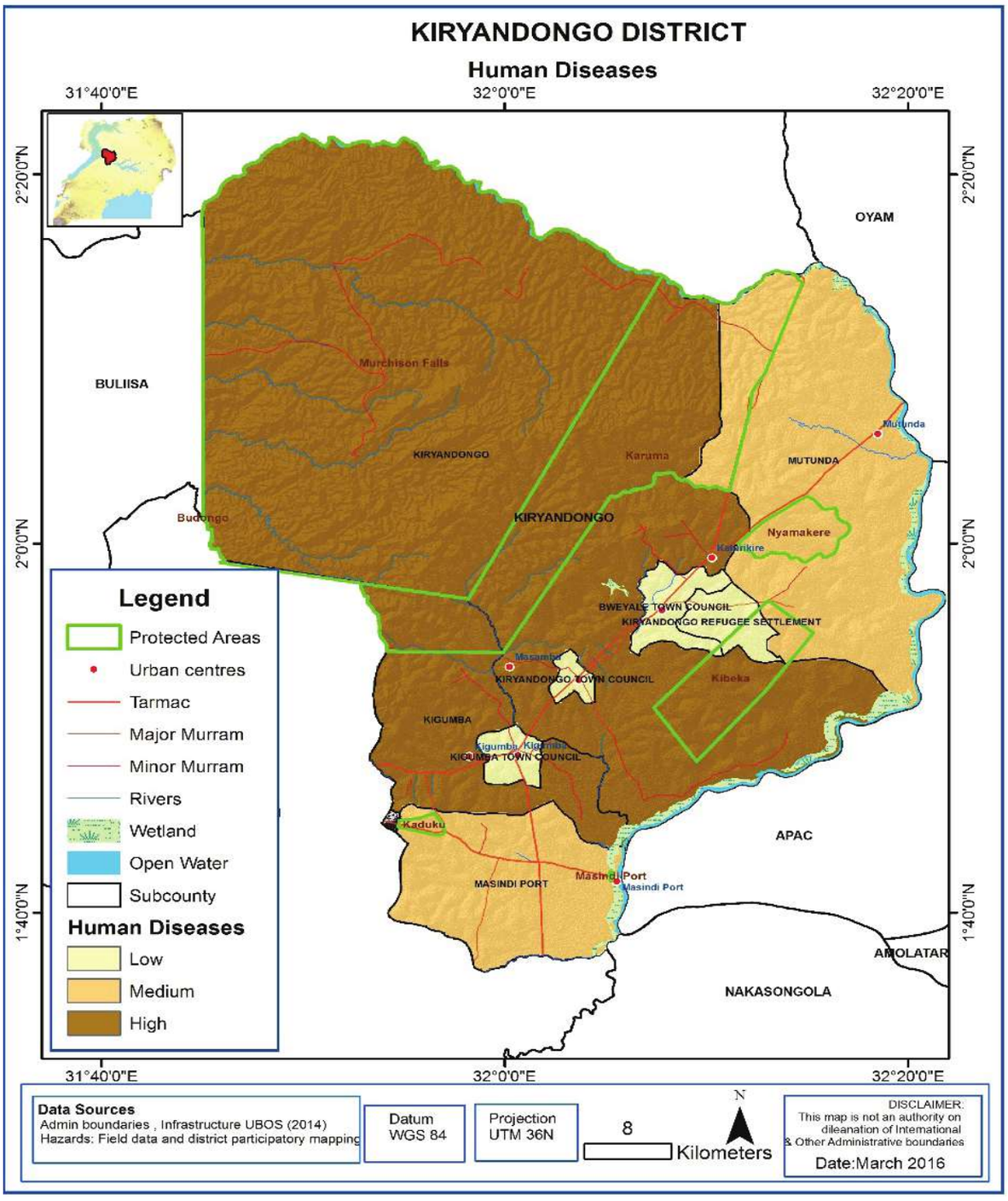

Figure 10: Human diseases risk map of Kiryandongo District

4.6 Vermin and wildlife animal attacks

Elephants in Mutunda sub-county often cross destroying people's crops and houses. This is mostly felt when mangoes and pineapples are getting ready around June and December. Buffaloes in Mutunda often attack people and crop raid while for vermin's such as vervets they are all over the district. Baboons are in Kitwara parish Kamusense village were they raid crops. Hotspots were noted in Mutunda sub county in Nyamahasa and Diima parishes, the strip along Karuma Wildlife reserve. Vermin and problem animals' attacks are rampant with almost daily incidence of attack and destruction of crops in these places.

