CLIMATE CHANGE VULNERABILITY ASSESSMENT REPORT FOR NANSANA MUNICIPALITY

December 2025

THE WORLD BANK

AFD AGENCE FRANÇAISE DE DÉVELOPPEMENT

OFFICE OF THE PRESIDENT
THE REPUBLIC OF UGANDA

EXECUTIVE SUMMARY

Climate change poses a growing threat to both natural ecosystems and human settlements in Uganda, with urban and peri-urban areas such as Nansana Municipality experiencing heightened climate-related vulnerabilities. Characterized by rapid urbanization, informal settlements, degraded wetlands, and inadequate drainage infrastructure, Nansana is particularly vulnerable to the adverse impacts of climate hazards, including flooding, prolonged dry spells, and rising temperatures. This Climate Change and Vulnerability Assessment (CCVA) report aimed to identify and analyze climate-related risks affecting communities, infrastructure, and ecosystems in the Nansana Municipality.

The methods used to develop the CCVA for Nansana Municipality included a literature review, stakeholder engagement, multi-hazard mapping and profiling, and exposure, vulnerability, and risk assessments. The key stakeholders who were consulted and validated this report included the senior environment officer, the environmental officer, the physical planner, and the community development officer. The consultations were conducted at both the municipal and division levels.

Climate change in Nansana Municipality has manifested as increased temperatures, more frequent extreme events such as floods, prolonged dry spells, unpredictable and erratic rainfall patterns, increased rainfall, and changes in planting seasons. The climate hazards that occur in Nansana Municipality include drought, floods, lightning, and windstorms. These hazards have impacted the agriculture, education, energy, health, land and housing, manufacturing, social development, trade, transportation, and water and environment sectors of the municipality.

The areas that have a high level of exposure (more than 80 percent) to all the climate hazards in Nansana Municipality include Magigye, Wamirongo, Ttikalu, Maganjo, Wamala, Nansana West, Nabweru South, Migadde, and Busukuma. The wards that are highly vulnerable to all the hazards include Nabweru South, Kazo, Nabweru East, Wamirongo, Lugo, Ocheng 7/8, and Magigye. Similarly, the wards at risk of all hazards in Nansana Municipality include Maganjo, Nansana East, Nansana West, Nabweru North, Nabweru South, Kazo, and Ocheng 7/8.

Therefore, the government, with support from partners, should design innovative approaches to reduce the vulnerability and risk of these communities to multi-hazards and also increase their resilience and livelihoods. Some of those approaches may include;

- develop and maintain a local climate risk database to support evidence-based planning
- integrate hazard-specific data into local development plans
- upgrade and regularly maintain flood-prone drainage systems and culverts
- promote stronger building materials, elevated housing, and storm-resistant roofing

FORWARD

Climate change has transitioned from a projected environmental threat to an active, systemic crisis, severely challenging the socio-ecological resilience of urban and peri-urban landscapes across Uganda. As sub-Saharan Africa experiences accelerated demographic shifts, municipalities like Nansana in Wakiso District find themselves at the intersection of rapid, unplanned urbanization and heightened climate vulnerability. Characterized by informal settlements, anthropogenically degraded wetland ecosystems, and structural deficits in drainage infrastructure, Nansana Municipality serves as a critical micro-cosmos for studying and mitigating localized climate risks.

This Climate Change and Vulnerability Assessment (CCVA) report establishes an empirical foundation for understanding how shifting climate variables intersect with localized socio-economic vulnerabilities. Utilizing a robust, multi-disciplinary methodology combining rigorous literature review, multi-hazard geospatial mapping, and targeted exposure, vulnerability, and risk assessments this document translates macro-climate data into actionable municipal intelligence. Crucially, the integration of participatory stakeholder engagements with key technical personnel, including the Senior Environment Officer, Environmental Officer, Physical Planner, and Community Development Officer across municipal and division levels, ensures that the institutional memory and lived realities of Nansana's frontline communities anchor these findings.

The empirical evidence compiled herein paints a sobering picture of Nansana's altered climate profile, manifested through escalating mean temperatures, erratic and unpredictable precipitation regimes, shifted agricultural phonologies, and an increased frequency of extreme weather events. The municipality confronts a complex matrix of multi-hazards, including catastrophic flash floods, prolonged droughts, lightning, and destructive windstorms. These hazards no longer operate in isolation; they exert compounded stress across a multitude of interconnected sectors, notably agriculture, public health, trade, manufacturing, social development, transportation, and municipal infrastructure.

Addressing these vulnerabilities requires a paradigm shift toward climate-resilient urban governance. This report outlines a strategic roadmap for the Government of Uganda, municipal authorities, and development partners to deploy targeted, innovative interventions aimed at risk reduction and livelihood adaptation. Priority must be given to the institutionalization of a localized, dynamic climate risk database to drive evidence-based urban planning. Furthermore, mainstreaming hazard-specific data into Local Development Plans (LDPs) is paramount. On the structural front, upgrading and systematically maintaining climate-resilient stormwater drainage networks and culverts, alongside enforcing climate-smart building codes such as elevated housing typologies and storm-resistant materials will be critical to safeguarding Nansana's infrastructure.

It is my profound hope that this CCVA report serves not merely as a diagnostic tool, but as a catalyst for transformative policy formulation, targeted capital investment, and sustainable urban development, ultimately securing a resilient, climate-defensive future for the citizens of Nansana Municipality.

Regina Bakitte Nakkazzi Musoke

Her Worship, Mayor

Nansana Municipality

ACKNOWLEDGEMENT

The formulation and successful completion of this comprehensive Climate Change and Vulnerability Assessment (CCVA) report for Nansana Municipality represents a collaborative, multi-sectoral milestone in urban climate resilience planning. We extend our profound gratitude to all institutional partners, technical experts, and community stakeholders whose invaluable data, strategic oversight, and localized insights anchored the empirical rigor of this assessment.

First and foremost, we express our sincere appreciation to the Greater Kampala Metropolitan Area Urban Development Program (GKMA-UDP) under the Office of the President. Their strategic mandate, funding facilitation, and overarching commitment to climate-resilient urban expansion provided the critical institutional framework necessary to execute this assessment. By aligning municipal planning with metropolitan-wide resilience goals, the GKMA-UDP has empowered Nansana Municipality to proactively confront the compounding threats of rapid urbanization, informal settlement expansion, and ecosystem degradation.

We are deeply indebted to the Nansana Municipality Technical and Administrative Teams for their unwavering leadership and institutional cooperation. Special recognition is extended to the key technical officers who meticulously guided the consultation, data aggregation, and validation processes at both the municipal and division levels. This report would lack its empirical depth without the active participation of both public and private stakeholders, civil society organizations, and local community leaders. Their contributions during the multi-hazard mapping, profiling, and exposure assessments were instrumental in identifying highly vulnerable hotspots and cross-sectoral climate risks. This collaborative engagement ensured that the data captured accurately reflects the cross-cutting impacts of erratic precipitation, prolonged dry spells, flash floods, and windstorms across Nansana's socioeconomic fabric spanning the infrastructure, public health, agriculture, and trade sectors.

Finally, we commend the technical teams who synthesized complex climate projections, geospatial data, and stakeholder inputs into a coherent, forward-looking urban adaptation roadmap. The collective dedication of all mentioned parties has resulted in a foundational planning tool that will drive evidence-based, risk-informed development across Nansana Municipality for years to come.

Tandeka Festo

Municipal Clerk

Nansana Municipality

TABLE OF CONTENTS

EXECUTIVE SUMMARY i
FORWARD ii
ACKNOWLEDGEMENT iii
LIST OF FIGURES vi
LIST OF TABLES viii
CHAPTER ONE: INTRODUCTION 1
1.1 Background 1
1.2 Purpose and Objectives 1
1.2.1 Purpose 1
1.2.2 Objectives 1
1.3 Policy, planning, and regulatory frameworks 2
CHAPTER TWO: OVERVIEW OF NANSANA MUNICIPALITY 8
2.1 Location 8
2.2 Topography 9
2.3 Soils 10
2.4 Wetland ecosystems 11
2.5 Climate 12
2.6 Socio-demographic characteristics of communities 14
CHAPTER THREE: METHODOLOGY 16
3.1 Literature Review 16
3.2 Key Informant Interviews 16
3.3 Focus Group Discussion (FGD) 16
3.4 Climate Risk Assessment 17
3.5 Climate Change Projections 18
3.6 Vulnerability and Risk Assessment 19
CHAPTER THREE: CLIMATE CHANGE AND VULNERABILITY 21
3.1 Climate Trends and Projections 21
3.1.1 Observed and Projected Maximum Temperature Trends in Nansana Municipality 21
3.1.2 Observed and Projected Minimum Temperature Trends in Nansana Municipality. 23
3.1.3 Observed and Projected Rainfall Trends in Nansana Municipality 26

3.2 Climate Hazards 29
3.2.1 Drought Hazard 29
3.2.2 Flood Hazard 31
3.2.3 Lightning Hazard 33
3.2.4 Windstorm Hazard 35
3.3 Exposure Assessment 37
3.4 Vulnerability Assessment 68
3.4.1 Exposure of communities to multi-hazards 68
3.4.2 Sensitivity of communities to multi-hazards 69
3.4.3 Adaptive capacity of communities to multi-hazards 72
3.4.4 Vulnerability of communities to multi-hazards 77
3.4.5 Risk of communities to multi-hazards 78
CHAPTER FOUR: RISK REDUCTION MEASURES TO CLIMATE HAZARDS 79
4.1 Introduction 79
4.2 Hazard-specific Disaster Risk Reduction Measures 79
CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS 81
5.1 Conclusion 81
5.2 Recommendations 81
REFERENCES 82
ANNEXES 83
Annex 1: Key informant interview guide 83
Annex 2: Focus group discussion checklist 89
Annex 3: Photographs of stakeholder engagements 90
Annex 4: Attendance of stakeholder engagements 93

LIST OF FIGURES

Figure 1: Location of Nansana Municipality in Uganda 8
Figure 2: Topography of Nansana Municipality 9
Figure 3: Soils of Nansana Municipality 11
Figure 4: Status of wetlands in the different divisions of Nansana Municipality 12
Figure 5: Annual precipitation and temperature for Nansana Municipality between 1994 and 2024 13
Figure 6: Monthly precipitation and temperature for Nansana Municipality between 1994 and 2024 13
Figure 7: Sources of livelihood for communities in Nansana municipality in 2014 15
Figure 8:The risk matrix 20
Figure 9: Historical and projected maximum temperature for Nansana municipality between 1994 and 2030 21
Figure 10: Projected maximum temperature under RCP 4.5 for the 2025-2030 near-term projection period in Nansana municipality 22
Figure 11: Projected maximum temperature under RCP 8.5 for the 2025-2030 near-term projection period in Nansana municipality 23
Figure 12: Historical and projected minimum temperature for Nansana municipality between 1994 and 2030 24
Figure 13: Projected minimum temperature under RCP 4.5 for the 2025-2030 near-term projection period in Nansana municipality 25
Figure 14: Projected minimum temperature under RCP 8.5 for the 2025-2030 near-term projection period in Nansana municipality 26
Figure 15: Historical and projected rainfall for Nansana municipality between 1994 and 2030 27
Figure 16: Projected rainfall under RCP 4.5 for the 2025-2030 near-term projection period in Nansana municipality 28
Figure 17: Projected rainfall under RCP 8.5 for the 2025-2030 near-term projection period in Nansana municipality 29
Figure 18: Drought hazard zonation in Nansana Municipality 31
Figure 19: Flood hazard zonation in Nansana Municipality 33
Figure 20: Lightning hazard zonation in Nansana Municipality 34
Figure 21: Windstorm hazard zonation in Nansana Municipality 36
Figure 22: Exposure of farmlands to drought hazard in Nansana Municipality 38
Figure 23: Exposure of farmlands to flood hazard in Nansana Municipality 39
Figure 24: Exposure of farmlands to hailstorm hazard in Nansana Municipality 40
Figure 25: Exposure of farmlands to windstorm hazard in Nansana Municipality 41
Figure 26: Exposure of schools to flood hazard in Nansana Municipality 42
Figure 27: Exposure of schools to lightning hazard in Nansana Municipality 43
Figure 28: Exposure of schools to windstorm hazard in Nansana Municipality 44
Figure 29: Exposure of distribution substations to floods in Nansana Municipality 45
Figure 30: Exposure of distribution substations to lightning in Nansana Municipality 46
Figure 31: Exposure of distribution transformers to lightning hazard in Nansana Municipality 47
Figure 32: Exposure of distribution transformers to windstorm hazard in Nansana Municipality 48
Figure 33: Exposure of distribution lines to lightning hazard in Nansana Municipality 49

Figure 34: Exposure of distribution lines to windstorm hazard in Nansana Municipality 50
Figure 35: Exposure of government health facilities to flood hazard in Nansana Municipality 51
Figure 36: Exposure of government health facilities to lightning hazard in Nansana Municipality 52
Figure 37: Exposure of government health facilities to windstorm hazard in Nansana Municipality 53
Figure 38: Exposure of buildings to flood hazard in Nansana Municipality 54
Figure 39: Exposure of buildings to lightning hazard in Nansana Municipality 55
Figure 40: Exposure of buildings to windstorm hazard in Nansana Municipality 56
Figure 41: Human population exposure to drought hazard in Nansana Municipality 57
Figure 42: Human population exposure to flood hazard in Nansana Municipality 58
Figure 43: Human population exposure to lightning hazard in Nansana Municipality 59
Figure 44: Human population exposure to windstorm hazard in Nansana Municipality 60
Figure 45: Human population exposed to hailstorm hazard in Nansana Municipality 61
Figure 46: Exposure of roads to flood hazard in Nansana Municipality 62
Figure 47: Exposure of forests to drought hazard in Nansana Municipality 64
Figure 48: Exposure of forests to flood hazard in Nansana Municipality 65
Figure 49: Exposure of water sources to drought hazard in Nansana Municipality 66
Figure 50: Exposure of water sources to flood hazard in Nansana Municipality 67
Figure 51: Multi-hazard exposure of communities to drought, floods, lightning, and windstorms in Nansana Municipality 68
Figure 52: Sensitivity of communities to multi-hazards in Nansana Municipality 72
Figure 53: Adaptive capacity of communities to multi-hazards in Nansana Municipality 76
Figure 54: Vulnerability of communities to multi-hazards in Nansana Municipality 77
Figure 55: Risk of communities to multi-hazards in Nansana Municipality 78

LIST OF TABLES

Table 1: Population census in Nansana municipality in 2024 14
Table 2: Categorization of drought based on SPI values 17
Table 3: Lightning hazard intensity scale 17
Table 4: Beaufort wind hazard intensity scale 18
Table 5: General Circulation Models (GCM) used for climate projection of Nansana Municipality 18
Table 6: Coverage of drought hazard in Nansana Municipality 30
Table 7: Flood hotspots in Nansana Municipality 32
Table 8: Coverage of flood hazard in Nansana Municipality 32
Table 9: Coverage of lightning hazard in Nansana Municipality 34
Table 10: Coverage of windstorm hazard in Nansana Municipality 36
Table 11: Sensitivity of elements at risk to the different climate hazards 37
Table 12: Exposure of farmlands to drought, flood, hailstorm, and windstorm hazards in Nansana Municipality 38
Table 13: Exposure of schools to floods, lightning, and windstorms in Nansana Municipality 41
Table 14: Exposure of distribution transformers to lightning and windstorm hazards 46
Table 15: Exposure of distribution lines to lightning and windstorm hazards 48
Table 16: Exposure of health facilities to floods, lightning, and windstorms in Nansana Municipality 50
Table 17: Exposure of buildings to floods, lightning, and windstorms in Nansana Municipality 53
Table 18: Human population exposed to drought, floods, lightning, and windstorms in Nansana Municipality 56
Table 19: Exposure of roads to floods in Nansana Municipality 61
Table 20: Exposure of forests to drought and floods in Nansana Municipality 63
Table 21: Exposure of water sources to drought and floods in Nansana Municipality 65
Table 22: Exposure of the different types of water sources to drought and floods in Nansana Municipality 66
Table 23: Sensitivity indicators to multi-hazards in Nansana Municipality 70
Table 24: Adaptive capacity indicators to multi-hazards in Nansana Municipality 74
Table 25: Structural and non-structural DRR measures in Nansana Municipality 79

CHAPTER ONE: INTRODUCTION

1.1 Background

Nansana Municipality is located in Wakiso District in the Central Region of Uganda, and lies within the rapidly growing Greater Kampala Metropolitan Area (GKMA). As one of Uganda's most urbanized municipalities, Nansana has experienced substantial population growth, expansion of informal settlements, and increased pressure on natural resources and infrastructure. This rapid urbanization has heightened the municipality's exposure and sensitivity to climate-related hazards such as floods, heat stress, and changing rainfall patterns.

Uganda's climate is characterized by two rainy seasons and is influenced by regional and global climate systems. In recent years, however, climate variability and change have become more pronounced across the country, including in urban areas like Nansana. The key challenges exacerbated by climate change in the municipality include increased frequency and intensity of flash floods due to heavy rains and poor drainage infrastructure, degradation of wetlands and green spaces as a result of encroachment and unregulated development, inadequate solid waste management contributing to blocked drainage and water contamination, and public health risks associated with poor sanitation and stagnant water, such as outbreaks of waterborne diseases. These challenges are compounded by a range of socioeconomic and institutional factors, including limited adaptive infrastructure, low public awareness, poor land-use planning, and constrained financial resources for climate adaptation.

The Ugandan government, through its National Climate Change Policy and Vision 2040, emphasizes the need for local governments to mainstream climate change into development planning. In this context, the Climate Change Vulnerability Assessment for Nansana Municipality aims to support informed decision-making and to guide the integration of climate-resilience strategies into urban planning, infrastructure development, and service delivery. This assessment provides a foundation for understanding the current and future risks posed by climate change in Nansana. It proposes evidence-based interventions that enhance the municipality's adaptive capacity, protect vulnerable populations, and build a sustainable urban environment.

1.2 Purpose and Objectives

1.2.1 Purpose

The purpose of the climate change and vulnerability assessment is to identify, analyze, and document the key climate-related risks and vulnerabilities affecting the communities, infrastructure, and ecosystems of Nansana Municipality.

1.2.2 Objectives

The objectives of the climate change and vulnerability assessment are;

I. To identify key climate hazards and their impacts on infrastructure, livelihoods, and ecosystems within the municipality.
II. To assess the vulnerability of populations and sectors in Nansana Municipality
III. To recommend practical and locally appropriate adaptation measures to strengthen climate resilience and inform policy and planning.

1.3 Policy, planning, and regulatory frameworks

The frameworks aim to reduce emissions, build resilience to climate impacts, enhance climate-resilient infrastructure and services, and strengthen the knowledge base. Table 1 outlines the policy, regulatory, and planning frameworks that guide the planning and implementation of climate-resilient mitigation and adaptation strategies.

Table 1: Strategies, International and national policy and regulatory frameworks

Frameworks, Policies, Plans and Acts	Relevance to Climate actions
International Frameworks	
United Nations Framework Convention on Climate Change (UNFCCC) 1992(Article 4)	Uganda signed and ratified the UNFCCC in 1992. The UNFCCC primarily focuses on developing NDCs, promotes the integration of climate change into national planning, and enables access to international climate finance, capacity building, and technology to align actions with global climate goals, thereby strengthening institutional frameworks for coordinated climate action.
The Sendai Framework for Disaster Risk Reduction (2015-2030) (Priority 2)	The **Sendai Framework** emphasizes the need to reduce disaster risks exacerbated by climate change, including droughts, floods, and extreme weather events. It encourages the integration of DRR into **climate change policies and plans**. To build climate resilience, improve EWS, and ensure climate adaptation efforts reduce vulnerability to climate-related disasters.
The United Nations Convention to Combat Desertification (1994) (Article 2)	The **UNCCD** focuses on promoting sustainable land management practices that prevent desertification, land degradation, and drought; implementing climate-resilient agricultural practices, improving soil health, and restoring degraded lands; mitigating the impacts of climate change, enhancing carbon sequestration, and increasing agricultural productivity in vulnerable areas, to contribute to **climate adaptation and greenhouse gas reduction**.
The Paris Agreement (2015) (Article 2)	The **Paris Agreement** is a core in limiting global temperature rise to well below 2°C and pursuing efforts to stay within 1.5°C; it guides the formulation and implementation of **NDCs**, which outline sector-specific strategies for climate mitigation and adaptation; enhances access to **international climate finance**, **capacity building and technology transfer**, and supports the transition to a low-carbon and climate-resilient development pathway.
Kyoto Protocol (2005) (Article 12.2 -12.6)	The **Kyoto** Protocol's primary focus is on reducing greenhouse gas emissions through the implementation of emission-reduction projects, access to climate finance, and the promotion of low-carbon technologies. Supporting climate action goals is easy through the Clean Development Mechanism CDM.
Sustainable Development Goals (2015) (SDG 13: Climate Action)	The **SDGs**, specifically **Goal 13 (Climate Action)**, focus on strengthening resilience and adaptive capacity to climate-related hazards; promoting the integration of climate change measures into national policies, strategies, and planning; encouraging access to climate finance,

Frameworks, Policies, Plans and Acts	Relevance to Climate actions
	investing in renewable energy, and promoting sustainable land and resource use to achieve a **low-carbon, climate-resilient future**.
African Union Agenda (2063) (Chapter 2, Aspiration 1)	Focuses on promoting a prosperous and sustainable Africa by supporting inclusive green growth, environmental sustainability, and climate-resilient economies; advocating for **renewable energy adoption**, **sustainable land use**, and **climate-smart agriculture;** encouraging regional cooperation and resource mobilization to tackle climate change effectively.
IGAD Initiatives on Drought & Desertification Strategy (2021-2025) (Pillar 1)	The strategy focuses on promoting climate-resilient agriculture, **sustainable land management**, **ecosystem restoration**, addressing land degradation, and reducing vulnerability to climate shocks, promoting cross-border collaboration, capacity building, and the use of climate-smart practices, contributing to greenhouse gas reduction, enhanced adaptive capacity, and improved food security in drought-prone areas.
UN 2030 Agenda (Goal 13: Climate Action)	The agenda adopted in 2015 outlines 17 SDGs, with Goal 13 (Climate Action) calling for urgent action to combat climate change and its impacts. It guides the integration of climate change into national planning, encourages **resilient development**, and supports **access to international climate finance and technology**.
The Ramsar Convention on Wetlands (1971) (Articles 3.1,4)	The Ramsar Convention promotes the **conservation and wise use of wetlands**, which advocates for **carbon storage**, **climate regulation**, and **biodiversity conservation** by buffering climate impacts and supporting climate-resilient livelihoods, including fishing, eco-tourism, and sustainable agriculture.
National Planning frameworks	
Uganda Vision (2040) (Chapter 5, section 5.9)	The Vision acknowledges climate change as a hindrance to development and promotes a shift to a green economy focused on low-carbon development, renewable energy, and sustainable natural resource use. It also supports the integration of climate change adaptation and mitigation across all sectors of the economy to ensure long-term sustainability.
Fourth National Development Plan	NDPIV focuses on **integrating climate change** into national and local development plans. It promotes sustainable use of natural resources, environmental protection, and low-emission development pathways. It has supported **investment in climate-smart technologies** and encourages coordination among sectors to strengthen climate resilience.
Updated Nationally Determined Contribution (2022) (Page iii)	The Updated NDC outlines the country's enhanced commitment to reduce greenhouse gas emissions by 24.7% by 2030, with a focus on sectors including **agriculture, energy, forestry, and waste management**. It promotes **transition to clean energy**, climate-smart agriculture, and **afforestation**, while advocating for inclusive participation and gender-responsive approaches.
Uganda Disaster Preparedness Plan (2005 – 2009)	Although it was developed before Uganda's formal climate change policy frameworks, the plan indirectly supports climate goals by strengthening

Frameworks, Policies, Plans and Acts	Relevance to Climate actions
	national capacity to prepare for climate-related **hazards** such as floods and droughts.
National Disaster Risk Management (DRM) Plan (2011 – 2028)	The DRM Plan supports the country's climate resilience efforts by promoting **risk-informed development planning**. It acknowledges the growing impact of **climate-induced hazards**, including droughts, floods, and landslides, and advocates for **adaptation measures** that reduce long-term vulnerability to climate change.
NRM manifesto (2021 – 2026) (Section 3, page 277)	The Manifesto highlights the importance of sustainable **natural resource management** as a foundation for Uganda's future development. It profiles a commitment to **climate-smart agriculture**, which aims to enhance productivity while minimizing environmental degradation. It promotes the adoption of **innovative technologies** to reduce carbon emissions and improve environmental sustainability. It also calls for integrating **climate change adaptation** and **mitigation** strategies across all sectors, including agriculture, energy, infrastructure, and transport, to ensure **climate resilience** in both urban and rural communities.
Uganda National Adaptation Programmes of Action (2007)	NAPA establishes a strategic approach to **climate change adaptation** by identifying the most vulnerable communities and sectors. It focuses on actions that enhance resilience in sectors including health, agriculture, and water resources. It proposes **adaptation measures**, including promoting drought-resistant crops, improving water storage, and enhancing EWS for extreme weather events.
Health Sector Development Plan (2015-2020)	The plan recognizes the growing impact of **climate change** on public health, primarily through **climate-sensitive diseases** such as cholera, malaria, and waterborne diseases. It underscores the need for **climate adaptation strategies** to protect health systems and improve **healthcare access** for vulnerable populations. The plan also supports initiatives such as **vector control** in malaria-prone areas and the strengthening of health sector capacity to manage climate-related health crises.
The Water Action Plan (1995)	The plan focuses on improving water resource management by ensuring sustainable water use amid growing climate change impacts. It emphasizes the development of **water infrastructure, water conservation**, and the promotion of efficient irrigation practices, all of which are important for adapting to climate-induced water scarcity and drought. It also advocates for better management of **wetlands** to improve water retention and resilience to climate-related shifts in water availability.
National Policies	
The 1995 Constitution of Uganda (1995) (XIII. Protection of natural resources, XXVII. The environment)	The Constitution establishes the foundation for environmental protection, recognizing the duty of the state and its citizens to safeguard natural resources, including water, land, wetlands, and biodiversity. It requires that development be ecologically sustainable, supporting climate action by providing a legal basis to integrate environmental and climate considerations into national and local policies.

Frameworks, Policies, Plans and Acts	Relevance to Climate actions
National Environment Management Policy (2014) (Chapter 3)	NEMP establishes a framework to integrate climate considerations and environmental sustainability into Uganda's development agenda by promoting the sustainable use of natural resources, supporting climate change mitigation and adaptation measures, and advocating for the integration of climate issues into sectoral plans, policies, **and budgets**. NEMP encourages the **mobilization of financial and technical resources** for environmental protection and resilience building.
Uganda National Land Policy (2013) (Chapter 6,6.7,6.10(150-152)	The policy advocates climate-resilient land-use **planning** by promoting **sustainable land management practices** that prevent degradation and enhance productivity. It encourages **protection of fragile ecosystems**, including forests, wetlands, and mountainous areas, which are crucial for carbon sequestration and climate regulation. The policy also emphasizes integrating **climate change adaptation strategies** into land tenure and utilization systems.
Uganda National Climate Change Policy (2015) (Page v, Section 3)	The policy is a **central framework for addressing climate change**, guiding both mitigation and adaptation efforts, promoting **low-carbon development**, encouraging **sustainable energy use**, and advocating for **integration of climate change into all national and sectoral plans;** supports **green economy initiatives** and provides direction for mobilizing **climate finance**, research, and technology transfer to build national climate resilience.
Disaster Preparedness and Management Policy (2010) (Section 1.1.4.9)	Although the policy primarily focuses on disaster management, it also recognizes the increasing climate-related hazards, including floods, droughts, and landslides, and their impacts; promotes the mainstreaming of climate change adaptation into disaster risk reduction strategies, and supports actions that build community resilience to the long-term effects of climate change.
The Uganda Forestry Policy (2001) (Policy statement 7, section 1.2.3,1.2.6)	The policy seeks to promote sustainable forest management for climate change mitigation through biodiversity conservation and carbon sequestration, and to encourage afforestation, reforestation, and the restoration of degraded forest ecosystems, all of which reduce greenhouse gas emissions and enhance climate resilience across landscapes.
The Water Statute (1995)	The Water Statute advocates sustainable use, conservation, efficient water use, protection of water resources, and resilience-building in water supply systems, which are key to climate adaptation. It establishes the legal basis for an **integrated water resources management (IWRM)** approach to ensure water availability amidst changing climate patterns.
The Gender Policy (2007) (Section 5.4)	The policy primarily emphasizes **equity and inclusiveness in climate change planning and response**. It recognizes that women and men experience climate impacts differently and promotes the **integration of gender perspectives into environmental and climate policies**; it

Frameworks, Policies, Plans and Acts	Relevance to Climate actions
	advocates for **women's participation in climate actions**, mainly in sectors including agriculture, water, and energy, which are highly climate-sensitive
National Acts	
National Forestry and Tree Planting Act (2003) (Section 2 (a -h), sections 37,39).	The Act establishes a legal framework that prioritizes the sustainable expansion of forests and their management to mitigate climate change through carbon sequestration. It also promotes afforestation, tree planting, and reforestation in degraded areas, and supports the conservation of natural forest reserves to reduce greenhouse gas emissions and protect biodiversity.
National Climate Change Act (2021) (Section 3(a -e))	The Act primarily seeks to address climate change. It mandates integrating **climate change into all national and sectoral plans, policies, and budgets**. It has established institutional structures for **climate governance**, enforces commitments under international agreements (e.g. the Paris Agreement), and promotes **emissions tracking**, **low-carbon development**, and **climate finance** mechanisms to support climate-resilient growth.
National Disaster Preparedness and Management Act (2021)	The Act supports **climate change adaptation** by integrating **disaster risk reduction (DRR)** into national development plans, thereby helping address the vulnerabilities of sectors such as water resources, agriculture, and health to climate change impacts, including droughts and floods. The Act enhances Uganda's capacity to prepare for and manage **climate-induced hazards**, thereby promoting community sustainability through EWS, resource mobilization, and adaptive measures.
The National Environment Act (NEA) (2019) (Page 9)	The NEA provides a framework for environmental management which emphasizes sustainable development and the integration of environmental concerns into national planning. It established the NEMA, a coordinating, monitoring, regulatory, and supervisory body for ecological activities. The Act seeks to address emerging environmental issues, including climate change, by promoting strategic environmental assessments and the management of hazardous chemicals.
The National Water Policy (1999) (Sections 4.1,4.3.3 ,6.4,7.2)	The **policy** provides a framework that prioritizes sustainable management and development of water resources. It has promoted IWRM to adapt to climate variability and ensure the equitable and efficient use of water across all sectors. It also supports water conservation and sustainable water supply for rain-fed agricultural production affected by climate change. It addresses the need for efficient water use across industries and urban areas to reduce their carbon and water footprints.
The Water Act, Cap. 152 (1997) (Section 4 (a-d)).	The Act establishes a framework for the use, protection, and management of water resources. It supports climate adaptation efforts by ensuring that water use across agricultural, domestic, industrial, and energy production is sustainable. This helps mitigate the impacts of climate change by maintaining the availability and integrity of water resources.

Frameworks, Policies, Plans and Acts	Relevance to Climate actions
Land Act, 1998 (as amended), Cap. 227.(Part III Sections 42,43,44,45)	The Act establishes a framework for land tenure, including customary, freehold, mailo, and leasehold; ownership, and management. Although the Act does not explicitly address climate change issues, but it encourages sustainable land-use practices and long-term investments in land conservation, which are essential in climate change mitigation and adaptation strategies.
The Local Governments Act (1997) (Second schedule, Part 2, item 15, Sections 30,31,32)	The Act entrusts local governments with managing natural resources within their jurisdictions. It empowers local authorities to implement environmental policies and programs customized to their specific contexts, facilitating more effective responses to climate change challenges; LGs can develop and enforce ordinances related to environmental conservation, promote sustainable land use practices, and engage communities in climate adaptation initiatives, enabling grassroots-level climate action, fostering resilience and sustainable development.
Public Finance Management Act, 2015 (Section 9(1), (3), (5), (6), (7), (8)	PFMA integrates climate change into planning and budgeting through prudent financial management, ensuring efficient allocation of resources to climate-related initiatives and enabling the government to fund climate adaptation and mitigation programs that build resilience to climate impacts.
The National Water & Sewerage Corporation Act. 1995(Section 4)	The policy gave rise to the establishment of the National Water and Sewerage Corporation (NWSC). The NWSC has been responsible for the provision of piped water and focuses on expanding water and sewerage services in large and small urban centres. In this context, the Act supports the implementation of **IWRM**, encourages the sustainable management and conservation of water resources, and enhances climate resilience in urban areas by helping communities adapt to climate change impacts, such as altered precipitation patterns and water scarcity.

CHAPTER TWO: OVERVIEW OF NANSANA MUNICIPALITY

2.1 Location

Nansana Municipality is located in Wakiso district within the central region of Uganda. The municipality is governed by the Nansana Municipal Council, located about 9.6 kilometers from the centre of Kampala, the capital city of Uganda, along Kampala-Hoima Road. The municipality covers an area of 295.3 square kilometers and borders Wakiso Town Council, Mende and Masuliita sub-counties to the West; Kampala city to the South; Kasangati Town Council and Kyampisi sub-county to the East; and Bombo Town Council as well as Makulubita, Nyimbwa, and Kalagala sub-counties to the North. Nansana municipality has four divisions namely Gombe, Busukuma, Nansana, and Nabweru divisions (**Figure 1**).

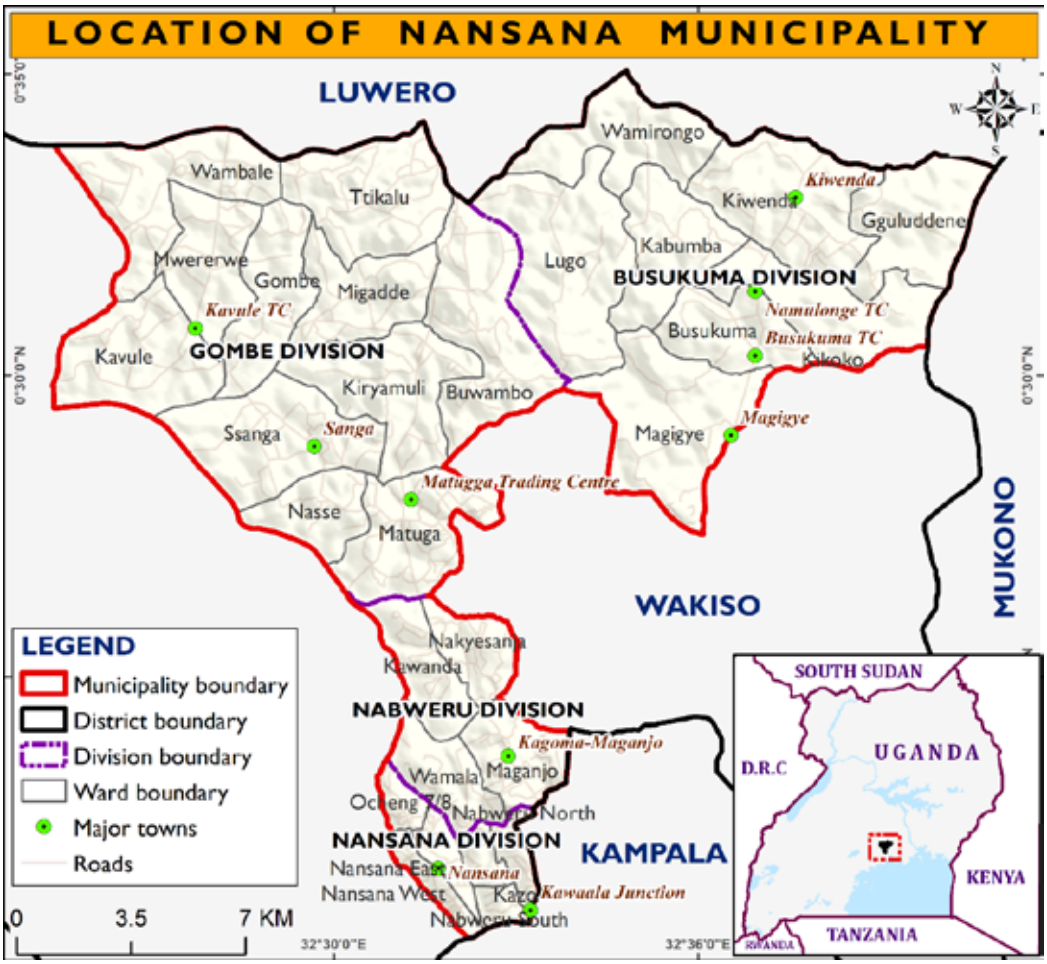


Figure 1: Location of Nansana Municipality in Uganda

2.2 Topography

The topography of Nansana Municipality ranges between 1,089 and 1,303 meters above sea level (**Figure 2**). The Municipality is characterized by isolated, flat-topped hills with gentle slopes that often merge abruptly into long, gentle pediments, which are usually dissected by relatively U-shaped valleys (PDP, 2018-2040). The high-altitude areas are observed in Maganjo, Buwambo, Migadde, and Ttikalu, whereas the lowest low-lying areas are found in Gguluddene and Kikoko (**Figure 2**). The topography of Nansana Municipality influences flooding: steep slopes accelerate runoff. They can lead to flash floods, whereas low-lying or flat areas are more prone to prolonged flooding because water accumulates and drains slowly.

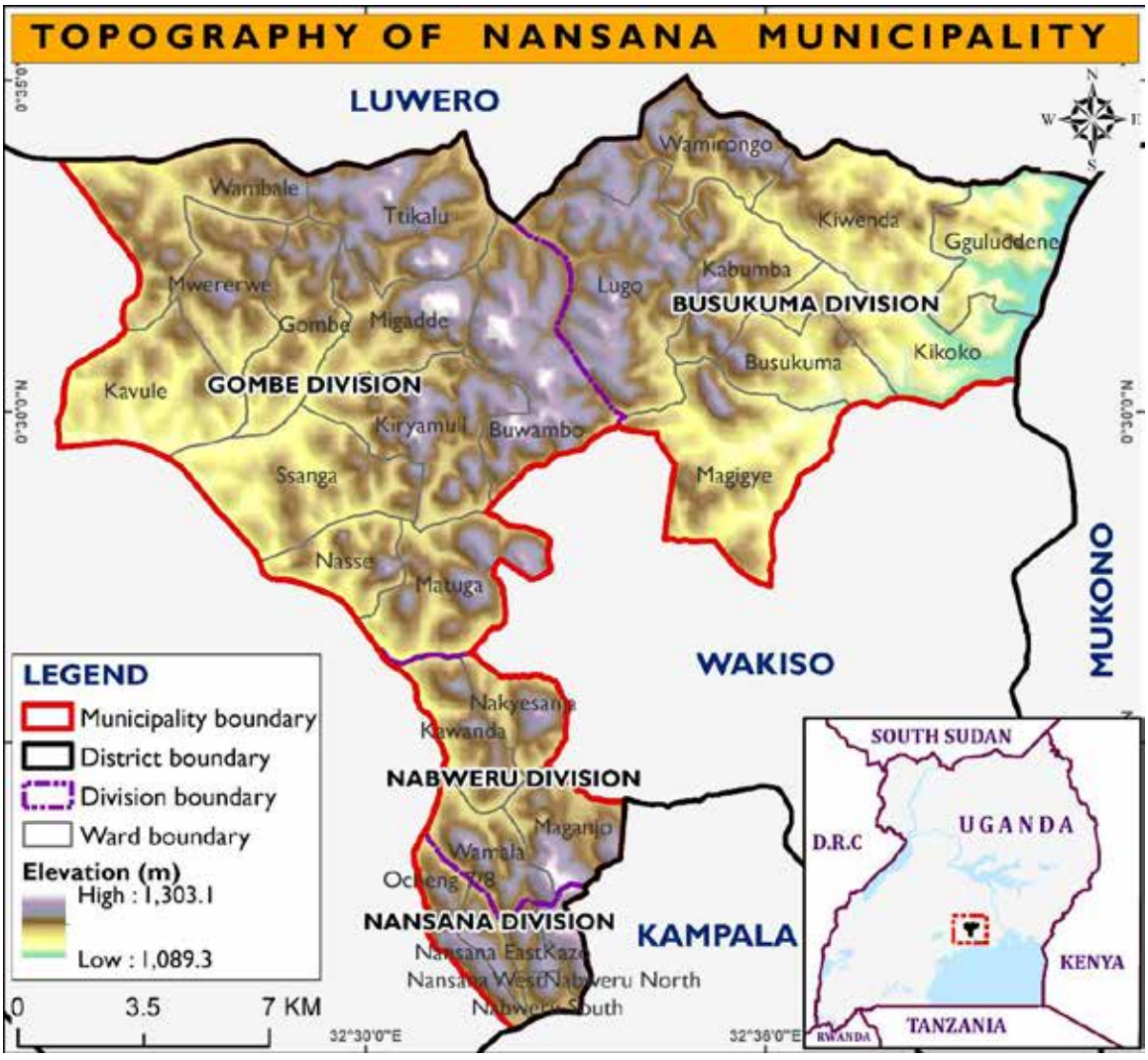


Figure 2: Topography of Nansana Municipality

2.3 Soils

According to the National Agriculture Research Organization (NARO), the soils in Nansana Municipality can be classified into Acric Ferralsols, Gleysols, and Luvisols (**Figure 3**). The largest share of the municipality is covered by Acric Ferralsols (50.8%), followed by Luvisols (31.6%) and Gleysols (17.5%). Acric Ferralsols are found only in the Gombe and Busukuma divisions; they are highly weathered tropical soils with a thick, clay-rich horizon that contains low-activity clays and poor nutrient retention. These soils have low flood risk due to good infiltration, but in degraded or compacted states, surface runoff can increase, slightly elevating flood risk.

