UGANDA

Climate Hazard Assessment – Kyegegwa District

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Climate Hazards in Uganda's Refugee-Hosting Districts.

INTRODUCTION

Uganda hosts one of the largest refugee populations in Africa,[1] many of whom live in climate-sensitive landscapes highly vulnerable to the impacts of climate change due to its reliance on rain-fed agriculture, limited adaptive capacity, and high exposure to extreme weather events such as floods, droughts, and prolonged dry spells.[2] Over recent decades, the country has experienced more frequent and intense climate hazards, undermining livelihoods, food security, health, and infrastructure.[3][4] Uganda's climate is characterized by a bimodal rainfall pattern; however, this pattern has become increasingly unpredictable, with delayed onset and erratic distribution of rainfall that disrupts agricultural cycles.[5]

Key National Signals

Temperatures have risen by ~1.0 –1.5°C over the last five decades, increasing heat stress and evapotranspiration.

More erratic rainfall: delayed onset, mid-season dry spells, intense rainfall events

Prolonged dry spells and flooding now co-exist as dominant hazards, disrupting agriculture, water access, transport, and shelter

Climate hazards vary across the country, with distinct patterns between the Northern/West Nile and Southwestern regions, highlighting the need for localized analysis. Although both regions are projected to become warmer and wetter by mid-century, the impacts will differ significantly due to variations in baseline conditions, terrain, and livelihood systems.

In the Northern/West Nile region including Yumbe, Koboko, Adjumani, Madi Okollo, Terego, Obongi, and Lamwo, average temperatures are projected to rise from about 25°C to 30°C by mid-century, while annual rainfall increases from roughly 1,138 mm to 1,587 mm. Despite higher rainfall, increased temperatures will accelerate evapotranspiration, leading to greater soil moisture loss and prolonged dry periods during key agricultural seasons. According to the Multi-Sectoral Needs Assessment (MSNA) conducted by **IMPACT Initiatives** in 2024, seasonal drought and heavy rains are the hazard types most frequently reported across West Nile and Southwestern regions. With accelerating climate change, they will remain dominant hazards, alongside a growing risk of flash flooding in low-lying and poorly drained areas.

Hazard Type	West Nile	Adjumani	Terego	Koboko	Lamwo	Madi Okollo	Obongi	Yumbe
Drought/ Prolonged dry spells	x	31%	39%	40%	46%	31%	36%	46%
Heavy Rains	x	38%	40%	42%	24%	33%	35%	38%
Extreme Temp. Events	x	19%	13%	12%	18%	26%	13%	7%
Flood	x	13%	8%	6%	12%	10%	15%	9%

Table 1: Climate hazards reported in the 2024 MSNA, Northern/West Nile Region

In Southwestern Uganda districts, Isingiro, Kamwenge, Kyegegwa, Kiryandongo, and Kikuube, historical temperatures average about **20.3°C** but are projected to rise to around **26°C** by mid-century, marking significant warming. Annual rainfall is also expected to increase from about **842 mm** to roughly **1,372 mm**.

Hazard Type	South west	Kiryandongo	Isingiro	Kamwenge	Kikuube	Kyegegwa
Drought/ Prolonged dry spells	x	49%	74%	45%	48%	58%
Heavy Rains	x	30%	17%	28%	25%	25%
Extreme Temp. Events	x	16%	6%	23%	18%	13%
Flood	x	6%	3%	4%	9%	3%

Table 2: Climate hazards reported in the 2024 MSNA, Southwestern Region

Across both regions, warmer and wetter conditions do not reduce climate risk. Instead, they increase overlapping hazards, with seasonal droughts, floods, and heat stress occurring in the same districts and seasons. These pressures are especially acute in refugee-hosting areas where land, water, and services are already limited.

District-level Climate Hazard Assessments translate national and regional climate trends into local evidence, highlighting key hazards, seasonal risks, and exposures to support targeted planning and resilience for host and refugee communities.

Climate Hazard Assessment – Kyegegwa District

CONTEXT & RATIONALE

Kyegegwa District is located in the Western Region of Uganda. It is part of the Toro Sub-region and borders Kibale, Mubende, Kiruhura, Kamwenge and Kyenjojo. Kyegegwa follows a **bimodal rainfall pattern**, which means it has two distinct rainy seasons and two dry seasons throughout the year. The climate is generally characterized by the first rainy season from March to May and the second rainy season from September to November, with **peaks in April and November** respectively. The local economy is dominated by agriculture, including crop cultivation (maize, bananas, beans, fruits and cassava) and animal rearing.[6] Kyegegwa District faces **increasing climate variability and environmental degradation** that compound existing development challenges. The district experiences erratic and unpredictable rainfall patterns, prolonged dry spells, and periods of intense rain, which undermine agricultural productivity and food security. Dry seasons often reduce soil moisture and limit crop growth, while heavy rainfall events can damage crops and critical infrastructure and increase the risk for localized flooding, especially in low-lying areas along rivers and cultivated wetlands. Kyegegwa District is characterized by generally high and favorable soil fertility boasting volcanic loamy soils highly suitable for crop cultivation, especially for crops such as bananas, maize and beans.[7]

Climate projections under the Moderate Socio-economic Path (SSP2-4.5 scenario), which represents a middle of the road development trajectory with moderate emissions and limited climate mitigation, indicate that Kyegegwa will become warmer and moderately wetter by mid-century, with mean annual temperatures rising from **21.2°C to 23.8°C** and annual rainfall increasing from **1,086 mm to about 1,226 mm**.[1] Despite this increase in rainfall, intensifying heat stress is expected to pose greater risks to rural households and displaced populations.[8]

As of early 2026, Kyegegwa District is estimated to host **over 135,000 refugees**, the majority of whom live in and around Kyaka II Refugee Settlement.[9] They account for a substantial share of the district's total population, putting **pressure on natural resources**. Reliance on wood fuel drives deforestation, while rising demand for farmland intensifies land competition, together increasing vulnerability to climate-related shocks.