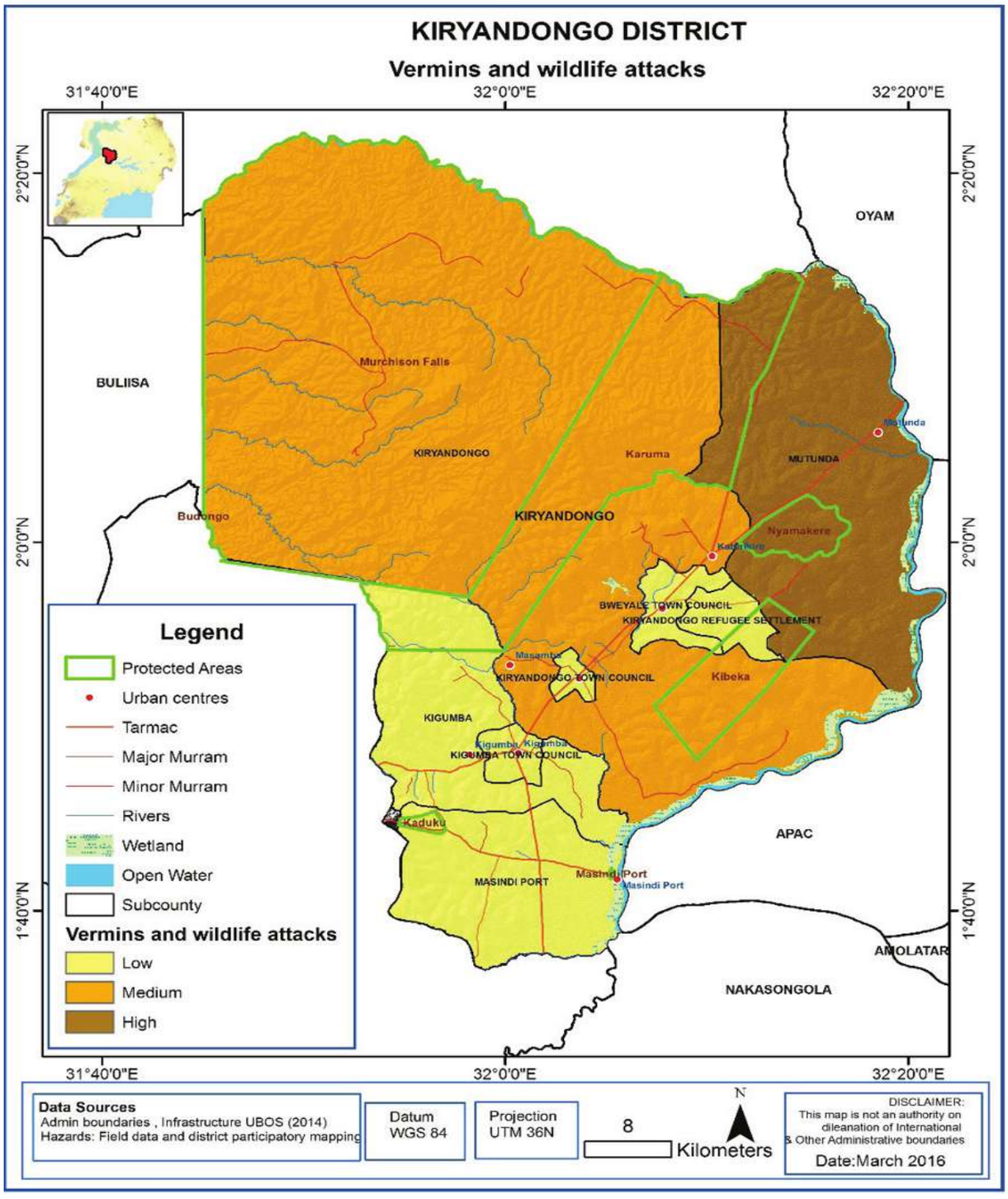

Figure 11: Vermins and wildlife attacks risk map of Kiryandongo District

4.7 Environmental degradation

Charcoal production contributes 21% of the district revenue. The district has lost over 60% of its forest cover specifically to charcoal producers and commercial farming. Wetland reclamation, conversion and encroachment for agriculture especially for sugar cane growing and cassava is a threat to conservation of wetlands. Waste management especially in town set up of Bweyare and kiryandongo. Drawing of water from wetlands and application of chemicals on farms that are being washed to wetlands also present a serious risk to the acquatic life and humans as well. Car washing at Titti river, the only main river were car washing is taking place could contaminate the river. Strategies such as planting of trees and adaptation of better methods of farming are being encouraged. Local environment committees have been formed to help with distribution of inputs of tree growing in order to recover the forest cover. The former Bunyoro ranch in Kiryandongo Sub County in Kitwara parish, Mutunda Sub County in Kakwokwo parish and Masindi Port Sub County in Waibango parish were identified as hotspots. This is because of the rampant charcoal burning and bush clearing for agricultural activities in these places.

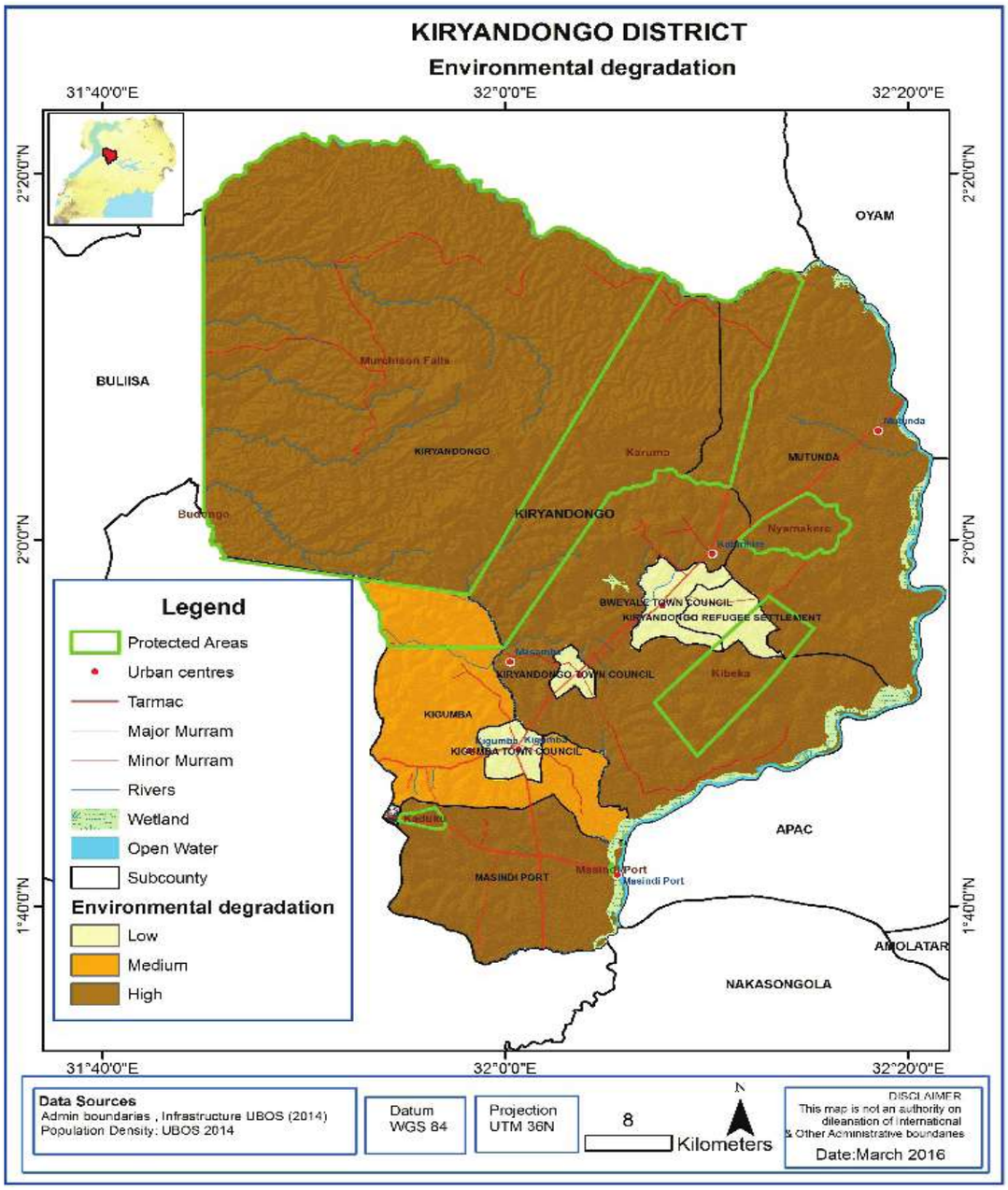

Figure 12: Environmental degradation risk map in Kiryandongo District

4.8 Land conflicts

Ranching areas have this problem and also the former central forest reserve has been occupied and people are always fighting for leases of such areas.