The Luvisols are found across all divisions of the municipality but predominate in the Nabweru and Nansana divisions. A clay-enriched subsoil characterizes these soils due to illuviation (clay movement). Luvisols have a moderate flood risk; however, surface runoff can occur during intense rainfall events, particularly when topsoil is compacted.

Gleysols are waterlogged soils typically found in low-lying, poorly drained areas with high water tables. They are characterized by gleying (grayish colors due to reduced conditions), indicating prolonged saturation. These soils have a high flood risk due to poor natural drainage and water retention.

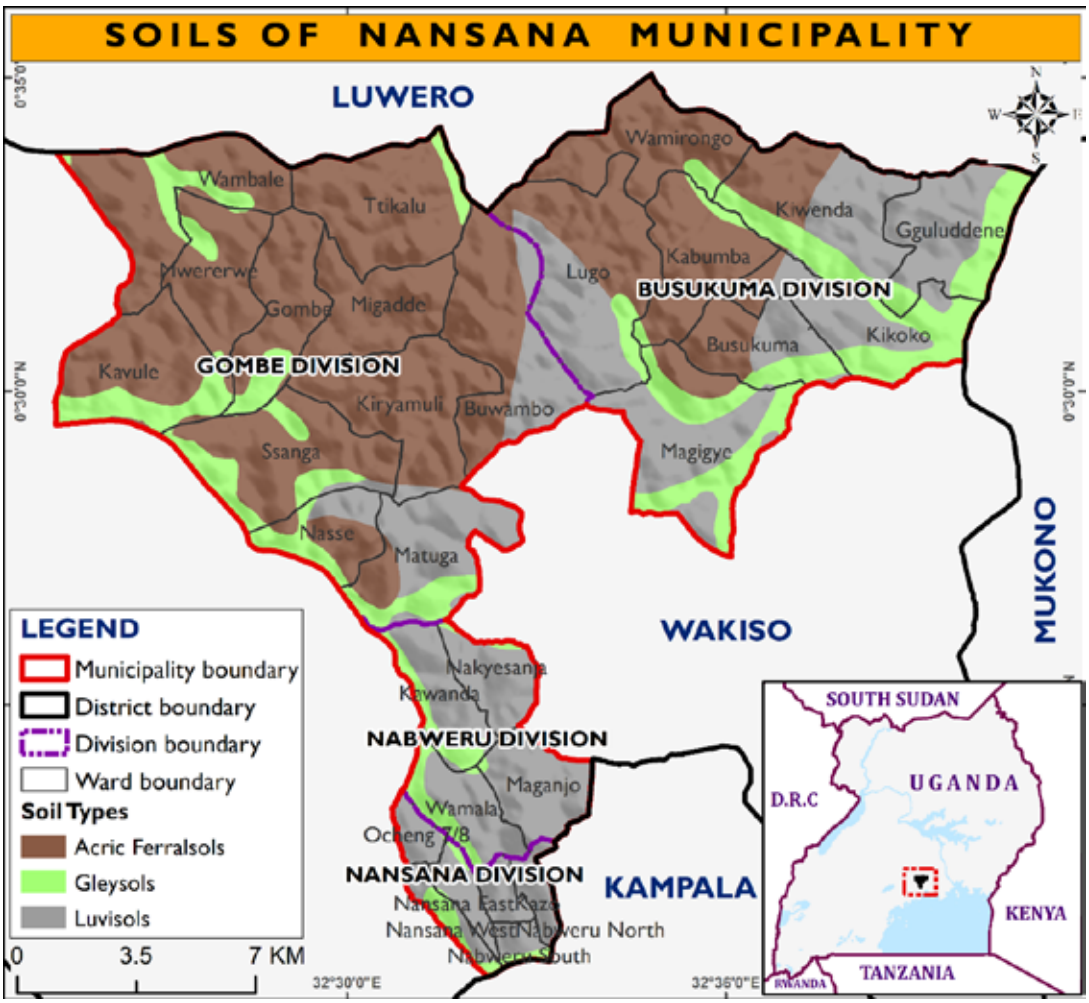


Figure 3: Soils of Nansana Municipality
Data source: NARO, 2017

2.4 Wetland ecosystems

Wetlands in Nansana Municipality play a critical role in local climate resilience. These wetlands help regulate urban flooding, support groundwater recharge, and serve as biodiversity hotspots within an increasingly urbanized landscape. Despite their importance, the wetlands in Nansana Municipality are under severe pressure from rapid urbanization, informal settlements, and land reclamation for agricultural and construction purposes. Climate change is expected to intensify rainfall events and increase variability, further stressing wetland systems. As rainfall becomes more erratic and extreme, degraded wetlands lose their capacity to buffer floods, leading to more frequent and severe flooding, particularly in low-lying and densely populated areas such as Nabweru, Nansana East, and Ocheng. Additionally, rising temperatures and prolonged dry spells may alter wetland hydrology, resulting in seasonal drying, vegetation loss, and reduced ecosystem services. These changes threaten both environmental sustainability and community livelihoods, particularly for households that rely on wetlands for urban agriculture and water access.

The national wetland status report for 2021 indicated that 49.6 sq. km (83%) of wetlands in Nansana Municipality are degraded, whereas 10.2 sq. km (17%). The major drivers of wetland degradation in Nansana Municipality include infrastructure development, solid waste dumping, brick-making, and crop cultivation. The Busukuma (87.9%) and Nansana (82.7%) divisions have the highest percentages of degraded wetlands (**Figure 4**). On the other hand, the Nabweru (27.6%) and Gombe (19.1%) divisions have the highest percentages of intact wetlands in the municipality.

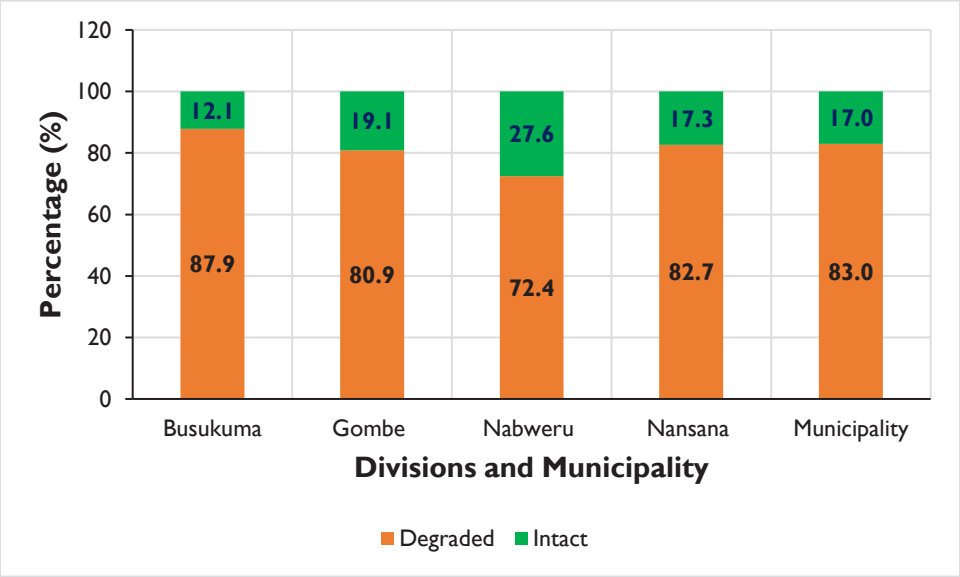


Figure 4: Status of wetlands in the different divisions of Nansana Municipality
Data source: WMD, 2021

Plate 1: Rice cultivation in a wetland

Plate 2: House constructed in a wetland

2.5 Climate

Nansana Municipality experiences a bimodal rainfall pattern, with two rainy seasons from March to May (MAM) and from September to December (SOND) (**Figure 6**). The dry months in the municipality are January-February and June-August (**Figure 6**). The city receives an average annual

rainfall of approximately 1,472.3 mm. Between 1994 and 2024, the lowest annual rainfall in Nansana municipality was recorded in 2005 (928.7mm), whereas the highest annual rainfall was recorded in 1996 (2,378.2mm) (**Figure 5**).

The minimum temperatures in the municipality range from 17.9 to 19.0 °C, whereas the maximum temperatures range from 25.7 to 29.0 °C (**Figure 5**). In terms of monthly variability, the highest maximum and minimum temperatures in Nansana municipality are recorded between January and March, whereas the lowest temperatures are recorded between May and August (**Figure 6**).

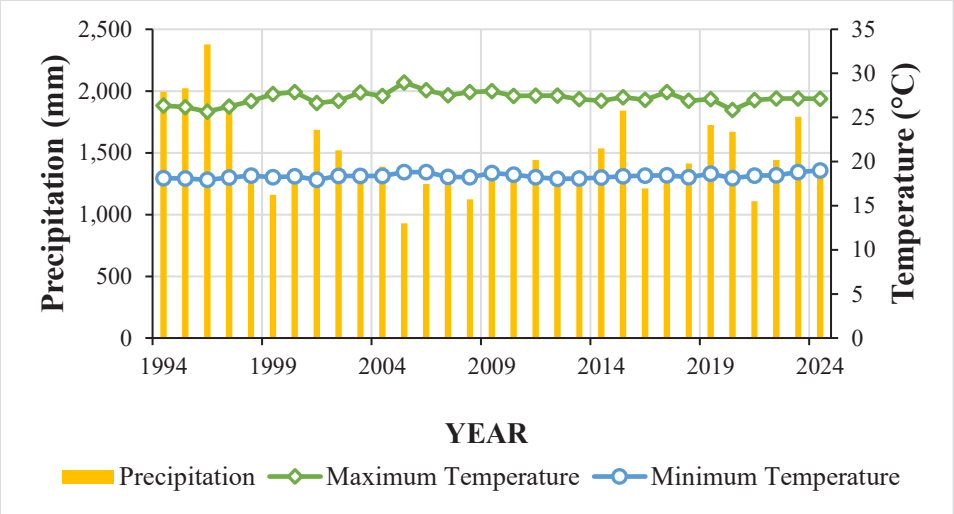


Figure 5: Annual precipitation and temperature for Nansana Municipality between 1994 and 2024
Data Source: NASA, 2024

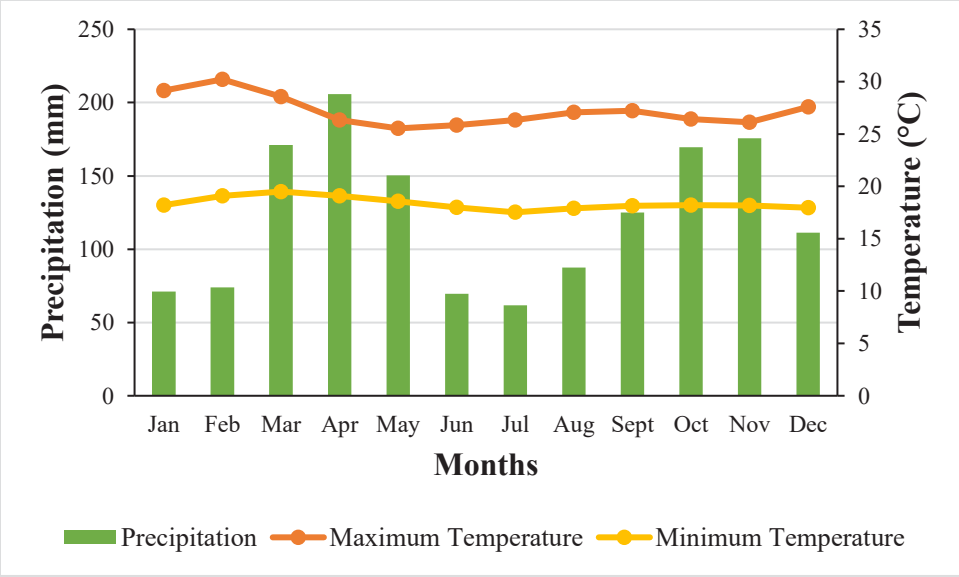


Figure 6: Monthly precipitation and temperature for Nansana Municipality between 1994 and 2024
Data Source: NASA, 2024

2.6 Socio-demographic characteristics of communities

According to the 2024 National Population and Housing Census (NPHC), Nansana Municipality has a population of 692,478 (**Table 2**). Of these, 368,887 people (53.3%) are males, whereas 323,591 people (46.7%) are females. The municipality has 195,699 households, and the average household size is 3.1. At the division level, Nabweru division has the most significant population (233,579), whereas Nansana division has the biggest number of households (69,405). Busukuma division has the least population (79,099) and number of households (19,858) in the municipality. However, the Busukuma division has the largest average household size (3.4) among the divisions. At the ward level, Wamala Ward in Nabweru Division has the largest population (91,709) and number of households (26,069) in the municipality. On the other hand, Nasse ward in Gombe division has the lowest population (4,960) in the municipality, whereas Kabuumba ward in Busukuma division has the fewest households (1,092) in the municipality. Despite having the fewest households in the municipality, Kabuumba ward has the largest average household size (4.0). At the municipality, division, and ward levels, the number of males is bigger than the number of females.

Table 2: Population census in Nansana municipality in 2024

Divisions	Wards	Males		Females		Total	Households	Average Household Size
		Population	%	Population	%			
Busukuma	Busukuma	6,977	56.0	5,487	44.0	12,464	2,962	3.5
	Guluddene	4,357	58.5	3,089	41.5	7,446	2,023	3.0
	Kabuumba	2,966	58.2	2,128	41.8	5,094	1,092	4.0
	Kikoko	3,302	56.4	2,551	43.6	5,853	1,328	3.7
	Kiwenda	8,221	55.2	6,679	44.8	14,900	3,986	3.3
	Lugo	5,852	55.2	4,752	44.8	10,604	2,726	3.4
	Magigye	9,371	53.8	8,050	46.2	17,421	4,482	3.4
	Wamirongo	2,880	54.2	2,437	45.8	5,317	1,259	3.7
Busukuma sub-total		**43,926**	**55.5**	**35,173**	**44.5**	**79,099**	**19,858**	**3.4**
Gombe	Buwambo	13,837	53.9	11,825	46.1	25,662	6,644	3.3
	Gombe	5,431	57.7	3,974	42.3	9,405	2,179	3.5
	Jaggala	6,944	55.0	5,691	45.0	12,635	3,134	3.5
	Kiryamuli	6,803	52.4	6,188	47.6	12,991	3,741	3.1
	Matugga	26,511	51.9	24,573	48.1	51,084	13,722	3.3
	Migadde	3,869	56.4	2,995	43.6	6,864	1,776	3.3
	Mwererwe	2,974	53.6	2,574	46.4	5,548	1,530	3.2
	Nasse	2,804	56.5	2,156	43.5	4,960	1,254	3.3
	Ssanga	8,735	54.0	7,453	46.0	16,188	4,413	3.2
	Tikalu	4,242	56.3	3,298	43.7	7,540	1,868	3.5
	Wambale	4,573	55.6	3,658	44.4	8,231	2,084	3.4
Gombe sub-total		**86,723**	**53.8**	**74,385**	**46.2**	**161,108**	**42,345**	**3.3**
Nabweru	Kawanda	17,683	52.4	16,051	47.6	33,734	8,869	3.4
	Maganjo	40,637	53.2	35,696	46.8	76,333	21,225	3.1

Divisions	Wards	Males		Females		Total	Households	Average Household Size
		Population	%	Population	%			
	Nakyesanja	17,664	55.5	14,139	44.5	31,803	7,928	3.3
	Wamala	47,842	52.2	43,867	47.8	91,709	26,069	3.2
Nabweru sub-total		**123,826**	**53.0**	**109,753**	**47.0**	**233,579**	**64,091**	**3.2**
Nansana	Kazo	23,073	51.8	21,453	48.2	44,526	13,940	2.9
	Nabweru North	19,805	53.4	17,305	46.6	37,110	11,416	2.9
	Nabweru South	13,327	54.2	11,276	45.8	24,603	7,673	2.8
	Nansana 7/8 Ochieng	15,998	53.3	13,997	46.7	29,995	9,173	2.8
	Nansana East	21,402	51.4	20,249	48.6	41,651	13,571	2.8
	Nansana West	20,807	51.0	20,000	49.0	40,807	13,632	2.7
Nansana sub-total		**114,412**	**52.3**	**104,280**	**47.7**	**218,692**	**69,405**	**2.8**
Nansana Municipality Total		**368,887**	**53.3**	**323,591**	**46.7**	**692,478**	**195,699**	**3.1**

Data Source: UBOS Census, 2024

The significant sources of livelihood for communities in Nansana municipality include employment income (52.7%), business enterprises (22.2%), subsistence farming (15%), remittances from friends and relatives (6.1%), commercial farming (1.8%), and property income (1.4%) (**Figure 7**).

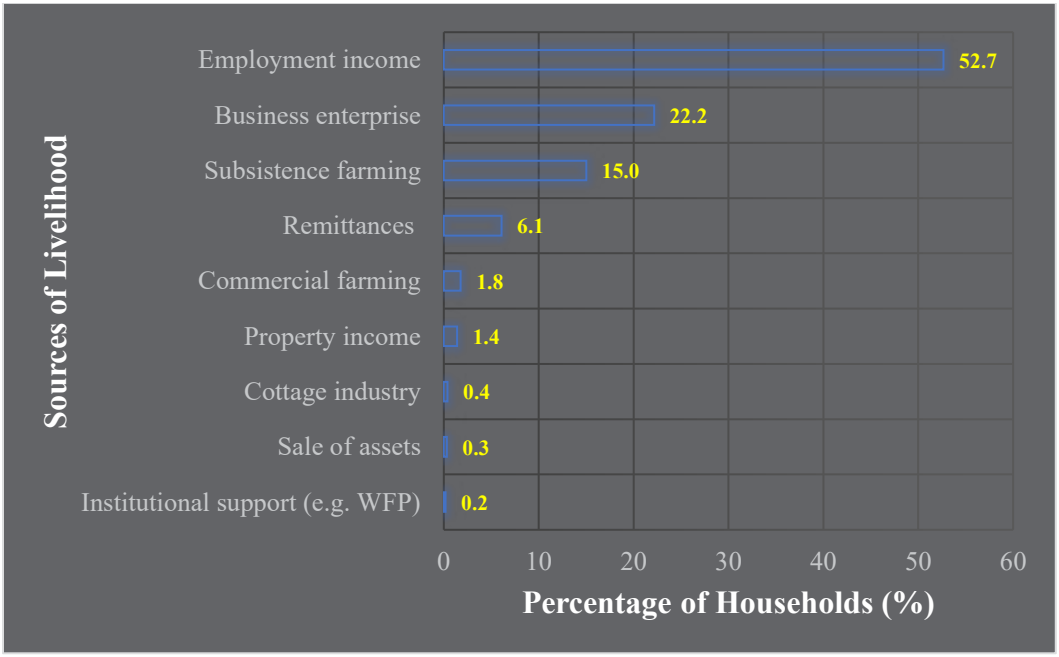


Figure 7: Sources of livelihood for communities in Nansana municipality in 2014
Data Source: UBOS, 2014

CHAPTER THREE: METHODOLOGY

The Climate Change and Vulnerability Assessment report for Nansana Municipality was developed using a diverse methodological approach. The methods used in the assessment are described below.

3.1 Literature Review

A comprehensive review of relevant literature was conducted to examine the key indicators of climate change in Nansana Municipality, assess its sectoral impacts, analyze the policy and institutional landscape governing climate change, identify gaps in current policies, and align findings with national adaptation and mitigation priorities. Key documents reviewed included the *Uganda National Climate Change Policy (2015)*, the *National Climate Change Act (2021)*, the *Uganda National Adaptation Programmes of Action (NAPA, 2007)*, sector-specific *National Adaptation Plans (NAPs) for Agriculture and Health*, the *National Development Plan IV*, *Vision 2040*, *the Uganda National Urban Policy, the Updated Nationally Determined Contribution (NDC, 2022)*, the *Wakiso District Development Plan*, and the *Wakiso Multi-Hazard, Risk, and Vulnerability Profile*, among others. This review provided a robust foundation for identifying climate risks, informing policy recommendations, and enhancing resilience planning for Nansana Municipality.

3.2 Key Informant Interviews

Several key informants were consulted to understand the hotspot areas and sectors in Nansana municipality that are affected by climate change, the climate risks affecting communities in the municipality, the impact of climate change on local livelihoods and sectors, the localized adaptation and mitigation options that align with national plans, the observed environmental changes, the key indicators for tracking progress and outcomes, and recommendations for adaptive management and continuous improvement. At Nansana Municipal Council, the key informants consulted included the senior environment officer, the municipal environment officer, the municipal physical planner, the deputy town clerk, the municipal education officer, the municipal agriculture officer, the senior veterinary officer, the principal health inspector, the senior engineer, and an agronomist at NARO, Kawanda. At the divisions, the key informants included the community development officers, environment officers, and forest officers. Key informant interviews were conducted using a guide reviewed by the client prior to testing and deployment (**Annex 1**).

3.3 Focus Group Discussion (FGD)

The consultant held various FGDs in the different divisions of Nansana municipality to further understand the impacts of climate change on local livelihoods and ecosystems, the climate risks affecting communities in the municipality, the areas mostly affected by climate change, the community perceptions of climate change and early warning systems, the adaptation and mitigation strategies to the impacts of climate change, and recommendations for adaptive management. Each FGD involved 10 participants, purposively selected based on their understanding of climate change. Key considerations were taken to ensure balanced participation across gender categories (men, women, and youth) and age groups (18-35, 36-60, 60+), in the FGDs. Marginalized groups, such as older adults

and people with disabilities, were included in the focus group discussions. The FGDs were conducted using a checklist that was reviewed by the client prior to testing and deployment (**Annex 2**).

3.4 Climate Risk Assessment

A climate risk assessment was conducted for four (4) climate events: drought, floods, lightning, and windstorms. To assess drought in the Nansana Municipality, rainfall data were obtained from the CHIRPS (Climate Hazards Group InfraRed Precipitation with Station data) for the period 1994-2024. The Standardized Precipitation Index (SPI) was used to assess the magnitude of meteorological drought in the municipality. The SPI was computed using the Drought Indices Calculator (DrinC). Drought was then categorized based on SPI values as described by Guttman (1999) and McKee et al. (1993) (**Table 3**).

Table 3: Categorization of drought based on SPI values

SPI Values	Drought category
0 to -0.99	Mild drought
-1.00 to -1.49	Moderate drought
-1.50 to -1.99	Severe drought
≤ -2.00	Extreme drought

Flooding in the Nansana municipality was delineated using the HEC-GeoRAS tool. The input datasets included rainfall, elevation, land use/cover, and stream geometry data. The flood extents were then categorized into flood hazard intensities based on water depth: very high (>2m), high (1.5m-2m), moderate (1m-1.5m), and low (0.5m-1m).

Lightning is the occurrence of a natural electrical discharge of very short duration and high voltage between a cloud and the ground or within a cloud. Lightning happens when the negative charges (electrons) in the bottom of the cloud are attracted to the positive charges (protons) in the ground (Earth Networks, 2023). Thunder day data were used to profile lightning, and this was supplemented with Over-shooting Tops (OT) data acquired from the NASA Meteosat Second Generation (MSG) 3km-resolution Spin-Enhanced Visible Infrared Imager (SEVIRI). The lightning hazard zonation was generated based on flashes per square kilometre per year and classified as very low, low, moderate, high, and very high according to severity (**Table 4**).

Table 4: Lightning hazard intensity scale

Intensity Class	OT Counts/month	Flash density (strikes/yr/km^2)
High	10-15	50-75
Moderate	5-10	10-50
Low	2-5	< 10

Wind is the perceptible natural movement of air. To develop the windstorm hazard, the assessment employed the wind-speed modelling approach proposed by Morjani (2011). Wind speed data for the Nansana municipality were obtained from the Climate Engine website for the period 1994-2024. The spatial distribution of wind hazard intensity was determined using kriging interpolation and the

Beaufort wind scale. The windstorm hazard was classified into very low, low, moderate, high, and very high (Table 5).

Table 5: Beaufort wind hazard intensity scale

Beaufort scale	Description	Wind speed (m/s)	Conditions	Windstorm Hazard Class
6	Strong breeze	10.8-14.5	Large tree branches/crops in motion; whistling heard in electric/telegraph wires; difficulty using umbrellas	Very low
7	High wind, moderate gale	14.6-20.0	Whole trees in motion; difficulty when walking against the wind	Low
8	Gale	20.1-22.0	Twigs break off trees; generally, impedes progress	Moderate
9	Strong/severe gale	22.1-28.0	Can cause slight structural damages	High
10	Storm, whole gale	> 28.1	Trees/crops uprooted; considerable structural damage, may be accompanied by widespread damage	Very high

3.5 Climate Change Projections

Daily baseline climate data (minimum temperature, maximum temperature, and precipitation) for Nansana municipality were obtained from the Uganda National Meteorological Authority (UNMA) for a period of 30 years (1994-2024). This data was supplemented with datasets from the NASA website for predicting global energy resources (https://power.larc.nasa.gov/). The baseline climate data were used to project future climate conditions in the municipality. Future climate projections were generated using the Agricultural Model Intercomparison and Improvement Project (AgMIP) implemented in R. The projection used the delta method, based on the sum of interpolated anomalies, to produce high-resolution monthly climate surfaces.

The method produces a smoothed (interpolated) surface of climate change (deltas or anomalies). Then it applies the interpolated surface to the baseline climate, accounting for potential bias arising from differences in the baselines (Ramirez-Villegas and Jarvis, 2010). Twenty-nine models embedded in AgMIP protocol were used for climate projection (**Table 6**). The projection was conducted under two representative concentration pathways (RCP4.5 and RCP8.5) and extended to 2030, the projection year for the climate action plan. The projection outputs were summarized in MS Excel and represented as graphs. The spatial and temporal variation of climate projections was also done in ArcGIS using the Inverse Distance Weighted (IDW) Interpolation technique.

Table 6: General Circulation Models (GCM) used for climate projection of Nansana Municipality

No.	GCM	Symbol	Institution
1	ACCESS1-0	A	Commonwealth Scientific and Industrial Research Organization (CSIRO) and Bureau of Meteorology (BOM), Australia
2	BCC-CSM1-1	B	Beijing Climate Center, China Meteorological Administration
3	BNU-ESM	C	College of Global Change and Earth Systems Science, Beijing Normal University (BNU)
4	CanESM2	D	Canadian Centre for Climate Modelling and Analysis
5	CCSM4	E	US National Center for Atmospheric Research (NCAR)

No.	GCM	Symbol	Institution
6	CESM1-BGC	F	US National Science Foundation (NSF), US Department of Energy (DOE), and the US National Centre for Atmospheric Research (NCAR)
7	CMCC-CM	G	Euro-Mediterranean Center on Climate Change
8	CMCC-CMS	H	Euro-Mediterranean Center on Climate Change
9	CNRM-CM5	I	France National Centre for Meteorological Research
10	CSIRO-Mk3-6-0	J	Queensland Climate Change Centre of Excellence and Commonwealth Scientific and Industrial Research Organization (CSIRO)
11	FGOALS-g2	K	Chinese Academy of Sciences
12	GFDL-CM3	L	NOAA/Geophysical Fluid Dynamic Laboratory (GFDL)
13	GFDL-ESM2G	M	NOAA/Geophysical Fluid Dynamic Laboratory (GFDL)
14	GFDL-ESM2M	N	NOAA/Geophysical Fluid Dynamic Laboratory (GFDL)
15	GISS-E2-H	O	National Aeronautics and Space Association Goddard Institute for Space Studies (NASA GISS)
16	GISS-E2-R	P	National Aeronautics and Space Association Goddard Institute for Space Studies (NASA GISS)
17	HadGEM2-AO	Q	UK Meteorological Office - Hadley Centre
18	HadGEM2-CC	R	UK Meteorological Office - Hadley Centre
19	HadGEM2-ES	S	UK Meteorological Office - Hadley Centre
20	INMCM4.0	T	Russian Institute for Numerical Mathematics (INM)
21	IPSL-CM5A-LR	U	Institute Pierre Simon Laplace (IPSL)
22	IPSL-CM5A-MR)	V	Institute Pierre Simon Laplace (IPSL
23	IPSL-CM5B-LR	W	Institute Pierre Simon Laplace (IPSL)
24	MIROC5	X	University of Tokyo, Japanese National Institute for Environmental Studies (NIES), and Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
25	MIROC-ESM	Y	University of Tokyo, Japanese National Institute for Environmental Studies (NIES), and Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
26	MPI-ESM-LR	Z	Max Planck Institute (MPI) for Meteorology (low resolution)
27	MPI-ESM-MR	I	Max Planck Institute (MPI) for Meteorology (mixed resolution)
28	MRI-CGCM3	2	Japanese Meteorological Research Institute (MRI)
29	NorESM1-M	3	Norwegian Climate Centre

3.6 Vulnerability and Risk Assessment

Vulnerability to climate change refers to the degree to which a system, community, or individual is susceptible to, and unable to cope with, the adverse impacts of climate change, including climate variability and extremes (IPCC, 2014). Vulnerability is shaped by physical, social, economic, and political factors that affect how prepared and resilient individuals or communities are to climate-related hazards. Vulnerability is a function of exposure, the sensitivity of a household or livelihood to the stress associated with that exposure, and the adaptive capacity to recover from its impacts.

*Vulnerability = (Exposure * Sensitivity) – Adaptive Capacity*

Exposure: The communities in the Nansana Municipality are predominantly exposed to drought, floods, lightning, and windstorms. These hazards were ranked, weighed, and normalized to produce the exposure index.

Sensitivity refers to socio-economic or demographic characteristics that can make individuals susceptible to the adverse effects of exposure (Declet-Barreto et al., 2020). The sensitivity indicators assessed at the ward level include access to health services; community awareness and preparedness; degradation of rivers; dependence on climate-sensitive sectors (e.g., agriculture); dependence on surface water; drainage systems; housing quality; income levels; population density; unemployment; and wetland degradation. Some indicators, such as income levels and wetland degradation, were compared with data from the Uganda Bureau of Statistics (UBOS) and the Wetland Management Department (WMD), respectively. These indicators were ranked, weighed, and normalized to produce the sensitivity index.

Adaptive capacity refers to the potential of communities to anticipate, minimize, or cope with the adverse effects of multiple hazards. The adaptive capacity indicators that were assessed at ward level included access to clean water and sanitation, access to credit, access to early warning information, access to renewable energy, awareness of climate risks and adaptation practices, diverse livelihood options, education levels, extension services, sound environmental management practices, healthcare infrastructure, proper waste disposal, rainwater harvesting, social networks, urban greening initiatives, and wetland and ecosystem restoration. These adaptive capacity indicators were ranked, weighed, and normalized to produce the adaptive capacity index.

The exposure, sensitivity, and adaptive capacity indices were analyzed in the geographical information system (GIS) environment to generate the vulnerability index, which was mapped at the ward level.

Disaster risk is the likelihood of loss of life, injury, or destruction and damage from a disaster in a given period (UNISDR, 2017). Disaster risk is widely recognized as the consequence of the interaction between a hazard and the characteristics that make people and places vulnerable and exposed (**Figure 8**).

Figure 8:The risk matrix
Source: de Brito et al., 2017

The multi-hazards experienced in Nansana municipality were combined, weighed, and normalized to produce the hazard index. The population of the communities in the different wards was considered the exposed element. The population data was normalized to produce the exposure index. The hazard, exposure, and vulnerability indices were analyzed and normalized to produce the risk index, which was mapped at the ward level.

CHAPTER THREE: CLIMATE CHANGE AND VULNERABILITY

3.1 Climate Trends and Projections

3.1.1 Observed and Projected Maximum Temperature Trends in Nansana Municipality

The observed average annual maximum temperature for Nansana municipality is about 26.1°C, with a minimum of 24.8°C in July and a maximum of 28.3°C in February. For the climatological period 1994-2024, the maximum temperature in the Nansana municipality has increased by 0.31°C per decade. Between 1994 and 2024, the highest maximum temperature of 27.0°C was recorded in 2017 (**Figure 9**). The projections of maximum temperature (2025-2030) indicate an increase of 0.3 °C and 0.6 °C under moderate (RCP 4.5) and high (RCP 8.5) greenhouse gas (GHG) concentration scenarios, respectively, relative to the 1994-2024 average.

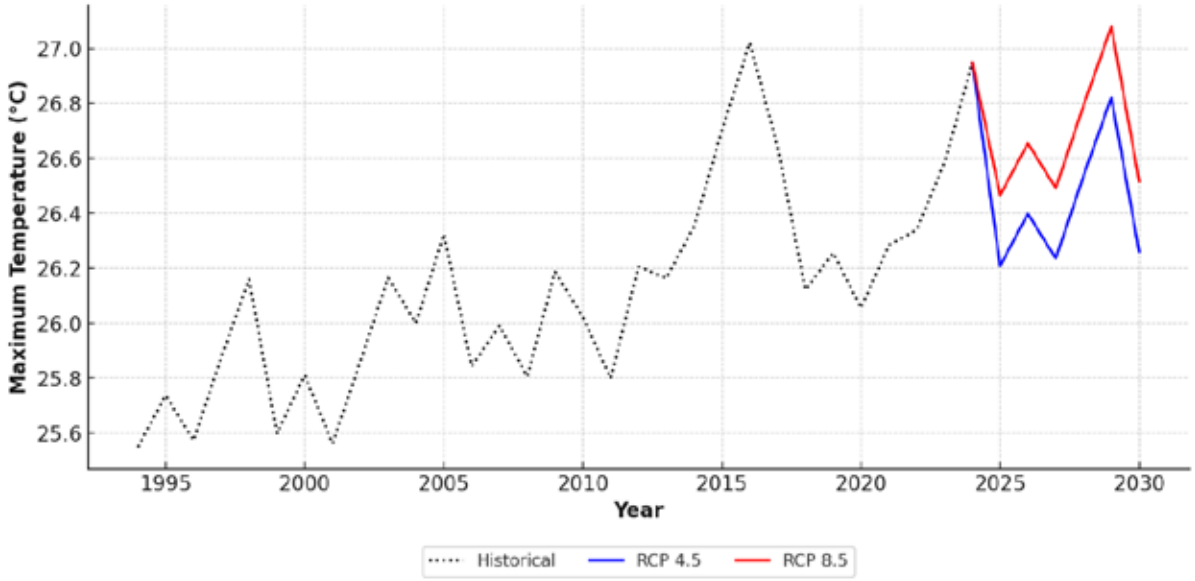


Figure 9: Historical and projected maximum temperature for Nansana municipality between 1994 and 2030

Busukuma and Gombe divisions are projected to have the highest maximum temperatures, ranging from 26.8 °C to 27.0 °C, compared to other areas, especially under the high (RCP 8.5) greenhouse gas (GHG) concentration scenario (**Figure 10** and **Figure 11**). Given this projected temperature, the municipality should strengthen its institutional structures (e.g., human resource capacity) to facilitate the rapid implementation of countermeasures to mitigate the effects of high temperatures.

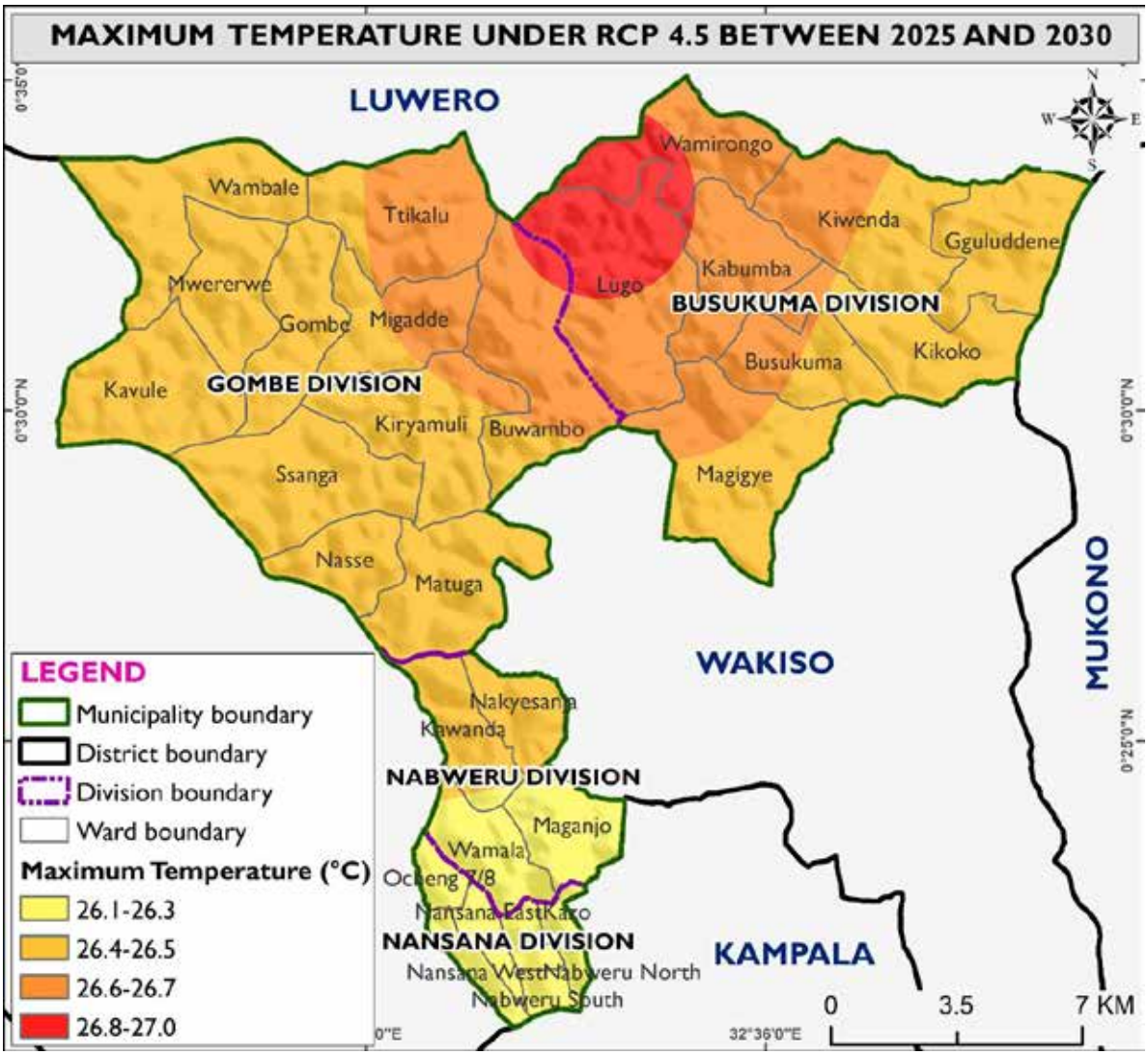


Figure 10: Projected maximum temperature under RCP 4.5 for the 2025-2030 near-term projection period in Nansana municipality

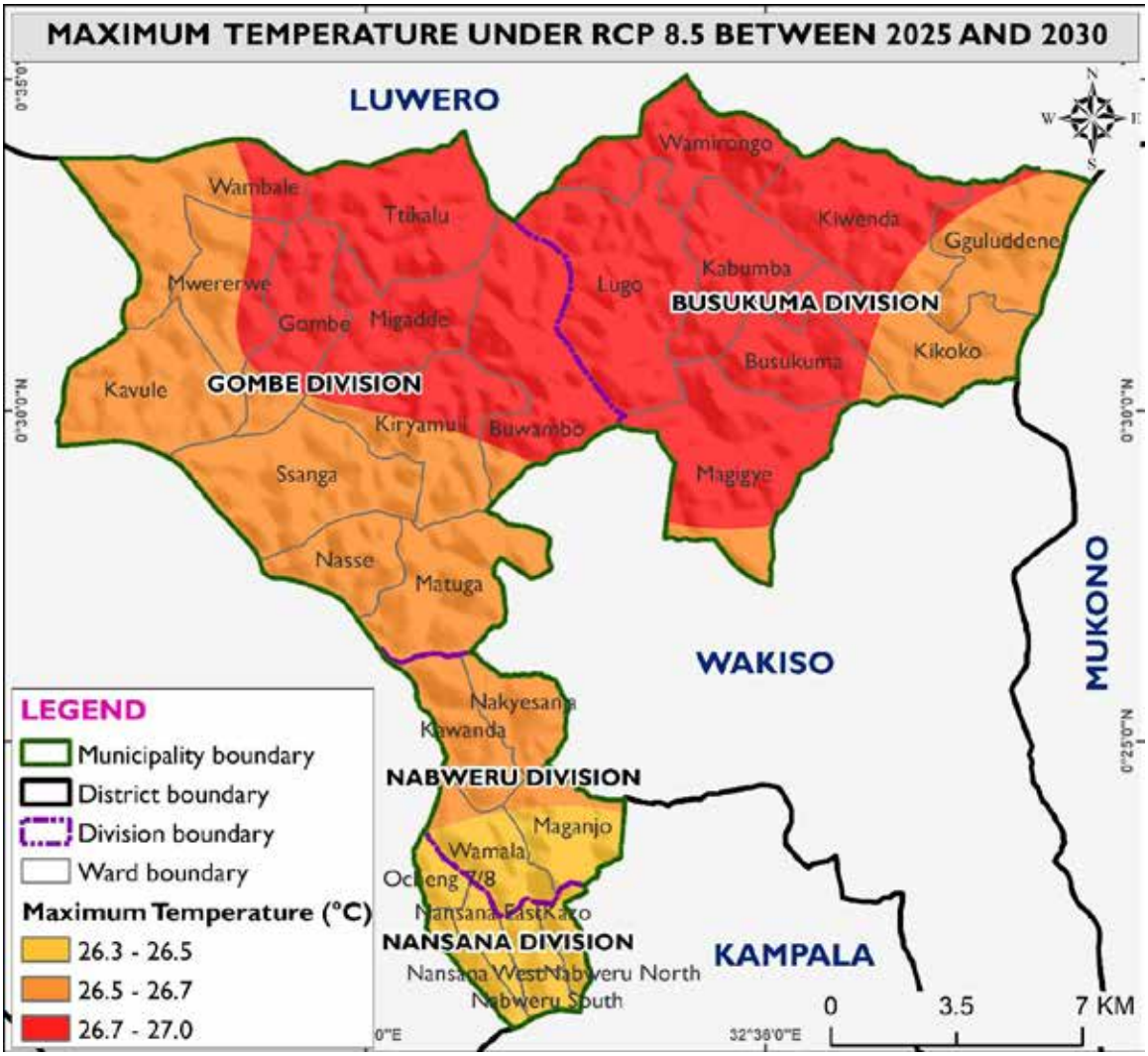


Figure 11: Projected maximum temperature under RCP 8.5 for the 2025-2030 near-term projection period in Nansana municipality

3.1.2 Observed and Projected Minimum Temperature Trends in Nansana Municipality

The observed average annual minimum temperature in Nansana municipality is about 17.0 ˚C, with a minimum of 16.3 ˚C in July and a maximum of 17.8 ˚C in April. Over the climatological period 1994-2024, the minimum temperature in Nansana municipality has increased by 0.19 ˚C per decade. Between 1994 and 2024, the highest minimum temperature of 17.7 ˚C was recorded in 2024 (**Figure 12**). The projections of minimum temperature (2025-2030) indicate an increase of 0.76 ˚C and 0.78 ˚C under moderate (RCP 4.5) and high (RCP 8.5) greenhouse gas (GHG) concentration scenarios, respectively, relative to the 1994-2024 average.