By identifying hazard susceptibility, exposure patterns, and future climate hazards, the assessment aims to support OPM, UNHCR, WFP, district authorities and humanitarian partners in developing targeted interventions, strengthening disaster preparedness and enhancing resilience within one of Uganda's largest refugee-hosting districts.

Key Messages

- Kyegegwa District currently receives **~1,086 mm** of annual rainfall, projected to rise moderately to **~ 1,266 mm** by mid-century under the SSP2-4.5 scenario. However, persistent dry-season deficits and higher evapotranspiration will intensify water stress, especially in areas like Ruyonza and Rwentuha.
- Temperatures are projected to increase by **2.2°C and 2.8°C** during the hottest and driest quarters, increasing the risk of seasonal drought, heat stress and the frequency of very hot days across agricultural and settlement areas.
- Seasonal drought remains a dominant hazard, with the Standard Precipitation Index and Vegetation Condition Index (VCI), which capture rainfall deficits and vegetation stress respectively, showing **severe dryness across Hapuuyo, Kasule, Kakabara, Kyegegwa Town Council, Mpara, and the Kyaka II Refugee Settlement**, leading to vegetation stress, reduced crop yields, and limited pasture and water availability.
- Overall, Kyegegwa has **low flood risk**, thanks to it landscape and river network. Flood risk is highest in Kakabara, Hapuuyo, Kasule and Ruyonza sub-counties

[1] SSP2-4.5 refers to a moderate climate change scenario that combines the "Middle-of-the-Road" Shared Socio-economic Pathway (SSP2) with a radiative forcing level of 4.5 W/m² by 2100. It assumes continued socio-economic development along current trends, moderate population growth, and limited but ongoing climate mitigation, resulting in continued warming and increasing climate variability.

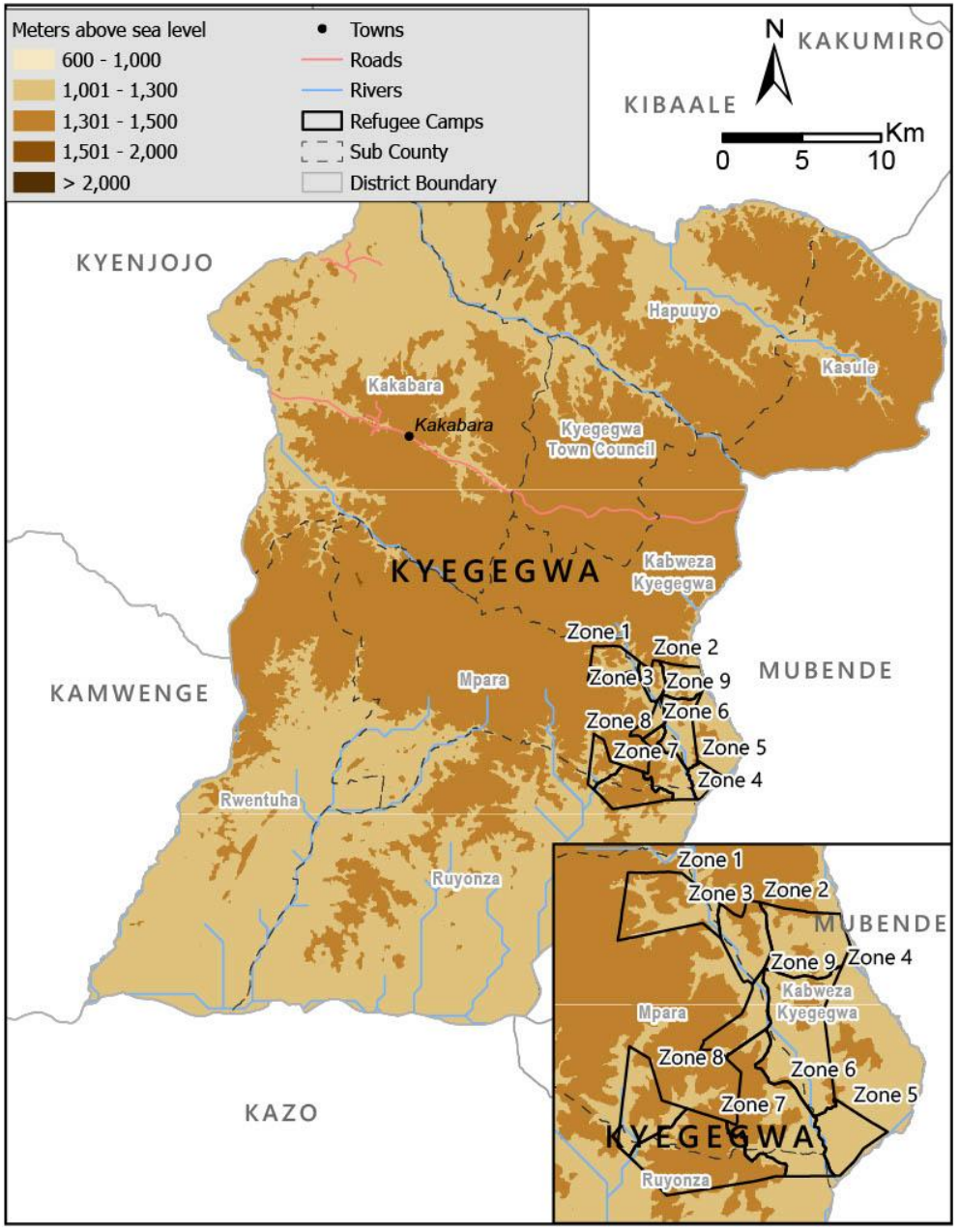
Location and Topography

Kyegegwa District is in the Western Region of Uganda, bordered by Mubenda to the east, Kibaale to the north, Kyenjojo to the northwest, and Kamwenge/Kiruhura to the south/southwest. It is part of the Toro Sub-region, and was established in 2008, having previously been part of the Kyenjojo district.