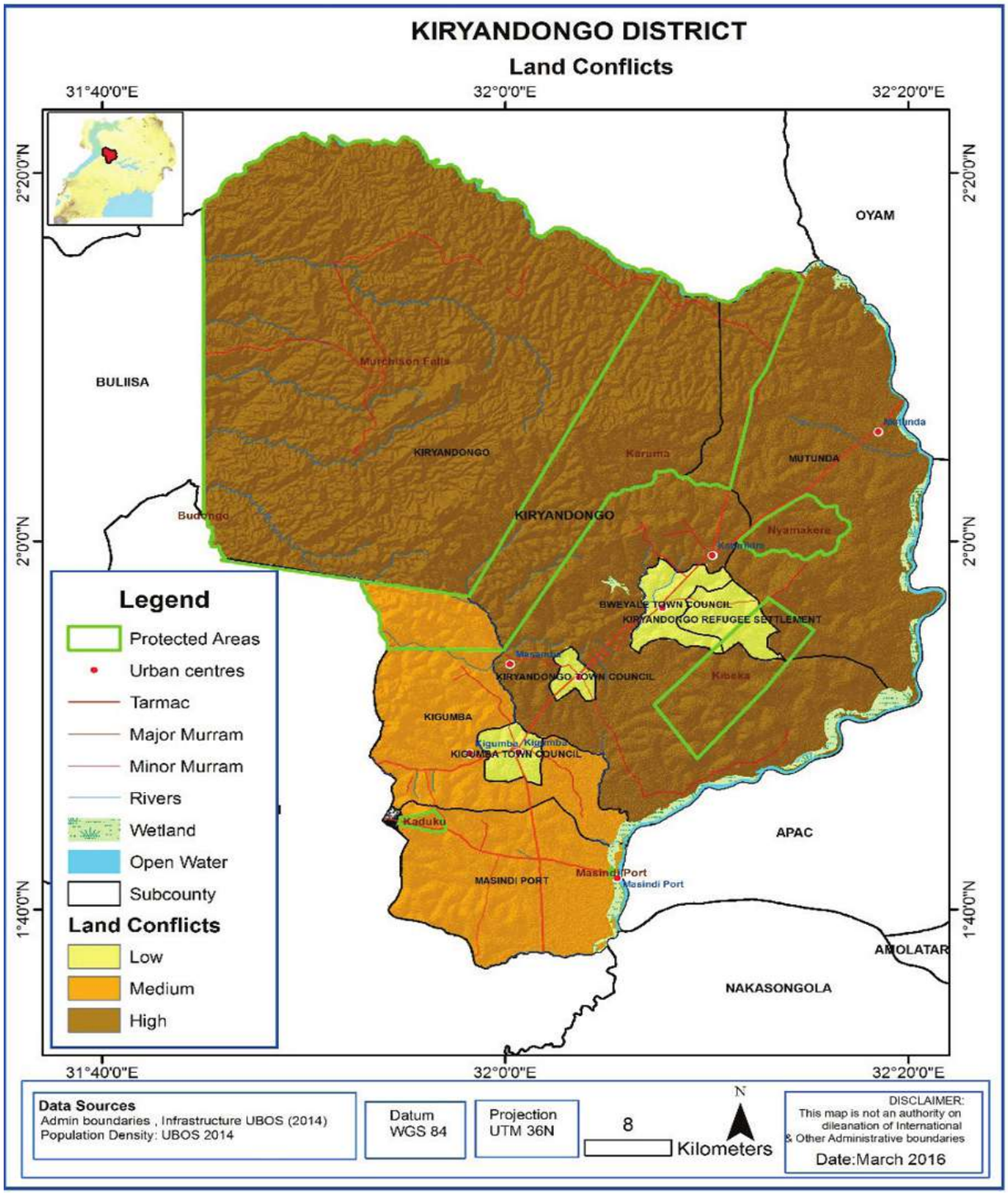

Figure 13: Land conflicts risk mapn Kiryandongo District

4.9 Strong winds, hailstorms and lightning

Strong winds are not a common phenomenon. However in Kiryandongo and Mutunda you get winds towards the end of the dry season although they are at a medium scale. Hailstorms are high especially in Kiryandongo. Incidences of lightning strike have also been noted for example at Ruyanja primary schools where Lightning hit and claimed 20 pupils and in another incidence an old woman was burnt by lightning.