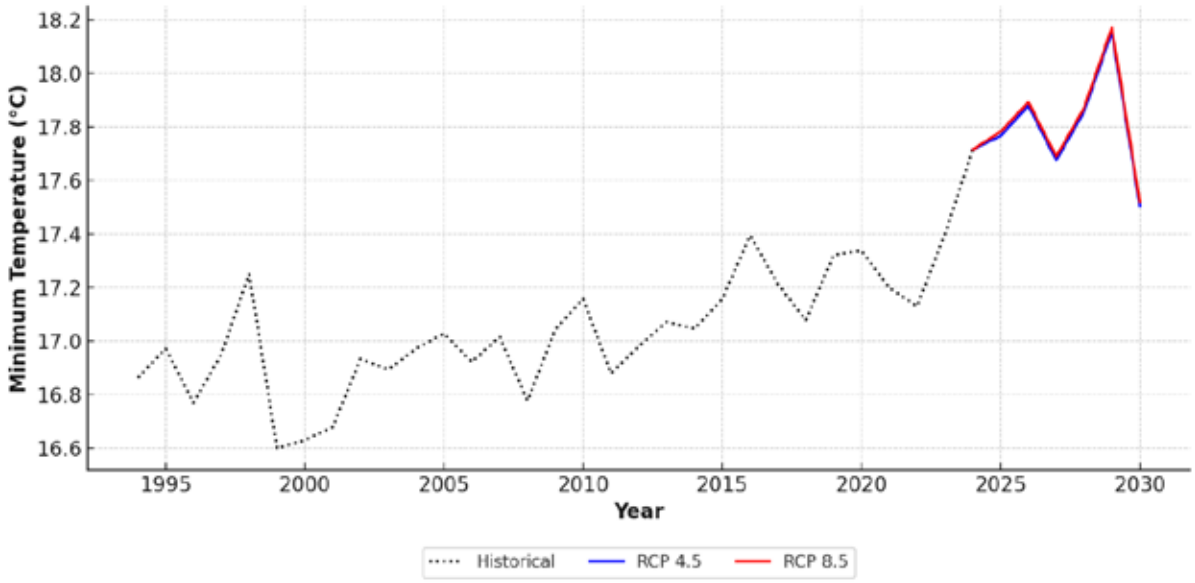


Figure 12: Historical and projected minimum temperature for Nansana municipality between 1994 and 2030

Nansana, Busukuma, and Gombe divisions are projected to have the highest minimum temperatures of between 17.9 °C and 18.0 °C compared to other areas, especially under the high (RCP 8.5) greenhouse gas (GHG) concentration scenario (**Figure 13** and **Figure 14**).

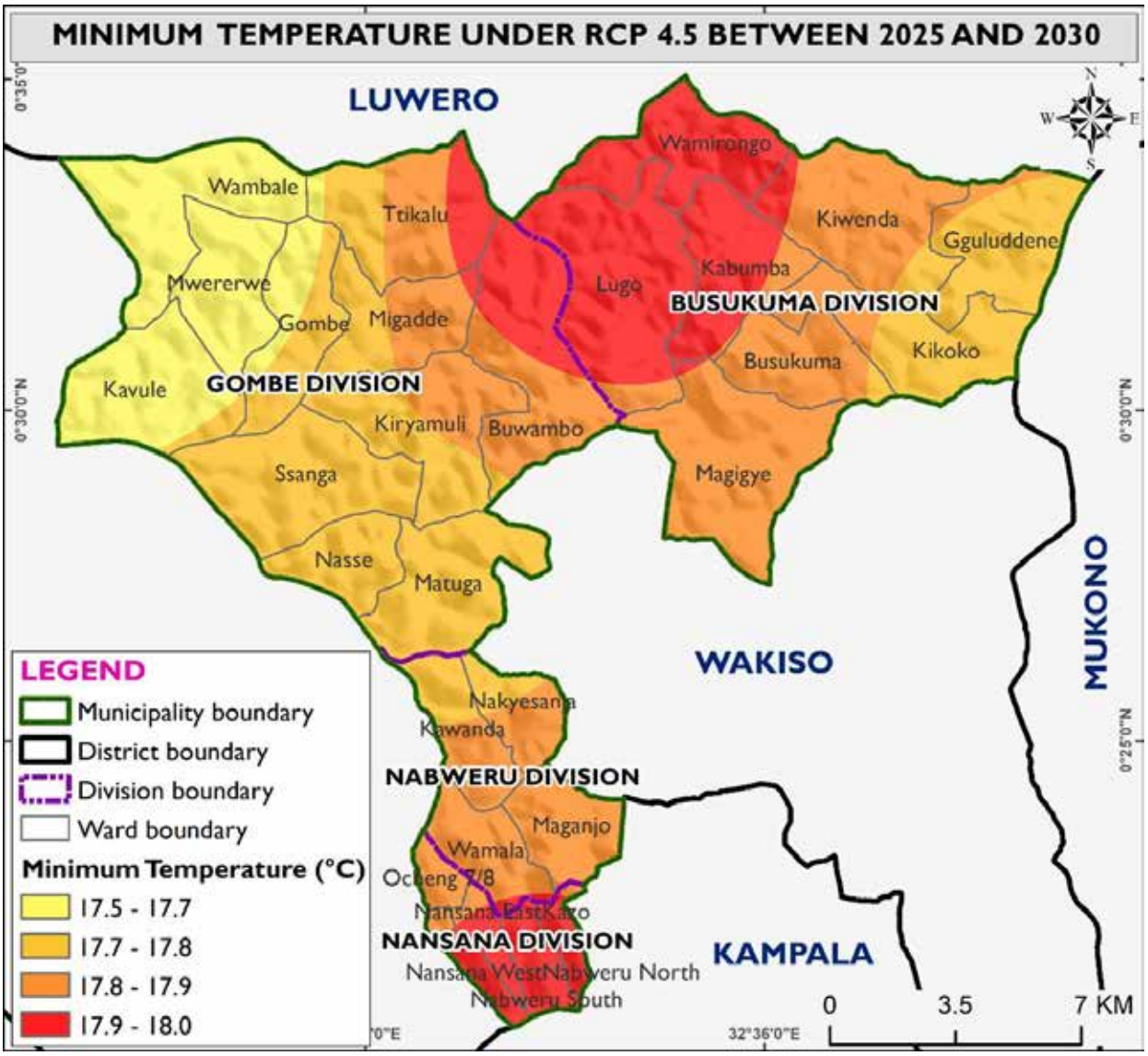


Figure 13: Projected minimum temperature under RCP 4.5 for the 2025-2030 near-term projection period in Nansana municipality

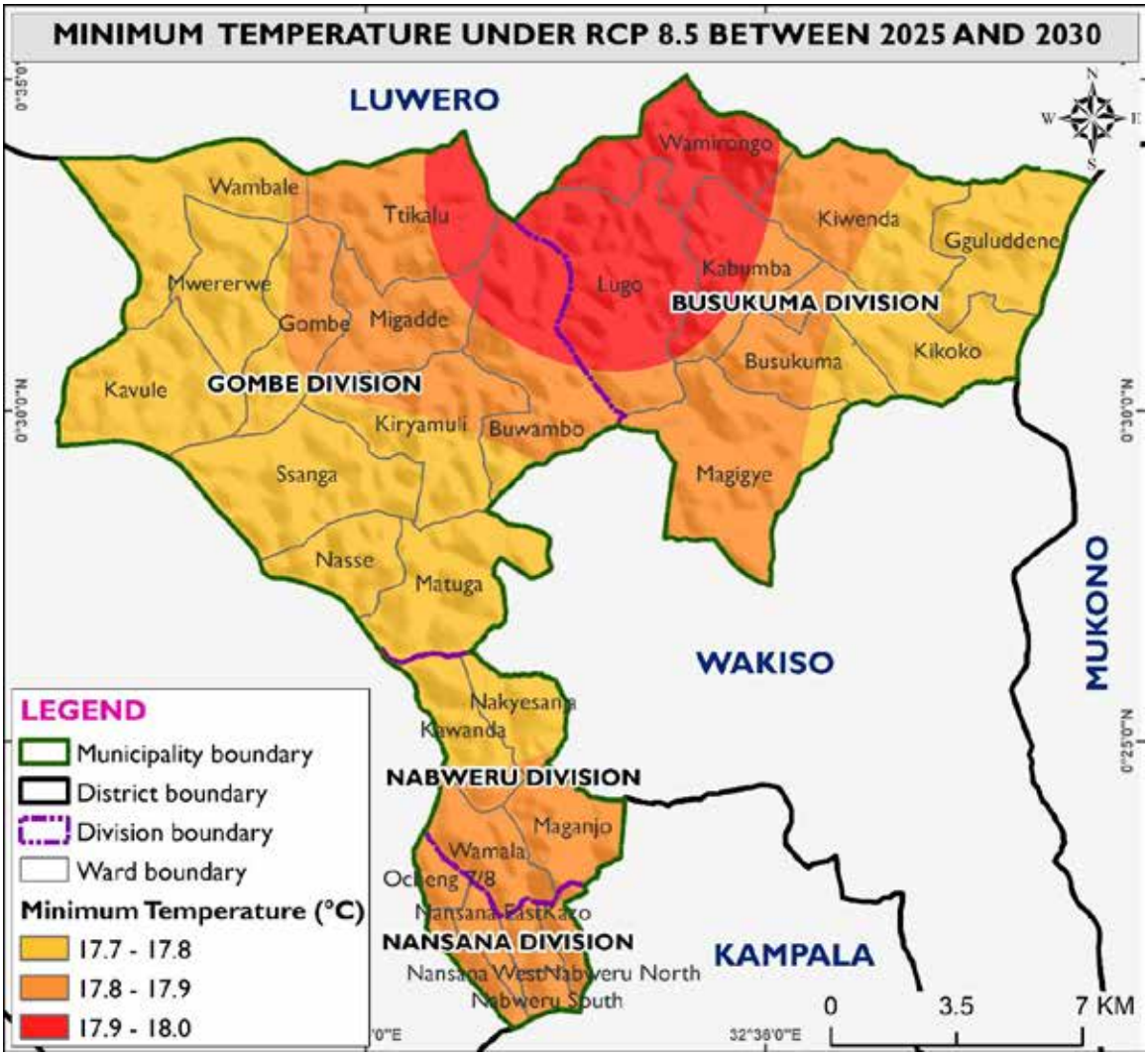


Figure 14: Projected minimum temperature under RCP 8.5 for the 2025-2030 near-term projection period in Nansana municipality

3.1.3 Observed and Projected Rainfall Trends in Nansana Municipality

Between 1994 and 2024, the annual average rainfall in Nansana Municipality was 1,363 mm, and the mean monthly rainfall ranged from 60.7 mm in July to 151.0 mm in November. Over the climatological period 1994-2024, rainfall in Nansana municipality has increased by 4.66 mm per decade. Between 1994 and 2024, the highest annual rainfall of 1,670.5 mm was recorded in 2019 (**Figure 15**). The projections (2025-2030) indicate an increase in mean rainfall for Nansana Municipality. Under RCP 4.5, mean rainfall is projected to increase by 220.9 mm (16.2%) relative to the 1994-2024 average. Similarly, under RCP 8.5, mean rainfall is projected to increase by 183.8 mm (13.5%) relative to the 1994-2024 average.

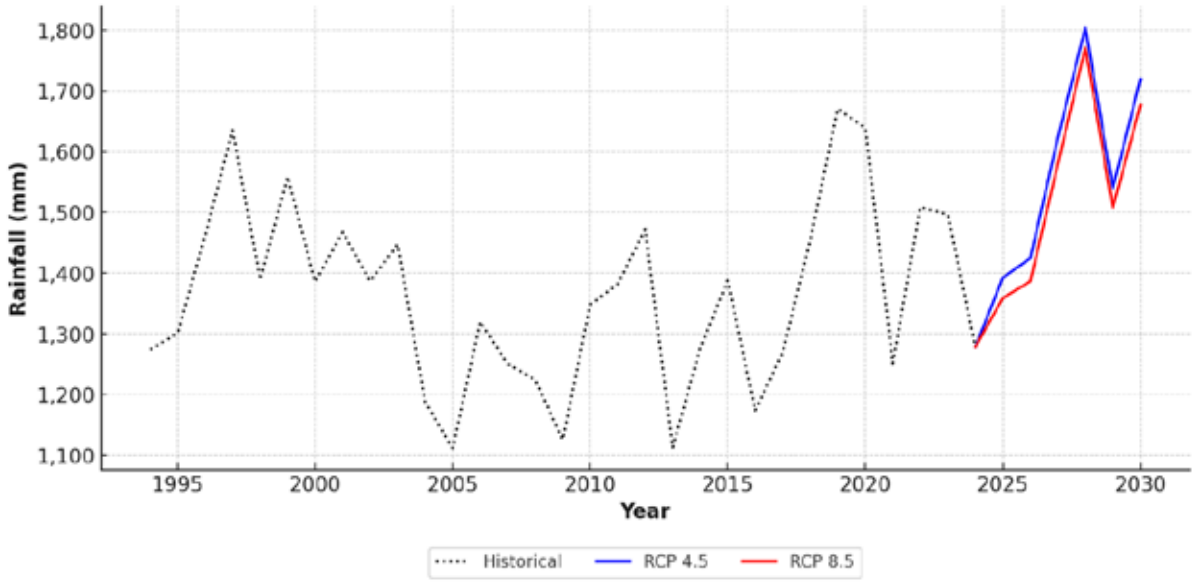


Figure 15: Historical and projected rainfall for Nansana municipality between 1994 and 2030

The highest projected mean rainfall in Nansana Municipality is expected in Busukuma division in the wards of Gguluddene, Kikoko, Kiwenda, and Busukuma (Figure 16 and Figure 17). Given high rainfall, the municipality should invest in the timely dissemination of early warning information to reduce losses and damage from flooding.

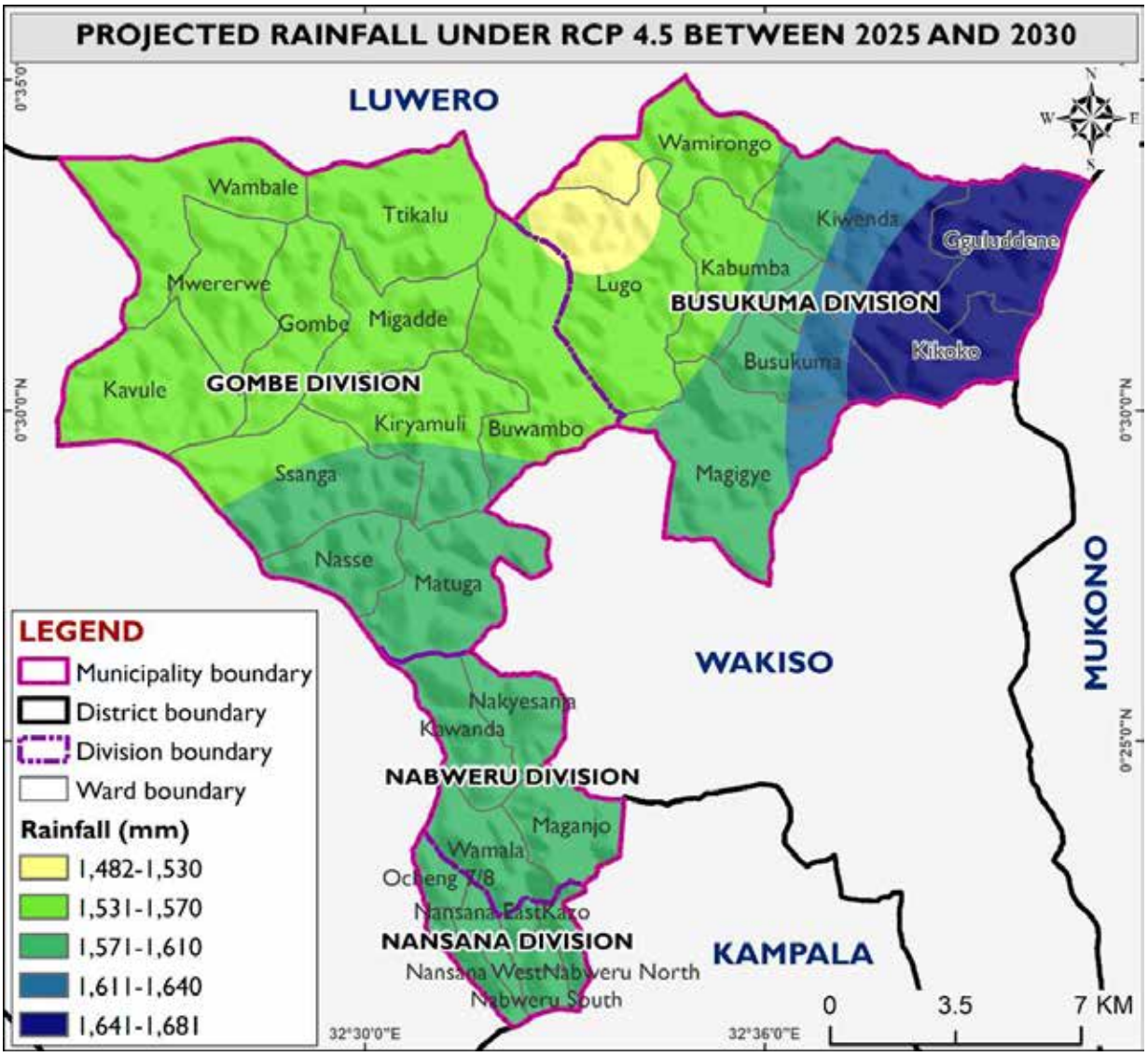


Figure 16: Projected rainfall under RCP 4.5 for the 2025-2030 near-term projection period in Nansana municipality

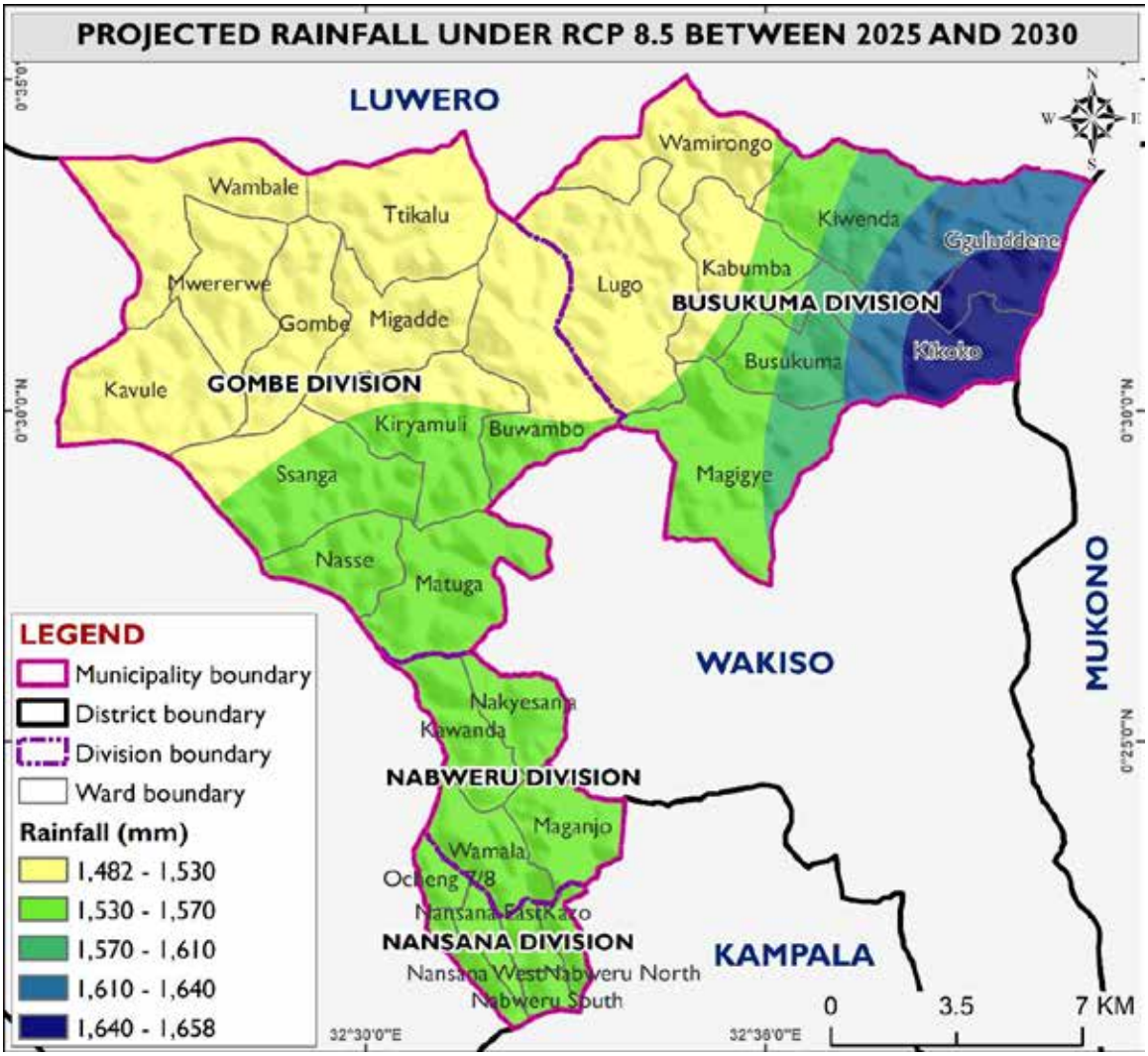


Figure 17: Projected rainfall under RCP 8.5 for the 2025-2030 near-term projection period in Nansana municipality

3.2 Climate Hazards

Climate hazards are events or conditions resulting from climate- or weather-related phenomena that have the potential to harm people, property, and the environment (Zscheischler et al., 2020). The climate hazards affecting Nansana Municipality include drought, floods, lightning, and windstorms. These climate hazards are briefly described below.

3.2.1 Drought Hazard

Drought is defined as a recurrent feature of the climate that occurs when there is an extended period of abnormal deficiency in precipitation (relative to what is considered normal) (Sivakumar & Wilhite, 2002). The key informants attributed the drought in the municipality to environmental degradation, primarily the deforestation and the encroachment of wetland ecosystems. The impacts of drought include water crisis, reduced crop and livestock productivity, and increased food prices. The warmer temperatures also favour the survival of some pests and parasites, thereby increasing their populations and the incidence of diseases.

In August 2021, a prolonged drought led to water shortages in areas like Maganjo, Katooke, Kagoma, and Kawanda (New Vision, 10 August 2021). Residents resorted to alternative water sources, such as swamps, ponds, and boreholes, which domestic animals frequently contaminate. This practice led to increased cases of waterborne diseases due to the consumption of contaminated water. Children were particularly at risk, as they were sometimes sent to fetch water from these unsafe sources, exposing them to dangers like drowning and exploitation.

The assessment showed that 64.5% of the municipality is exposed to low drought hazard (**Table 7**). However, 26.8% of the municipality is exposed to moderate drought hazard with hotspots in Maganjo, Migadde, Ttikalu, Gombe, Mwererwe, Wambale, and Wamirongo (**Figure 18**).

Table 7: Coverage of drought hazard in Nansana Municipality

Drought Hazard Intensities	Busukuma		Gombe		Nabweru		Nansana		Total	
	Area (Km²)	%	Area (Km²)	%	Area (Km²)	%	Area (Km²)	%	Area (Km²)	%
Very Low	21.1	18.7	4.6	3.2	0.03	0.1	0.0	0.0	25.8	8.7
Low	83.3	73.8	75.0	52.4	19.6	73.9	12.8	96.5	190.7	64.5
Moderate	8.5	7.6	63.5	44.4	6.9	26.0	0.5	3.5	79.4	26.8
Total	**113.0**	**100**	**143.1**	**100**	**26.6**	**100**	**13.2**	**100**	**295.9**	**100**

Figure 18 shows the drought hazard in Nansana Municipality.

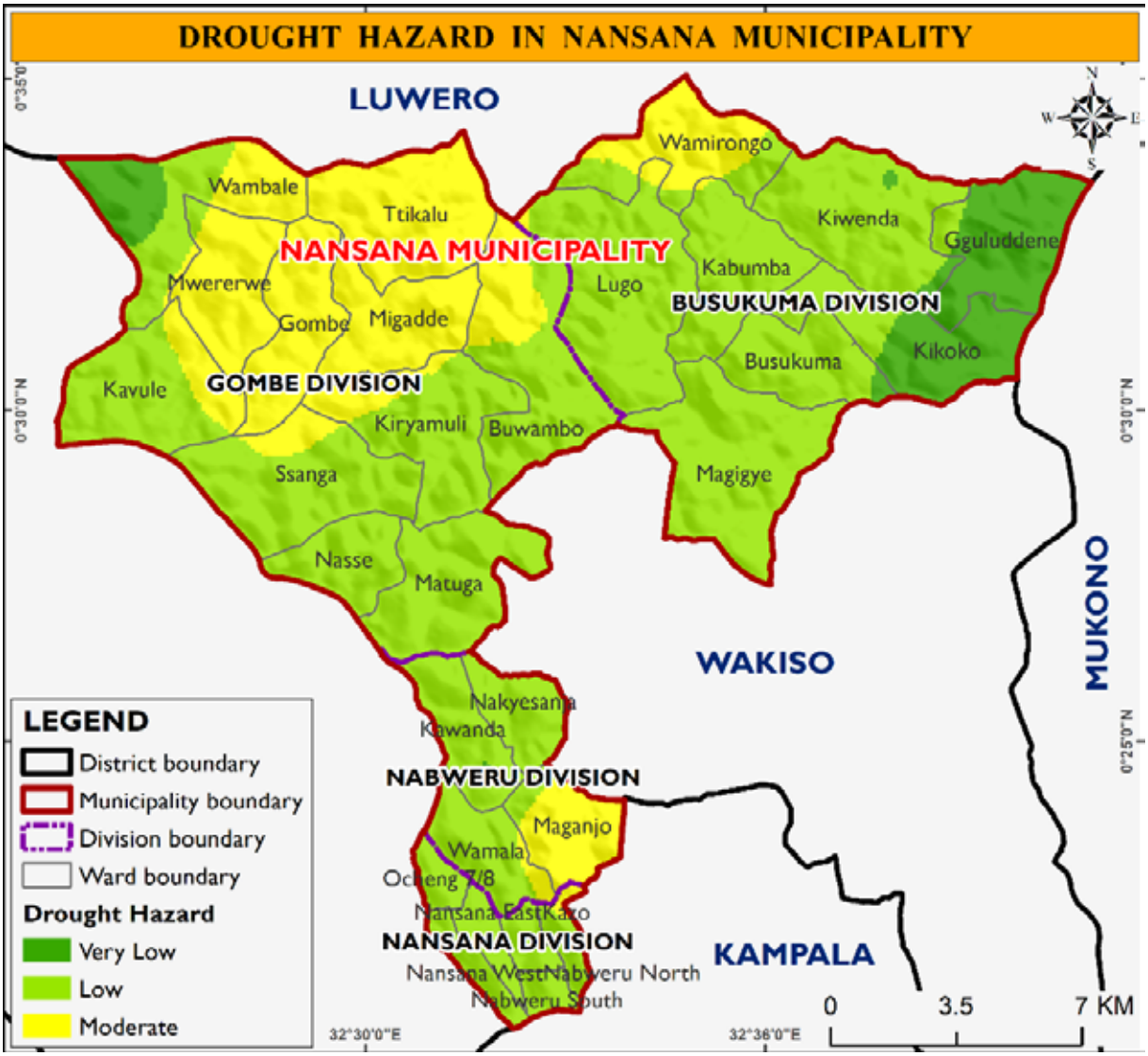


Figure 18: Drought hazard zonation in Nansana Municipality

3.2.2 Flood Hazard

Flooding is an overflow of water that submerges land that is usually dry (Farida & Maswanku, 2022). The key informants attributed floods in the municipality to excessive rainfall due to climate change, clearing of trees and vegetation, wetland encroachment, municipal waste disposal in drainage channels, and increased farming along the riverbanks. The impacts of floods in Nansana Municipality include loss of life; destruction of houses and household property; destruction of croplands; contamination of water sources; and destruction of WASH facilities and infrastructure, such as health centres, schools, roads, bridges, and culverts.

The heavy rains in May 2023 caused flooding of the River Mayanja, affecting areas in Wakiso District, including parts of Nansana (Monitor, 5 May 2023). The floods cut off several roads (including Nansana-Maganjo Road, Kawanda-Kayunga Crossing, and Gobero-Kakiri-Masulita Road); disrupted transportation, forced residents to seek alternative routes, and affected access to essential services

like schools and health facilities. On October 2, 2023, a child named Mukisa Favour tragically drowned in a water channel in Katooke A Zone, Nansana Municipality, following heavy rains (Examiner, 2 October 2023). According to her mother, Mukisa had gone out to play after the rain and was later found to have drowned. On November 25, 2024, the body of Julius Ssemambo was found floating in stagnant water in an abandoned house in the Lubigi wetland area of Nabweru South Ward, Nansana Municipality (UPF, 25 November 2024). It was suspected that he drowned due to flooding in the area.

Table 8 presents the flood hotspots identified by community members across the divisions of Nansana Municipality.

Table 8: Flood hotspots in Nansana Municipality

Divisions	Busukuma	Nabweru	Nansana	Gombe
Hotspots	Kattabaana, Nasirye, Bulesa, Butera, Namawata, Kabonge-Buyaga, Kigemezi-Buwanuka, Nabutiti, Bukemba-Kabanyolo, Bulyankuyege-Butera, Namulonge TC	Kawempe B, Tula, Kisimu, Katooke, Kakira, Nabweru Division Head Quarters, Wamala	Katoogo, Lubigi, Bwaise, Kibwa, Kazo, Lugoba-kazinga, Bujjagaali, Kabumbi	Watindo Wambale, Along Semuto road, Ngalomyambe, Kavule, Gombe

The largest portion of the municipality (85.2%) is not prone to flooding (**Table 9**). However, 2.9%, 3.4%, 3.9%, 3.2%, and 1.4% of the municipality is exposed to very low (< 0.5m), low (0.5-1.0m), moderate (1.0-1.5m), high (1.5-2.0m), and very high (> 2.0m) flood hazard intensities, respectively.

Table 9: Coverage of flood hazard in Nansana Municipality

Flood Hazard Intensities	Busukuma		Gombe		Nabweru		Nansana		Total	
	Area (Km^2)	%	Area (Km^2)	%	Area (Km^2)	%	Area (Km^2)	%	Area (Km^2)	%
Not Prone	96.1	84.6	123.0	85.6	22.2	83.2	12.2	90.7	253.6	85.2
Very Low	3.3	2.9	4.5	3.1	0.7	2.6	0.1	1.0	8.6	2.9
Low	3.9	3.4	5.0	3.5	1.0	3.9	0.3	2.0	10.2	3.4
Moderate	5.0	4.4	4.8	3.3	1.3	5.0	0.5	3.4	11.5	3.9
High	3.9	3.5	4.3	3.0	1.1	3.9	0.3	1.9	9.5	3.2
Very High	1.5	1.3	2.1	1.5	0.4	1.4	0.1	0.9	4.1	1.4
Total	**113.6**	**100**	**143.7**	**100**	**26.7**	**100**	**13.4**	**100**	**297.5**	**100**

The flood hazard hotspots in Nansana Municipality are presented in **Figure 19**.

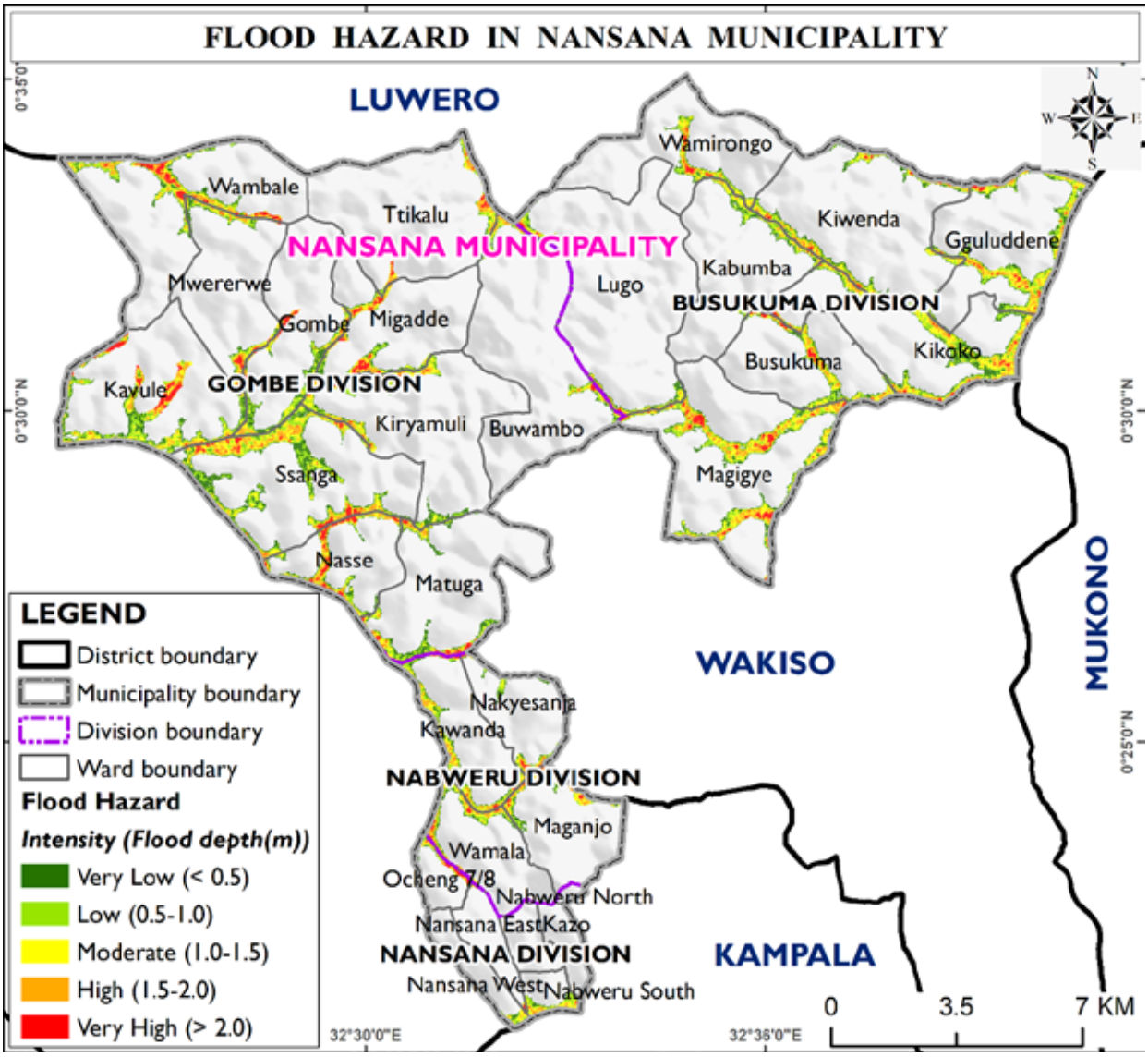


Figure 19: Flood hazard zonation in Nansana Municipality

3.2.3 Lightning Hazard

Lightning is the occurrence of a natural electrical discharge of very short duration and high voltage between a cloud and the ground or within a cloud (Agrawal & Nigam, 2014). Lightning happens under favourable conditions, where electrical discharges occur from a charge centre in a cloud either to: (i) the induced charge on the earth, (ii) the charge centres of another cloud, or (iii) a charge centre of the same cloud.

The most significant part of Nansana Municipality (57.9%) is exposed to low lightning hazard (**Table 10**). However, some areas in Wamirongo ward, Busukuma division, are exposed to high lightning hazard (**Figure 20**). There are no incidences of lightning that have been documented in the municipality.

Table 10: Coverage of lightning hazard in Nansana Municipality

Lightning Hazard Intensities	Busukuma		Gombe		Nabweru		Nansana		Total	
	Area (Km²)	%	Area (Km²)	%	Area (Km²)	%	Area (Km²)	%	Area (Km²)	%
Low	6.4	5.7	125.0	87.4	26.5	100	13.2	100	171.2	57.9
Moderate	102.9	91.1	18.1	12.6	0.0	0.0	0.0	0.0	121.0	40.9
High	3.6	3.2	0.0	0.0	0.0	0.0	0.0	0.0	3.6	1.2
Total	**113.0**	**100**	**143.1**	**100**	**26.5**	**100**	**13.2**	**100**	**295.8**	**100**

The lightning hazard zonation in Nansana Municipality is presented in **Figure 20**.

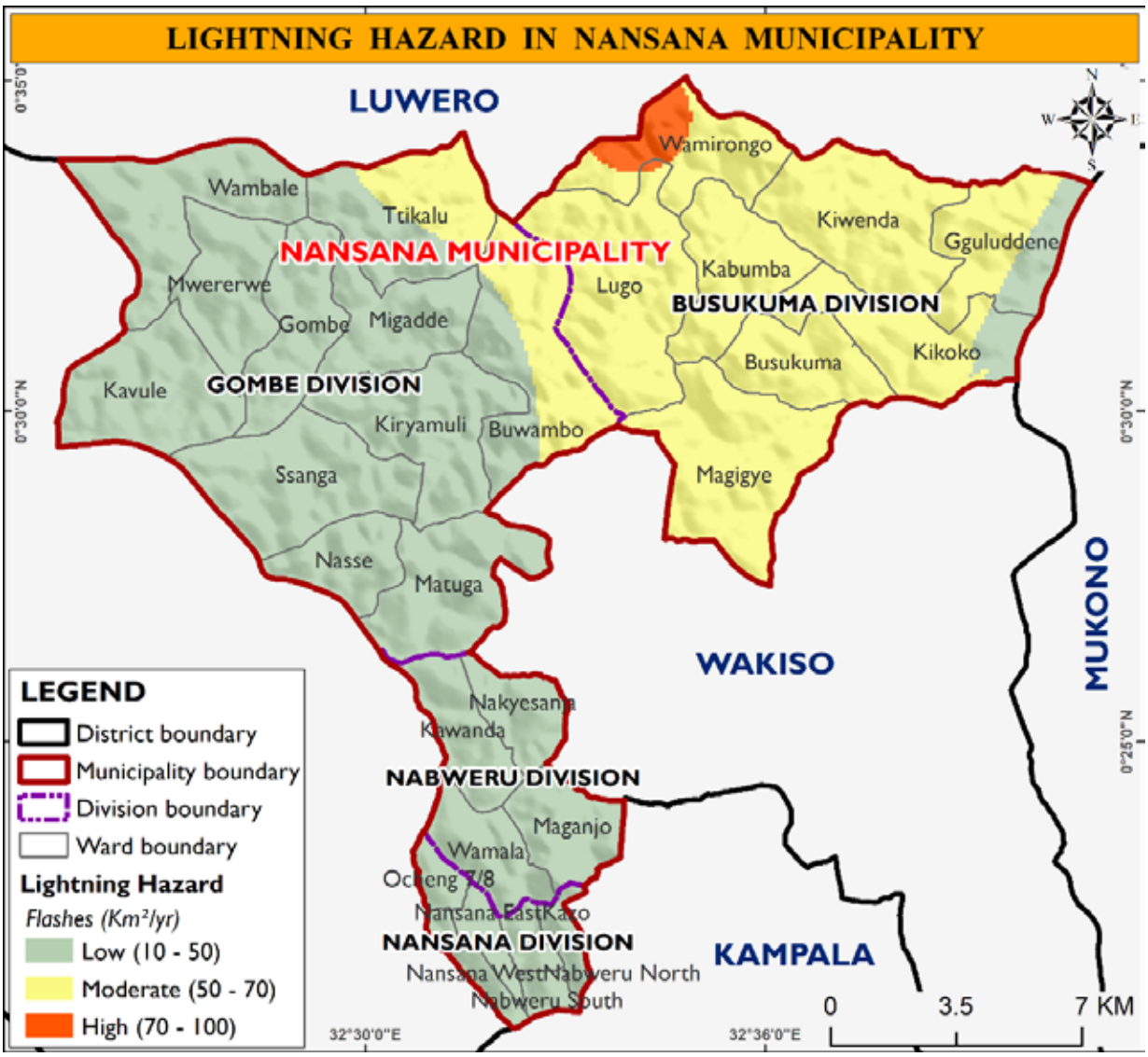


Figure 20: Lightning hazard zonation in Nansana Municipality

3.2.4 Windstorm Hazard

Wind is the perceptible natural movement of air. Differences in atmospheric pressure cause wind. When a difference in atmospheric pressure exists, air moves from the higher-pressure area to the lower-pressure area, resulting in winds of varying speeds. The impacts of windstorms in Nansana Municipality include air pollution, the spread of human diseases, uprooting of trees, and considerable structural damage to buildings, power and telephone lines, communication masts, and other urban infrastructure.