According to Map 1, Kyegegwa District features a generally **flat to gently rolling plateau topography, often characterized by scattered rocky outcrops and hills**. The district sits at an **average elevation of 1,285 meters**, with terrain rising from a minimum of 1,252 meters to a maximum of 1,572 meters.[10] The district's lower-lying, flatter and swampier areas are generally located in the southern and western parts, particularly in Rwentuha and Kakabara Sub-counties. The higher-altitude areas are typically found in the sub-counties that make up their hilly, rocky, and higher-altitude terrains, often associated with tea-growing regions and bordering neighboring mountainous districts like Mubende and Kyenjojo.

The district's topography, characterized by a central plateau with hilly and rocky terrain, directly shapes its land use and settlement patterns, predominantly through its influence on agriculture and infrastructure development. The hilly terrain has directed agricultural focus towards subsistence farming of maize, cassava, bananas, beans and ground nuts, largely driven by farmers adapting to the varied slopes.[11] The undulating landscape is utilized for grazing, with livestock keeping being a significant activity in the district, often interspersed with crop farming. Settlement patterns are influenced by the district's hilly landscape, encouraging a more scattered pattern along rural roads rather than a densely concentrated one. Urban centers are mostly found along the main highway running through the district, connecting Mubende and Fort Portal.

Due to the dry nature of the hilly uplands, there is significant pressure on wetlands for cultivation, leading to environmental concerns, particularly with the planting of rice, sugarcane, and cabbages in low-lying wet areas. The district's low-lying areas, particularly those near wetlands and riverbanks in sub-counties, such as Hapuuyo and Kigambo, are highly prone to flooding during the rainy season.[12] Flooding is primarily driven by a combination of rapid deforestation, wetland degradation, and poor land-use practices on hillsides. The removal of trees and vegetation on hills leaves soil bare and vulnerable to erosion, causing heavy rain to wash mud and water directly into low-lying areas.



Map 1: Map showing the Location and Elevation of Kyegegwa District.

Demographics and Population Distribution

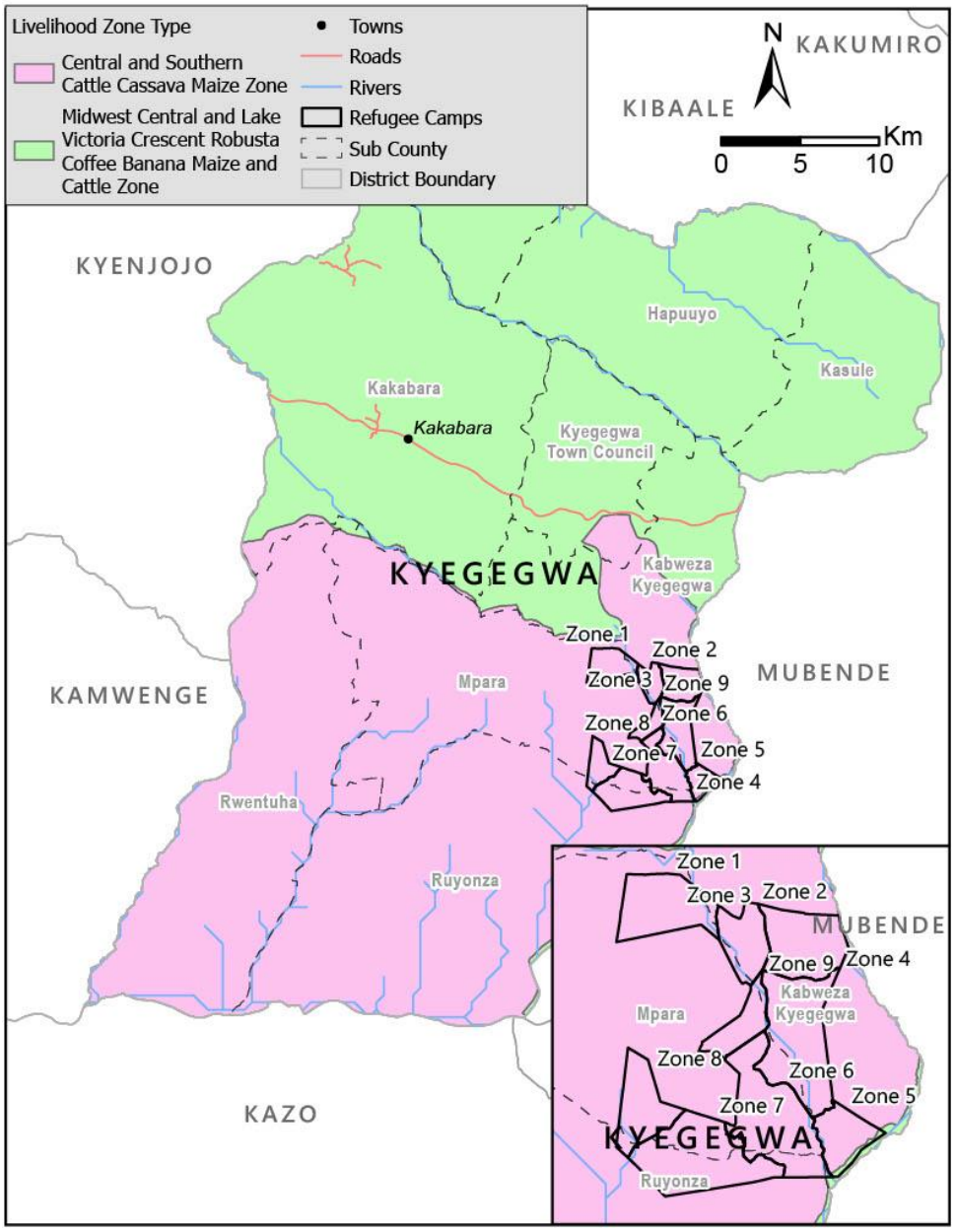
According to the 2024 National Population and Housing Census, Kyegegwa District has **a population of over 500,000**, reflecting steady population growth since 2014, when the population was estimated to be 281,000.[13] The district's rapid population growth is driven by internal migration, high fertility rates and a high influx of refugees into the Kyaka II Refugee Settlement. The district is predominantly rural, with approximately 93.3% of its population living in rural areas and only 6.7% living in urban centres.[14] Kyegegwa is ethnically diverse, largely because of migration. The major tribes inhabiting the area are the Banyankole, Batooro, Bakiga, and Bafumbira. The primary languages used for communication are Ruturoo and Runyankole. Kyegegwa's economy is centred around agriculture and livestock farming, employing most of the district's population. The most grown crops include maize, bananas, beans, cassava and groundnuts.[15]