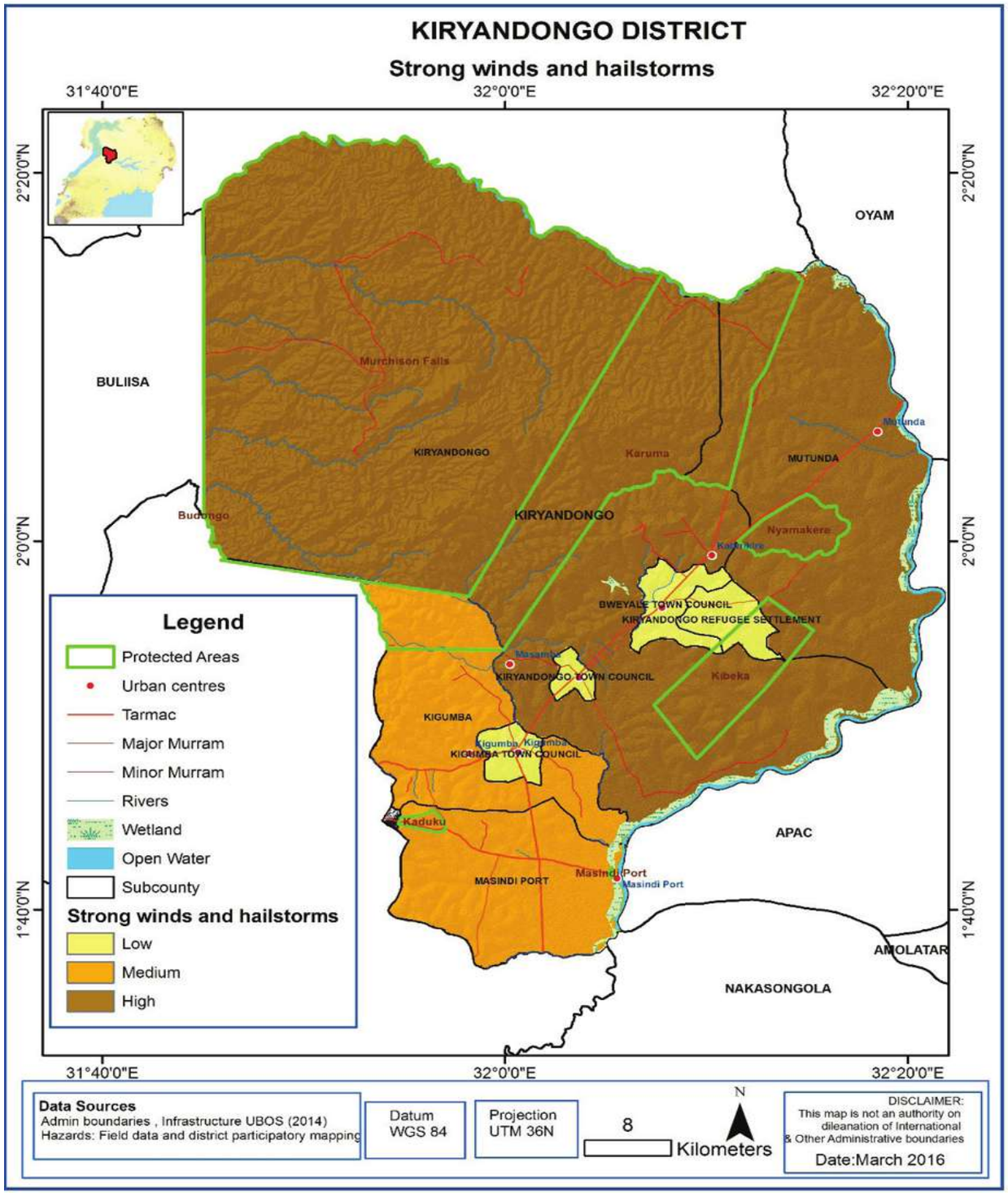

Figure 14: Strong winds, hailstorms risk map of Kiryandongo District

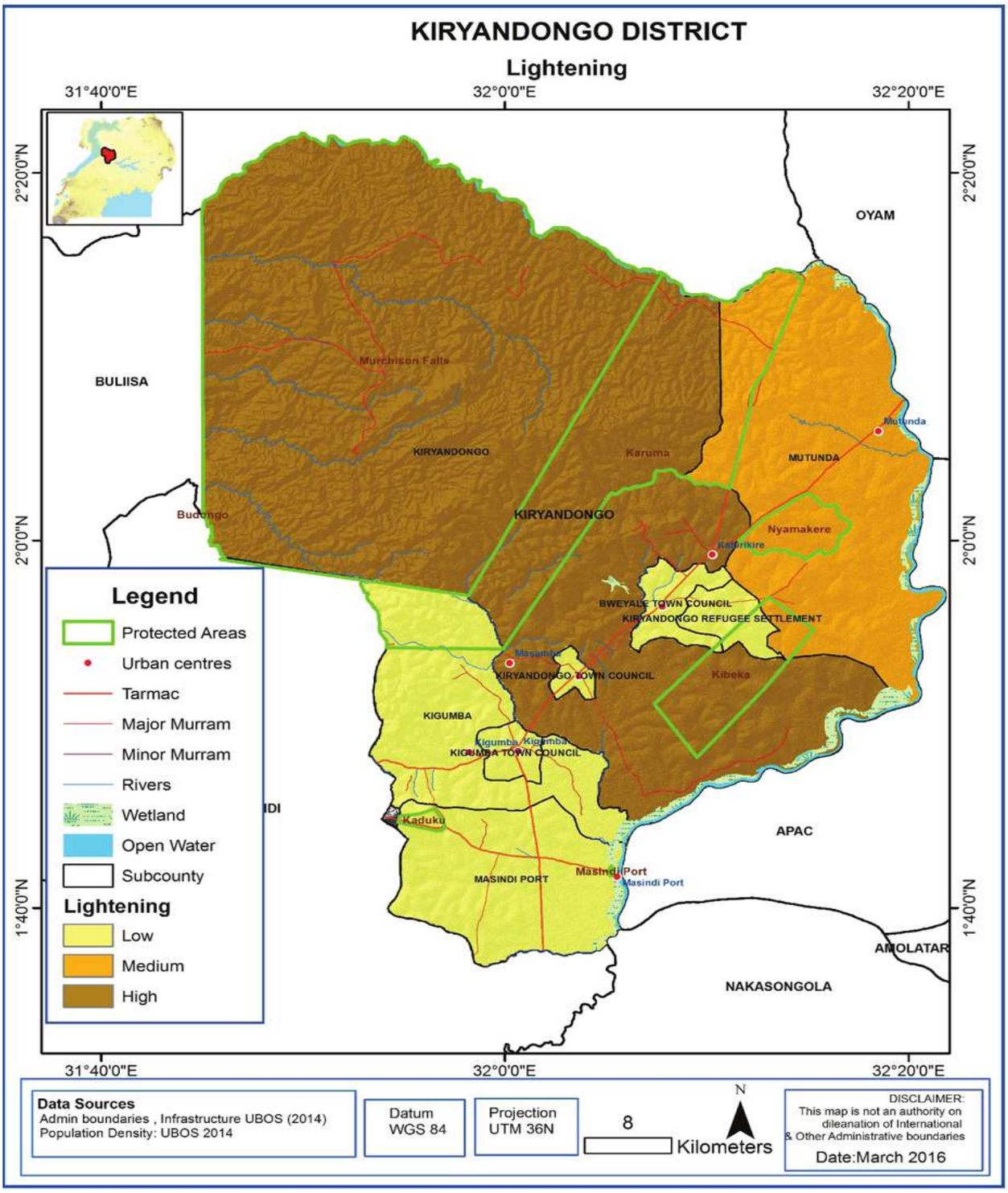

Figure 15: Lightning risk map in Kiryandongo District

4.10 Floods

Masindi Port has got areas prone to flooding especially in Kikaitu in Waibango village. Mutuda also occasionally floods because of the road works that broke the water system. In Kiryandogo flooding around Mukwano farm is common especially during heavy rains.

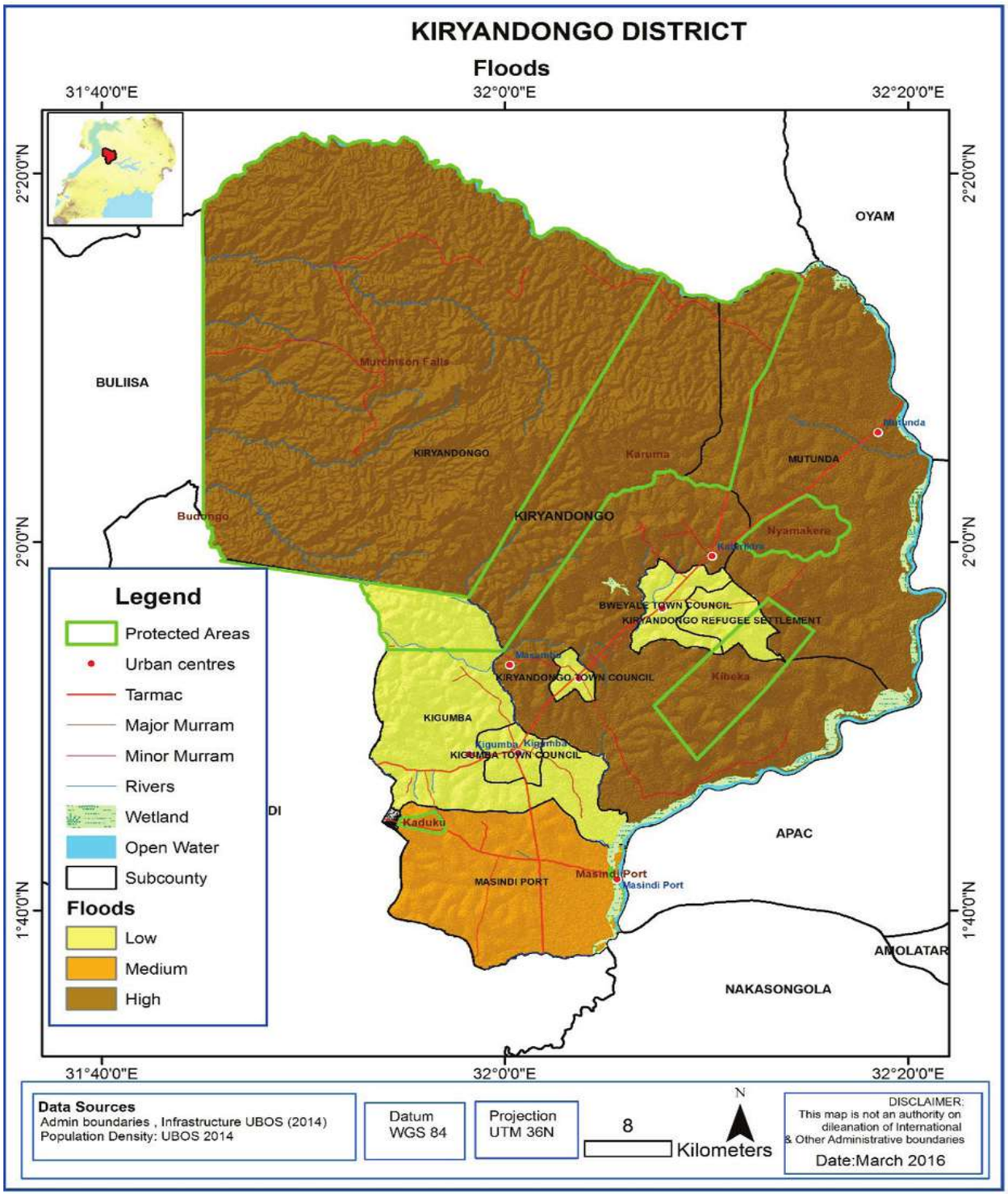

Figure 16: Floods risk map of Kiryandongo District

4.11 Soil erosion

Moderate levels of erosion is Kiryandogo and Masidi Port were reported although in other areas its non-existent.