During a severe windstorm accompanied by heavy rain on October 1, 2023, a billboard collapsed at the Lubigi Police Post in Nansana, crushing a parked vehicle (Explorer, 2 October 2023). Inside the car was 17-year-old Mildred Najjemba, a resident of Wamala, who tragically lost her life. Another occupant, Zaharah Nanyonjo, survived by lying on the floor of the vehicle. The same windstorm event caused the collapse of at least five billboards in Nansana and surrounding areas, including one at the Stabex petrol station on Hoima Road. These collapses led to significant traffic disruptions until emergency services cleared the debris.

Plate 3: One of the billboards that was affected by the strong winds in Nansana
Photo credit: The Explorer

The assessment showed that the most significant part of the municipality (83.1%) is exposed to very low windstorm hazard, especially in Gombe and Busukuma divisions (**Table 11**). However, the most significant portion of the Nansana division (95.4%) is exposed to a moderate windstorm hazard (**Figure 21** and **Table 11**). This finding aligns with the observed impact of windstorms in the Nansana division, as highlighted above.

Table 11: Coverage of windstorm hazard in Nansana Municipality

Windstorm Hazard Intensities	Busukuma		Gombe		Nabweru		Nansana		Total	
	Area (Km²)	%	Area (Km²)	%	Area (Km²)	%	Area (Km²)	%	Area (Km²)	%
Very Low	103.4	91.5	142.4	99.5	0.02	0.1	0.0	0.0	245.8	83.1
Low	9.6	8.5	0.7	0.5	21.2	79.9	0.6	4.6	32.1	10.8
Moderate	0.0	0.0	0.0	0.0	5.3	20.0	12.6	95.4	17.9	6.0
Total	**113.0**	**100**	**143.1**	**100**	**26.5**	**100**	**13.2**	**100**	**295.8**	**100**

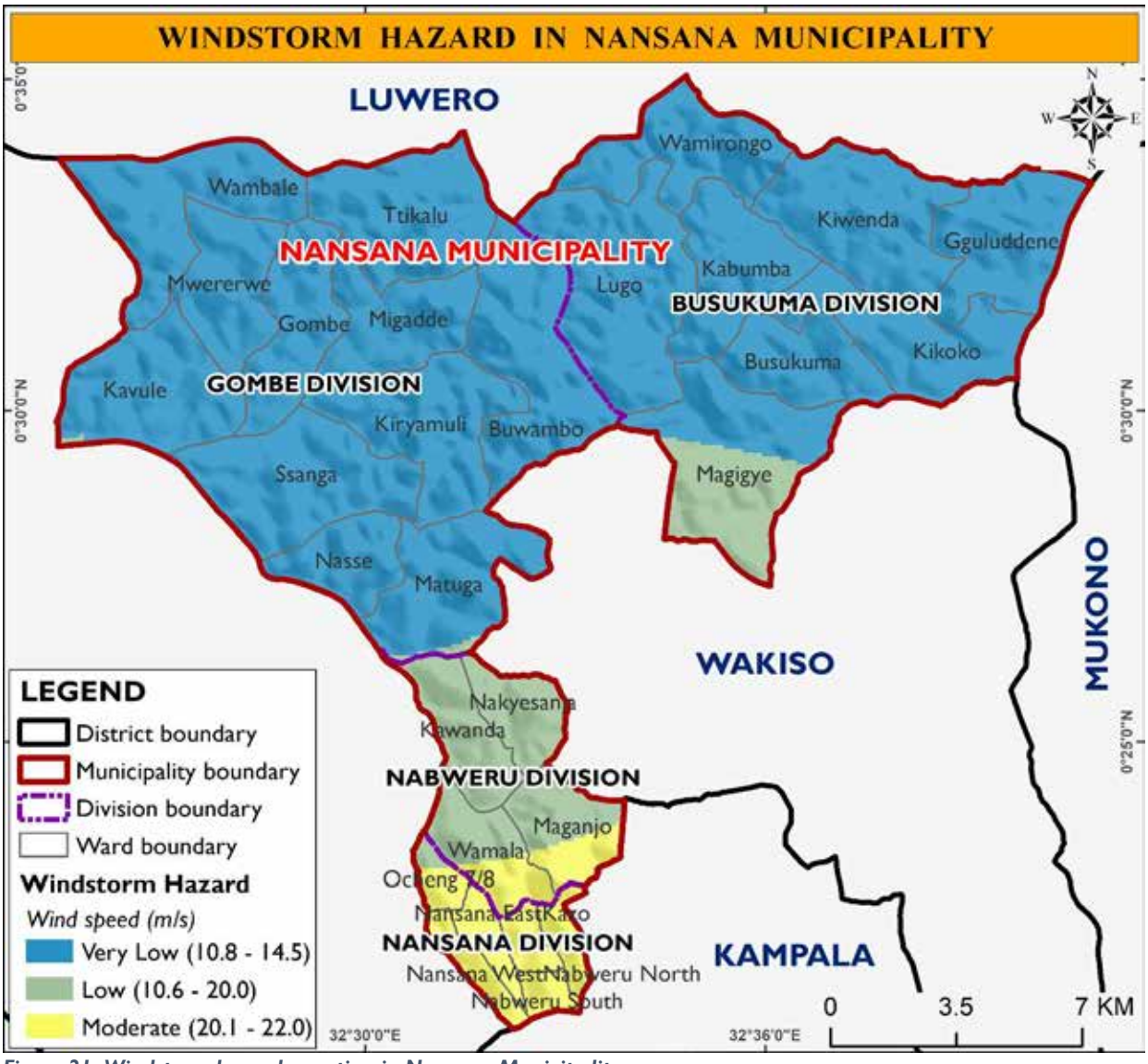


Figure 21: Windstorm hazard zonation in Nansana Municipality

3.3 Exposure Assessment

Exposure is defined as the situation of people, infrastructure, housing, production capacities, and other tangible human assets located in hazard-prone areas (UNISDR, 2017). The criterion considered for exposure assessment of elements at risk was location in moderate, high, and very high hazard intensities (OPM, 2019). Exposure of the elements at risk was done based on the availability of spatial datasets. **Table 12** presents the elements at risk and their sensitivity to various climate hazards.

Table 12: Sensitivity of elements at risk to the different climate hazards

Sector and Element at Risk	Data Source	Drought	Floods	Hailstorms	Lightning	Windstorms
1. Agriculture						
1.1 Farmlands	Satellite Imagery, 2025	High	High	Moderate	Low	Moderate
2. Education						
2.1 Schools	MoES, 2018	Low	High	Low	Moderate	High
3. Energy						
3.1 Substations	UMEME, 2024	Low	High	Low	High	Low
3.2 Transformers	UMEME, 2024	Low	Moderate	Low	High	High
3.3 Distribution lines	UMEME, 2024	Low	Low	Low	High	High
4. Health						
4.1 Health facilities	MoH, 2024	Low	High	Low	Moderate	High
5. Land and Housing						
5.1 Buildings	OSM & Satellite Imagery, 2025	Low	High	Low	High	Moderate
6. Social development						
6.1 Human population	UBOS Census, 2014	High	High	High	High	High
7. Transportation						
7.1 Roads	UNRA, 2022	Low	High	Low	Low	Low
8. Water and Environment						
8.1 Forests	Satellite Imagery 2025 & NFA 2024	Moderate	High	Low	Low	Low
8.2 Water sources	MWE, 2024	High	High	Low	Low	Low

Exposure of the agriculture sector to climate hazards

The agricultural sector element in Nansana Municipality that is exposed to climate hazards comprises small-scale farmlands.

Table 13: Exposure of farmlands to drought, flood, hailstorm, and windstorm hazards in Nansana Municipality

Climate Hazards	Drought				Floods				Hailstorms		Windstorms			
Division	Exposed		Not Exposed		Exposed		Not Exposed		Exposed		Exposed		Not Exposed	
	Area (Km²)	%	Area (Km²)	%	Area (Km²)	%	Area (Km²)	%	Area (Km²)	%	Area (Km²)	%	Area (Km²)	%
Busukuma	2.4	5.4	41.3	94.6	3.8	8.8	40.0	91.2	43.9	100.0	0.0	0.0	43.7	100.0
Gombe	22.6	43.3	29.7	56.7	3.2	6.1	49.2	93.9	52.4	100.0	0.0	0.0	52.3	100.0
Nabweru	1.8	21.3	6.5	78.7	1.1	13.3	7.2	86.7	8.3	100.0	1.0	12.0	7.2	88.0
Nansana	0.1	3.2	2.3	96.8	0.3	12.2	2.1	87.8	2.4	100.0	2.2	93.5	0.1	6.5
Total	26.8	25.2	79.7	74.8	8.4	7.9	98.5	92.1	107.0	100.0	3.2	3.0	103.4	97.0

The assessment indicated that 26.8 Km2 (25.2%) of farmland in Nansana Municipality is exposed to drought hazard. The Gombe (43.3%) and Nabweru (21.3%) divisions have the highest proportions of farmland exposed to drought hazard (**Table 13** and **Figure 22**).

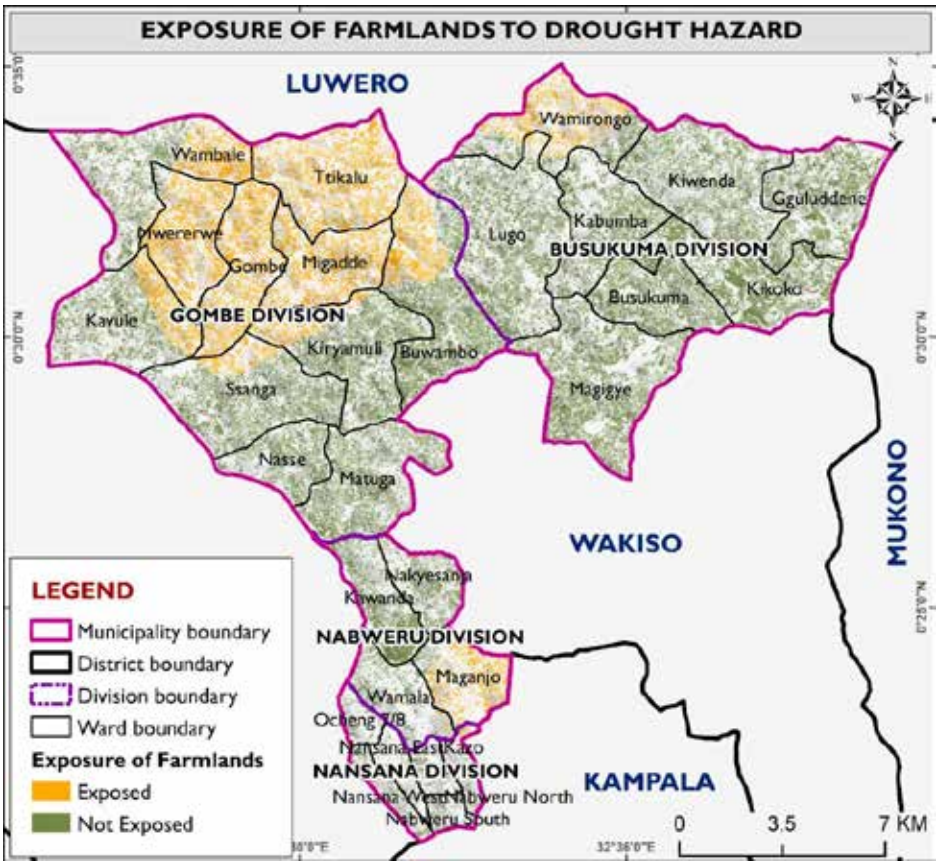


Figure 22: Exposure of farmlands to drought hazard in Nansana Municipality

A total of 8.4 Km² (7.9%) of farmland in Nansana Municipality is exposed to flood hazard. Nabweru (13.3%) and Nansana (12.2%) divisions have the highest proportions of farmland exposed to flood hazard (**Table 13** and **Figure 23**).

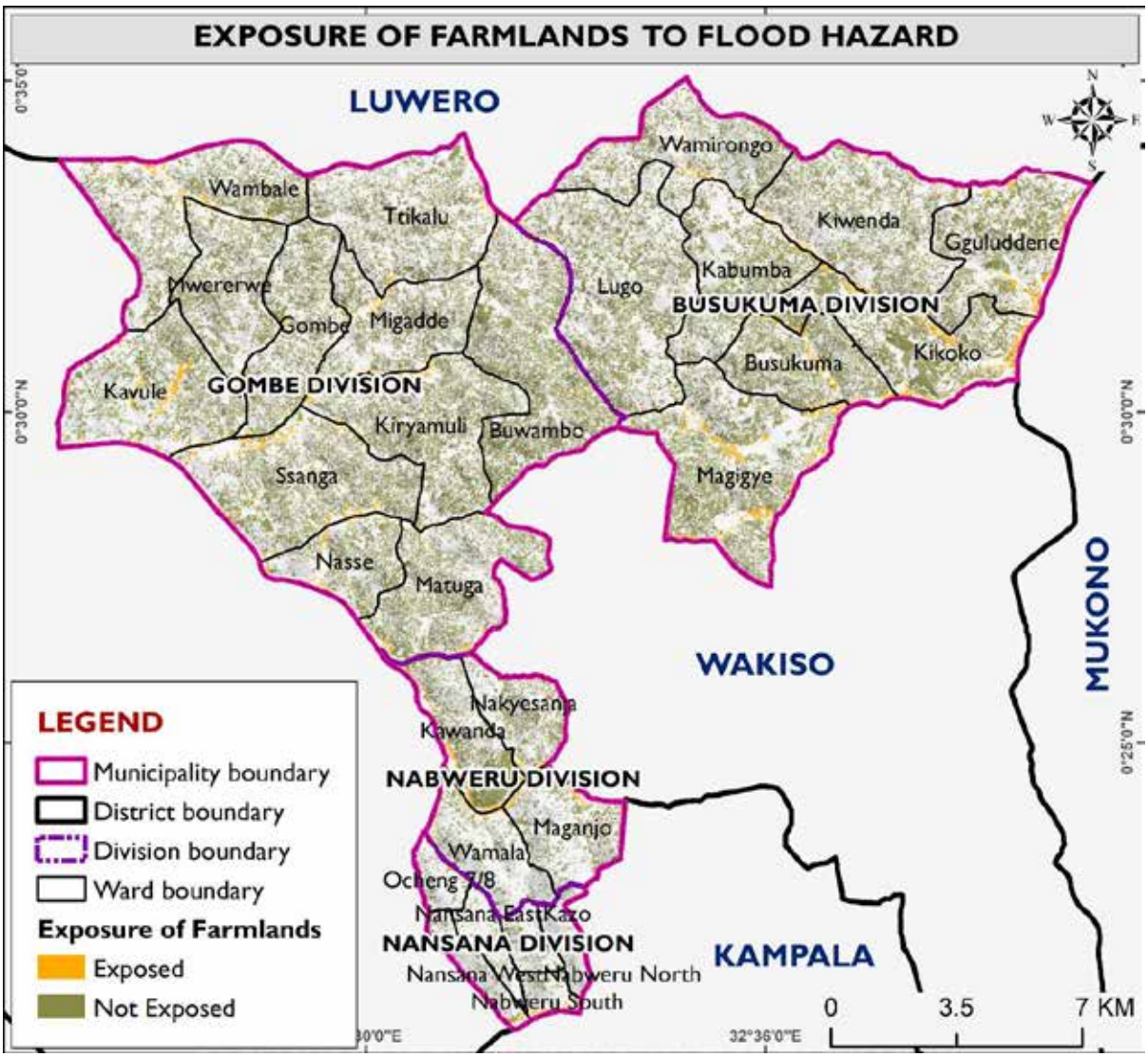


Figure 23: Exposure of farmlands to flood hazard in Nansana Municipality

All the farmlands (100%) in Nansana Municipality are exposed to hailstorm hazard (**Figure 24**). The Gombe (52.4 Km²) and Busukuma (43.9 Km²) divisions have the most significant areas of farmland exposed to hailstorms (**Table 13**).

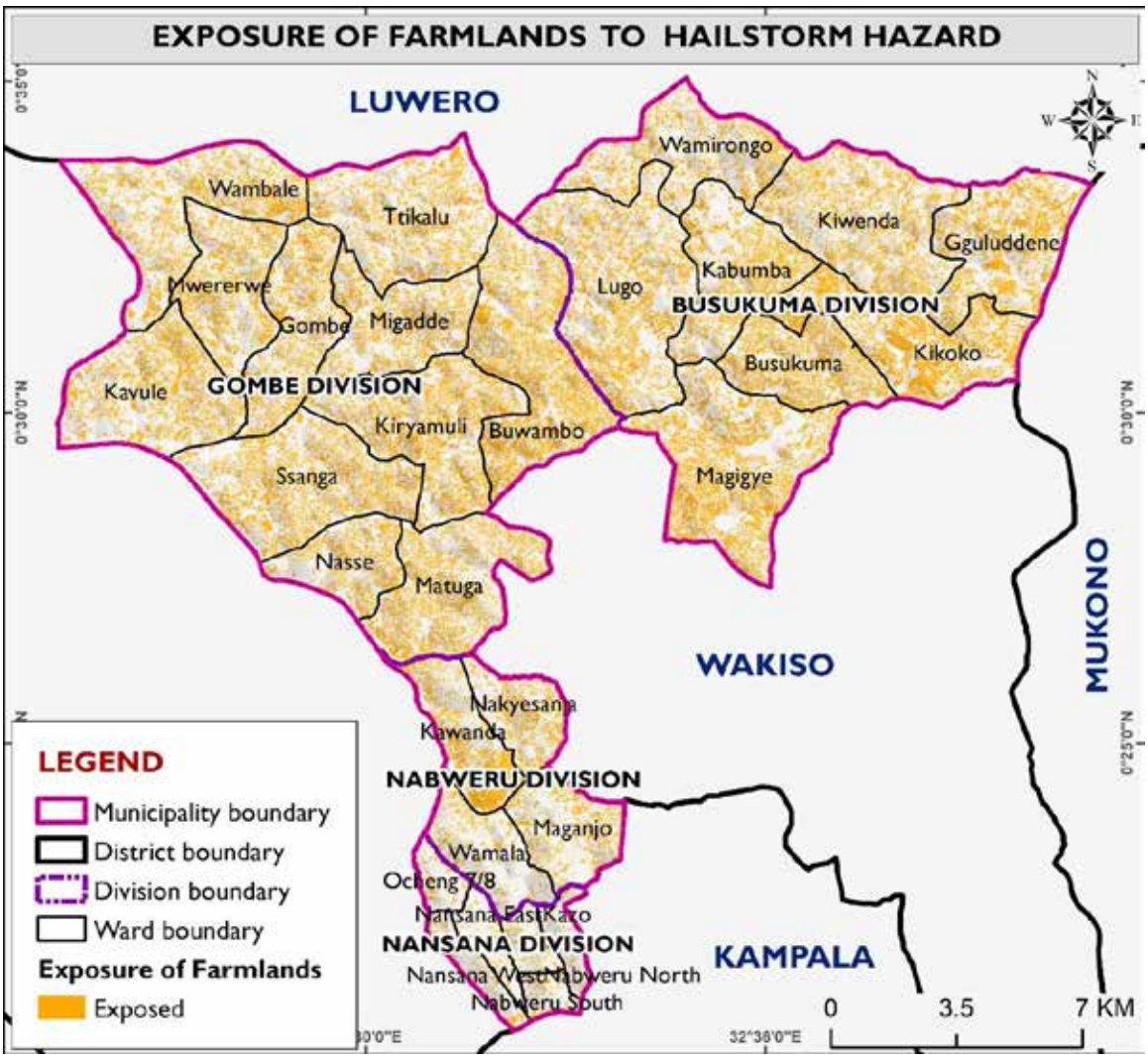


Figure 24: Exposure of farmlands to hailstorm hazard in Nansana Municipality

In Nansana Municipality, 3.2 Km^2 (3%) of farmlands are exposed to windstorms, whereas 103.4 Km^2 (97%) are not exposed to this hazard (**Table 13**). The exposed farmlands to windstorm hazard are located in Nabweru and Nansana divisions (**Figure 25**).

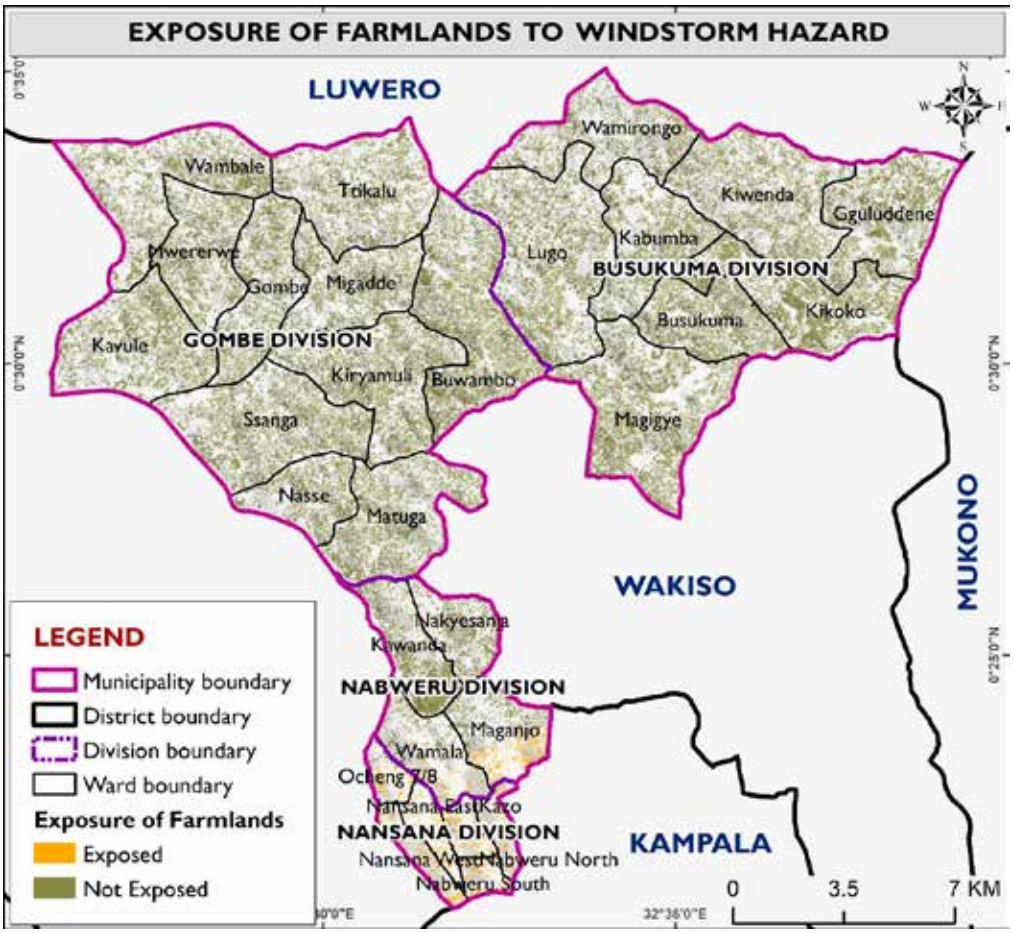


Figure 25: Exposure of farmlands to windstorm hazard in Nansana Municipality

Exposure of the education sector to climate hazards

The education sector element exposed to climate hazards in Nansana Municipality is schools. Nansana Municipality has 669 schools (including pre-primary, primary, secondary, and tertiary institutions) (Nansana Education Department, 2025). However, these schools are not georeferenced; therefore, this assessment used the Ministry of Education and Sports (2018) georeferenced school dataset to determine schools' exposure to climate hazards within the municipality.

Table 14: Exposure of schools to floods, lightning, and windstorms in Nansana Municipality

Climate Hazards	Floods				Lightning				Windstorms			
Divisions	Exposed		Not Exposed		Exposed		Not Exposed		Exposed		Not Exposed	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Busukuma	0	0.0	49	100	48	98.0	1	2.0	0	0	49	100
Gombe	1	1.3	79	98.8	11	13.9	68	86.1	0	0	79	100
Nabweru	3	2.8	105	97.2	0	0.0	107	100.0	34	31.8	73	68.2
Nansana	5	4.6	104	95.4	0	0.0	108	100.0	104	96.3	4	3.7
Total	9	2.6	337	97.4	59	17.2	284	82.8	138	40.2	205	59.8

The analysis showed that 9 schools (2.6%) in Nansana Municipality are exposed to flooding, whereas 337 schools (97.4%) are not (**Table 14**). Nansana division (4.6%) has the highest percentage of schools exposed to floods (*Figure 26*). Schools such as Light Nyange Quality School and Alliance High School in Ochieng 7/8 ward, as well as Standard Parents Namungoona P/S in Nansana West, are highly exposed to floods.

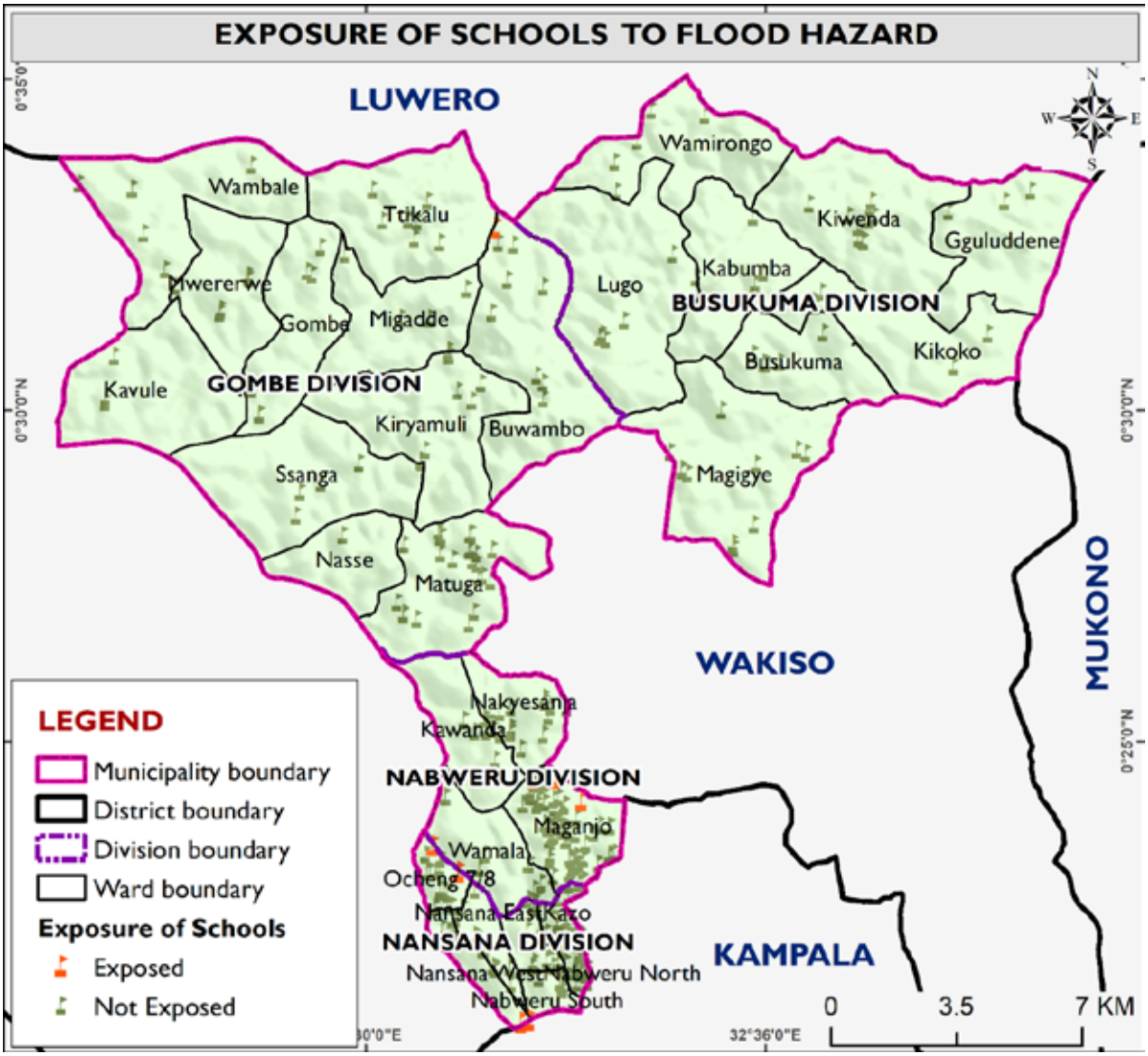


Figure 26: Exposure of schools to flood hazard in Nansana Municipality

A total of 59 schools (17.2%) are exposed to lightning hazard in Nansana Municipality (**Table 14**). The schools in Nansana Municipality most exposed to lightning are located in the Busukuma (98%) and Gombe (13.9%) divisions (*Figure 27*).

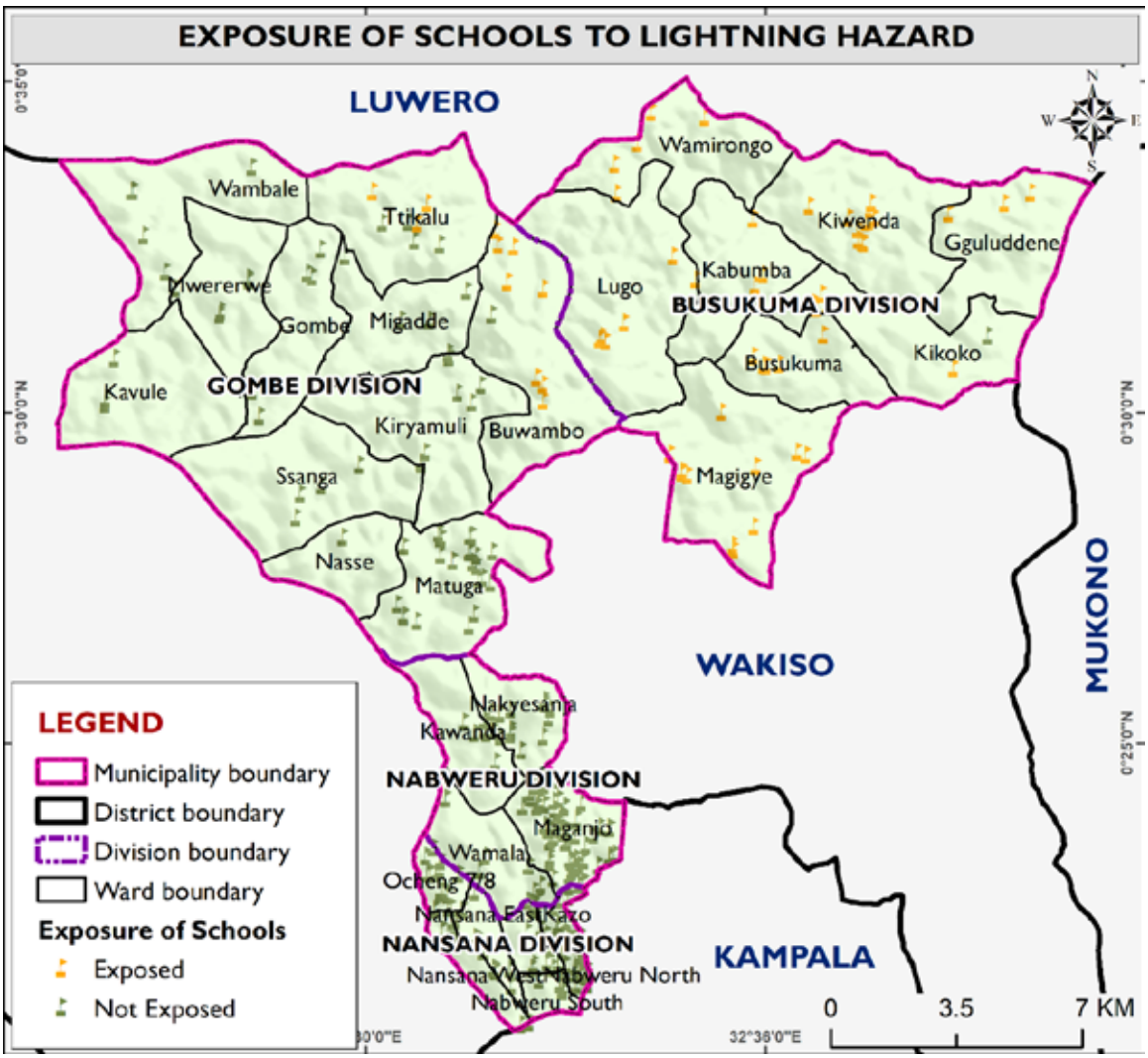


Figure 27: Exposure of schools to lightning hazard in Nansana Municipality

In Nansana Municipality, 138 schools (40.2%) are exposed to windstorms, whereas 205 schools (59.8%) are not (**Table 14**). The schools in Nansana Municipality that are exposed to windstorms are located in Nansana (96.3%) and Nabweru (31.8%) divisions (*Figure 28*).

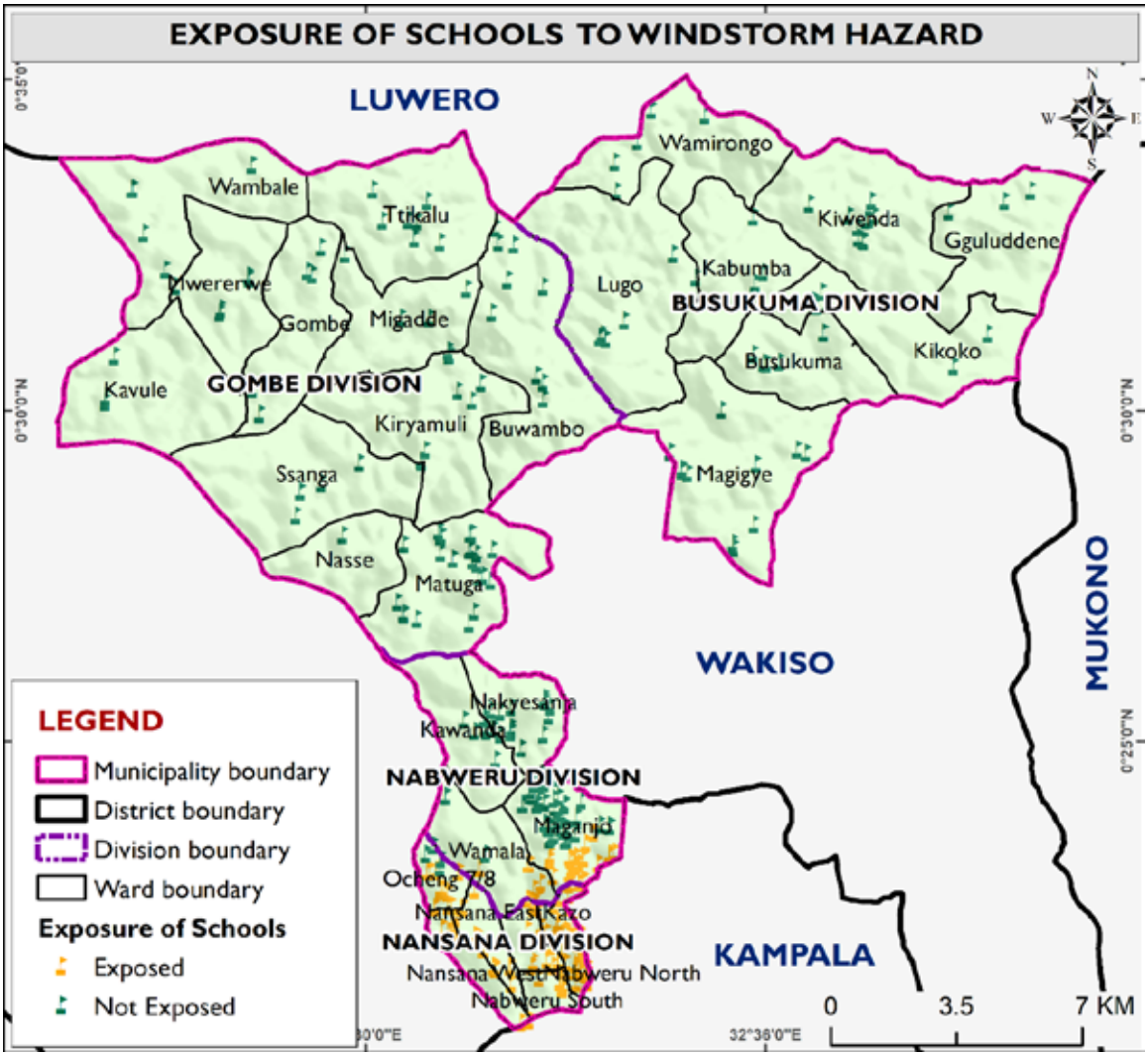


Figure 28: Exposure of schools to windstorm hazard in Nansana Municipality

Exposure of the energy sector to climate hazards

The energy sector elements exposed to climate hazards in Nansana Municipality include substations, transformers, and distribution lines.

Exposure of distribution substations to flood and lightning hazards: The assessment showed that 1 distribution substation of Kawanda (50%) is moderately exposed to floods, whereas another distribution substation of Kawanda UETCL (50%) is not exposed to floods (*Figure 29*). Both distribution substations are found in Nakyesanja ward, Nabweru division, Nansana Municipality.

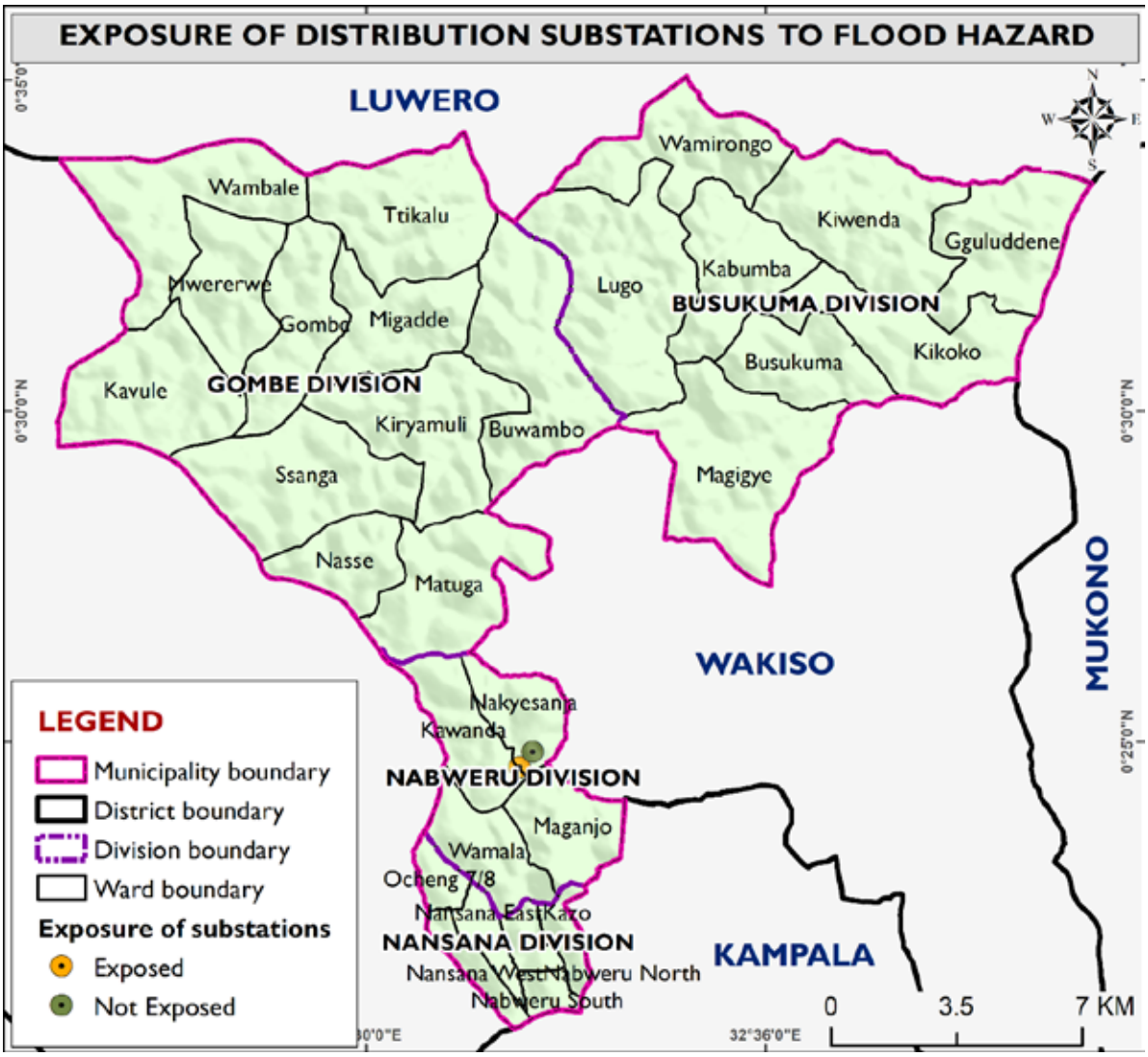


Figure 29: Exposure of distribution substations to floods in Nansana Municipality

Neither substation is exposed to lightning hazard (*Figure 30*).