Kyegegwa is also a **major refugee-hosting area**, particularly for those fleeing violence in the Democratic Republic of Congo. Refugees are mostly hosted in the Kyaka II Refugee Settlement, divided into 9 administrative zones and spanning 3 sub-counties, namely Mpara, Kyegegwa and Kabweza. As of early 2026, Kyegegwa District hosts over **135,000 refugees**, mostly living in and around Kyaka II refugee settlement. Refugees account for a substantial and growing share of the district's total population. Due to ongoing instability in the DRC, the number of refugees in the settlement has increased from roughly 50,000 in 2018 to over 135,000 in late 2025.[16]

This demographic composition has important implications for district planning and climate risk management. Both host and refugee populations depend heavily on climate-sensitive natural resources and basic services, including land, water, education, health and sanitation. The high concentration of people in settlement-hosting areas intensifies pressures on land, forests, and water resources, **increasing vulnerability to climate-related hazards, such as flooding, erratic rainfall and seasonal droughts**.

Livelihoods

Livelihoods in Kyegegwa District are primarily based on **small holder agriculture, with most households depending on rain-fed crop production and livestock keeping**. These livelihoods vary across the district's main zones (see *Map 2*), including the *Central and Southern Cattle Cassava Maize Zone* and the *Midwest Victoria Crescent Robusta Coffee Banana Maize and Cattle Zone*. Households commonly



Map 2: Map showing livelihood zones in Kyegegwa District.

combine cassava, maize, bananas, and coffee cultivation with cattle rearing, forming the backbone of local livelihoods.

The northern sub-counties Hapuuyo, Kasule, and Kakabara fall within the Midwest *Victoria Crescent Robusta Coffee Banana Maize and Cattle Zone*. Elevations range from 1,001–1,300 m and rainfall are 1,122–1,317 mm. Here, communities rely on mixed farming, including coffee and banana cultivation alongside livestock. The central sub-counties Kyeggegwa Town Council and Kabweza, are at 1,301–1,500 m, supporting similar mixed farming systems.

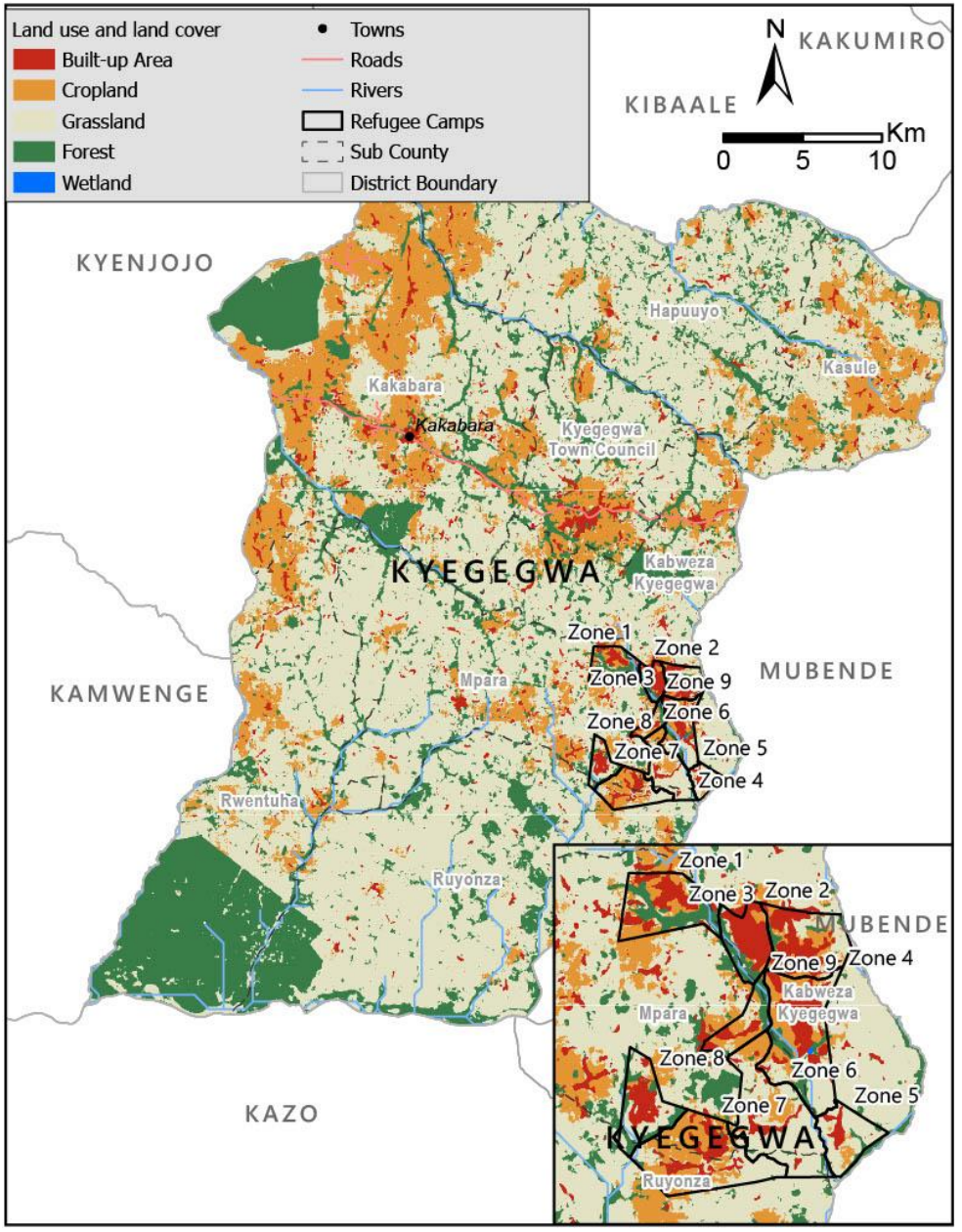
Southern and western sub-counties Mpara, Rwentuha, Ruyonza, and southern Kabweza lie within the *Central and Southern Cattle Cassava Maize Zone* at 1,001–1,300 m, receiving 888–1,121 mm of rainfall. Livelihoods focus on cassava, maize, and cattle production. All Refugee Settlement zones (1–9) fall within this southern zone, at elevations 1,001–1,500 m and rainfall 888–1,317 mm, supporting similar crop-livestock systems for both refugees and host communities.