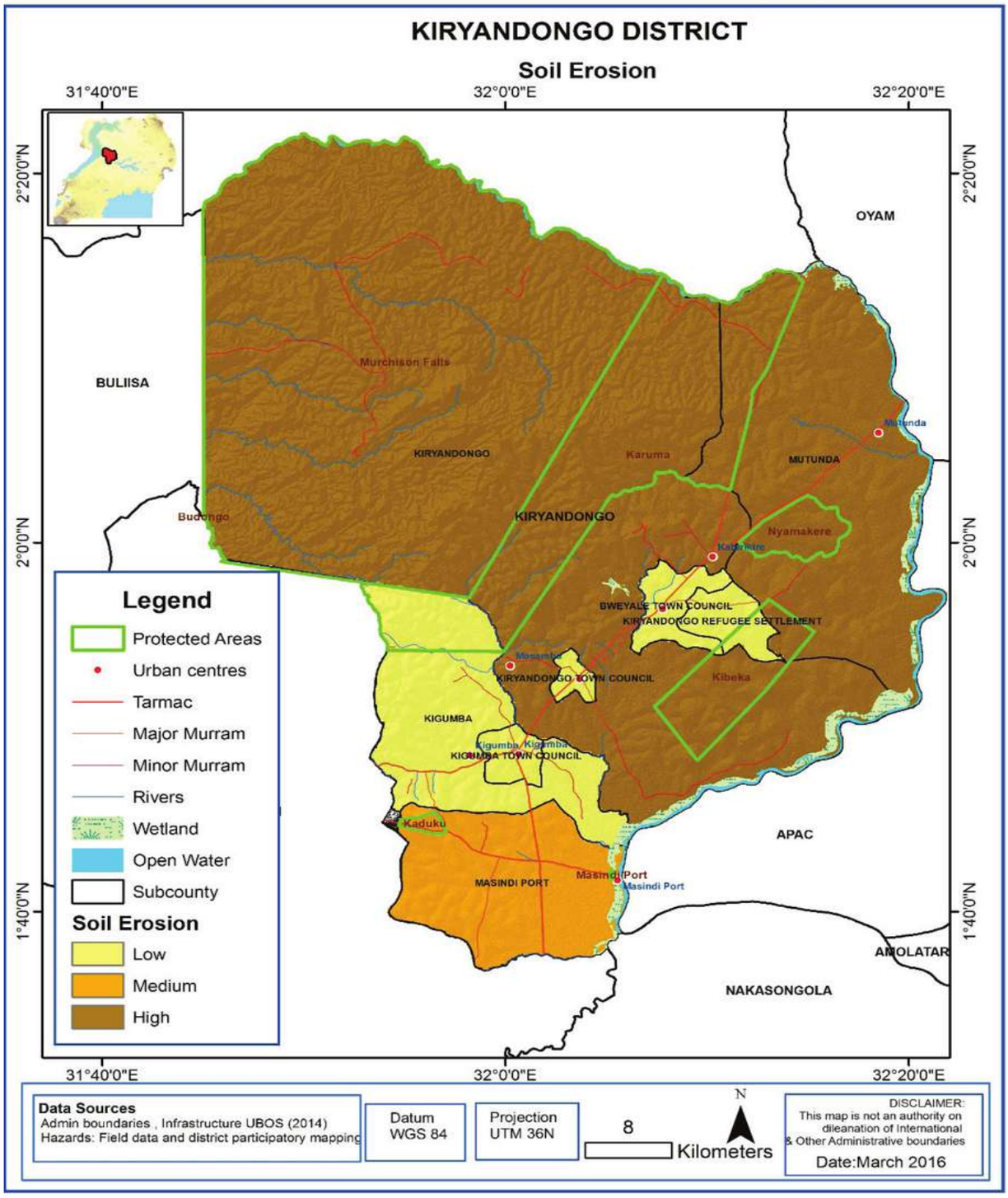

Figure 17: Soil Erosion risk map of Kiryandongo District

5.0 District Vulnerability Analysis

For vulnerability assessment, this study utilised the second conceptualization which as outcome *vulnerability,* which "represents an integrated vulnerability concept that combines information on potential climate impacts and on the socio-economic capacity to cope and adapt." The IPCC framework builds on this, in that vulnerability is considered to be a function of *exposure* to climate impacts, including variability and extremes, and the *sensitivity* and *adaptive capacity* of the system being exposed. The three components can further be expanded on as follows:

- **Exposure (E)** - the size of the area and/or system, sector or group affected and the magnitude of the stressor.
- **Sensitivity (S)** - the characteristics of a system or population and the governance/market structures that influence the degree to which it is affected by stressors.
- **Adaptive capacity (A)** - capacities of the system, sector or group to resist impacts, cope with losses and/or regain functions.

Table 1: Indicators utilised by vulnerability component

COMPONENT	DATA	SOURCE
Exposure	Precipitation Coefficient of Variation	CHIRPS blended satellite- station precipitation
	Average Precipitation	CHIRPS blended satellite- station precipitation
	Average Temperature	MODIS Land surface Temperature
	Flood frequency	Participatory mapping at District Level
	Droughts	Participatory mapping at District Level
Sensitivity	Landslides	Participatory mapping at District Level
	Winds and hailstorms	Participatory mapping at District Level
	Crop pests	Participatory mapping at District Level
	Livestock Diseases	Participatory mapping at District Level
	Human Diseases	Participatory mapping at District Level
	Land Conflicts	Participatory mapping at District Level
	Bush fires	Participatory mapping at District Level
	Environmental hazards	Participatory mapping at District Level
	Vermin pests	Participatory mapping at District Level
	Road Accidents	Participatory mapping at District Level
	Soil Erosion	Participatory mapping at District Level
	Strong winds	Participatory mapping at District Level
	Earthquake	Participatory mapping at District Level
	Lightning	Participatory mapping at District Level
Lack of Adaptive Capacity	Market Access	Joint Research Centre
	Poverty Index	Multi Criteria Poverty Index from DHS

5.1 Exposure Analysis

The exposure analysis involved the combination of the precipitation coeficient of variation (PPTCV), average precipitation (AVGPPT), average temperature (AVGTEMP), flood and drought layers.