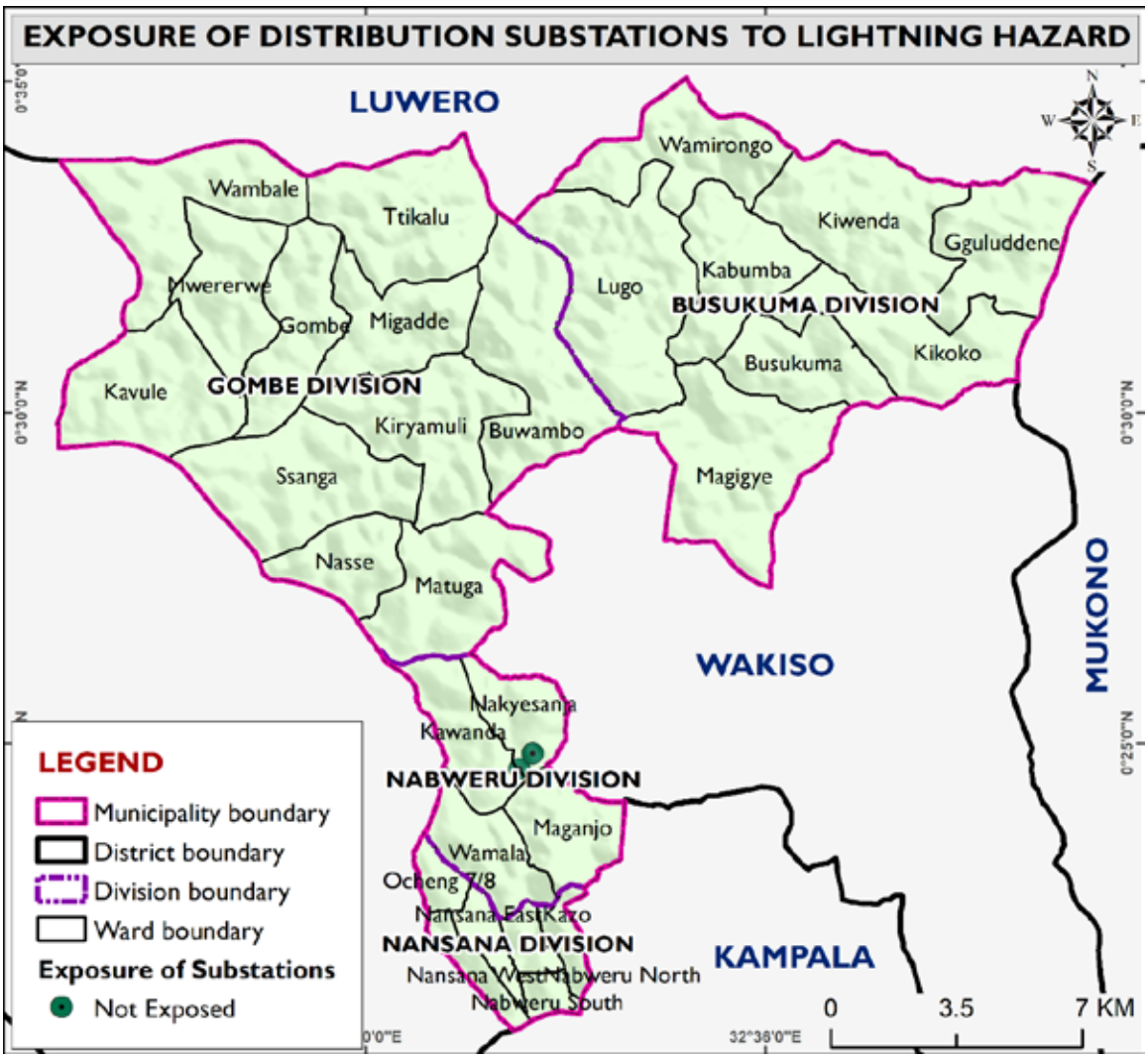


Figure 30: Exposure of distribution substations to lightning in Nansana Municipality

Exposure of distribution transformers to lightning and windstorm hazards:

Table 15: Exposure of distribution transformers to lightning and windstorm hazards

Climate Hazards	Lightning				Windstorms			
Divisions	Exposed		Not Exposed		Exposed		Not Exposed	
	Number	%	Number	%	Number	%	Number	%
Busukuma	48	92.3	4	7.7	0	0.0	52	100
Gombe	8	8.3	88	91.7	0	0.0	96	100
Nabweru	0	0.0	83	100	25	30.1	58	69.9
Nansana	0	0.0	66	100	63	95.5	3	4.5
Total	56	18.9	241	81.1	88	29.6	209	70.4

The analysis showed that 56 distribution transformers (18.9%) are exposed to lightning hazard, whereas 241 distribution transformers (81.1%) are not (**Table 15**). The exposed distribution transformers to lightning are located in Busukuma (92.3%) and Gombe (8.3%) divisions (*Figure 31*).

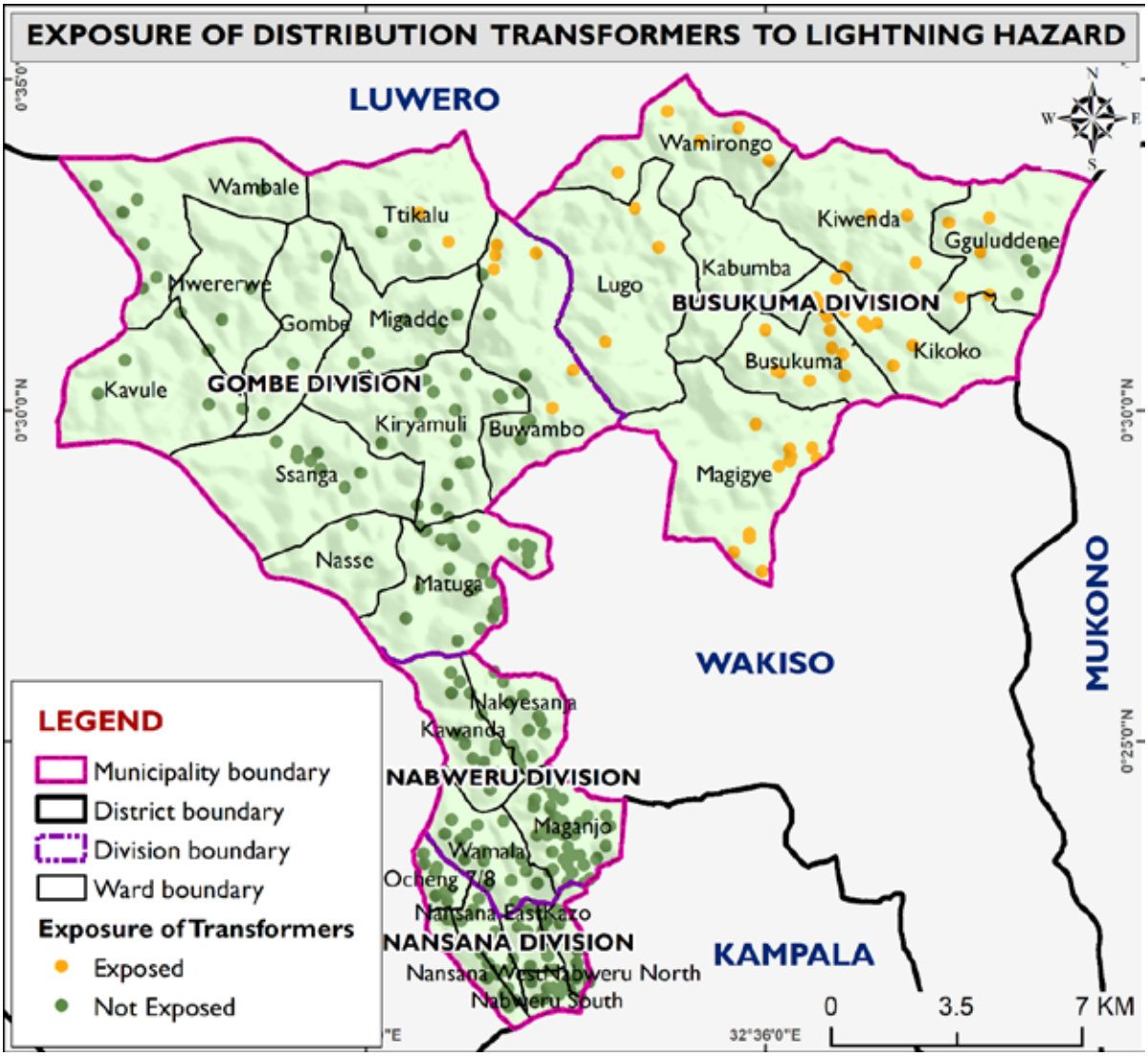


Figure 31: Exposure of distribution transformers to lightning hazard in Nansana Municipality

A total of 88 distribution transformers (29.6%) are exposed to windstorm hazard, while 209 distribution transformers (70.4%) are not exposed to this hazard (**Table 15**). The Nansana (95.5%) and Nabweru (30.1%) divisions have the highest proportions of distribution transformers exposed to the windstorm hazard (*Figure 32*).

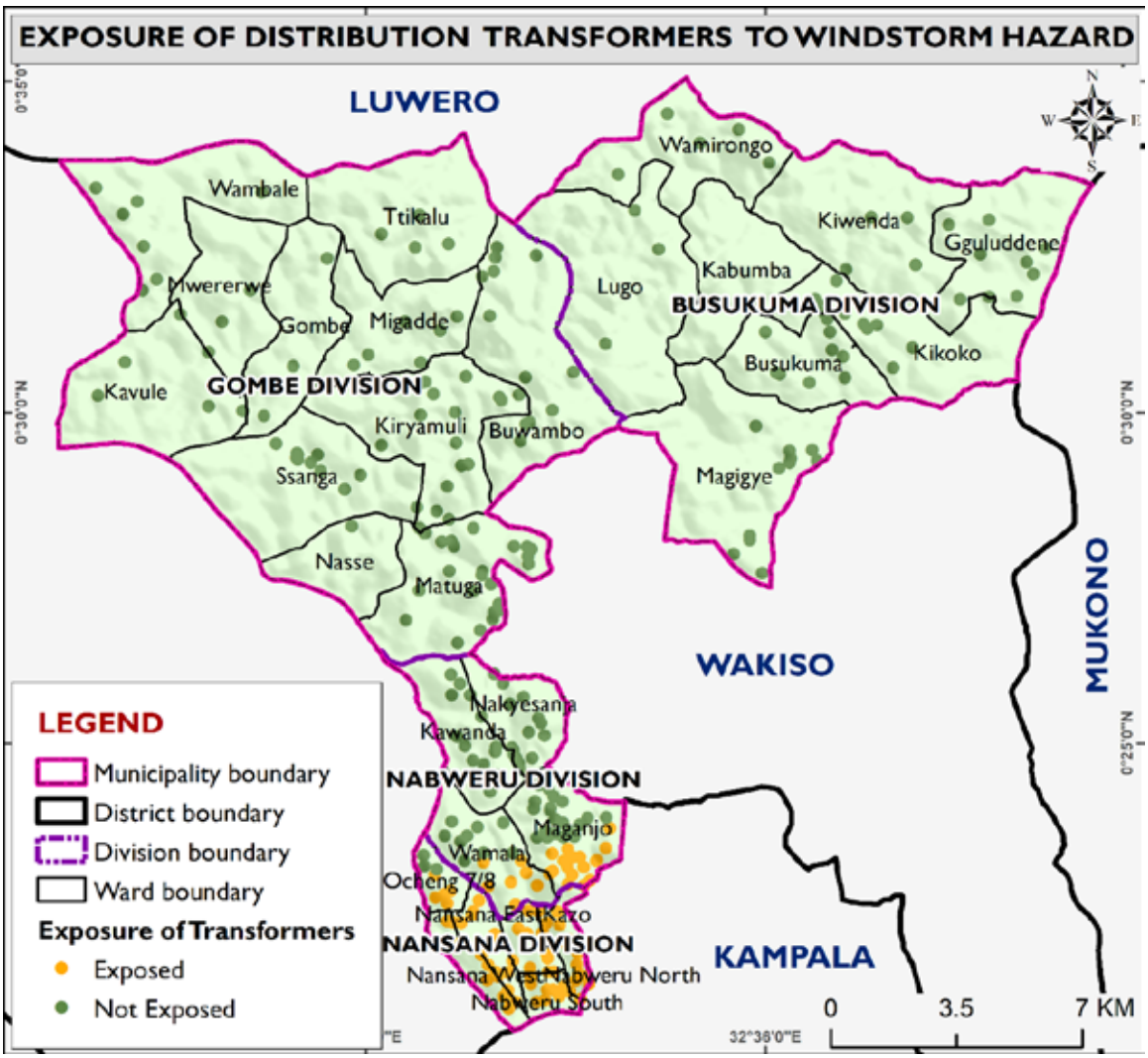


Figure 32: Exposure of distribution transformers to windstorm hazard in Nansana Municipality

Exposure of distribution lines to lightning and windstorm hazards:

Table 16: Exposure of distribution lines to lightning and windstorm hazards

Climate Hazards	Lightning				Windstorms			
Divisions	Exposed		Not Exposed		Exposed		Not Exposed	
	Length (Km)	%	Length (Km)	%	Length (Km)	%	Length (Km)	%
Busukuma	48.9	94.2	3.0	5.8	0.0	0.0	51.9	100
Gombe	13.8	9.0	139.0	91.0	0.0	0.0	152.8	100
Nabweru	0.0	0.0	53.2	100	9.2	17.2	44.0	82.8
Nansana	0.0	0.0	22.2	100	20.8	93.9	1.4	6.1
Total	**62.7**	**22.4**	**217.5**	**77.6**	**30.0**	**10.7**	**250.2**	**89.3**

The assessment showed that 62.7 kilometers (22.4%) of distribution lines in Nansana Municipality are exposed to lightning hazard (**Table 16**). The exposed distribution lines to lightning hazard in Nansana Municipality are found in Busukuma (94.2%) and Gombe (9%) divisions (*Figure 33*).

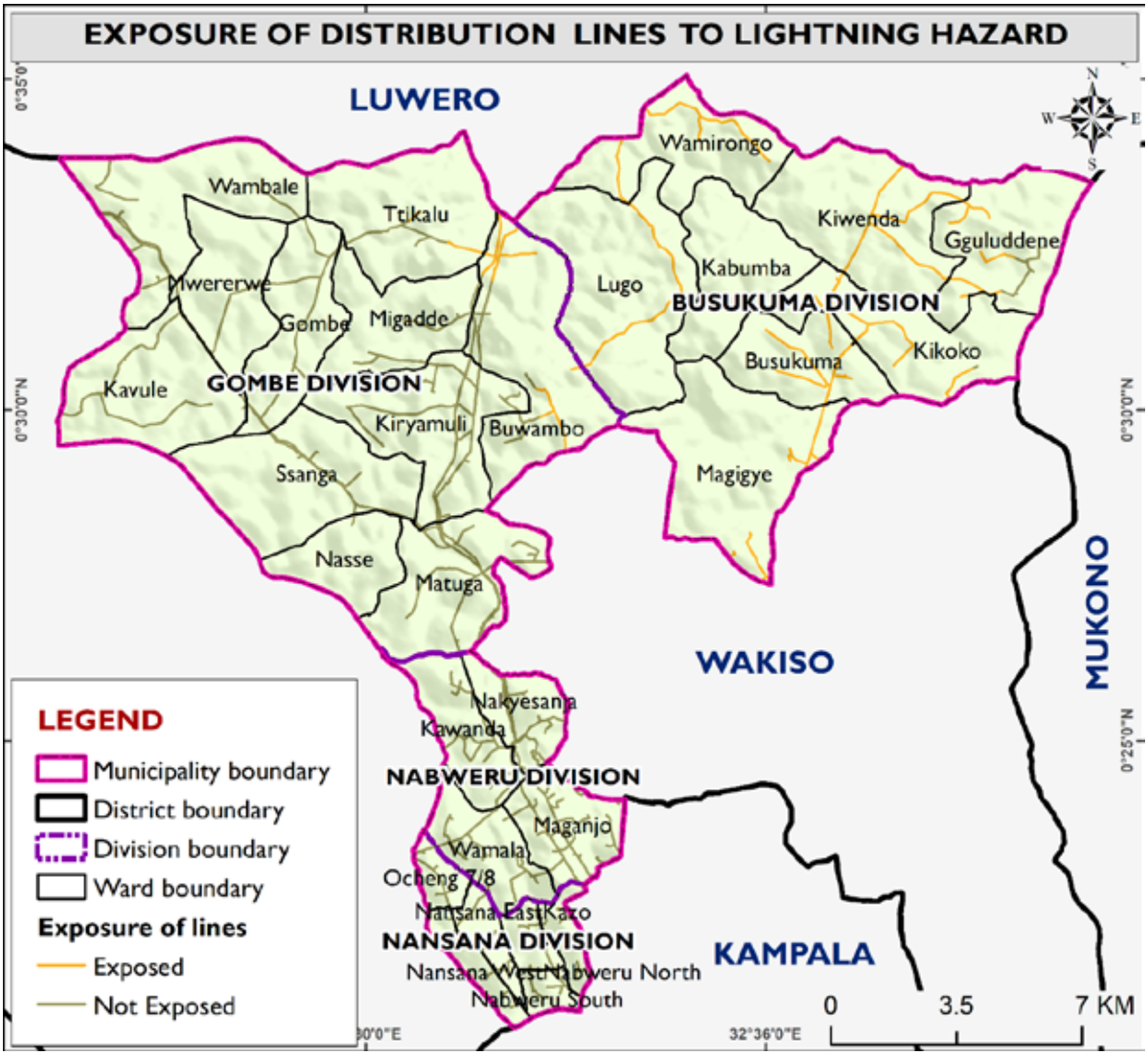


Figure 33: Exposure of distribution lines to lightning hazard in Nansana Municipality

A total of 30 kilometers (10.7%) of distribution lines are exposed to windstorms, whereas 250.2 kilometers (89.3%) of distribution lines are not exposed to windstorms (**Table 16**). The Nabweru (17.2%) and Nansana (93.9%) divisions have the highest proportions of distribution lines exposed to the windstorm hazard (*Figure 34*).

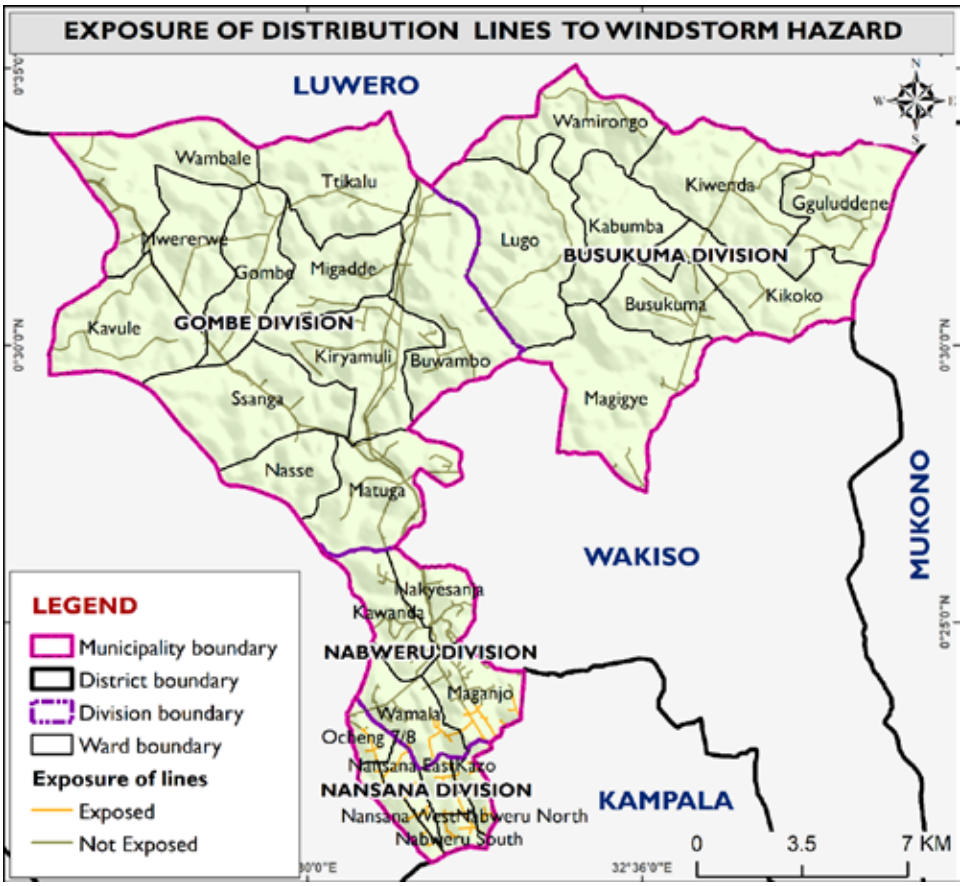


Figure 34: Exposure of distribution lines to windstorm hazard in Nansana Municipality

Exposure of the health sector to climate hazards

The health sector element exposed to climate hazards in Nansana Municipality is health facilities. Nansana Municipality has over 600 health facilities (including clinics, HC II, HC III, HC IV, and Hospitals) (Nansana Health Department, 2025). However, these health facilities are not georeferenced; therefore, this assessment used the Ministry of Health's (2024) georeferenced health facilities dataset to determine the exposure of health facilities to climate hazards within the municipality. It is important to note that these are the health facilities supported by the ministry and its partners.

Table 17: Exposure of health facilities to floods, lightning, and windstorms in Nansana Municipality

Climate Hazards	Floods				Lightning				Windstorms			
	Exposed		Not Exposed		Exposed		Not Exposed		Exposed		Not Exposed	
Divisions	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Busukuma	0	0	10	100	9	90	1	10	0	0	10	100
Gombe	0	0	19	100	2	10.5	17	89.5	0	0	19	100
Nabweru	0	0	31	100	0	0	31	100	13	41.9	18	58.1
Nansana	0	0	42	100	0	0	40	100	38	95	2	5
Total	0	0	102	100	11	11	89	89	51	51	49	49

All the government health facilities (100%) in Nansana Municipality are not exposed to flood hazard (**Table 17** and **Figure 35**).

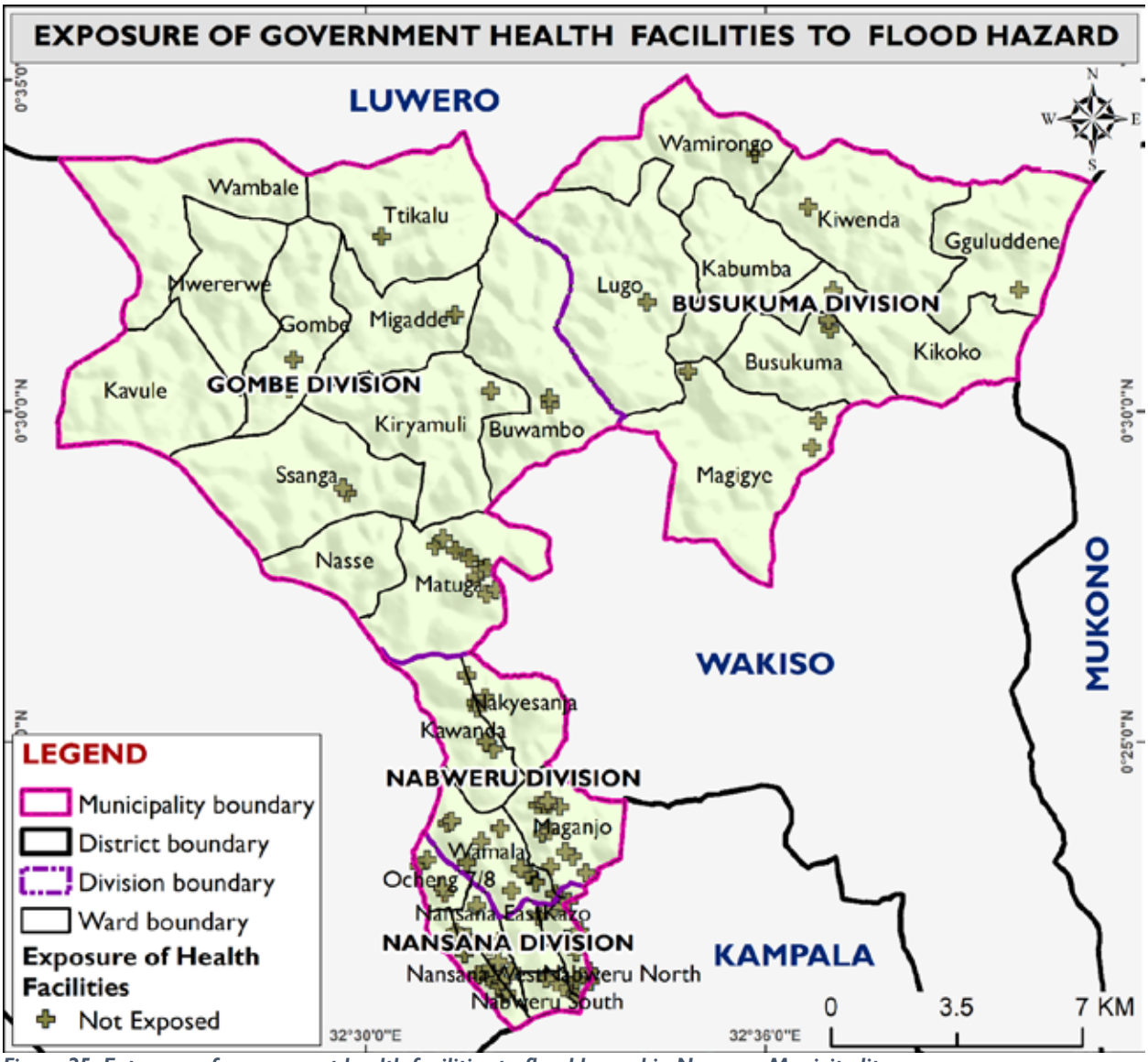


Figure 35: Exposure of government health facilities to flood hazard in Nansana Municipality

The assessment showed that 11 government health facilities (11%) in Nansana Municipality are exposed to lightning, whereas 89 government health facilities (89%) are not (**Table 17**). Exposed government health facilities to lightning are found in the Busukuma (90%) and Gombe (10.5%) divisions (**Figure 36**).

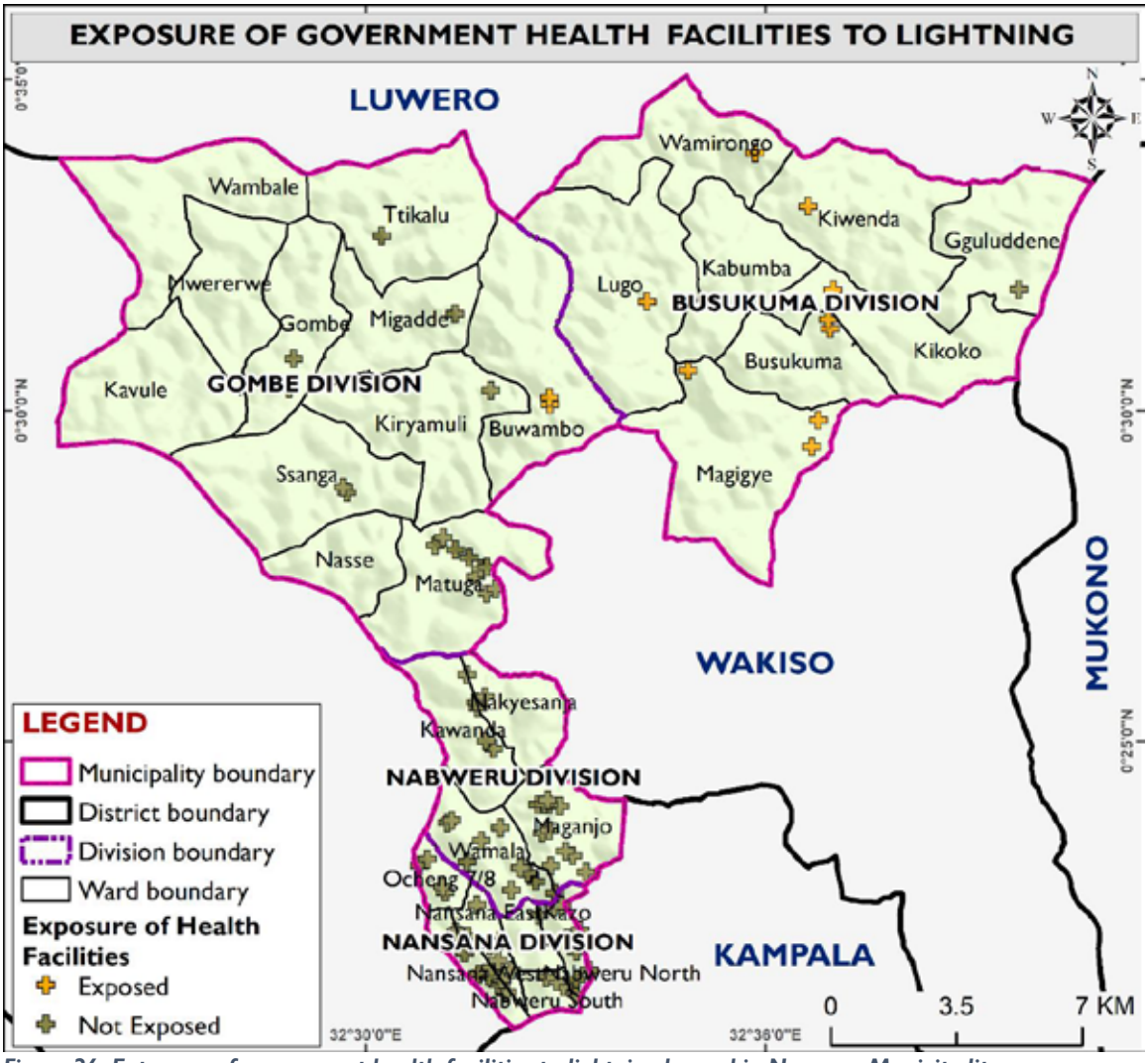


Figure 36: Exposure of government health facilities to lightning hazard in Nansana Municipality

A total of 51 government health facilities (51%) in Nansana Municipality are exposed to windstorms, whereas 49 (49%) are not (**Table 17**). The government health facilities affected by windstorms are located in the Nansana (95%) and Nabweru (41.9%) divisions (**Figure 37**).

The wards that have a very high ada
windstorms) include Gombe, Buwa
Ocheng 7/8, Nansana East, Kazo,

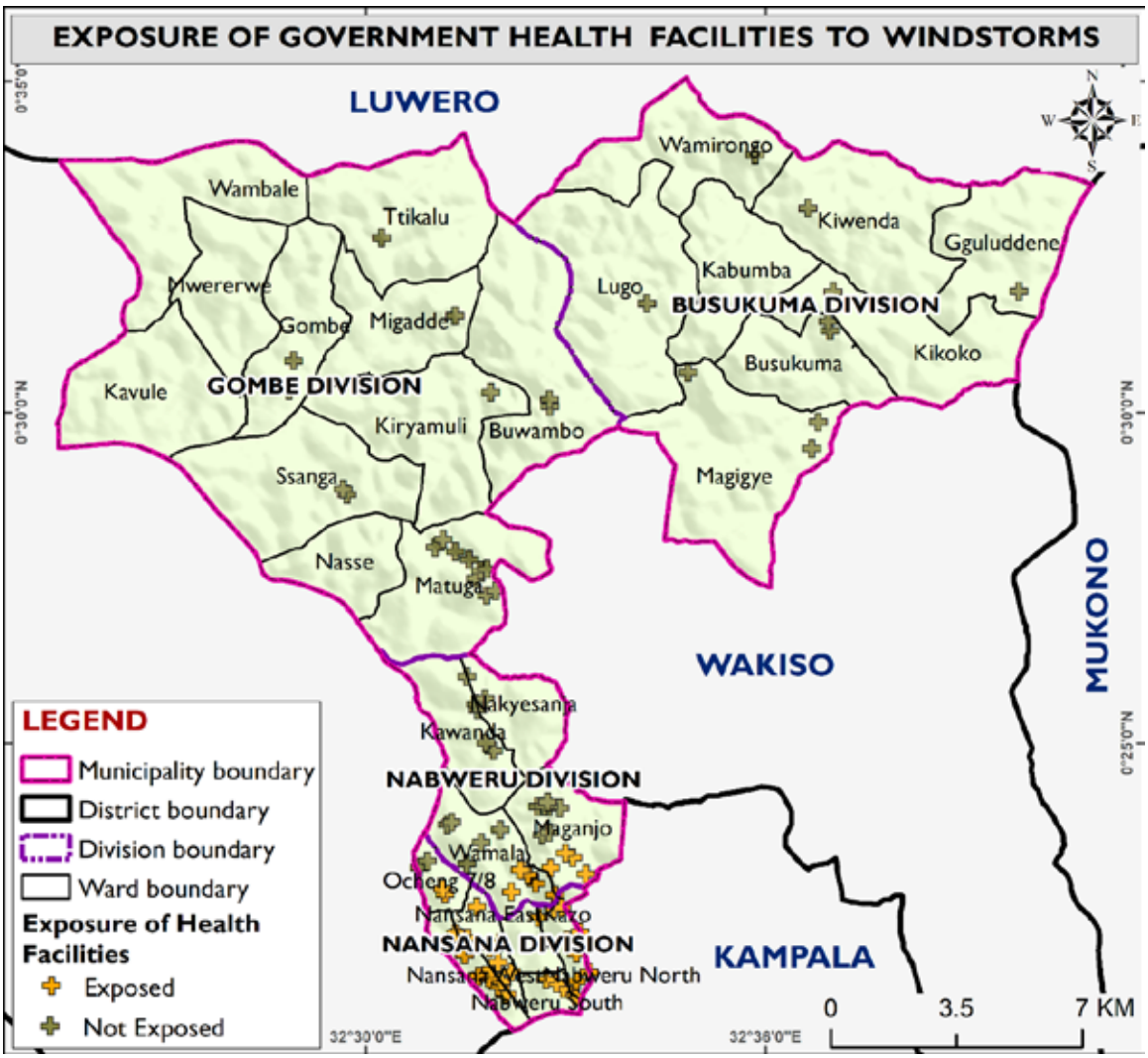


Figure 37: Exposure of government health facilities to windstorm hazard in Nansana Municipality

Exposure of the land and housing sector to climate hazards

In Nansana Municipality, the land and housing sector exposed to climate hazards comprises buildings (both commercial and residential).

Table 18: Exposure of buildings to floods, lightning, and windstorms in Nansana Municipality

Climate Hazards	Floods				Lightning				Windstorms			
	Exposed		Not Exposed		Exposed		Not Exposed		Exposed		Not Exposed	
Divisions	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
Busukuma	1,803	6.1	27,757	93.9	26,676	95.3	1,328	4.74	0	0	27,958	100
Gombe	1,601	3.6	42,599	96.4	6,055	14.2	36,592	85.8	0	0	42,572	100
Nabweru	2,215	6.9	29,661	93.1	0	0	30,119	100	6,619	21.9	23,553	78.1
Nansana	1,947	3.9	47,889	96.1	0	0	48,233	100	46,440	96.2	1,838	3.81
Total	7,566	4.9	147,906	95.1	32,731	22	116,272	78	53,059	35.6	95,921	64.4

e capacity to multi-hazards (i.e., drought, floods, lightning, and
o, Kawanda, and Maganjo (**Figure 24**). On the other hand,
weru South, Wamirongo, and Gguluddene have a very low

The analysis showed that 7,566 buildings (4.9%) are exposed to flooding, whereas 147,906 buildings (95.1%) are not (**Table 18**). Nabweru (6.9%) and Busukuma (6.1%) divisions have the highest proportions of buildings exposed to flooding (**Figure 38**).

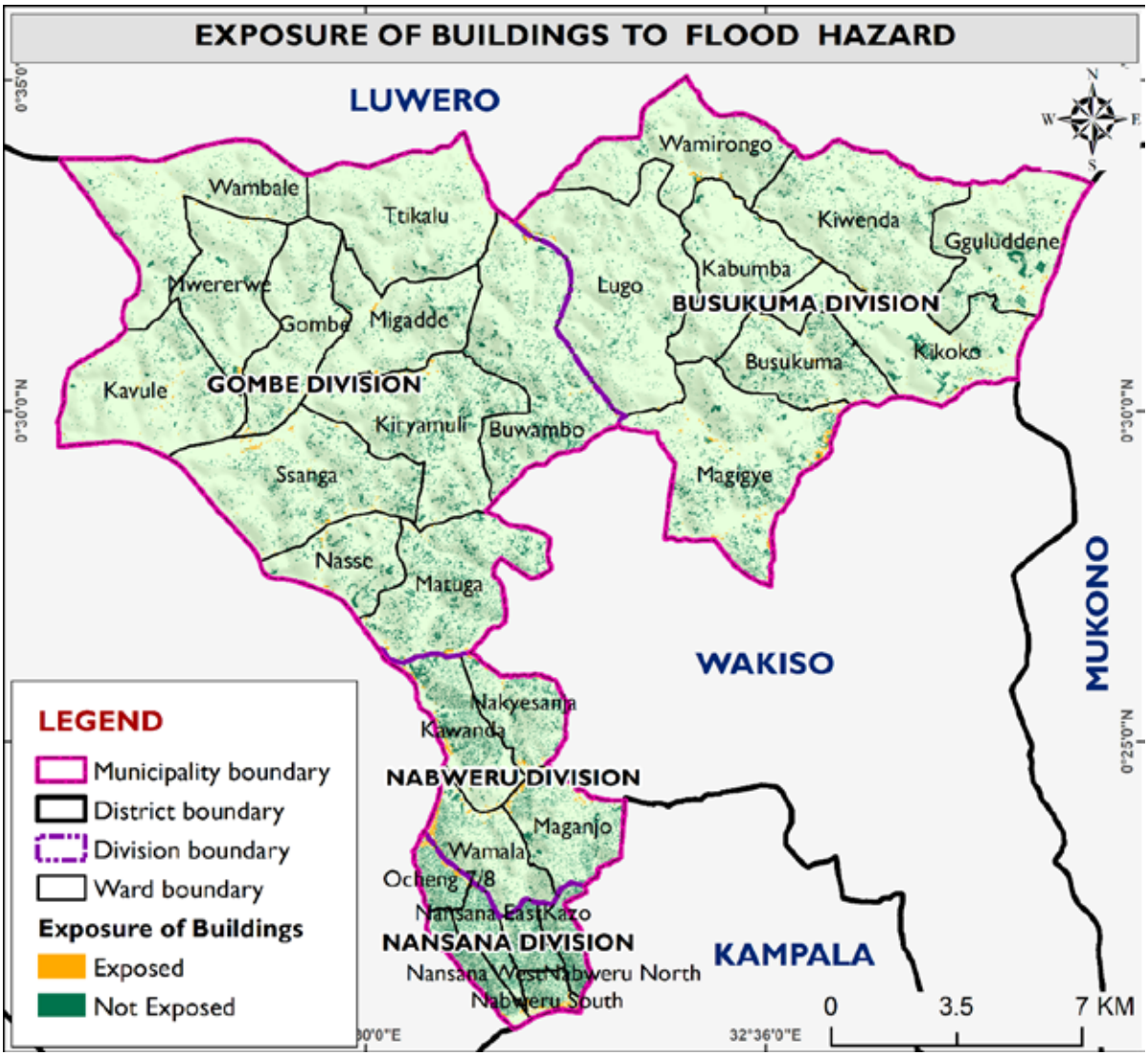


Figure 38: Exposure of buildings to flood hazard in Nansana Municipality

A total of 32,731 buildings (22%) are exposed to lightning hazard, while 116,272 buildings (78%) are not exposed to this hazard (**Table 18**). Buildings exposed to lightning are found in the Busukuma (95.3%) and Gombe (14.2%) divisions (**Figure 39**).

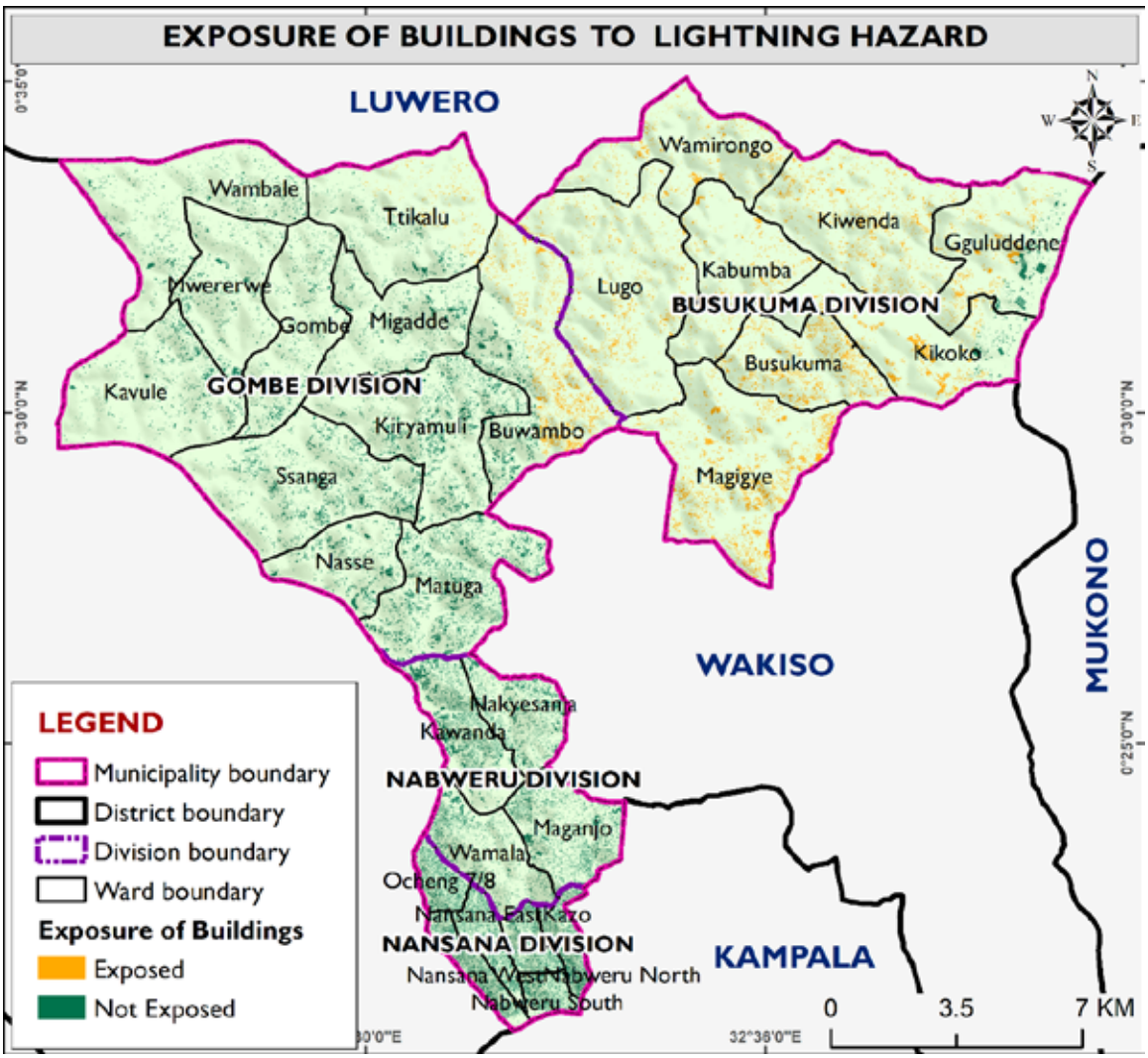


Figure 39: Exposure of buildings to lightning hazard in Nansana Municipality

In Nansana Municipality, 53,059 buildings (35.6%) are exposed to windstorm hazard, whereas 95,921 buildings (64.4%) are not exposed to this hazard (**Table 18**). Buildings exposed to windstorms in Nansana Municipality are located in Nansana (96.2%) and Nabweru (21.9%) divisions (**Figure 40**).