Variations in rainfall and elevation influence crops and livestock productivity across the district, with northern and central areas favoring coffee and banana, and southern areas better suited for cassava, maize, and cattle. Communities remain vulnerable to climate-related risks, particularly during dry spells.

To strengthen resilience, government and development partners are promoting interventions such as **climate-smart agriculture, improved natural resource management, and livelihood diversification**. These efforts aim to enhance agricultural productivity, reduce environmental pressure, and support sustainable livelihoods for both refugee and host communities in Kyegegwa District.

Environment, Land Use and Land Cover

Kyegegwa District is in the Western Region of Uganda within the Toro Sub-region. The district is characterised by rolling hills, mid-altitude plains, and scattered forested landscapes, with vegetation ranging from natural grasslands to cultivated agricultural land. These **landscapes support a variety of rural livelihoods including farming, livestock grazing, and settlement development**. Over the past decade, the district has experienced growing environmental pressure driven by rapid population growth and expanding land use. The population increased significantly from 281,637 in 2014 to 501,120 in 2024, increasing demand for land, food, settlement space, and natural



Map 3: Map showing Land Use and Land Cover in Kyegegwa District. Source: ESRI land cover map.

resources. The presence of the Kyaka II Refugee Settlement has also contributed to pressure on land and vegetation, as both refugee and host communities rely on agriculture, grazing, and forest resources for their livelihoods.

Rainfall and elevation play an important role in shaping land use and livelihood activities across the district. Most areas of Kyegegwa District lie within moderate elevations, ranging roughly from 1,001 to 1,500 meters above sea level, and receive seasonal rainfall that supports both crop cultivation and livestock keeping. Agricultural productivity in the district remains highly dependent on these rainfall patterns, making communities vulnerable to periods of seasonal drought or irregular precipitation. To meet the demands of the rapidly growing population, land is increasingly being converted from natural grasslands and forests into cropland and settlement areas, placing additional pressure on the district's natural resources and ecosystems

Land use patterns in the district reflect this strong reliance on natural resources. Grassland dominates the landscape, covering about 59% of the district, supporting livestock grazing and mixed farming systems. Forests account for approximately 21%, providing important ecosystem services such as fuelwood, timber, and environmental protection. Cropland covers about 17%, reflecting the central role of agriculture in supporting household food security through crops such as maize, cassava, bananas, and coffee. Built-up areas occupy around 3% of the land, representing settlements, trading centers, and infrastructure associated with population growth. Wetlands are minimal in the mapped area, accounting for approximately 0% of the district's land cover in this assessment.

These **land use patterns highlight the importance of agriculture, grazing, and forest resources in sustaining local livelihoods**. Grasslands and croplands provide the main foundation for livestock rearing and crop production, while forests contribute to household energy needs and environmental stability. However, continued population growth and expanding settlements are increasing pressure on these resources, emphasizing the need for improved land management, sustainable agriculture, and environmental conservation to support long-term livelihoods in Kyegegwa District.

CLIMATE CONTEXT

This section presents an analysis of Kyegegwa District's climate using key indicators. Rainfall and temperatures are examined from both historical records and future climate projections to understand long-term trends and emerging risks and hazards associated with them. The aim is to provide a clear picture of how climate patterns have evolved over time and how they are expected to change in the coming decades, informing both vulnerability profiling and resilience planning.

Rainfall

Kyegegwa District typically experiences a **bimodal rainfall pattern**, characterized by two distinct rainy seasons with moderate to heavy precipitation. The first rainy season occurs from March to May, **with peak rain normally in April**, while the second typically heavier rainy season runs from September to November/ early December, with **peak rainfall often occurring in November**. The driest months are June and July, and the period from December to February. These months record the least amount of rain, historically averaging around 50 mm of precipitation in the form of minimal and sporadic showers. Consistent with these patterns, the dashed line in *Figure 1* shows the long-term average rainfall (1981-2024) in Kyegegwa. **Year-to-year variation** is evident, with 2022, 2023, and 2024 showing different magnitudes and timing of rainfall, when compared against the historical averages. For example:

- 2022: Rainfall departed from the 1981-2024 average. March and April in particular recorded totals above the long-term mean, while January, February, June and July recorded totals below.
- 2023: Rainfall fluctuated around the 1981-2024 average, with February, May, July, August and September experiencing below average precipitation, while March and to a lesser extent November and December recorded above-average totals.
- 2024: Rainfall patterns deviated from the 1981-2024 average, with March, July, and November recording slightly above-average precipitation, while January, February, April, June and September recorded totals below