PPTCV + AVGPPT + AVGTEMP + FLOOD + DROUGHT = EXPOSURE

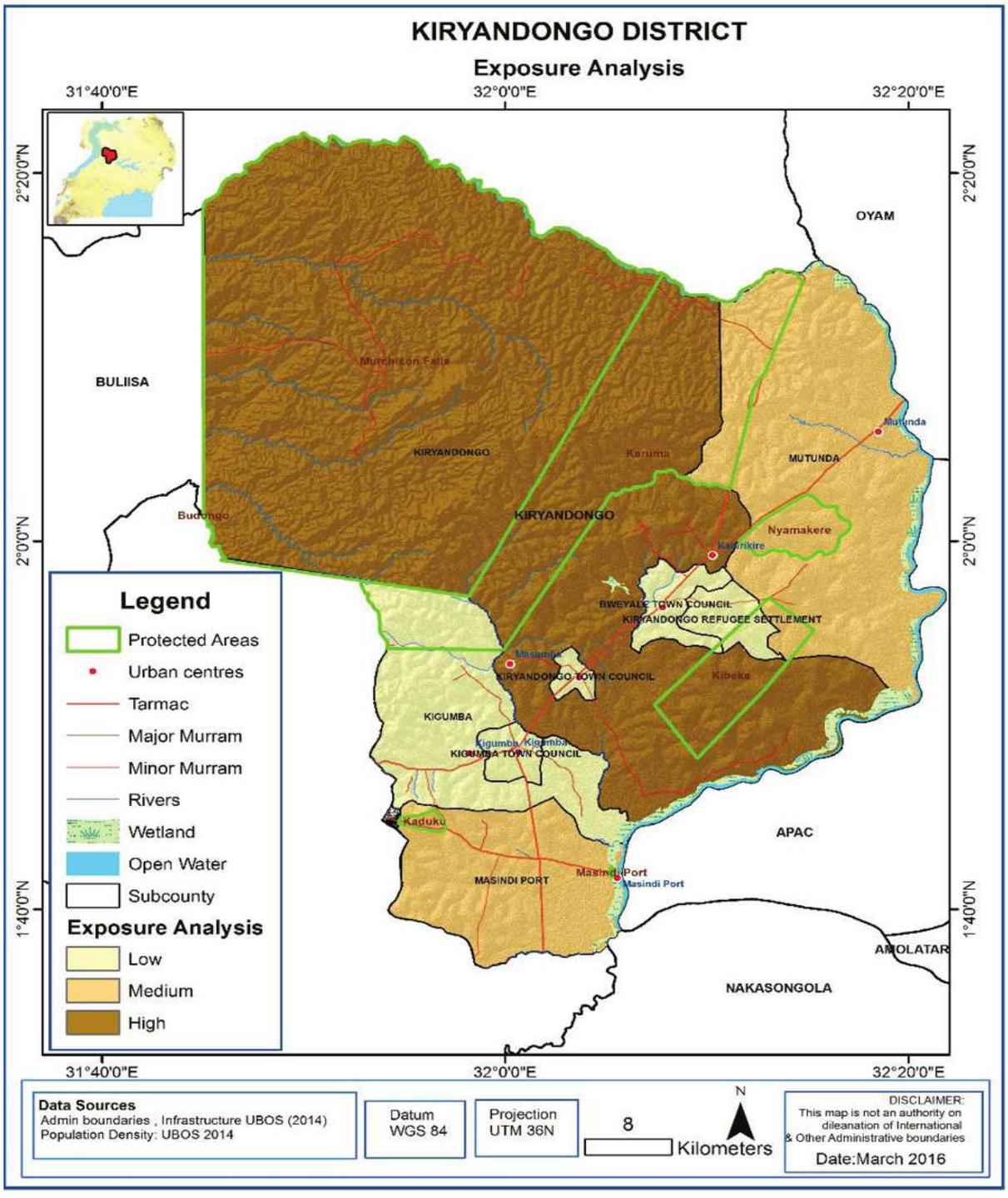

Figure 17: Exposure of climatic conditions in Kiryandongo District

Kiryandongo Sub County experienced the highest levels of exposure to climate stressors due to the prevalence of floods which contributed greatly to the overall exposure of the entire area.

5.2 Sensitivity Analysis

The exposure analysis involved the combination of the follwing layers ; land conflicts, environmental degradation, road accidents, lightning, bush fires, landslides, vermins, crop diseases, humn diseases, soil erosion, earth quakes, strong winds and landslides.

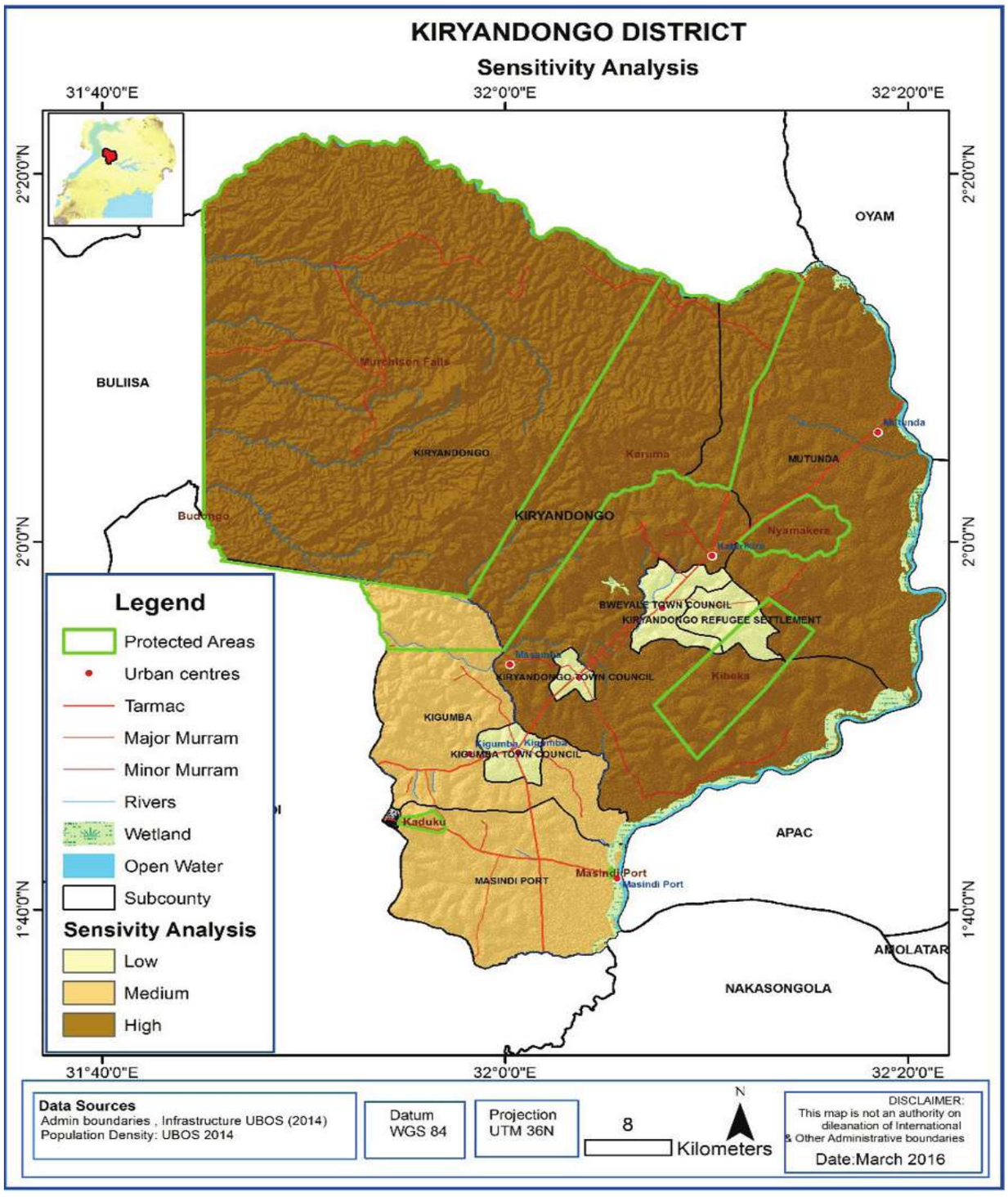

Figure 18: Sensitivty of stressors in Kiryandongo District

In Kiryadongo, livestock diseases, crop pests, environmental hazards and road accidents influenced the overall sensitivity of the area. Kiryadongo and Mutunda sub counties experienced the highest sensitivity due to the two areas being prone to different hazards.