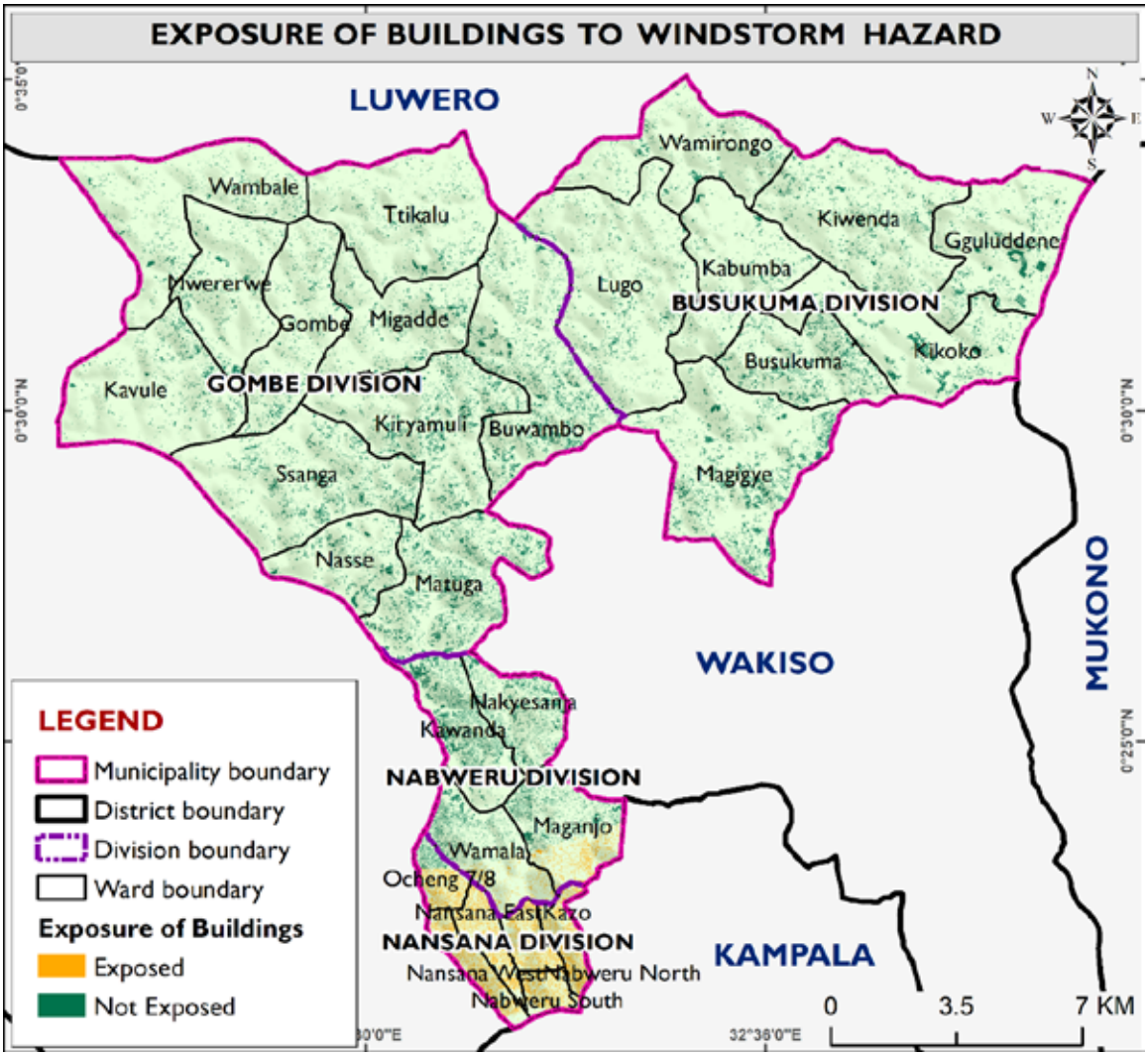


Figure 40: Exposure of buildings to windstorm hazard in Nansana Municipality

Exposure of the social development sector to climate hazards

The social development sector element exposed to climate hazards in Nansana Municipality is the human population.

Table 19: Human population exposed to drought, floods, lightning, and windstorms in Nansana Municipality

Climate Hazards	Drought				Floods				Lightning				Windstorms			
Divisions	Exposed		Not Exposed		Exposed		Not Exposed		Exposed		Not Exposed		Exposed		Not Exposed	
	Popln	%	Popln	%	Popln	%	Popln	%	Popln	%	Popln	%	Popln	%	Popln	%
Busukuma	2,572	6.8	35,158	93.2	3,489	9.2	34,241	90.8	35,712	94.7	2,018	5.3	0	0	37,730	100
Gombe	24,552	30.2	56,758	69.8	5,526	6.8	75,784	93.2	8,275	10.2	73,035	89.8	0	0	81,310	100
Nabweru	39,209	56.2	30,520	43.8	6,489	9.3	63,240	90.7	0	0.0	69,729	100	17,718	25.4	52,011	74.6
Nansana	6,866	4.8	137,624	95.2	8,440	5.8	136,050	94.2	0	0.0	144,490	100	139,251	96.4	5,239	3.6
Total	73,200	22.0	260,059	78.0	23,944	7.2	309,315	92.8	43,988	13.2	289,271	86.8	156,969	47.1	176,290	52.9

The assessment showed that 73,200 people (22%) in Nansana Municipality are exposed to drought hazards, whereas 260,059 people (78%) are not (**Table 19**). The largest proportion of the human population exposed to the drought hazard is in the Nabweru (56.25%) and Gombe (30.2%) divisions. The wards most affected by drought include Maganjo, Ttikalu, Gombe, Migadde, Mwererwe, and Wamirongo (**Figure 41**).

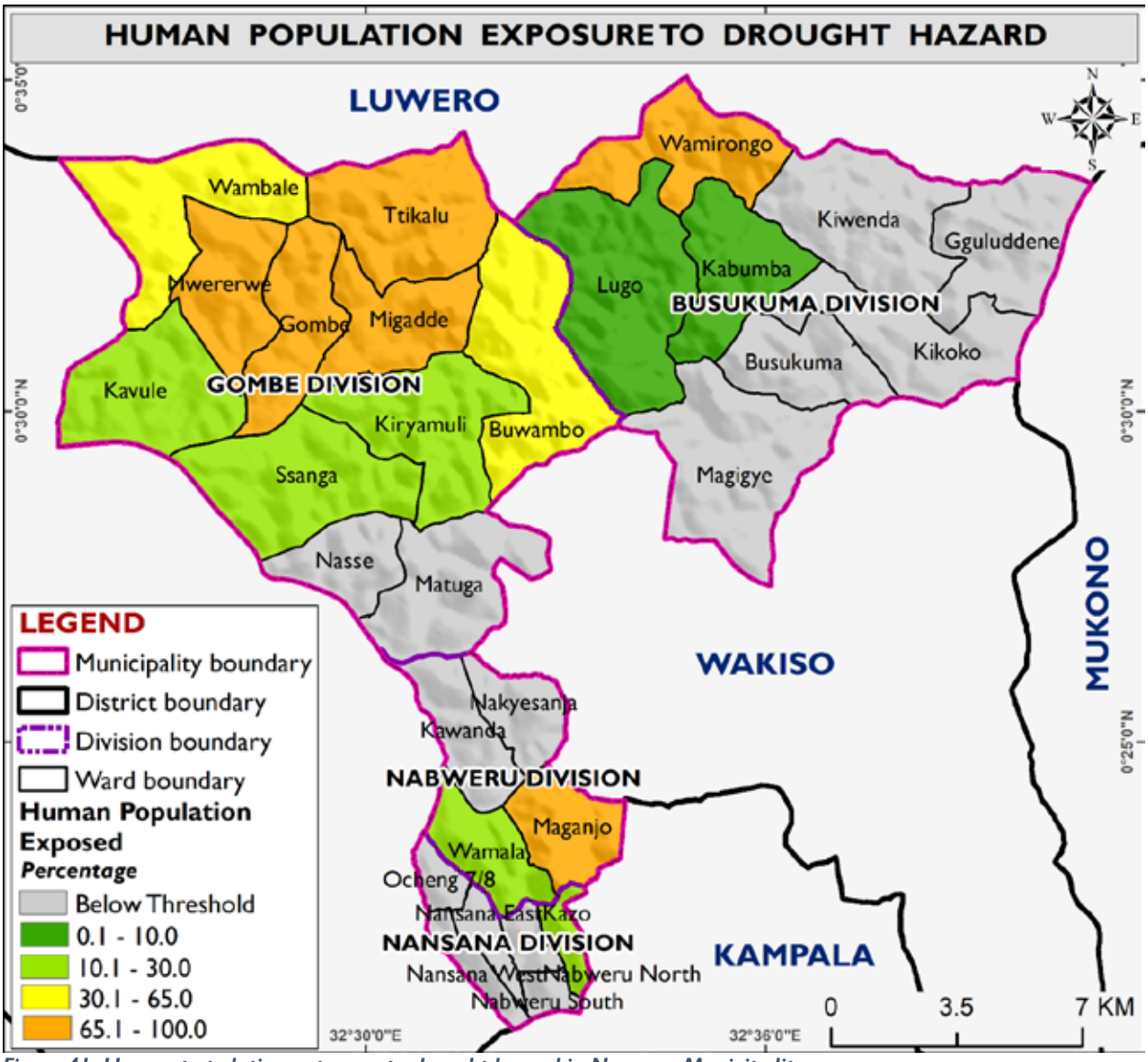


Figure 41: Human population exposure to drought hazard in Nansana Municipality

A total of 23,944 people (7.2%) are exposed to floods, whereas 309,315 people (92.8%) are not exposed to floods (**Table 19**). The Busukuma (9.2%) and Nabweru (9.3%) divisions have the highest percentage of the population exposed to floods. The wards with the highest proportion of the population exposed to flooding include Nabweru South, Nasse, Magigye, and Kikoko (**Figure 42**).

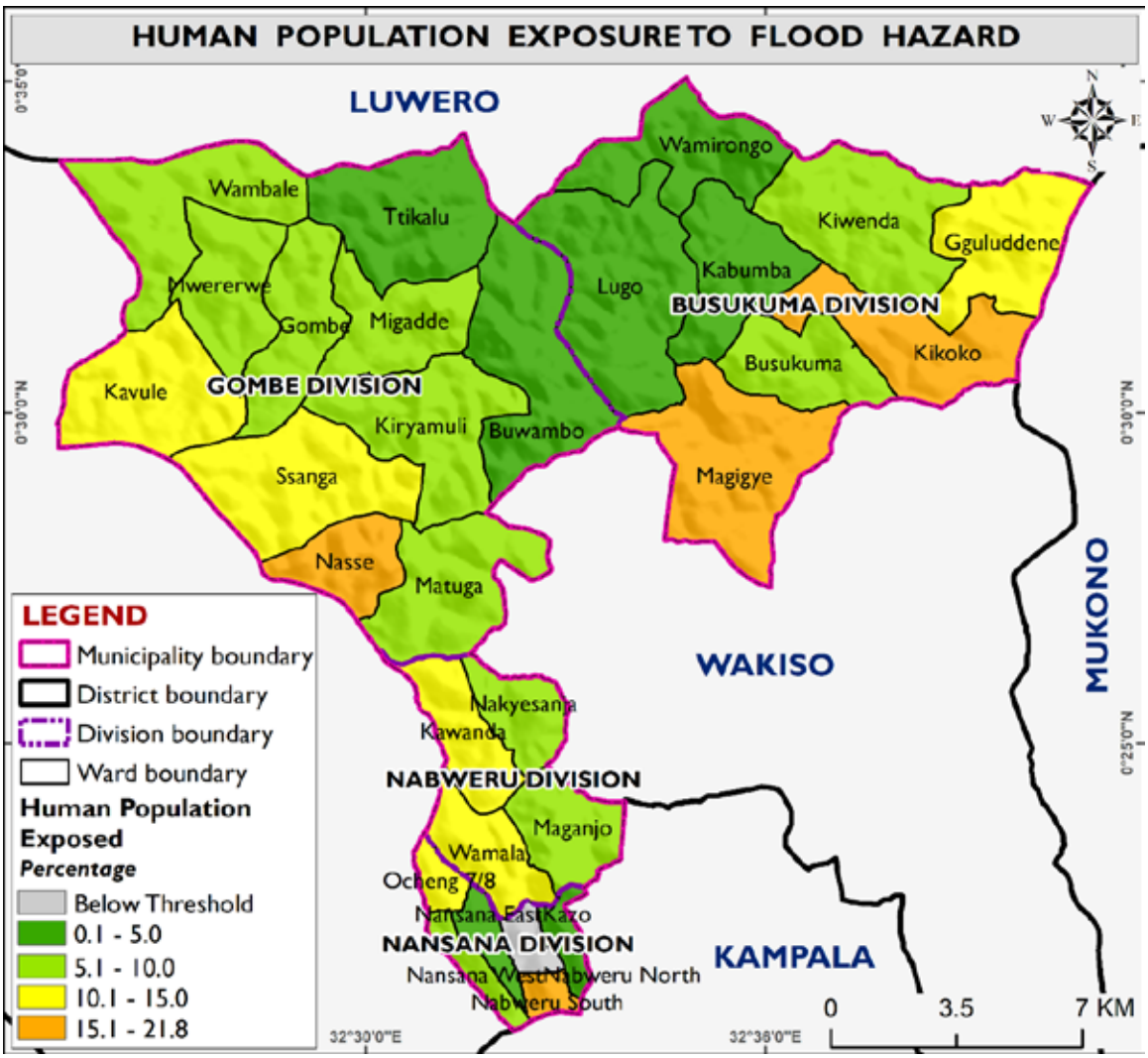


Figure 42: Human population exposure to flood hazard in Nansana Municipality

In Nansana Municipality, 43,988 people (13.2%) are exposed to lightning hazard, whereas 289,271 people (86.8%) are not (**Table 19**). People exposed to lightning hazard are located in the Busukuma (94.7%) and Gombe (10.2%) divisions. The wards with high exposure to lightning include Magigye, Busukuma, Kikoko, Kiwenda, Kabumba, Lugo, and Wamirongo (**Figure 43**).

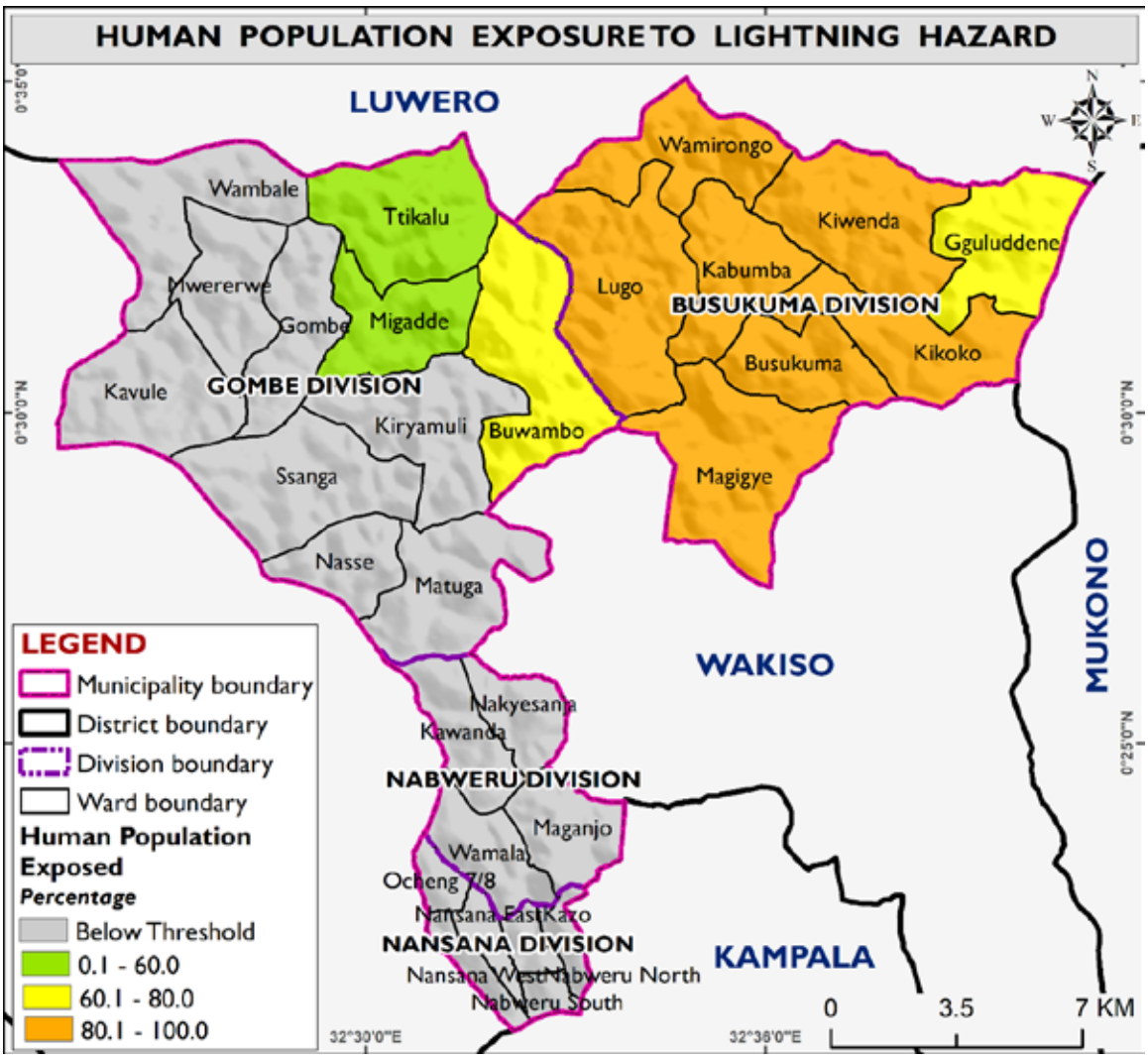


Figure 43: Human population exposure to lightning hazard in Nansana Municipality

The analysis showed that 156,969 people (47.1%) in Nansana Municipality are exposed to windstorm hazard, whilst 176,290 people (52.9%) are not (**Table 19**). The human population exposed to windstorms is found in Nansana (96.4%) and Nabweru (25.4%) divisions. The wards with the highest proportion of the population exposed to windstorms include Kazo, Nabweru North, Nabweru South, Nansana East, and Nansana West (**Figure 44**).

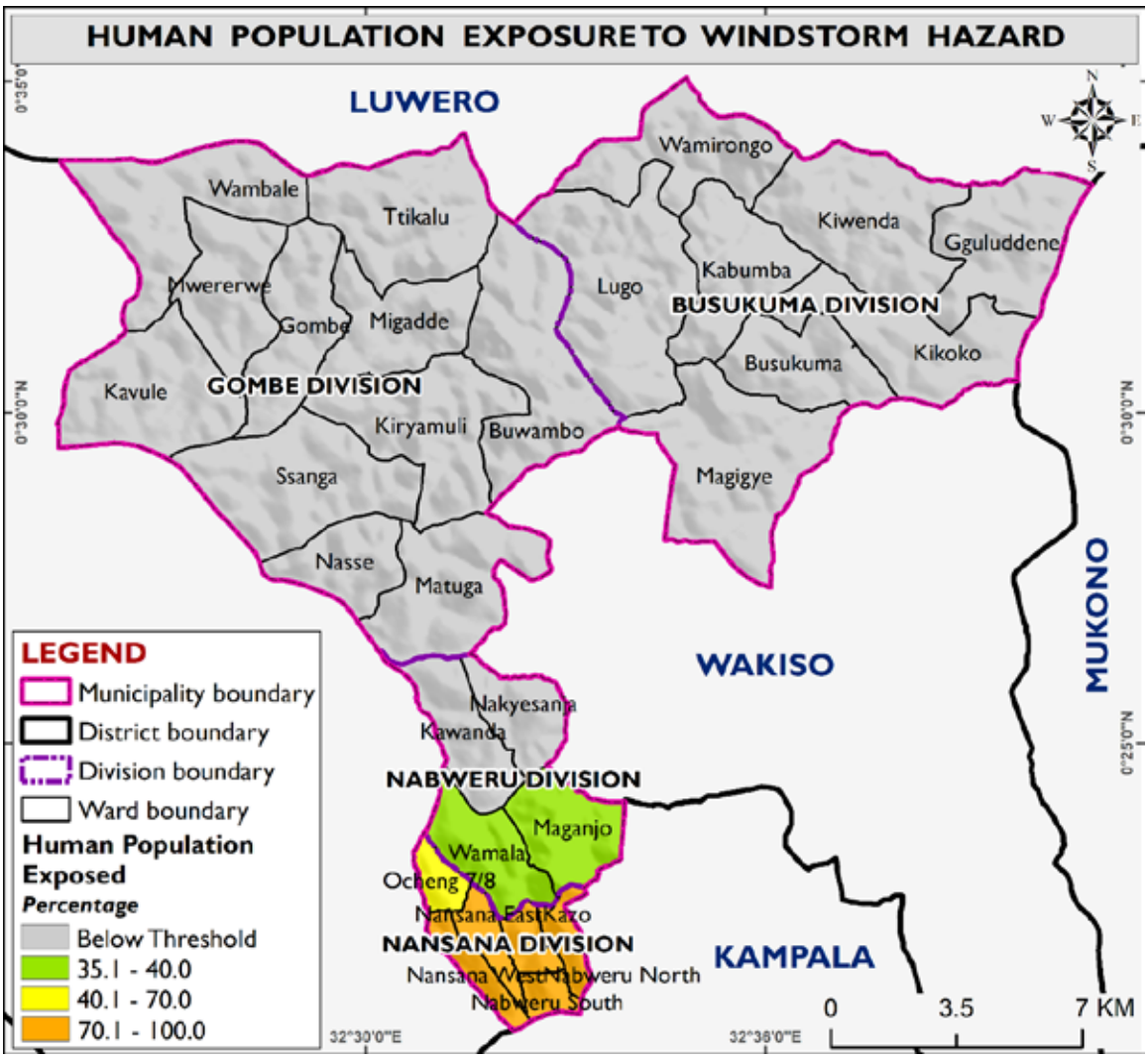


Figure 44: Human population exposure to windstorm hazard in Nansana Municipality

All the people (100%) in Nansana Municipality are exposed to hailstorm hazard. The wards with the most significant population exposed to hailstorms include Maganjo, Kazo, Matugga, Nansana East, Nansana West, Nabweru North, Nabweru South, and Ochieng (**Figure 45**).

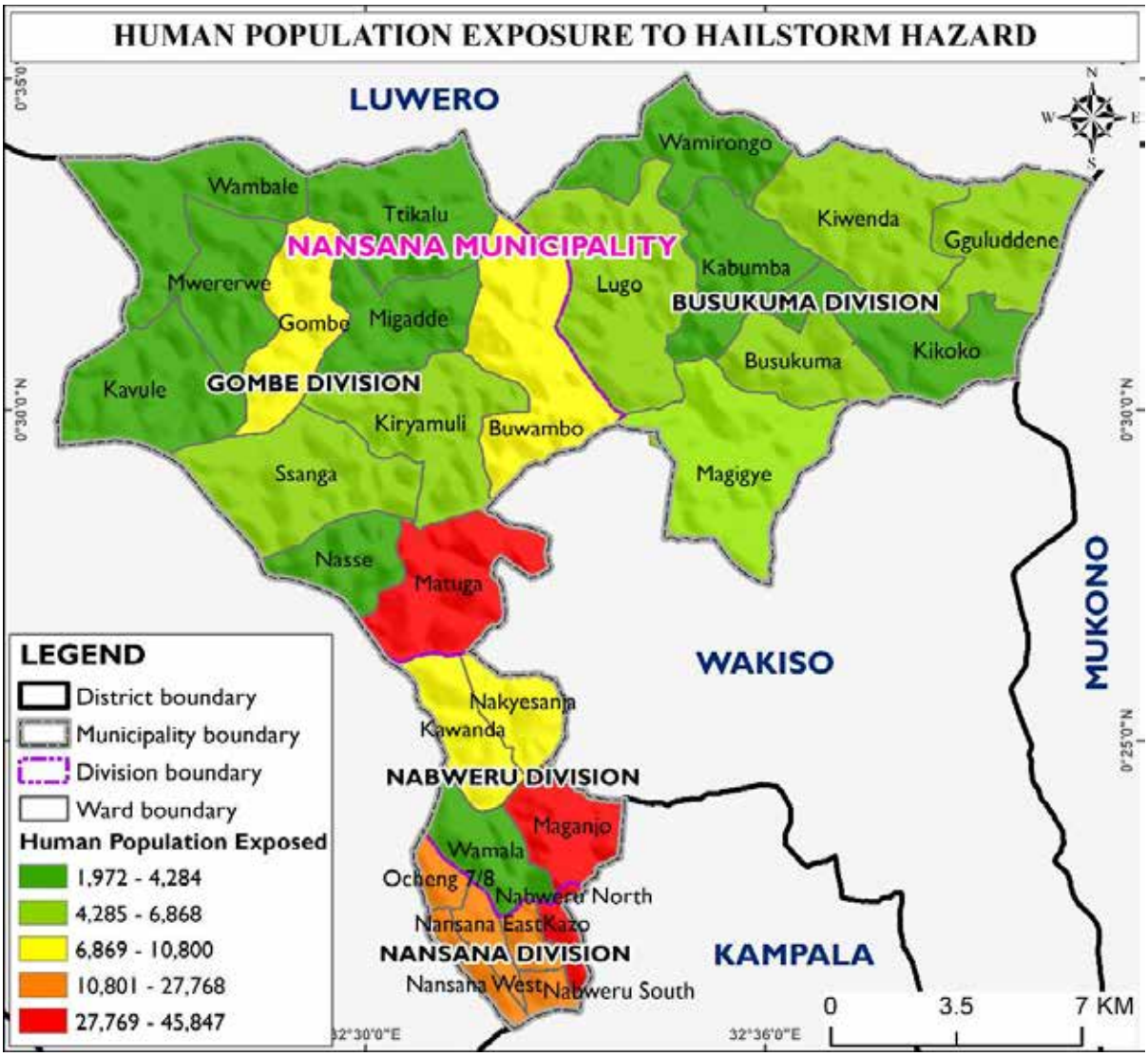


Figure 45: Human population exposed to hailstorm hazard in Nansana Municipality

Exposure of the transportation sector to floods

The transportation sector element in Nansana Municipality exposed to flooding is roads.

Table 20: Exposure of roads to floods in Nansana Municipality

	Exposed		Not Exposed		Total	
Division	Length (Km)	%	Length (Km)	%	Length (Km)	%
Busukuma	3.0	3.0	96.6	97.0	99.6	20.9
Gombe	7.8	2.9	257.4	97.1	265.2	55.7
Nabweru	2.6	3.9	62.9	96.1	65.4	13.7
Nansana	1.0	2.3	44.6	97.7	45.7	9.6
Total	14.4	3.0	461.5	97.0	475.9	100

The assessment showed that 14.4 kilometers (3%) of roads in Nansana Municipality are exposed to flooding, whereas 461.5 kilometers (97%) are not (**Table 20**). The Nabweru (3.9%) and Busukuma (3.0%) divisions have the highest proportion of roads exposed to flooding in Nansana Municipality.

Some of the road sections that are highly exposed to floods include Bukemba-Nabutiiti road in Magigye ward; Kabumba-Busukuma road in Busukuma ward; Kakoligo road in Matugga and Kawanda wards; Kasana-Guludene-Balita road in Kiwenda and Gguluddene wards; Kiryagonja-Nasse-Ssanga Road in Nasse and Ssanga wards; Serunjogi road in Wamala ward; Wabitembe road in Nakyesanja ward; and Nakiduduma-Mabanda road in Matugga ward, among others.

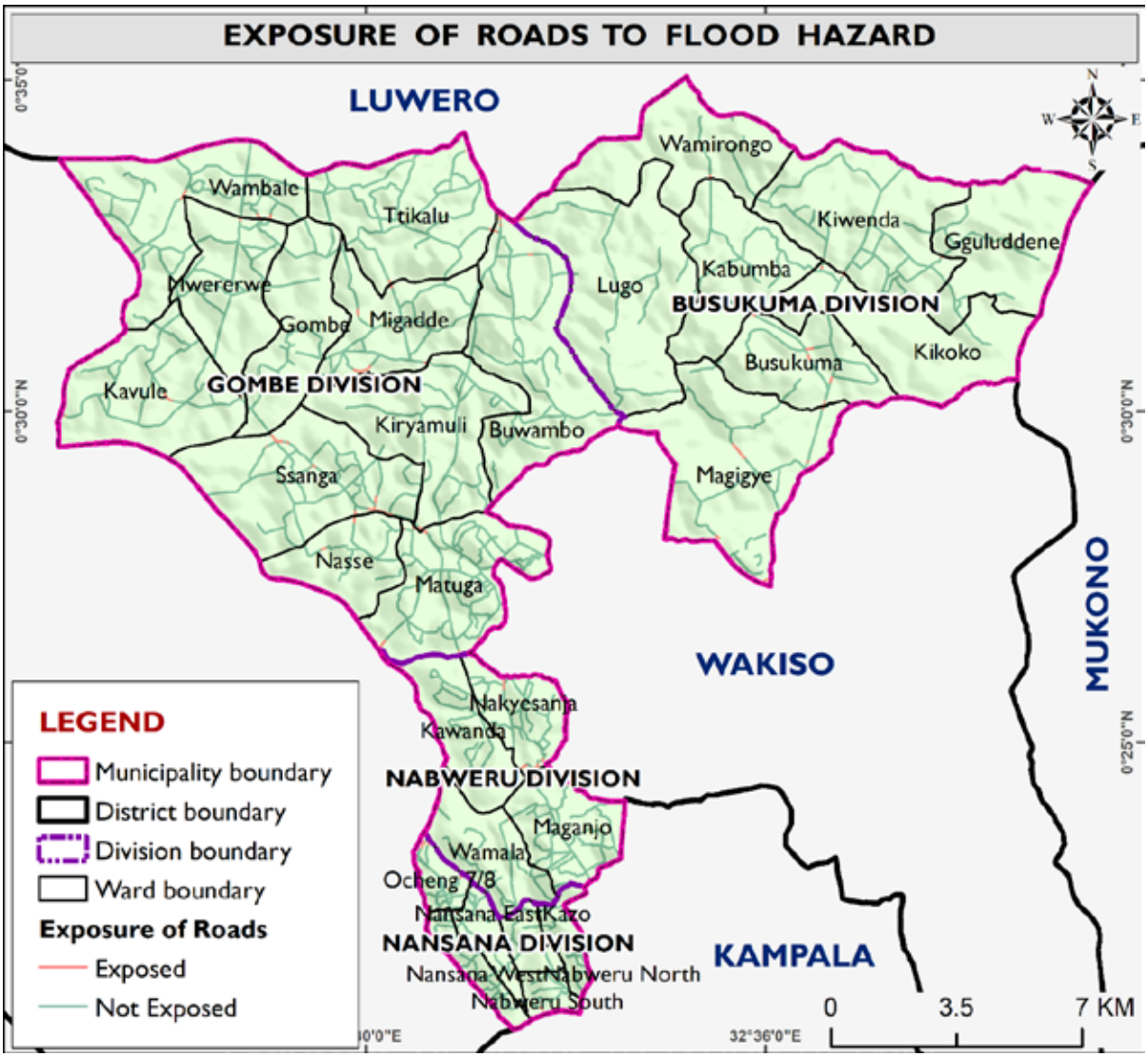


Figure 46: Exposure of roads to flood hazard in Nansana Municipality

Exposure of the water and environment sector to climate hazards

The water and environment sector elements in Nansana Municipality exposed to climate hazards include forests and water sources.

Exposure of forests to drought and flood hazards:

Table 21: Exposure of forests to drought and floods in Nansana Municipality

Climate Hazards	Drought				Floods			
Division	Exposed		Not Exposed		Exposed		Not Exposed	
	Area (Km²)	%	Area (Km²)	%	Area (Km²)	%	Area (Km²)	%
Busukuma	0.6	9.8	5.4	90.2	0.3	5.5	5.6	94.5
Gombe	2.2	52.1	2.0	47.9	0.4	9.1	3.9	90.9
Nabweru	0.0004	1.4	0.03	98.6	0.01	32.5	0.02	67.5
Nansana	0.0	0.0	0.0001	100	0.0	0.0	0.0001	100
Total	2.8	27.3	7.4	72.7	0.7	7.1	9.5	92.9

The assessment showed that 2.8 sq.km (27.3%) of forests are exposed to drought, whereas 7.4 sq.km (72.7%) are not (**Table 21**). The largest share of forests exposed to the drought hazard in Nansana Municipality is located in the Gombe (52.1%) and Busukuma (9.8%) divisions (**Figure 47**).

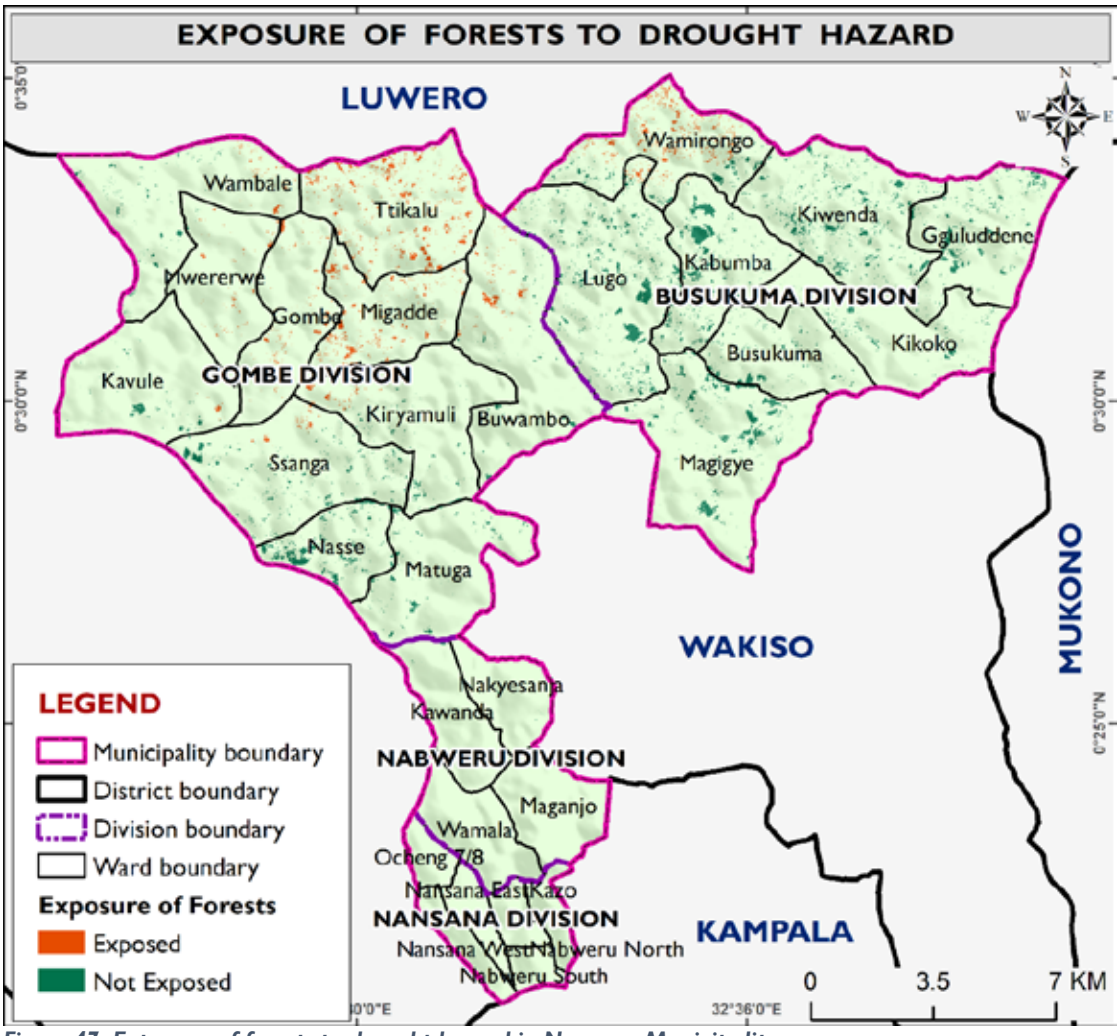


Figure 47: Exposure of forests to drought hazard in Nansana Municipality

A total of 0.7 sq.km (7.1%) of forests are exposed to floods, while 9.5 sq.km (92.9%) of forests are not exposed to flood hazard (**Table 21**). The largest share of forests exposed to flooding is in the Nabweru (32.5%) and Gombe (9.1%) divisions (**Figure 48**).

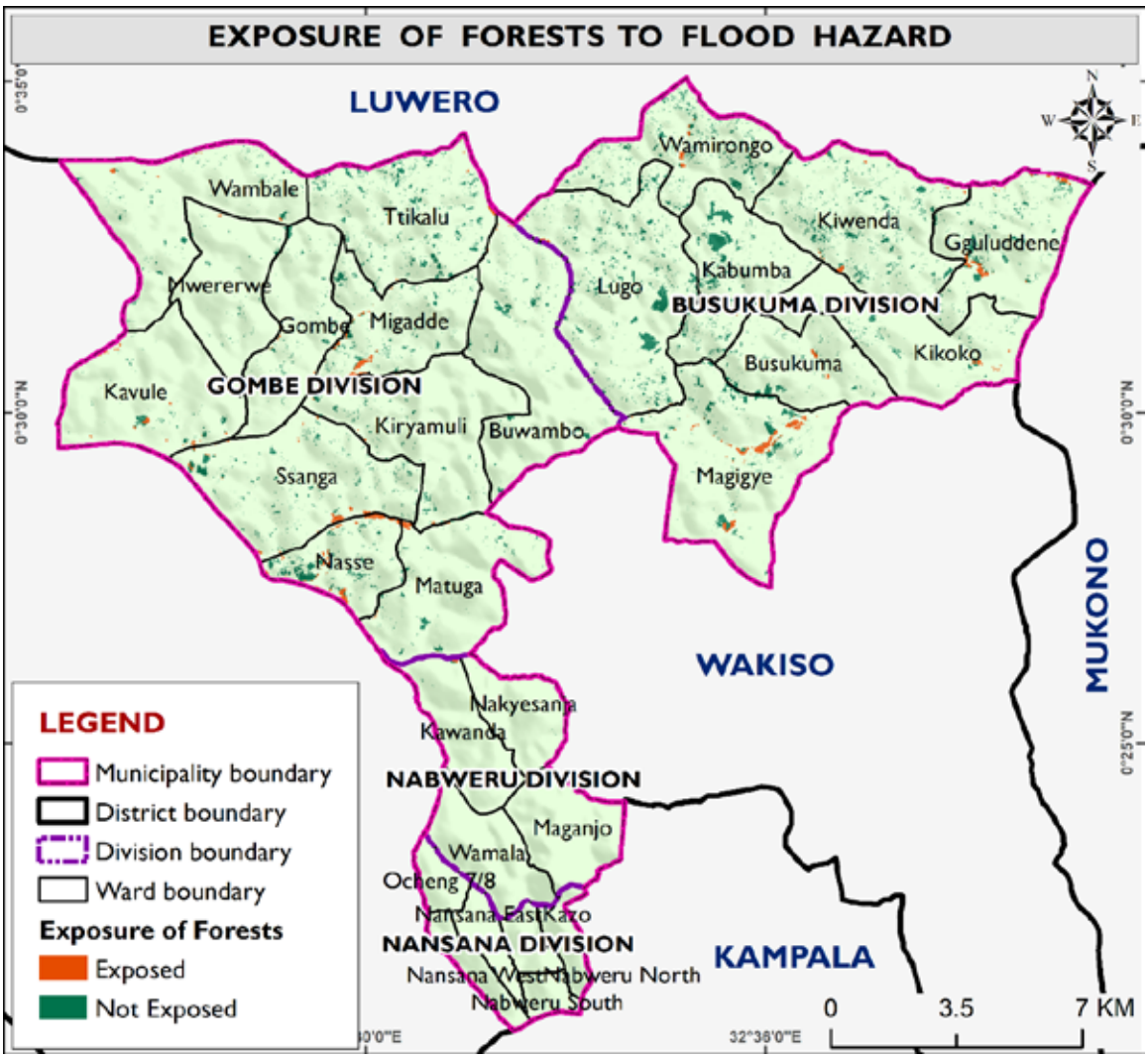


Figure 48: Exposure of forests to flood hazard in Nansana Municipality

Exposure of water sources to drought and flood hazards:

Table 22: Exposure of water sources to drought and floods in Nansana Municipality

Climate Hazard	Drought				Floods			
Divisions	Exposed		Not Exposed		Exposed		Not Exposed	
	Number	%	Number	%	Number	%	Number	%
Busukuma	10	5.2	182	94.8	2	1.0	192	99.0
Gombe	99	40.1	148	59.9	13	5.3	234	94.7
Nabweru	143	59.8	96	40.2	5	2.1	234	97.9
Nansana	1	33.3	2	66.7	0	0.0	3	100
Total	253	37.2	428	62.8	20	2.9	663	97.1

The assessment showed that 253 water sources (37.2%) are exposed to drought hazards in Nansana Municipality (**Table 22**). The Nabweru (59.8%) and Gombe (40.1%) divisions have the highest proportions of water sources exposed to drought hazard (**Figure 49**).