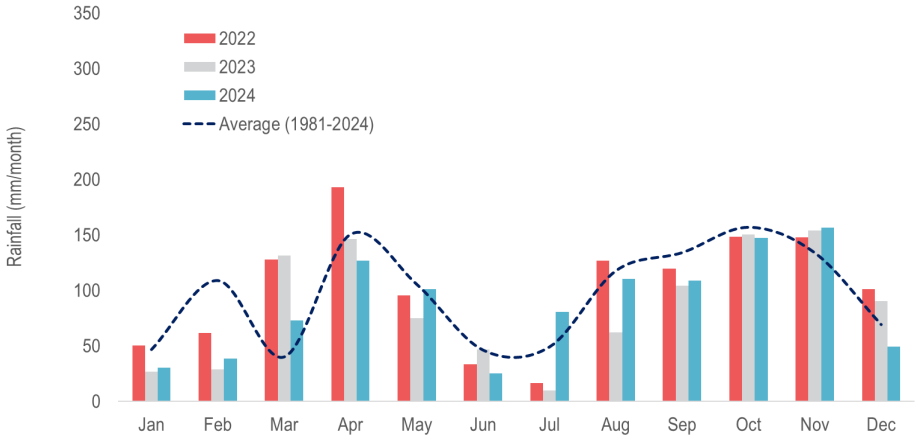


Figure 1: Graph 1 showing Long-term Average Rainfall (2022-2024) in Kyegegwa District.

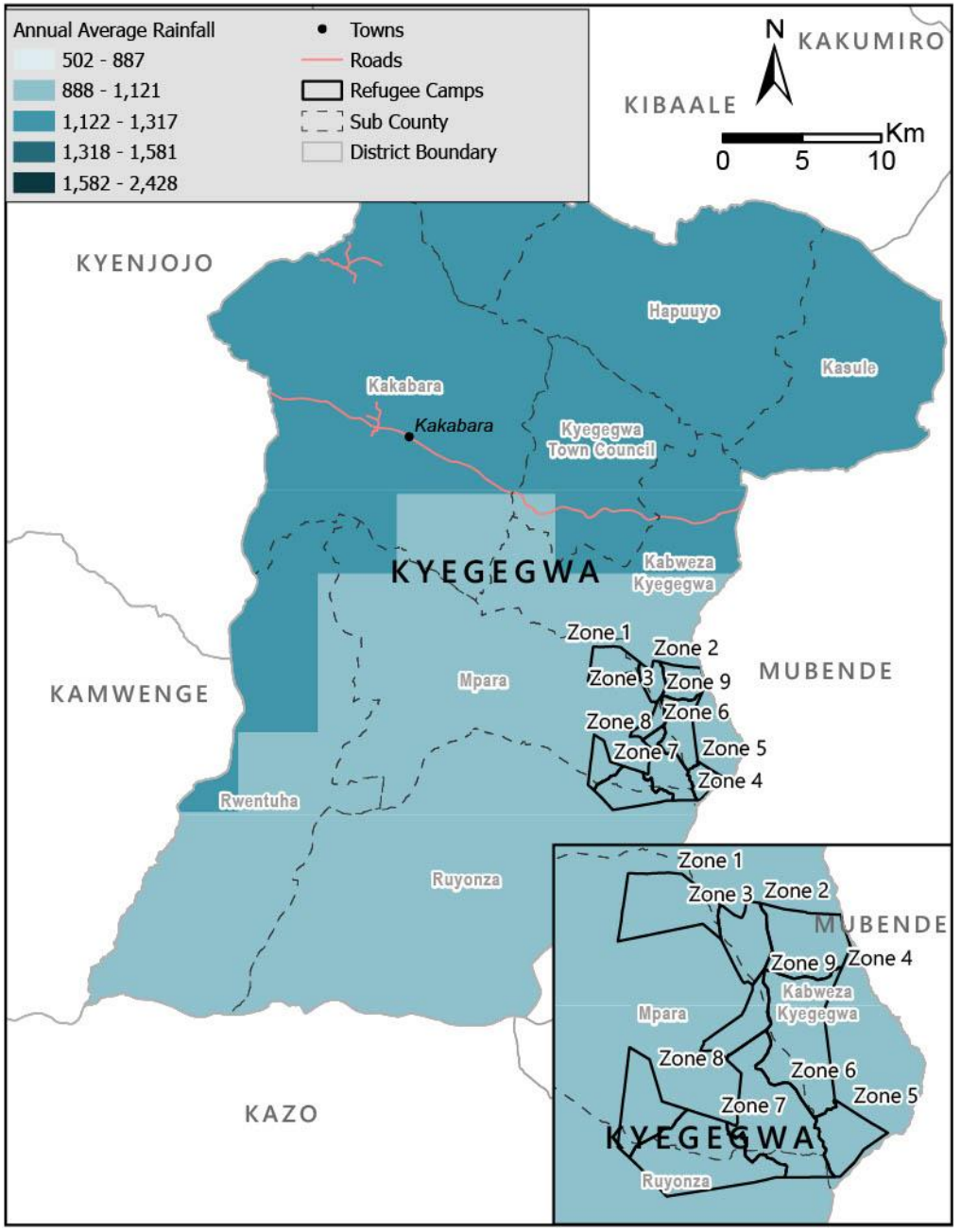
These fluctuations are influenced by climate variability phenomena such as the El Niño Southern Oscillation (ENSO), which can alter the onset, duration, and intensity of seasonal rains. Historically, the El Niño Southern Oscillation (ENSO) typically occurred in an irregular cycle of two to seven years with the individual El Nino persisting for 9 to 12 months. In the recent decades, greater variability in ENSO timing, intensity and impacts are contributing to less predictable rainfall patterns across the region and as a result, Kyegegwa is increasingly vulnerable to both seasonal droughts and flooding. Prolonged dry spells during the two dry seasons (December to February and June to August) lead to water scarcity, crop stress, and pasture depletion. Conversely, intense rainfall events during the two main rainy seasons (March-May and September-November) can trigger flash floods, crop damage, and disruption of transport and livelihoods.