5.3 Lack of Adaptive Capacity

The lack of adaptive capacity was analyzed using the market access and poverty index.

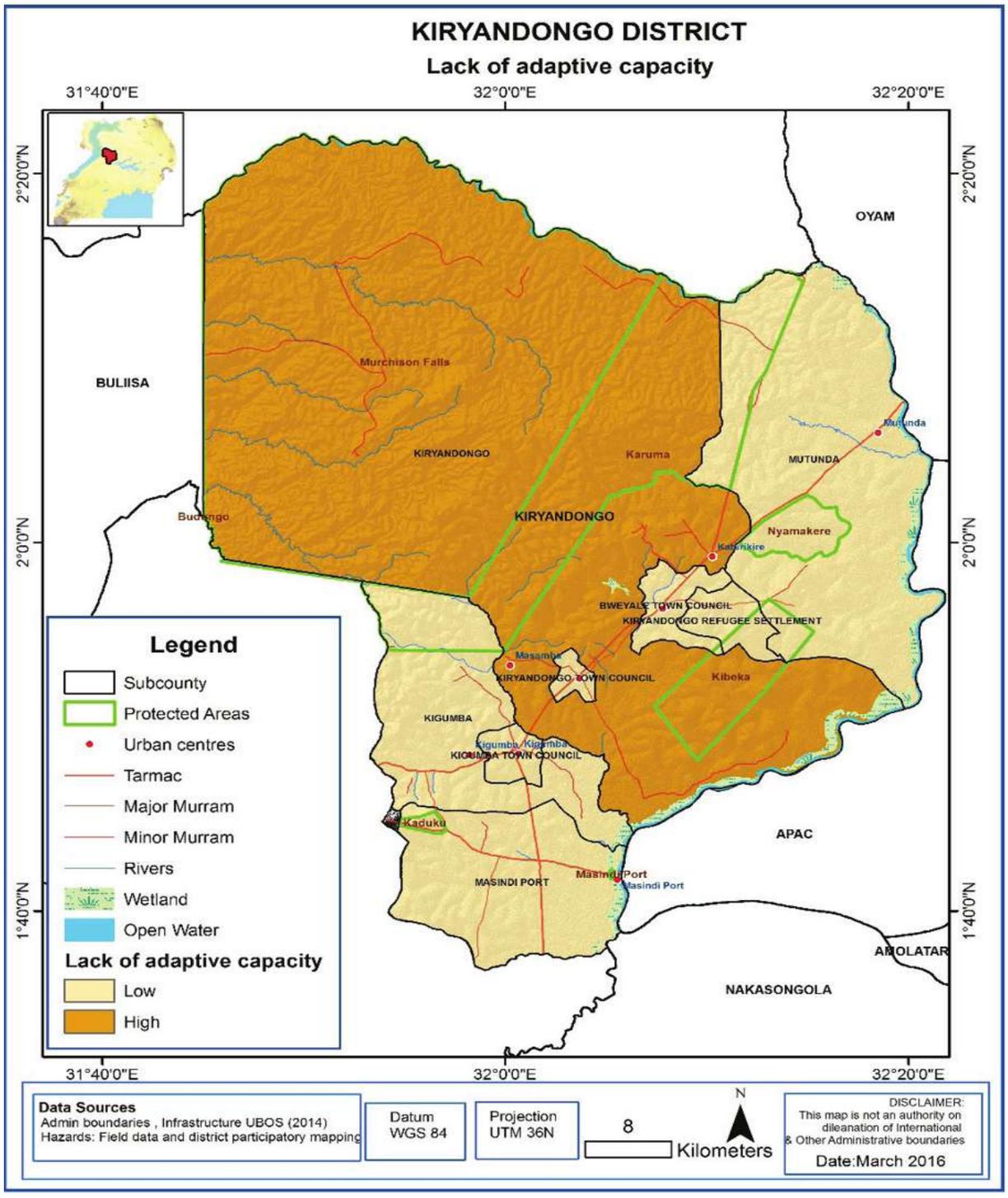

Figure 19: Lack of adaptive capacity in Kiryandongo District

Poverty index influenced the adaptive capacity of the area, with Kiryadongo lacking the capacity to adapt to the climate stressors.

5.4 Vulnerability Assessment

The vulnerability assessment is a result of combination of the exposure, sensitivity and lack of adaptive capacity layers.

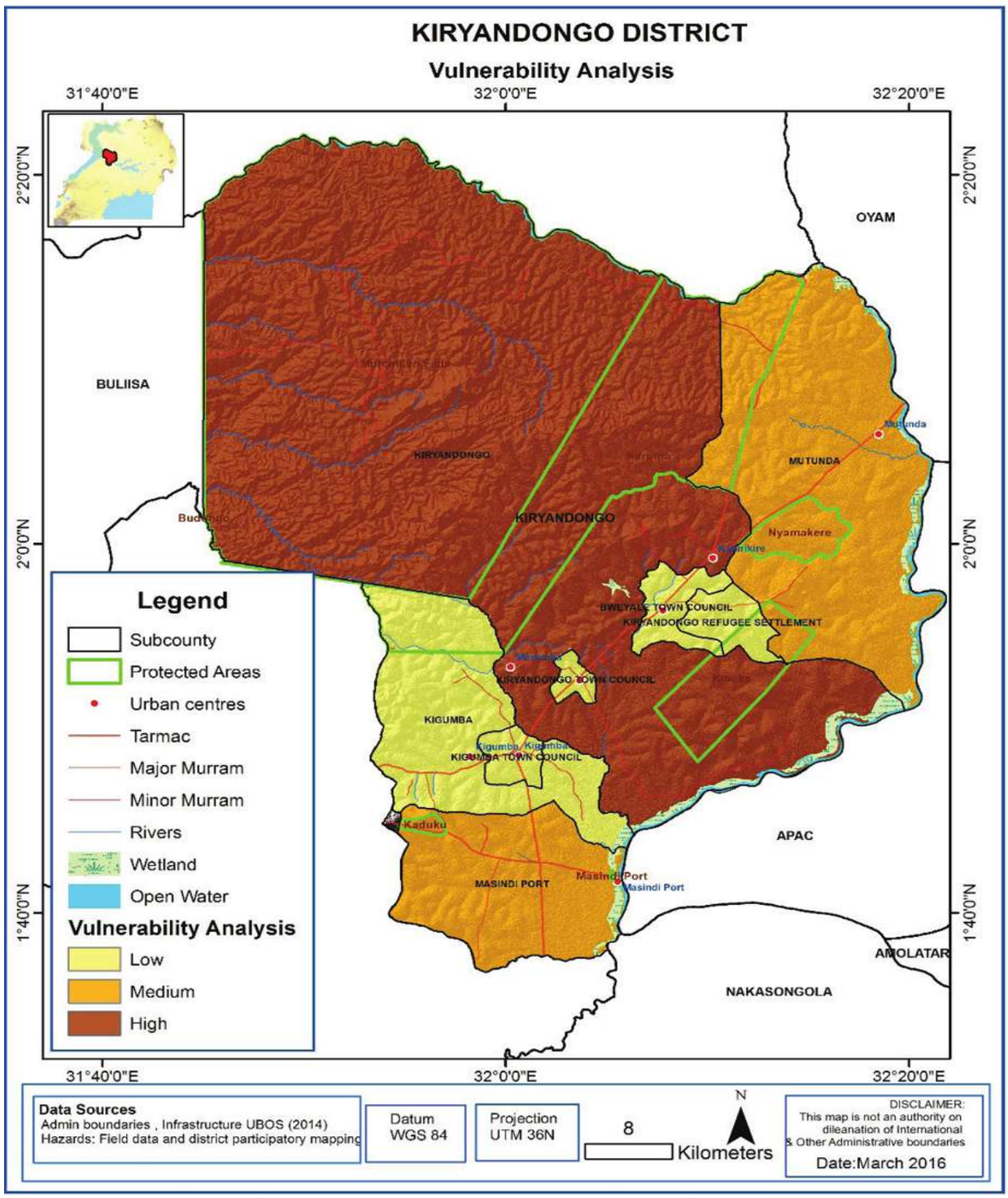

Figure 20: Vulnerability assessment of Kiryandongo District

Exposure and adaptive capacity influenced the overall vulnerability of the area with Kiryandongo emerging as the most vulnerable sub county due to being highly exposed to climate stressors and highly sensitive to different hazards.