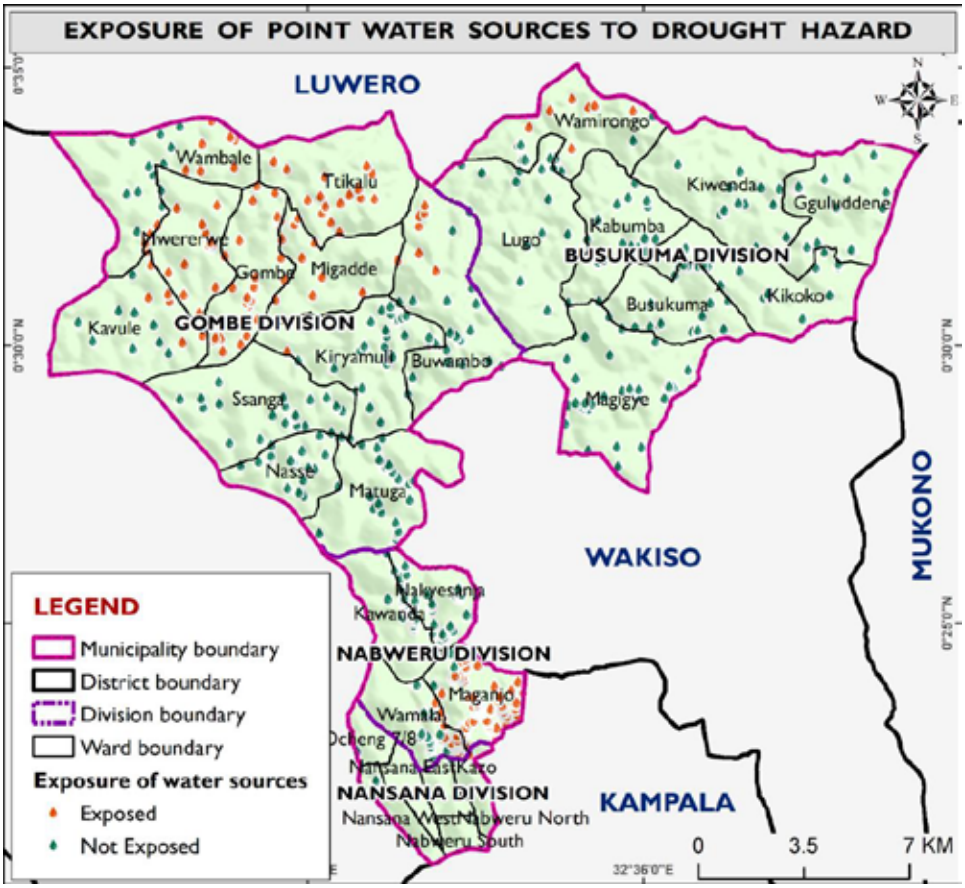


Figure 49: Exposure of water sources to drought hazard in Nansana Municipality

In terms of exposure by water source type, dam (100%), yard taps for public use (53.9%), rainwater harvest tanks (35.3%), shallow wells (31.8%), and protected springs (26.7%) have the most significant percentages exposed to drought hazard in Nansana Municipality (**Table 23**). On the other hand, protected springs (8.2%) and shallow wells (4.9%) have the highest proportional exposure to flooding in Nansana Municipality (**Table 23**).

Table 23: Exposure of the different types of water sources to drought and floods in Nansana Municipality

Climate Hazard	**Drought**				**Floods**			
Types of water sources	Exposed		Not Exposed		Exposed		Not Exposed	
	Number	%	Number	%	Number	%	Number	%
Dam	1	100.0	0	0.0	0	0.0	1	100
Deep borehole	15	24.2	47	75.8	1	1.6	61	98.4
Protected spring	16	26.7	44	73.3	5	8.2	56	91.8
Public Stand Post	0	0.0	2	100.0	0	0.0	2	100
Rainwater Harvest Tank	47	35.3	86	64.7	2	1.5	131	98.5
Shallow well	78	31.8	167	68.2	12	4.9	234	95.1
Yard tap for public use	96	53.9	82	46.1	0	0.0	178	100
Total	253	37.2	428	62.8	20	2.9	663	97.1

A total of 20 water sources (2.9%) are exposed to floods, whereas 663 water sources (97.1%) are not exposed to flood hazard (**Table 22**). The largest share of water sources exposed to flooding in Nansana Municipality is located in the Gombe (5.3%) and Nabweru (2.1%) divisions (**Figure 50**).

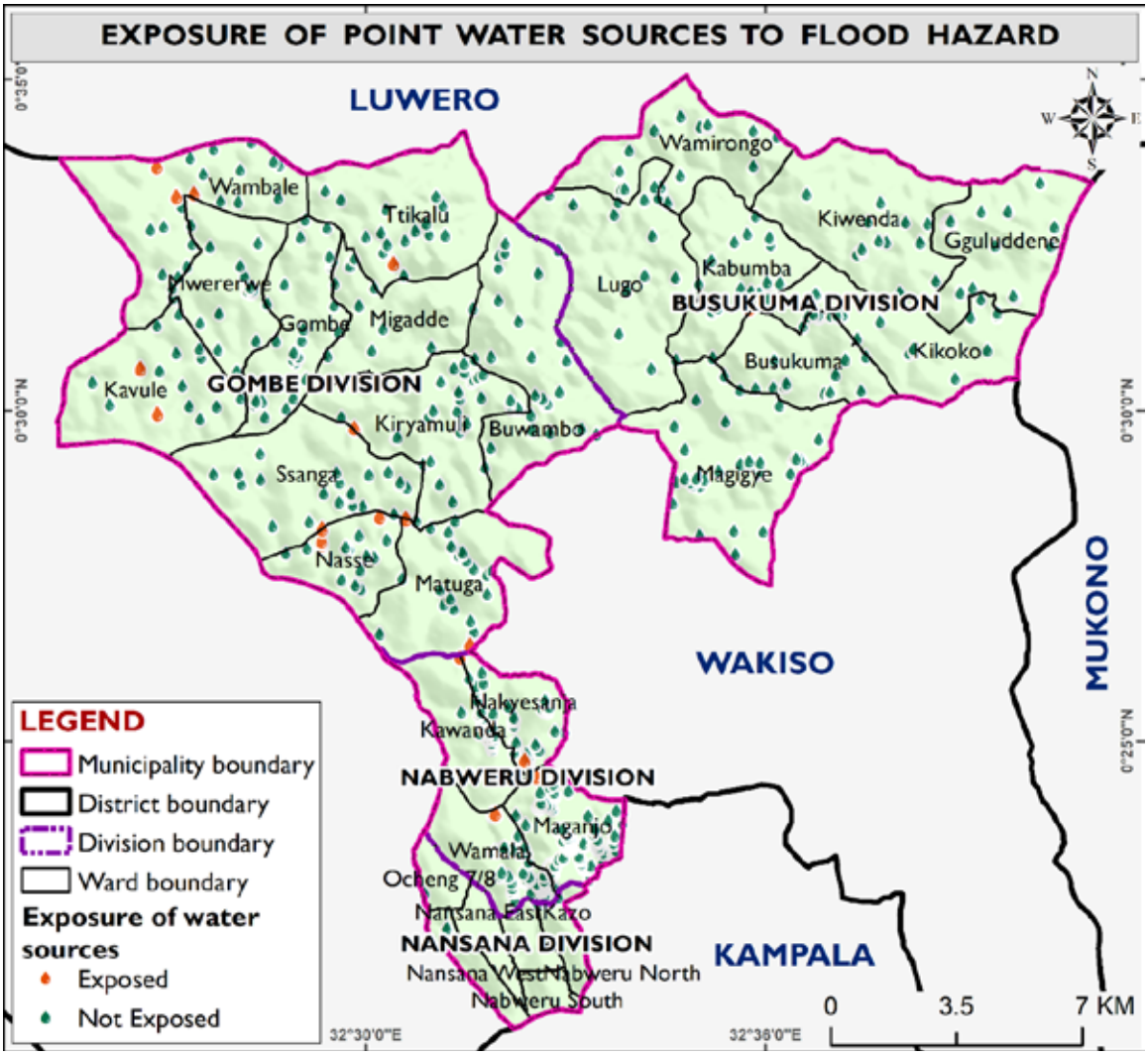


Figure 50: Exposure of water sources to flood hazard in Nansana Municipality

3.4 Vulnerability Assessment

This section presents the exposure, sensitivity, adaptive capacity, and risk of communities to multi-hazards in Nansana Municipality.

3.4.1 Exposure of communities to multi-hazards

Exposure refers to the extent to which a system is exposed to climate change-related hazards. Nansana Municipality is mostly exposed to drought, floods, lightning, and windstorms. These hazards were ranked, weighed and normalized to produce the exposure index. The assessment showed that the wards that have a high level of exposure (more than 80 percent) to drought, floods, lightning, and windstorms in Nansana Municipality include Magigye, Wamirongo, Ttikalu, Maganjo, Wamala, Nansana West, Nabweru South, Migadde, and Busukuma (**Figure 51**).

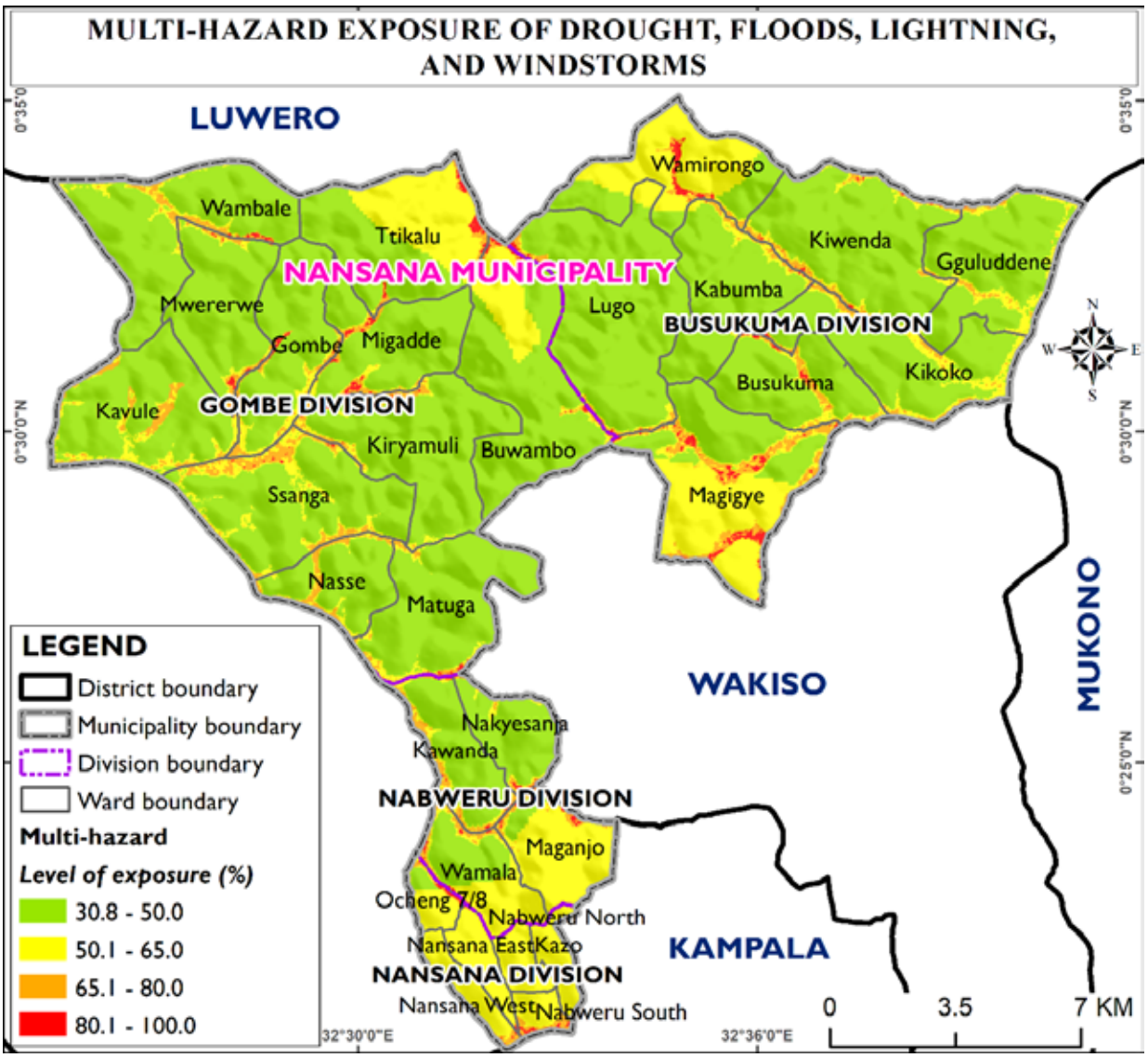


Figure 51: Multi-hazard exposure of communities to drought, floods, lightning, and windstorms in Nansana Municipality

3.4.2 Sensitivity of communities to multi-hazards

Sensitivity describes the socio-economic or demographic characteristics that can make people susceptible to the negative effects of exposure (Declet-Barreto et al., 2020). The sensitivity indicators that were assessed at ward level are presented in **Table 24**. These indicators were ranked, weighed, and normalized to produce the sensitivity index.

Description of sensitivity indicators

Access to health services reflects a community's ability to prevent, respond to, and recover from climate-related health impacts such as heat stress, disease outbreaks, and injuries from extreme weather. Community awareness and preparedness reflect how well individuals and groups understand climate risks and their capacity to respond in a timely manner. Degradation of rivers signifies the reduced ability of freshwater ecosystems to absorb and adapt to climate impacts, thereby increasing the vulnerability of communities that rely on these rivers for water, food, and livelihoods. Dependence on climate-sensitive sectors highlights how heavily communities rely on industries like agriculture, fisheries, and tourism, which are directly affected by climate variability, making them more vulnerable to disruptions from extreme weather events, changing temperatures, and shifting ecosystems. Dependency on surface water reveals how reliant communities are on rivers, wetlands, and reservoirs that are highly vulnerable to a changing climate, increasing their risk of water scarcity and reduced water quality under climate stress. The design and capacity of drainage systems determine how well a community can manage increased rainfall, flooding, and storm surges; inadequate or poorly maintained systems heighten vulnerability to climate-induced water-related hazards.

Housing quality reflects how well homes protect occupants from climate-related hazards, such as floods, with poor-quality housing increasing the risk of damage, displacement, and health impacts during climate shocks. Income levels influence a community's ability to prepare for, respond to, and recover from climate impacts, with lower-income populations often lacking the resources needed for adaptation, making them more vulnerable to climate-related risks. High-density areas can amplify the impacts of climate hazards, such as heatwaves and disease spread, while straining infrastructure and emergency response systems, thereby increasing overall community vulnerability. Unemployment reflects limited economic resilience and reduced access to resources, making individuals and communities less able to adapt to or recover from climate-related events such as floods. Wetland degradation weakens the natural buffers that wetlands provide against climate impacts like flooding, storm surges, and droughts, reducing ecosystem resilience and increasing the vulnerability of both human and ecological communities that depend on them.

Table 24: Sensitivity indicators to multi-hazards in Nansana Municipality

Divisions	Wards	Access to health services	Community awareness and preparedness	Degradation of rivers	Dependency on climate-sensitive sectors	Dependency on surface water	Drainage systems	Housing quality	Income levels	Population density	Unemployment	Wetland degradation	Total
Nansana	Kazo	4	3	0	3	3	4	3	4	5	2	0	**31**
Nansana	Nabweru North	4	3	0	3	3	3	2	4	5	2	5	**34**
Nansana	Nabweru South	4	3	0	3	3	3	2	4	5	2	2	**31**
Nansana	Nansana East	4	3	0	3	3	2	4	4	4	3	5	**35**
Nansana	Nansana West	4	3	0	2	3	2	3	4	5	2	3	**31**
Nansana	Ocheng 7/8	3	3	1	3	4	2	2	4	4	2	5	**33**
Nabweru	Kawanda	4	3	0	2	3	3	4	4	3	3	3	**32**
Nabweru	Maganjo	4	3	4	2	2	2	3	4	4	3	4	**35**
Nabweru	Nakyesanja	3	3	3	3	3	3	4	4	3	3	4	**36**
Nabweru	Wamala	4	3	3	3	3	3	4	4	1	3	4	**35**
Busukuma	Busukuma	5	3	3	2	1	1	5	4	3	3	5	**35**
Busukuma	Gguluddene	3	3	2	3	3	3	3	3	2	3	3	**31**
Busukuma	Kabumba	2	3	2	3	3	2	3	3	2	3	5	**31**
Busukuma	Kikoko	2	3	3	3	4	3	2	4	2	3	4	**33**
Busukuma	Kiwenda	4	3	4	2	1	1	4	4	3	3	5	**34**
Busukuma	Lugo	4	3	4	5	3	2	3	4	2	3	5	**38**
Busukuma	Magigye	4	3	5	5	3	3	4	3	3	3	4	**40**
Busukuma	Wamirongo	2	3	2	5	4	3	2	2	2	3	5	**33**
Gombe	Buwambo	5	3	0	3	1	3	3	4	3	2	4	**31**
Gombe	Gombe	4	3	0	4	1	3	3	3	3	3	5	**32**
Gombe	Kavule	3	3	0	4	1	3	3	3	3	3	3	**29**

Divisions	Wards	Access to health services	Community awareness and preparedness	Degradation of rivers	Dependency on climate-sensitive sectors	Dependency on surface water	Drainage systems	Housing quality	Income levels	Population density	Unemployment	Wetland degradation	Total
Gombe	Kiryamuli	3	3	0	4	1	5	3	4	2	2	5	**32**
Gombe	Matugga	4	3	3	2	1	3	3	4	4	2	4	**33**
Gombe	Migadde	4	3	0	3	1	3	3	3	2	3	5	**30**
Gombe	Mwererwe	2	3	0	4	1	3	3	3	2	3	5	**29**
Gombe	Nasse	3	3	0	3	1	3	3	3	2	2	2	**25**
Gombe	Ssanga	2	3	4	5	1	3	3	4	3	2	3	**33**
Gombe	Ttikalu	4	3	0	4	1	3	3	3	2	2	5	**30**
Gombe	Wambale	2	3	0	5	1	3	3	3	2	3	5	**30**
		KEY: 0=Not Available; 1=Very Low; 2=Low; 3=Moderate; 4=High; 5=Very High											

Source: Key Informant Interviews, 2025

The wards that have a high sensitivity to multi-hazards (i.e., drought, floods, lightning, and windstorms) include Lugo, Magigye, Busukuma, Kiwenda, Nakyesanja, Maganjo, Wamala, Nansana North, and Nansana East.

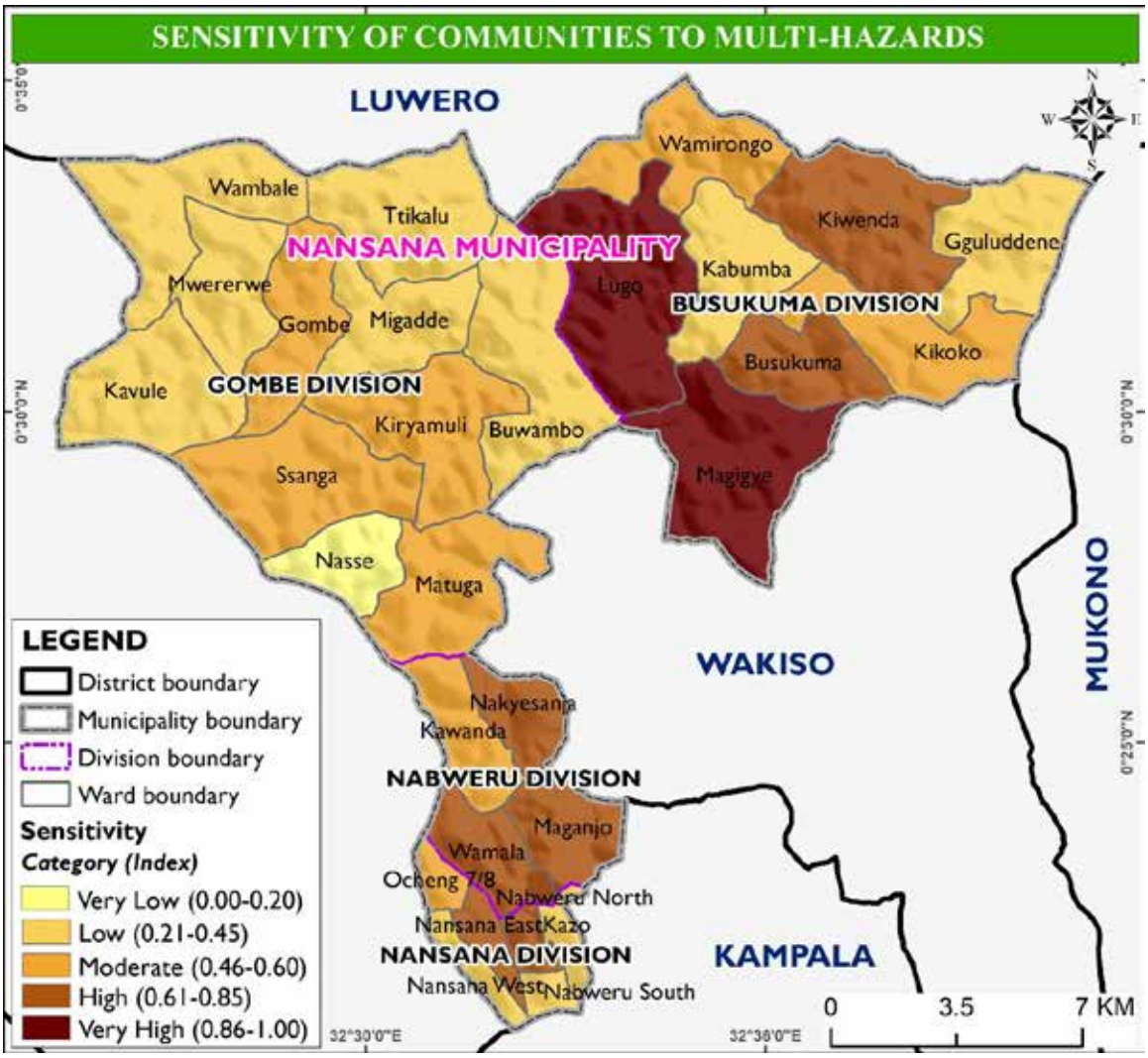


Figure 52: Sensitivity of communities to multi-hazards in Nansana Municipality

3.4.3 Adaptive capacity of communities to multi-hazards

Adaptive capacity is defined as the ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences of climate change (IPCC, 2023). The adaptive capacity indicators assessed at the ward level are presented in **Table 25**. These adaptive capacity indicators were ranked, weighed, and normalized to produce the adaptive capacity index.

Description of adaptive capacity indicators

Access to clean water and sanitation ensures that communities can maintain good health and hygiene, reducing the risk of waterborne diseases during extreme weather events and enabling better

resilience to climate-induced health challenges. Access to credit allows individuals and communities to invest in resilience-building measures, such as climate-smart agriculture, infrastructure improvements, and emergency preparedness, providing the financial resources needed to recover from and adapt to climate-related disruptions. Access to early warning information enables communities to prepare for and respond effectively to climate-related hazards, such as storms, floods, or heatwaves, by providing timely alerts and guidance that help reduce risks, protect lives, and minimize damage. Access to renewable energy provides communities with a sustainable and reliable energy source, reducing dependence on fossil fuels, minimizing greenhouse gas emissions, and enhancing resilience by ensuring energy availability during climate-related disruptions such as storms and power outages.

Awareness of climate risks and adaptation practices reflects how well individuals and communities understand climate-related challenges and the actions they can take to mitigate risks, enabling them to make informed decisions and implement strategies that enhance resilience to changing climate conditions. Diverse livelihood options provide communities with multiple sources of income and resources, enabling them to better withstand climate shocks and adapt by shifting to more resilient economic activities when needed. Higher levels of education enable individuals and communities to better understand climate risks, access information, and adopt effective adaptation strategies, thereby enhancing their ability to respond to and recover from climate-related challenges. Extension services provide farmers, communities, and local businesses with essential knowledge, skills, and resources to adopt climate-resilient practices, improve productivity, and better cope with changing climate conditions. Good environmental management practices promote sustainable resource use, reduce environmental degradation, and enhance ecosystem resilience, enabling communities to better withstand and adapt to climate impacts.

Robust and well-maintained healthcare systems improve a community's ability to respond to climate-related health challenges, such as heatwaves, disease outbreaks, and extreme weather events, by providing timely medical care, disease prevention, and emergency services. Proper waste disposal helps prevent environmental degradation, reduces the risk of disease outbreaks, and ensures cleaner, healthier living conditions, thereby enabling communities to withstand better the health and environmental impacts of climate change, such as flooding. Rainwater harvesting provides an alternative and supplemental water source, reducing dependence on traditional sources such as rivers, especially during the dry season. Strong, connected communities are better able to share resources, information, and support during climate events, helping individuals and groups recover more quickly and effectively from climate impacts. Urban greening initiatives enhance cities' resilience by increasing green spaces, improving air quality, reducing heat-island effects, and providing natural buffers against extreme weather, helping communities better cope with climate-related challenges. Wetland and ecosystem restoration enhances the natural capacity of wetlands to absorb the impacts of climate change, such as flooding, while supporting biodiversity, improving water quality, and strengthening the resilience of communities that rely on these ecosystems.

Table 25: Adaptive capacity indicators to multi-hazards in Nansana Municipality

Divisions	Wards	Access to clean water and sanitation	Access to credit	Access to early warning information	Access to renewable energy e.g., solar	Awareness of climate risks and adaptation practices	Diverse livelihood options	Education levels	Extension services	Good environmental management practices	Healthcare infrastructure	Proper waste disposal	Rainwater harvesting	Social networks	Urban greening initiatives	Wetland and ecosystem restoration	Total
Nansana	Kazo	3	3	2	3	3	2	2	3	2	1	2	3	3	1	0	**33**
Nansana	Nabweru North	2	3	2	3	3	2	2	3	2	2	2	2	3	2	0	**33**
Nansana	Nabweru South	2	3	2	3	3	2	2	3	1	1	2	2	3	2	0	**31**
Nansana	Nansana East	3	3	1	3	3	3	3	3	2	2	2	2	3	2	0	**35**
Nansana	Nansana West	3	3	1	3	3	3	3	3	2	2	2	2	3	2	0	**35**
Nansana	Ocheng 7/8	2	3	1	2	3	2	3	2	2	1	2	1	2	2	0	**28**
Nabweru	Kawanda	4	3	4	2	3	4	4	3	2	4	3	4	3	4	2	**49**
Nabweru	Maganjo	4	3	4	2	3	4	4	3	2	4	4	3	3	3	2	**48**
Nabweru	Nakyesanja	3	3	3	3	3	2	3	3	3	3	2	3	3	4	2	**43**
Nabweru	Wamala	3	3	3	3	3	4	3	3	3	3	2	4	3	4	2	**46**
Busukuma	Busukuma	4	3	3	2	2	3	2	2	3	4	3	3	3	2	2	**41**
Busukuma	Gguluddene	2	2	2	2	2	3	2	2	3	2	2	2	2	2	2	**32**
Busukuma	Kabumba	2	2	3	2	2	3	3	3	3	3	2	2	2	2	2	**36**
Busukuma	Kikoko	3	3	2	2	2	3	3	3	3	2	2	2	2	2	2	**36**
Busukuma	Kiwenda	4	4	3	2	2	4	3	3	3	4	3	3	2	2	2	**44**
Busukuma	Lugo	2	3	2	2	2	2	3	3	3	3	3	2	3	2	2	**37**
Busukuma	Magigye	4	3	3	3	2	4	3	3	3	4	3	3	3	2	2	**45**
Busukuma	Wamirongo	2	2	2	2	2	3	2	1	3	2	2	1	2	2	2	**30**
Gombe	Buwambo	4	3	2	2	3	4	4	4	3	5	2	4	3	3	3	**49**
Gombe	Gombe	3	3	2	2	3	3	3	4	3	4	3	4	3	4	3	**47**
Gombe	Kavule	3	3	2	2	3	4	3	4	3	2	2	4	3	3	3	**44**
Gombe	Kiryamuli	3	3	2	2	3	4	3	4	3	2	3	4	3	3	3	**45**
Gombe	Matugga	2	3	2	2	3	4	4	3	3	4	2	3	3	1	2	**41**
Gombe	Migadde	3	3	2	2	3	3	3	4	3	4	2	4	3	3	3	**45**

Divisions	Wards	Access to clean water and sanitation	Access to credit	Access to early warning information	Access to renewable energy e.g., solar	Awareness of climate risks and adaptation practices	Diverse livelihood options	Education levels	Extension services	Good environmental management practices	Healthcare infrastructure	Proper waste disposal	Rainwater harvesting	Social networks	Urban greening initiatives	Wetland and ecosystem restoration	Total
Gombe	Mwererwe	3	3	2	2	3	3	3	4	3	2	3	4	3	3	3	**44**
Gombe	Nasse	3	3	2	2	3	3	3	4	3	2	3	4	3	2	3	**43**
Gombe	Ssanga	3	3	2	2	3	4	3	4	3	2	1	4	3	2	2	**41**
Gombe	Ttikalu	3	3	2	2	3	3	3	4	3	4	3	4	3	3	3	**46**
Gombe	Wambale	3	3	2	2	3	2	3	4	3	2	4	4	3	4	3	**45**
		KEY: 0=Not Available; 1=Very Low; 2=Low; 3=Moderate; 4=High; 5=Very High															

Source: Key Informant Interviews, 2025

The wards that have a very high adaptive capacity to multi-hazards (i.e., drought, floods, lightning, and windstorms) include Gombe, Buwambo, Kawanda, and Maganjo (**Figure 24**). On the other hand, Ocheng 7/8, Nansana East, Kazo, Nabweru South, Wamirongo, and Gguluddene have a very low adaptive capacity to multi-hazards.

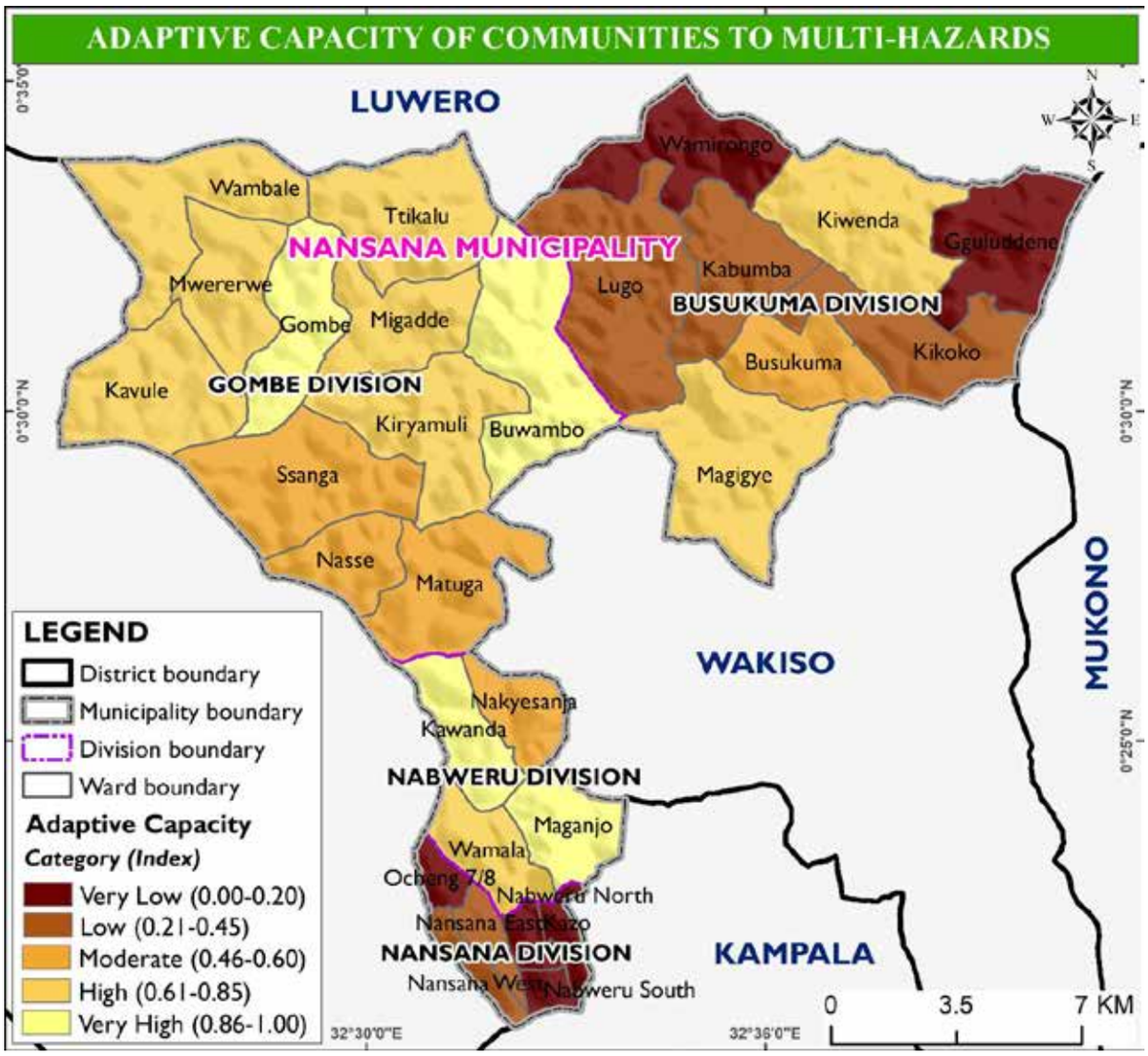


Figure 53: Adaptive capacity of communities to multi-hazards in Nansana Municipality

3.4.4 Vulnerability of communities to multi-hazards

The communities that are highly vulnerable to multi-hazards (i.e., drought, floods, lightning, and windstorms) in Nansana Municipality are found in Nabweru South, Kazo, Nabweru East, Wamirongo, Lugo, Ocheng 7/8, and Magigye (**Figure 54**).

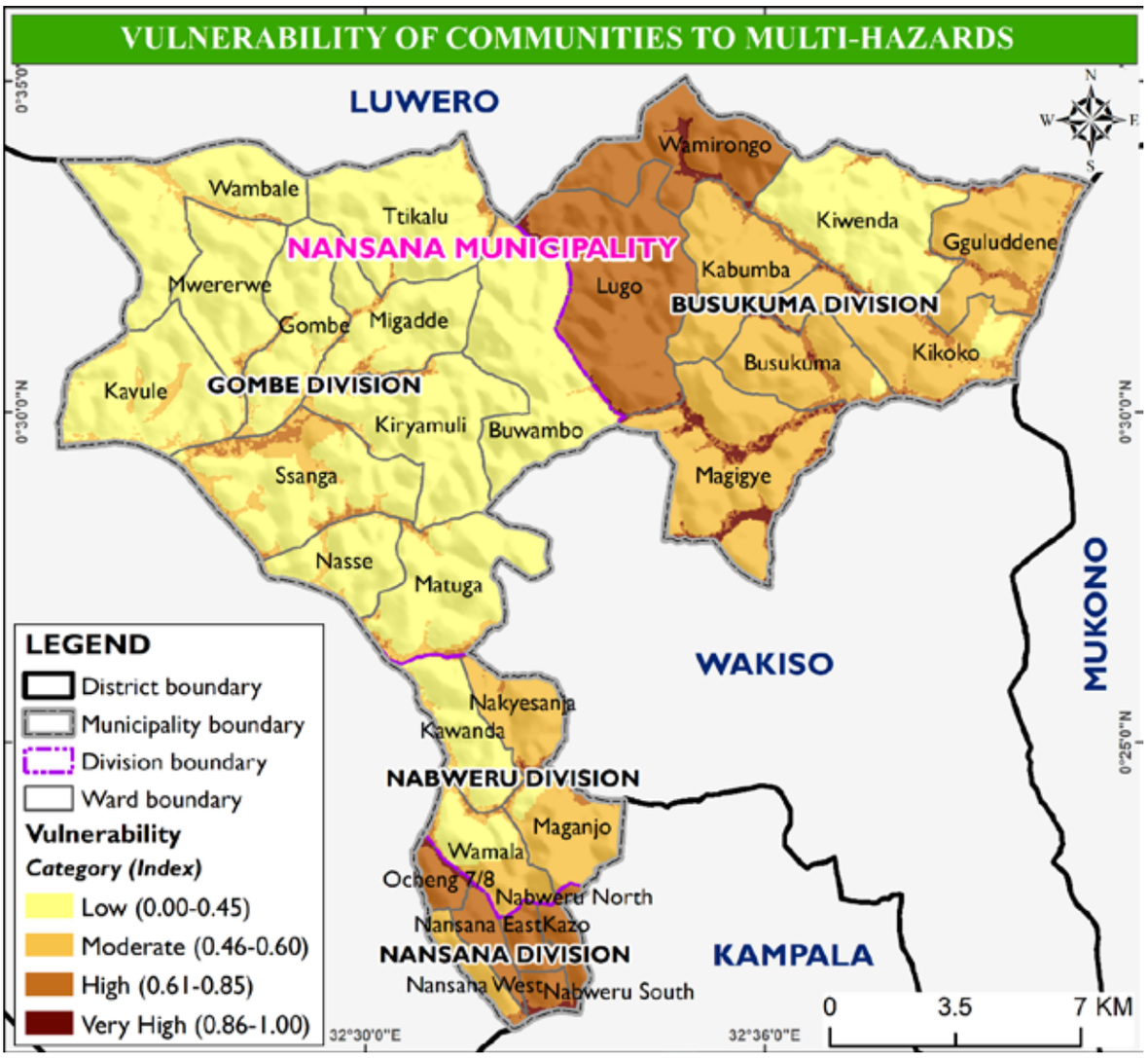


Figure 54: Vulnerability of communities to multi-hazards in Nansana Municipality

3.4.5 Risk of communities to multi-hazards

The communities at high risk of multi-hazards (i.e., drought, floods, lightning, and windstorms) in Nansana Municipality are located in Maganjo, Nansana East, Nansana West, Nabweru North, Nabweru South, Kazo, and Ocheng 7/8 (**Figure 55**).

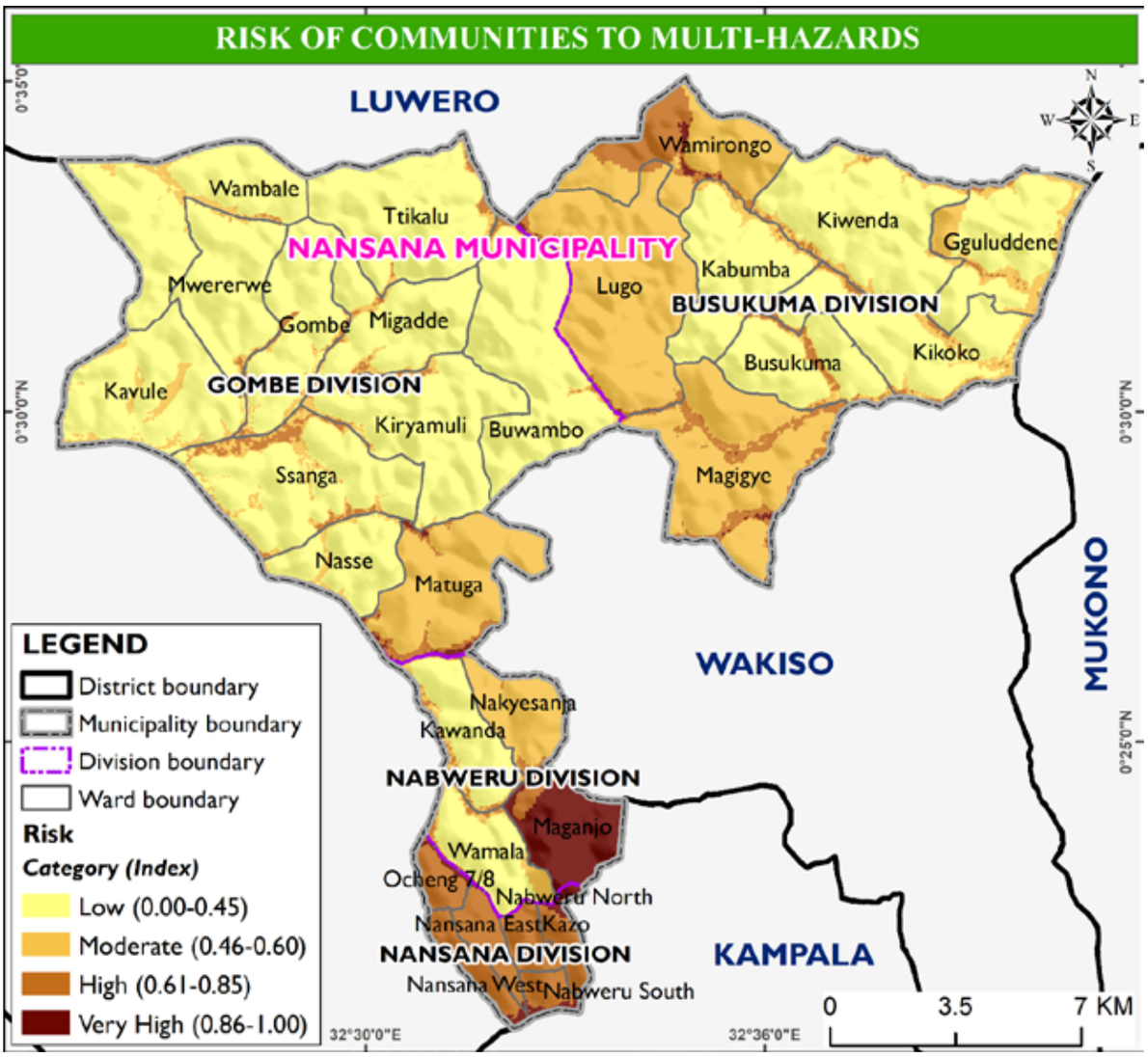


Figure 55: Risk of communities to multi-hazards in Nansana Municipality

CHAPTER FOUR: RISK REDUCTION MEASURES TO CLIMATE HAZARDS

4.1 Introduction

This chapter presents disaster risk reduction measures implemented by communities in Nansana Municipality to mitigate the negative impacts of disasters. The measures are aimed at improving communities' resilience to disaster impacts and enhancing their livelihoods.