Recent rainfall patterns in Kyegegwa District have become **increasingly erratic and unpredictable, characterized by sharp variations in distribution and shifting seasonal patterns**. While the district typically experiences a bimodal rainfall pattern with peaks from March to May and September to November/December, recent trends indicate that these patterns are less reliable than they used to be, particularly affecting the second rainy season from September to November/December.

The overall **trend moves towards more intense, shorter-duration rain events and less reliable onset of the rainy seasons**. These shifting seasonal patterns have had a negative impact on rain-fed agriculture and rural livelihoods, disrupting planting seasons, reducing yields and leading to crop failures, therein threatening residents' livelihoods. This underscores the urgent need for integrated climate adaptation and resilience strategies to safeguard water availability, food security and sustainable livelihoods.

Map 4 displays the spatial distribution of average annual rainfall across Kyegegwa District for the period 1981-2024, derived from long-term CHIRPS precipitation data. Kyegegwa District straddles the **888-1,121 and 1,318-1,581 mm annual rainfall zones**, with southern and central parts of the region typically experiencing less precipitation and overall drier conditions, particularly during June, July and August.[17] These parts have lower and more unpredictable rainfalls because of their location in a rain shadow zone, sheltered by surrounding higher terrain. Mountains trap the moisture on their windward sides meaning that central and southern Kyegegwa is comparatively dry. **Rainfall in Kyegegwa is generally sufficient in volume for rain-fed agriculture**, with the region typically experiencing near-normal to above-normal rainfall. However, its **reliability** for agriculture is **increasingly compromised by climate variability**, with more erratic, shorter and at times excessively intense and poorly distributed rainfall patterns. Furthermore, specific areas within the district tend to receive below-mean precipitation and are drought-prone.

Similar to trends in neighboring districts, Kyegegwa District experiences increasingly unreliable and unpredictable rainfall patterns, which presents significant challenges to water security, agriculture and rural livelihoods. Seasonal rainfall variability often drives environmental degradation, such as soil erosion, soil nutrient loss and water availability, which in turn disrupts the traditional agricultural calendar, meaning the timing of planting, growing and harvesting. Overall, the increasing variability in rainfall patterns, coupled with the district's reliance on rain-fed agriculture, heightens climate risks for both refugee and host communities. For example, maize, one of the main sources of livelihood in the area, is a highly vulnerable crop: highly sensitive to water stress, maize can suffer significant yield losses after 10-14 days without rain during critical periods like tasseling, silking, and grain filling. During early stages, plants can usually withstand only 3-5 days of no rainfall. During peak dry season in July, intense sunlight and lack of water can scorch maize plants, with severe cases causing entire fields to wither.



Map 4: Map showing Average Annual Rainfall (1981-2024) of Kyegegwa District.

Beekeeping is another common source of income in Kyegegwa.[18] It is a popular and rapidly growing livelihood thanks to its high profitability and minimal land requirements. [19] That said, climate change, primarily in the form of unpredictable rainfall patterns, prolonged dry spells and increasing temperatures, severely affect the foraging environment, negatively impacting on honey production and potential for income.[20] Dry periods reduce bees' activity levels and lead to higher mortality rates. The number of empty hives has increased, with bees abandoning their hives given a lack of nectar and pollen.[21]

The recent changes pose **specific challenges for refugee-hosting areas**. Kyaka II Settlement is highly susceptible to both floods and seasonal droughts, because of climate-related, geographical and human-induced factors. Heavy and unpredictable rainfall can result in flash floods, destroying temporary structures, such as tarpaulins and mud-based shelters. Poor road infrastructure and very limited drainage further compound the situation, allowing water to stand, often damaging sanitation infrastructure and leading to disease outbreaks. The soil's capacity to absorb heavy rain is severely limited due to deforestation and the removal of vegetation cover.[22] In recent years, **environmental degradation has accelerated** given the rising demand for fuel and building materials following an increase in the settlement population. The settlement is now operating at nearly maximum capacity, putting intensifying pressure on natural resources. Refugee communities in Kyaka II are dependent on rain-fed subsistence agriculture and therefore highly exposed to crop failures and the negative impact of climate change. Overall, they are more vulnerable than host communities whose livelihoods are distributed across a wider landscape and diversified through larger landholdings and livestock.

The increasing variability and rapid shifts in the known climatic patterns pose growing risks in Kyegegwa. These shifts influence water availability, crop performance, pasture regeneration and the reliability of rain-fed farming systems that both host and refugee communities depend upon.

Temperature

Over the past four decades, Kyegegwa District has experienced a significant rise in temperatures, with an increase of approximately **2.6°C**, a substantial warming trend for a single district. As shown in the graph in Figure 2 the most pronounced rise has occurred in recent years (2014-2023), simultaneously accompanied by greater **year-to-year variability in temperatures**.