6.0 Coping Strategies

Table 2: Coping strategies of Kiryandongo district

Hazard	Ranking	Coping Strategies In Kiryandongo
Accident	01	• Construction of market stalls away from the highway • Negotiating with UNRA to construct speed limiting infrastructures such as humps • sensitizing the community through radio talk-shows by traffic police
Drought	02	• Sensitizing the community abut negative effect of environmental degradation. • Encouraging the communities to plant trees
Crop pest and diseases	03	• Sensitizing the community to adapt better agricultural practices such as crop rotation, planting certified seeds
Human disease out-break	05	• LC system strengthened to control movement of Refugees • Vaccination of all newly arrived refugees • Well stocked Health Centre III at Panyadoli • Sensitizing communities on disease symptoms and what to do • Disease surveillance and reporting scaled up
Vermin and wildlife animal attacks	06	• Trenches are being dug • Bee-hives have been set along the perimeter of the game reserve to scare off elephants
Environmental degradation	07	• Sensitizing the community to plant trees and Farmer Managed Natural Resources (FMNR) • Promotion of best/ improved practices in charcoal production • Promotion of tree planting

7.0 General Conclusions and Recommendations

7.1 Conclusions

Over all it was acknowledged that identifying hazards, risks and vulnerable communities is important in the planning process to know which areas require agent attention to address vulnerability. It was also noted that hazard and disaster management should be mainstreamed with a special policy regarding preparedness at all the levels at the district departments to the lower local governments in order to effectively respond to these hazards. Finally, with these hazards profiled it is possible to approach Development partners to assist in intervening or supporting the district in putting up mitigation measures.

7.2 Recommendations

Crop Pests and Diseases

- Ordinances/ bye-laws on movement of planting materials.
- Registration and certification of agro-chemical dealers.
- Enhance budget support for certification, plant clinics and extension service delivery

Environmental Degradation

- Include Environment among the grant-aided sectors.
- Recruitment and enhance capacity for Environmental staff.
- Strengthening the financial and technical capacity environment committees.
- Putting in place a District Environmental Ordinance (On-Going).
- Provide more tree seedlings and support to energy saving technology access.
- Strengthening compliance to environmental laws enforcement.

Livestock Pests and Diseases

- Enhance budget support for certification and extension service delivery.
- Regulating private service providers in a bid to control quality of services.
- Provision of constant power supply for Cold chain.
- Increasing stock for ant-rabbies vaccines at health centers

Land Conflicts

- Constituting area land committees.

Human Disease Outbreak

- Improve stock outs and other consumables.
- Rehabilitation of health centers and improvement of staff houses.
- Budget enhancement for health centers

Road Accidents

- Sensitization and enforcement on Traffic High way code for all road users.
- Installation of road signs and marking.
- Installation of warning signs at black spots.
- Involvement of communities in maintenance of road signs.

Drought

- Enhance budget support for drought tolerant/ climate adaptation and resilient measures.
- Enhance budget support for water harvesting and simple irrigation technologies.

Floods

- De-silting of streams along wetlands.
- Sensitization of communities along wetlands catchment areas on proper wetland use and good farming practices.
- Implementation of land fund policy

Soil Erosion

- Budget support to carry out the sensitizations.

Vermin and Wild life animal attack

- Budget support for vaccination and sensitization.
- Enforcement.

Strong Winds

- Intensification of tree planting throughout the district especially where there is severe degradation.

Hail storms

- Dissemination of information on weather forecasts

Annex I: Hazard risk assessment in sub-counties within the district

Hazard	Sub-county										
	Nakitoma	Nabiswera	Lwabyata	Nakasongola TC	Wabinyonyi	Lwampanga	Kalungi	Kalongo	Kakooge	Migera TC	Kakooge TC
Floods	H	H	L	N	L	H	H	L	L	N	N
Drought	H	H	H	H	H	H	H	M	M	H	M
Erosion	L	H	L	H	M	L	L	L	L	H	L
Strong winds	L	H	H	L	L	H	H	L	L	L	L
Hailstorms	N	N	N	N	N	H	N	M	L	N	L
Lightning	M	M	N	N	N	N	M	N	N	N	N
Crop pests and Diseases	H	H	H	H	H	H	H	H	H	H	H
Livestock pests and Diseases	H	H	M	H	H	M	H	H	H	M	M
Human disease outbreaks	H	H	H	M H	H	H	H	H	H	H	H
Vermin and Wildlife animal attacks	H	H	M	M	M	M	M	M	M	M	M
Land conflicts	H	H	H	H	H	H	H	H	H	H	H
Bush fires	H	H	H	M	H	H	H	H	L	M	M
Environmental degradation	H	H	H	H	H	H	H	H	H	H	H
Earthquakes	N	N	N	N	N	N	N	N	N	N	N
Road accidents	H	H	N	L	H	L	N	N	H	L	L

N= Not reported, **L =** Low, **M=** Medium, **H=** High

Annex II: Field Data collection questionnaire

DATA COLLECTION

FOCUS GROUP DISCUSSION GUIDE FOR DISTRICT DISASTER RISK MANAGEMENT FOCAL PERSONS

Interviewer Team Name(s)	District: Sub- county:	GPS Coordinates	
		X:	
		Y:	
		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.

Hazard risk assessment

1. Which crops are majorly grown in your area of jurisdiction?

2. Which domestic animals are dominant in your area of jurisdiction?

3. List down/ elaborate on the major contributor’s hazards in the region.

4. Which gender (Male and female) and age group (children≤5, youth10-25, middle aged 30-40, old (>60years) in the societal set-up is the most affected and by what hazard.

5. What challenges are faced by farmers in your area of jurisdiction?

6. Have you experienced any of the following (risks and disasters) in the last 10 years?

   - Floods, Droughts, Landslides, rock falls and erosion
   - Strong winds, hailstorms and Lightning

- Crop pests and diseases
- Animal pests and diseases
- Human diseases and out breaks
- Vermin and wildlife animal attacks
- Land conflicts
- Bush fires
- Environmental degradation
- Earthquakes and faults road accidents

7. How often do you experience such?

8. Which sub-counties have been most affected?

9. As a way of ranking from (1-5) for not reported, Low, Medium, High and Very high, rank sub-counties that have been most affected?

10. What impacts have been caused by the above hazards?

11. List the above hazards in their order of importance on how they are affecting you?

12. What strategies are being adopted by communities to cope with the above hazards?

13. Is there any relevant government's interventions focusing on mitigating the above challenges?

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