Disaster Risk Reduction (DRR) measures are referred to as a combination of activities that mitigate the adverse impacts of natural hazards and increase community resilience by:

I. Identifying and analyzing hazards and threats: Supporting vulnerable communities to understand the major hazards they face.
II. Reducing exposure and vulnerabilities: Addressing the conditions that make communities susceptible to those hazards and shocks they have identified.
III. Controlling and treating risks: helping communities address the potential damage and losses caused by the hazards and threats and preventing hazardous events from becoming disasters to the communities.
IV. Enhancing capacities: building the capacity of individuals, communities, and institutions to reduce risk and build greater resilience.

DRR measures can be broadly classified as policy- and planning-related (non-structural) and physical (structural).

I. Policy and planning measures are implemented at the national and sub-national levels and help to integrate DRR into the policy and institutional frameworks.
II. Physical measures are designed to reduce the exposure and vulnerability of infrastructure to natural hazards (prevention) as well as to provide coping and adaptive infrastructure in case of a disaster event (coping/adaptive).

4.2 Hazard-specific Disaster Risk Reduction Measures

The structural and non-structural disaster risk reduction measures for each climate hazard in Nansana Municipality are presented in Table 25.

Table 26: Structural and non-structural DRR measures in Nansana Municipality

No	Hazard	Structural Measures	Non-Structural Measures
1	Drought	1. Plant drought-resistant and quick-maturing crop varieties. 2. Implement small-scale irrigation systems. 3. Demarcate wetlands to reduce encroachment. 4. Promote urban greening (tree planting, green corridors) to reduce heat and erosion. 5. Adopt alternative sources of livelihood such as cultural tourism, crafts and apiary 6. Construct community water reservoirs and underground tanks.	1. Sensitize communities about water-saving technologies, water and soil conservation practices, and environmental degradation. 2. Implement good environmental management practices 3. Encourage use of drought-tolerant crops 4. Promote rainwater harvesting systems on schools, health centers, and households 5. Encourage farmers to purchase crop insurance.
2	Floods	1. Relocate vulnerable communities to safer areas.	1. Develop and implement an ordinance on River bank management to regulate human activities along river banks.

No	Hazard	Structural Measures	Non-Structural Measures
		2. Reforest and replant native vegetation in degraded wetland areas. 3. Limit or restrict development in floodplains. 4. Construct appropriate drainage infrastructure especially in flood-prone areas. 5. Desilt and expand existing drainage channels. 6. Promote raised foundations and water-resistant building materials 7. Develop, design and implement urban settlement plans. 8. Implement community-led solid waste management to prevent drain blockages	2. Sensitize communities about flood risk and safety as well as sustainable land management. 3. Develop and implement catchment and community-based wetland management plans. 4. Incorporate flood mitigation in local planning. 5. Protect and restore flood natural mitigation features such as wetlands, river banks and hill/mountain slopes 6. Use indigenous knowledge in planning and management of floods. 7. Use low-cost sensors and community reporting to monitor water levels. 8. Restoration of watersheds through FMNR.
3	Windstorms	1. Plant windbreaks (trees and shrubs) around vulnerable settlements and open areas. 2. Implement climate smart agriculture practices like agroforestry. 3. Provide technical guidance for retrofitting existing structures.	1. Increase awareness about severe windstorms. 2. Support enforcement of building codes to strengthen roof anchoring and wall bracing 3. Install an effective monitoring and early warning system about windstorms. 4. Enforce use of safety gears like life jackets and use motorised boats
4	Lightning	1. Install lightning arresters on critical buildings. 2. Plant trees	1. Conduct lightning awareness programs and education (e.g., avoiding shelter under trees). 2. Install an effective monitoring and early warning system about lightning. 3. The government should subsidize lightning arrestors.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Over time, Nansana Municipality has experienced a range of climate hazards. These include drought, floods, windstorms, and lightning. However, the frequency and severity of these hazards have increased in recent years due to climate change. This has increased the vulnerability and risk of elements and communities to multi-hazards. The wards in Nansana Municipality that are highly vulnerable to multi-hazards include Nabweru South, Kazo, Nabweru East, Wamirongo, Maganjo, Nansana West, Nabweru North, Lugo, Ocheng 7/8, and Magigye. Therefore, the Government, with support from partners, should design innovative approaches to reduce the vulnerability and risk of these communities to multi-hazards and also increase their resilience and livelihoods.

5.2 Recommendations

The recommendations are categorized into four themes: understanding disaster risk; improving disaster risk governance; investing in disaster risk reduction, preparedness, and early warning; and building back better in the aftermath of disasters.

Understanding disaster risk

- Create a centralized GIS-based platform for mapping local climate hazards
- Conduct participatory risk mapping and engage communities to validate and update local hazard data using indigenous knowledge.
- Regularly monitor and update hazard data, e.g., through routine post-disaster data reviews and assessments
- Use schools, radio, and local leaders to educate residents about climate-related risks and safety practices.

Improving disaster risk governance

- Use hazard-specific information to guide land use, zoning, and infrastructure investments.
- Train local government staff (e.g., planners, engineers, and councilors) in climate risk analysis and resilient urban planning.
- Establish a local disaster risk coordination committee that facilitates cross-sectoral coordination and accountability for risk reduction efforts.
- Align budgets with risk priorities. This may include allocating local funds to areas with identified vulnerability hotspots and community needs.

Investing in disaster risk reduction, preparedness, and early warning

- Upgrade and regularly maintain flood-prone drainage systems and culverts.
- Use ecosystem-based adaptation to mitigate flood impacts and recharge water sources.
- Install lightning arrestors on public facilities such as schools, health centers, and markets.
- Promote water harvesting structures (such as rooftop tanks, underground reservoirs, and community water banks) for drought resilience.
- Develop effective localized flood and storm alert systems via SMS, radio, and community leaders.
- Enforce building codes for wind- and flood-resilient construction and retrofitting.
- Equip local response units with tarpaulins, tools, and essential items for rapid deployment.

Building back better in the aftermath of disasters

- Provide fast-track access to seeds and tools after drought events.
- Promote stronger building materials, elevated housing, and storm-resistant roofing.
- Train local teams to evaluate damage, estimate needs, and coordinate response.
- Ensure that rebuilding also addresses social protection, such as water access, secure housing, and livelihood support.

REFERENCES

1. Agrawal, S., & Nigam, M. K. (2014). Lightning phenomena and its effect on transmission line. Recent Research in Science and Technology, 6(1).
2. Declet-Barreto, J., Ramirez, M. J., & Fedinick, K. P. (2020). Guide to community climate vulnerability assessments. Pages 1-25. https://www.nrdc.org/sites/default/files/guide-community-climate-vulnerabilityassessments-report.pdf
3. Farida, N., & Maswanku, L. M. (2022). A Panoramic View of The Flood Problem in Eastern Uganda: Lessons from Pakistan and India. Islamic University Journal of Social Sciences, 3(1).
4. Guttman, N. B. (1999). Accepting the standardized precipitation index: a calculation algorithm 1. JAWRA Journal of the American Water Resources Association, 35(2), 311-322.
5. Intergovernmental Panel on Climate Change. (2014). Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (C. B. Field, V. R. Barros, D. J. Dokken, K. J. Mach, M. D. Mastrandrea, T. E. Bilir, & L. L. White, Eds.). Cambridge University Press.
6. IPCC (2023): Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, 184 pp., doi: 10.59327/IPCC/AR6-9789291691647.
7. McKee, T. B., Doesken, N. J., & Kleist, J. (1993, January). The relationship of drought frequency and duration to time scales. In Proceedings of the 8th Conference on Applied Climatology (Vol. 17, No. 22, pp. 179-183).
8. Morjani, D. Z. E. A. E., 2011. Wind Speed Modelling, Ibn Zohr University of Agadir. Morocco: s.n.
9. OPM (2019). National Risk and Vulnerability Atlas of Uganda. Department of Relief, Disaster Preparedness and Management. Vol.1.
10. Sivakumar, M. V. K., & Wilhite, D. A. (2002). Drought preparedness and drought management. Drought Mitigation and Prevention of Land Desertification, University of Ljubljana, Slovenia, 21-25.
11. Uganda Bureau of Statistics (UBOS) 2024: The National Population and Housing Census 2024 – Final Report - Volume 1 (Main), Kampala, Uganda.
12. Uganda Bureau of Statistics (UBOS), 2021. Uganda National Household Survey 2019/2020. Kampala, Uganda; UBOS
13. UNISDR (2017). UNISDR Terminology on Disaster Risk Reduction.
14. New Vision. (2021, August 10). Water shortage hits Wakiso District. New Vision. https://www.newvision.co.ug/new_vision/news/1318763/water-shortage-hits-wakiso-district
15. Monitor. (2023, May 5). Traffic paralysed as floods cut off Buloba-Nsangi road. Daily Monitor. https://www.monitor.co.ug/uganda/news/national/traffic-paralysed-as-floods-cut-off-buloba-nsangi-road-4224550
16. Examiner. (2023, October 2). Three die in Kampala floods. https://examiner.co.ug/news/three-die-in-kampala-floods/
17. Uganda Police Force. (2024, November 25). Caution against severe weather and potential incidents. https://upf.go.ug/caution-against-severe-weather-and-potential-incidents/

ANNEXES

Annex 1: Key informant interview guide

Introduction

Dear respondent,

My name is……. from Ardent Services International Limited, Kampala, Uganda. Ardent was hired by Nansana Municipal Council to develop a Climate Action Plan and a Disaster Risk Management Plan. The plans aim to increase the resilience of communities and ecosystems to the impacts of climate change. You have been identified as a key informant for data collection to support the development of the mentioned plans. Your guidance in understanding climate change and DRM in this area will be highly appreciated.

Situational Analysis

1. Which climate extreme events (e.g., drought, floods) affect this municipality?
2. What are the previous efforts undertaken to document disasters?
3. How are climate disasters managed in this municipality?
4. How has climate change impacted the local livelihoods and ecosystems in this area?
5. Describe the capacity of the municipality to manage these disasters in terms of?
   a. *Human resource availability*
   b. *Budgetary allocation*
   c. *Infrastructure*
   d. *Availability of equipment*
   e. *Existence of early warning systems*

6. What are the challenges faced in disaster risk management in the municipality?
7. What are the strengths, weaknesses, opportunities and threats (SWOT) of disaster risk management in the municipality?

Hazard Profiling

1. What are the causes and impacts of the climate hazards identified above? Identify hotspots and feasible DRR interventions.

Hazards	Causes	Impacts	Hotspots (Division and Ward)	Disaster risk reduction measures
Drought	•	•		•
Floods	•	•		•

Vulnerability Assessment- Division level

1. Rank the following sensitivity indicators to climate change in the different wards/parishes of Nansana municipality? (0= Not Available, 1= Very Low, 2= Low, 3= Moderate, 4= High, 5= Very High)

Nansana division

Sensitivity indicators	Kazo	Nabweru North	Nabweru South	Nansana East	Nansana West	Ocheng 7/8
Access to health services						
Community awareness and preparedness						
Degradation of rivers						
Dependency on climate-sensitive sectors e.g., agriculture						
Dependency on surface water						
Drainage systems						
Housing quality						
Income levels						
Population density						
Unemployment						
Wetland degradation						

Nabweru division

Sensitivity indicators	Kawanda	Maganjo	Nakyesanja	Wamala
Access to health services				
Community awareness and preparedness				
Degradation of rivers				
Dependency on climate-sensitive sectors e.g., agriculture				
Dependency on surface water				
Drainage systems				
Housing quality				
Income levels				
Population density				
Unemployment				
Wetland degradation				

Busukuma division

Sensitivity indicators	Busukuma	Gguluddene	Kabumba	Kikoko	Kiwenda	Lugo	Magigye	Wamirongo
Access to health services								
Community awareness and preparedness								
Degradation of rivers								

Sensitivity indicators	Busukuma	Gguluddene	Kabumba	Kikoko	Kiwenda	Lugo	Magigye	Wamirongo
Dependency on climate-sensitive sectors e.g., agriculture								
Dependency on surface water								
Drainage systems								
Housing quality								
Income levels								
Population density								
Unemployment								
Wetland degradation								

Gombe division

Sensitivity indicators	Buwambo	Gombe	Kavule	Kiryamuli	Matugga	Miggadde	Mwererwe	Nasse	Ssanga	Ttikalu	Wambale
Access to health services											
Community awareness and preparedness											
Degradation of rivers											
Dependency on climate-sensitive sectors e.g., agriculture											
Dependency on surface water											
Drainage systems											
Housing quality											
Income levels											
Population density											
Unemployment											
Wetland degradation											

2. Rank the following adaptive capacity indicators to climate change in the different wards/parishes of Nansana municipality? (0= Not Available, 1= Very Low, 2= Low, 3= Moderate, 4= High, 5= Very High)

Nansana division

Adaptive capacity indicators	Kazo	Nabweru North	Nabweru South	Nansana East	Nansana West	Ocheng 7/8
Access to clean water and sanitation						
Access to credit						
Access to early warning information						
Access to renewable energy e.g., solar						
Awareness of climate risks and adaptation practices						
Diverse livelihood options						
Education levels						
Extension services						

Adaptive capacity indicators	Kazo	Nabweru North	Nabweru South	Nansana East	Nansana West	Ocheng 7/8
Good environmental management practices						
Healthcare infrastructure						
Proper waste disposal						
Rainwater harvesting						
Social networks						
Urban greening initiatives						
Wetland and ecosystem restoration						

Nabweru division

Adaptive capacity indicators	Kawanda	Maganjo	Nakyesanja	Wamala
Access to clean water and sanitation				
Access to credit				
Access to early warning information				
Access to renewable energy e.g., solar				
Awareness of climate risks and adaptation practices				
Diverse livelihood options				
Education levels				
Extension services				
Good environmental management practices				
Healthcare infrastructure				
Proper waste disposal				
Rainwater harvesting				
Social networks				
Urban greening initiatives				
Wetland and ecosystem restoration				

Busukuma division

Adaptive capacity indicators	Busukuma	Gguluddene	Kabumba	Kikoko	Kiwenda	Lugo	Magigye	Wamirongo
Access to clean water and sanitation								
Access to credit								
Access to early warning information								
Access to renewable energy e.g., solar								
Awareness of climate risks and adaptation practices								
Diverse livelihood options								
Education levels								
Extension services								

Adaptive capacity indicators	Busukuma	Gguluddene	Kabumba	Kikoko	Kiwenda	Lugo	Magigye	Wamirongo
Good environmental management practices								
Healthcare infrastructure								
Proper waste disposal								
Rainwater harvesting								
Social networks								
Urban greening initiatives								
Wetland and ecosystem restoration								

Gombe division

Adaptive capacity indicators	Buwambo	Gombe	Kavule	Kiryamuli	Matugga	Migadde	Mwererwe	Nasse	Ssanga	Ttikalu	Wambale
Access to clean water and sanitation											
Access to credit											
Access to early warning information											
Access to renewable energy e.g., solar											
Awareness of climate risks and adaptation practices											
Diverse livelihood options											
Education levels											
Extension services											
Good environmental management practices											
Healthcare infrastructure											
Proper waste disposal											
Rainwater harvesting											
Social networks											
Urban greening initiatives											
Wetland and ecosystem restoration											

Vision and Goals

1. What is the vision of climate resilience and sustainability in Nansana municipality?
    a. What are the goals to achieve this vision?

2. What is the vision of disaster risk management in Nansana municipality?
    a. What are the goals to achieve this vision?

Result Areas

1. What actions can be done in the following result areas to reduce the emission of greenhouse gases and improve the community resilience to climate change?

Result Area	Climate actions to reduce GHGs	Priority areas (Division and parishes)	Implementation Period (S= 0-2 years; M= 3-4 years; L= 5 years and above)	Responsibility
Agriculture				
Energy				
Environment				
Housing				
Manufacturing				
Social development (communities)				
Trade				
Transportation				
Waste management				

2. What actions can be done in the following result areas to manage or reduce disaster risks in Nansana municipality?

Result Area	Disaster risk reduction (DRR) measures	Priority areas (Division and parishes)	Implementation Period (S= 0-2 years; M= 3-4 years; L= 5 years and above)	Responsibility
Enhancing environmental protection to mitigate disasters				
Profiling of disaster risks, vulnerability and losses/damages				
Promoting disaster preparedness, response and recovery measures				
Strengthening disaster early warning systems				
Strengthening disaster governance structures				
Supporting community resilience to manage disasters				

Implementation

1. Describe how the implementation of the climate action and disaster risk management plans should be coordinated?

2. Who are the major and minor stakeholders in the implementation of this plan?
3. How should early warning systems be strengthened? And which early warning information is passed on to the communities and which modes of communication are used?
4. Describe the major sources of climate/disaster funding in the municipality?

Annex 2: Focus group discussion checklist

Dear respondent,

My name is……. from Ardent Services International Limited, Kampala, Uganda. Ardent was hired by Nansana Municipal Council to develop a Climate Action Plan and a Disaster Risk Management Plan. The plans aim to increase the resilience of communities and ecosystems to the impacts of climate change. Your guidance in understanding climate change and DRM in this area will be highly appreciated.

Location

a	Division	
b	Parish/Ward	
c	Village/Cell	

Section 1: Climate change and early warning information to communities

1. What are the indicators of climate change in this area?
2. What are the drivers of climate change in this area?
3. How has climate change impacted the local livelihoods and ecosystems in this area?
4. What strategies are employed by communities to respond to climate change?
5. What are the barriers for climate change adaptation in communities?
6. What should be done to improve community resilience to climate change?
7. What methods have been used to share climate information in your community, and how effective have they been?
8. What roles has the municipal council played in relaying climate information to the community, and how effective has this been?
9. How have farming practices or daily activities in your community changed based on the climate information shared?
10. What challenges have emerged in accessing, understanding, or using climate information in your community?
11. What improvements could be made to the climate information system or the way information is shared to make it more effective for your community?
12. What is the long-term vision for climate resilience and sustainability in the community?
13. What will the climate look like 5 years after implementing adaptation and mitigation measures?

Annex 3: Photographs of stakeholder engagements

FGD held in Nabweru Division

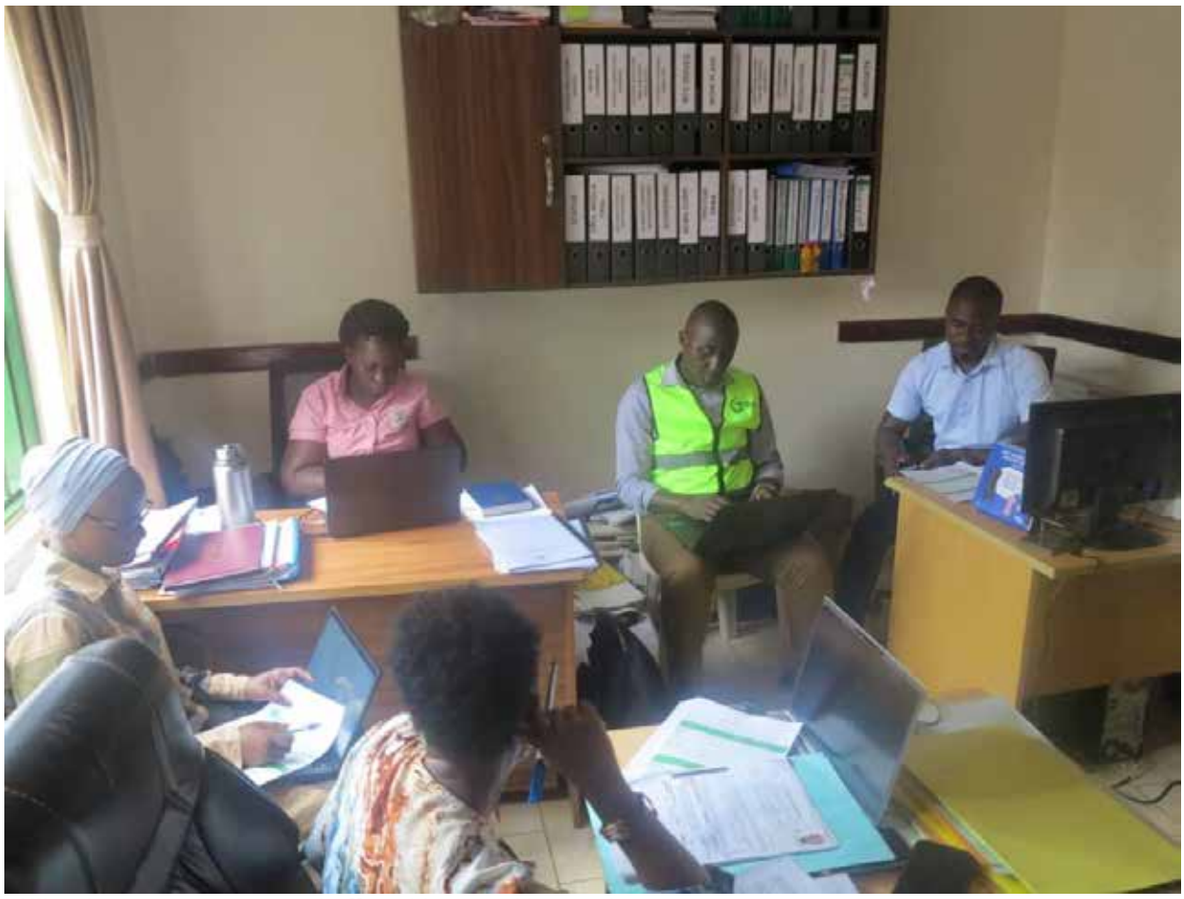
FGD held in Nansana Division

FGD held in Busukuma Division

FGD held in Gombe Division

Engagement with local leaders in Busukuma Division

Engagement with local leaders in Gombe Division

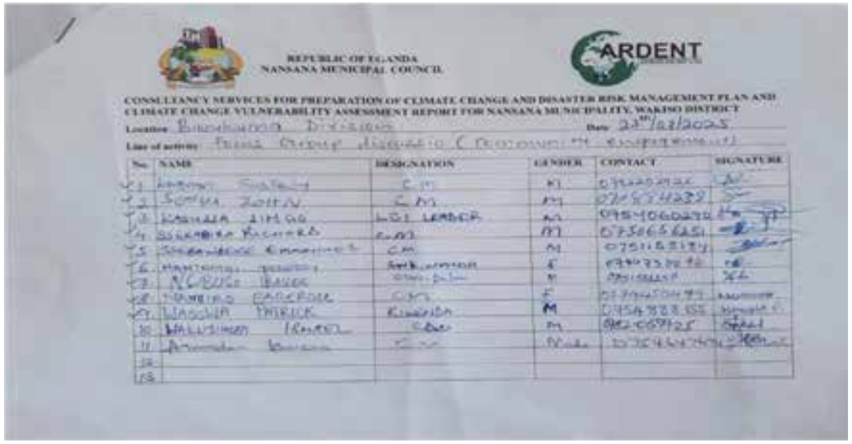


KII with senior environmental officer, Nansana Municipality

KII with CDO, Nansana division

Annex 4: Attendance of stakeholder engagements

Busukuma Division



REPUBLIC OF UGANDA
NANSANA MUNICIPAL COUNCIL

ARDENT

CONSULTANCY SERVICES FOR PREPARATION OF CLIMATE CHANGE AND DISASTER RISK MANAGEMENT PLAN AND CLIMATE CHANGE VULNERABILITY ASSESSMENT REPORT FOR NANSANA MUNICIPALITY, WAKISO DISTRICT

Location: Busukuma Division
Date: 07/03/2025
Line of activity: Committee Engagement Sheet 2

No.	NAME	DESIGNATION	GENDER	CONTACT	SIGNATURE

Gombe Division

REPUBLIC OF UGANDA
NANSANA MUNICIPAL COUNCIL

ARDENT

CONSULTANCY SERVICES FOR PREPARATION OF CLIMATE CHANGE AND DISASTER RISK MANAGEMENT PLAN AND CLIMATE CHANGE VULNERABILITY ASSESSMENT REPORT FOR NANSANA MUNICIPALITY, WAKISO DISTRICT

Location: Gombe Division
Date: 5/03/2025
Line of activity: Committee Engagement Sheet 2

No.	NAME	DESIGNATION	GENDER	CONTACT	SIGNATURE

REPUBLIC OF UGANDA
NANSANA MUNICIPAL COUNCIL

ARDENT

CONSULTANCY SERVICES FOR PREPARATION OF CLIMATE CHANGE AND DISASTER RISK MANAGEMENT PLAN AND CLIMATE CHANGE VULNERABILITY ASSESSMENT REPORT FOR NANSANA MUNICIPALITY, WAKISO DISTRICT

Location: Gombe Division
Date: 5/03/2025
Line of activity: Committee Engagement Sheet 1

No.	NAME	DESIGNATION	GENDER	CONTACT	SIGNATURE

REPUBLIC OF UGANDA
NANSANA MUNICIPAL COUNCIL

ARDENT

CONSULTANCY SERVICES FOR PREPARATION OF CLIMATE CHANGE AND DISASTER RISK MANAGEMENT PLAN AND CLIMATE CHANGE VULNERABILITY ASSESSMENT REPORT FOR NANSANA MUNICIPALITY, WAKISO DISTRICT

Location: Gombe Division Date: 27th/03/2025

Line of activity: FGDs focus Group discussion · Community engagement

No.	NAME	DESIGNATION	GENDER	CONTACT	SIGNATURE
1	Tumusiime Harriet	CM	F	0755688137	[illegible]
2	Katalo Abigail	CM	F	0781344982	[illegible]
3	Tendo Bena	CM		0782521071	[illegible]
4	Ssemanda ALEX	CM	M	0707524447	ALEX
5	Ssentu Asuman	CM	M	0780876112	[illegible]
6	ISABIRYE ALBERT	CM	M	0774175565	[illegible]
7	PERA CANAN	CM	M	0788153729	[illegible]
8	NANKUGWA ALLEN	CM	F	0756741501	Allen
9	NAMBUKA PATRICIA H	CM	F	0775329439	[illegible]
10	MATEKERE NECKSON	CM	M	0783359514	[illegible]
11	SSEMUKO KAZIBWE F	CM	M	0752976956	[illegible]
12	Kobusinge Sharon	CM	F	0773342731	Sharon
13	MALUGO JOAN	CM	F	0702669110	Joan

Nabweru Division

REPUBLIC OF UGANDA
NANSANA MUNICIPAL COUNCIL

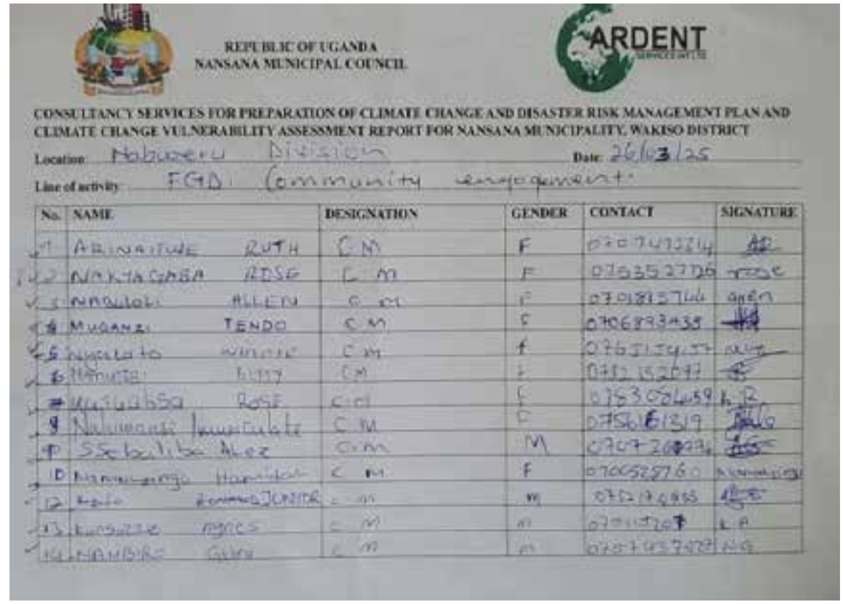
ARDENT

CONSULTANCY SERVICES FOR PREPARATION OF CLIMATE CHANGE AND DISASTER RISK MANAGEMENT PLAN AND CLIMATE CHANGE VULNERABILITY ASSESSMENT REPORT FOR NANSANA MUNICIPALITY, WAKISO DISTRICT

Location: NABWERU DIVISION OFFICES Date: 27th/02/2025

Line of activity: COMMITTEE ENGAGEMENT Sheet 1

No.	NAME	DESIGNATION	GENDER	CONTACT	SIGNATURE
01	[illegible]	[illegible]	Male	[illegible]	[illegible]
02	Nambassa Dissovia	ATC	Female	0782310862	[illegible]
3	Namuwa Rachael	CDO	Female	0782314771	[illegible]
4	KASULE TEFA	TIA	MALE	[illegible]	[illegible]
5	SEBINA SIMON	T/A	MALE	0776225095	[illegible]
6	MUKOSE SOWALI	LC2 C/P MAGANJO	M	[illegible]	[illegible]
7	NKATA STEPHEN -K	LC II C/p NAKY.	M	0789 182746	[illegible]
8	Nakawunga Milly	GISO NABWERU	F	[illegible]	[illegible]
9	NAKIWALI LYDIA	H/A	Female	0700043037	[illegible]
10	MATOVU NICHOLAS	LC2 [illegible]	M	[illegible]	[illegible]
11	Namuyomba Ritah	TIAgent	F	0706213010	[illegible]
12	[illegible]	TIAgent	F	[illegible]	[illegible]
13	[illegible]	[illegible]	M	[illegible]	[illegible]



REPUBLIC OF UGANDA
NANSANA MUNICIPAL COUNCIL

ARDENT

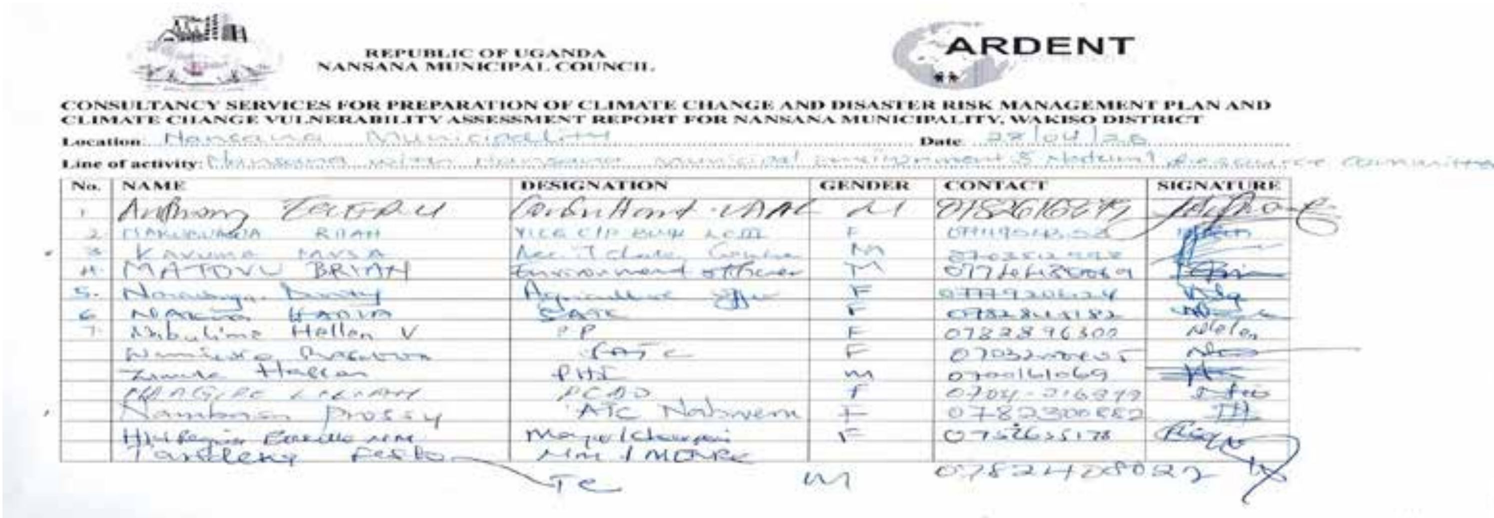
CONSULTANCY SERVICES FOR PREPARATION OF CLIMATE CHANGE AND DISASTER RISK MANAGEMENT PLAN AND CLIMATE CHANGE VULNERABILITY ASSESSMENT REPORT FOR NANSANA MUNICIPALITY, WAKISO DISTRICT

Location: Nabweru Division Date: 26/03/25

Line of activity: FGD: Community engagement.

No.	NAME	DESIGNATION	GENDER	CONTACT	SIGNATURE
1	ABINAITWE RUTH	CM	F	[illegible]	[illegible]
2	NAKYAGABA ROSE	C M	F	[illegible]	rose
3	NABULOLI ALLEN	C M	F	[illegible]	[illegible]
4	MUGANZI TENDO	C M	F	0706893435	[illegible]
5	[illegible] WINNIE	C M	F	[illegible]	[illegible]
6	[illegible]	CM	F	[illegible]	[illegible]
7	[illegible] ROSE	CM	F	[illegible]	[illegible]
8	[illegible]	CM	F	[illegible]	[illegible]
9	Ssebaliba Alex	CM	M	[illegible]	[illegible]
10	[illegible]	C M	F	[illegible]	[illegible]
12	[illegible] JUNIOR	CM	M	[illegible]	[illegible]
13	[illegible] AGNES	CM	M	[illegible]	[illegible]
14	[illegible]	CM	M	[illegible]	[illegible]

Nansana Division



REPUBLIC OF UGANDA
NANSANA MUNICIPAL COUNCIL

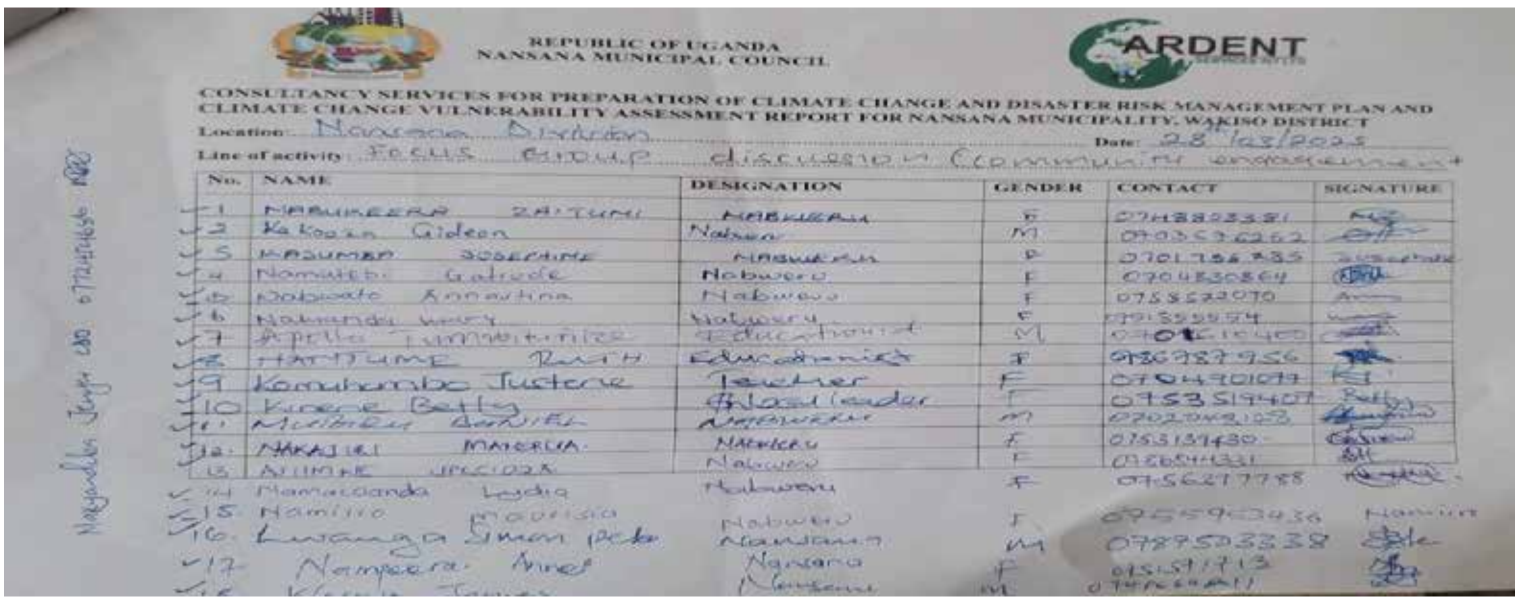
ARDENT

CONSULTANCY SERVICES FOR PREPARATION OF CLIMATE CHANGE AND DISASTER RISK MANAGEMENT PLAN AND CLIMATE CHANGE VULNERABILITY ASSESSMENT REPORT FOR NANSANA MUNICIPALITY, WAKISO DISTRICT

Location: Nansana Municipality Date: 28/04/25

Line of activity: [illegible] with Nansana municipal environment & natural resource committee

No.	NAME	DESIGNATION	GENDER	CONTACT	SIGNATURE
1	Anthony [illegible]	Consultant - [illegible]	M	[illegible]	[signature]
2	NAKUBULWA RIAH	VICE CIP BUK LCIII	F	[illegible]	[signature]
3	KAVUMA [illegible]	[illegible]	M	[illegible]	[signature]
4	MATOVU BRIAN	Environment officer	M	[illegible]	[signature]
5	[illegible]	Agriculture officer	F	[illegible]	[signature]
6	[illegible]	SACE	F	[illegible]	[signature]
7	[illegible] Hellen V	PP	F	0782896300	[signature]
	[illegible]	[illegible]	F	[illegible]	[signature]
	[illegible]	PHI	M	0700161069	[signature]
	[illegible]	PCDO	F	0704-216879	[signature]
	Nambasa Prossy	ATC Nabweru	F	0782300882	[signature]
	[illegible]	Mayor/chairperson	F	[illegible]	[signature]
	Tashleng [illegible]	MM/MONRE TC	M	0782428082	[signature]



REPUBLIC OF UGANDA
NANSANA MUNICIPAL COUNCIL

ARDENT

CONSULTANCY SERVICES FOR PREPARATION OF CLIMATE CHANGE AND DISASTER RISK MANAGEMENT PLAN AND CLIMATE CHANGE VULNERABILITY ASSESSMENT REPORT FOR NANSANA MUNICIPALITY, WAKISO DISTRICT

Location: Nansana Division Date: 28/03/2025

Line of activity: Focus group discussion (community engagement

No.	NAME	DESIGNATION	GENDER	CONTACT	SIGNATURE
1	NABUKEERA ZAITUNI	NABWERU	F	[illegible]	[signature]
2	Kakooza Gideon	Nabweru	M	[illegible]	[signature]
3	NASUMBA JOSEPHINE	NABWERU	F	0701756335	[signature]
4	Namutebi Gatrude	Nabweru	F	0704830864	[signature]
5	Nabwato Annastina	Nabweru	F	0758572070	[signature]
6	Nakanda [illegible]	Nabweru	F	[illegible]	[signature]
7	Apollo Tumwesigire	Educationist	M	[illegible]	[signature]
8	[illegible] Ruth	Educationist	F	[illegible]	[signature]
9	Komuhendo Justene	Teacher	F	0704901077	[signature]
10	Kirene Betty	Local leader	F	0753519407	Betty
11	[illegible] DANIEL	NABWERU	M	[illegible]	[signature]
12	NAKAJUBI MAGRETA	NABWERU	F	0753139430	[signature]
13	[illegible]	Nabweru	F	[illegible]	[signature]
14	Namusoke Lydia	Nabweru	F	0756277788	[signature]
15	Namiiro [illegible]	Nabweru	F	[illegible]	Namiiro
16	Lwanga Simon Peter	Nansana	M	0787503338	[signature]
17	Nampeera Annet	Nansana	F	[illegible]	[signature]
18	[illegible]	Nansana	M	[illegible]	

Nagawa[illegible] Joyce [illegible] 0772[illegible]