The long-term temperature trend can be summarized as follows:

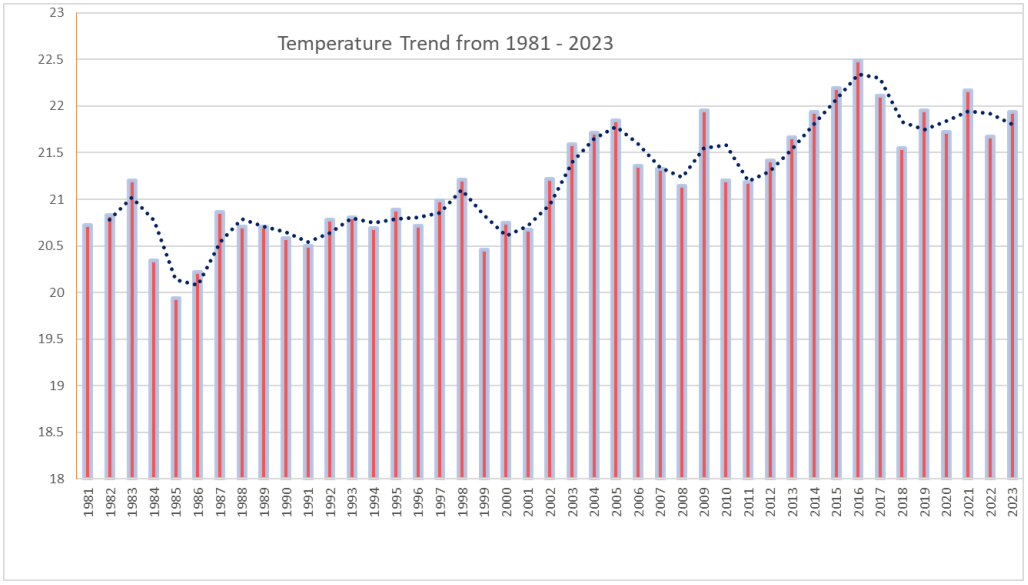


Figure 2: Graph showing the Long-term Temperature Trend (1981-2023) in Kyegegwa District.

- 1980s-2002: Average annual temperatures generally ranged between about 19.9°C and 21.2°C, with some year-to-year variability, particularly in the mid-1980s, where mean annual temperatures dropped as low as 19.9°C in 1985. That said, overall there was no warming trend during this time period.
- 2003-2014: Average annual temperatures increased, with the year 2009 recording average annual temperatures of 22.0°C. Overall, this period is marked by more year-to-year variability and a clearer warming signal.
- 2015 onwards: A clearer warming signal and even greater variability, with average annual temperatures reaching 22.5°C in 2016 for the first time.

The rise in temperatures coupled with greater variability highlights the **growing climate stress in the region**, with implications for agriculture, water availability, health and overall resilience.

In Kyegegwa, the warmer periods generally fall within the first dry season (December to February). **February is often considered one of the hottest months** before the March/Aprils rains start. The graph in *Figure 3* indicates a rise in temperatures, with recent years showing more days where average daily temperatures exceed the long-term mean. This suggests that **hotter-than-normal years are becoming more frequent**, increasing heat stress on crops, pasture, livestock and water resources. These emerging extremes, coupled with rising seasonal temperatures, highlight Kyegegwa District's growing vulnerability to climate-induced heat stress.

The long-term monthly temperature average (2022-2024) shown by the dashed line in *Figure 3* indicates two temperature rises within the rainy season that coincide with crop flowering (May/June and October/November) and crop germination (March/April and August/September).

The recent monthly temperature trend (2022-2024) can be summarized as follows:

- 2022: Monthly temperature in the crop flowering stage was slightly above normal of the long-term average in October.
- 2023: Monthly temperature in the crop flowering stage was slightly above normal of the long-term average in May, June and October.
- 2024: Monthly temperature in the crop flowering stage was generally above normal of the long-term average, particularly in May and June

Above-normal temperatures negatively affect crops at all stages-reducing

- germination by accelerating metabolism, leading to depletion of energy reserves, impairing starch breakdown and causing poor root development before seedlings establish prematurely.
- flowering by hindering pollination, fertilization, and impairing chlorophyll function, thus lowering carbohydrate supply and leading flowers to drop prematurely.
- seed development by reducing carbohydrate and oil accumulation in seeds, resulting in smaller seeds and thus lowering the seed germination potential of harvested seeds.

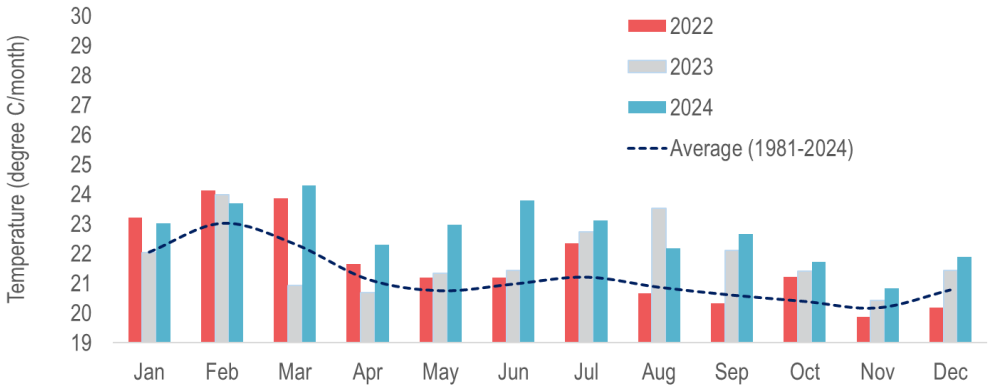


Figure 3: Graph showing Average Annual Temperature (2022-2024) in Kyegegwa District.

In short, heat stress is most damaging during flowering and seed development. Farmers might mitigate heat stress effect through adjusted sowing dates, use of heat-tolerant varieties and irrigation scheduling

CLIMATE CHANGE PROJECTIONS

In this study, bioclimatic variables from WorldClim v2.1, which provide historical high-resolution baseline climate data, such as temperature and precipitation patterns, were compared with future climate projections generated by the UKESM1-0-LL Earth system model under the SSP2-4.5 scenario, a "middle-of-the-road" pathway. Under this scenario, socio-economic development and moderate mitigation policies lead to stabilizing greenhouse gas emissions. This comparison allows researchers to assess how key climatic factors like seasonal rainfall, temperature extremes, and drought indices are expected to shift in coming decades, highlighting potential impacts on ecosystems, agriculture, and water resources under a moderately warming future.

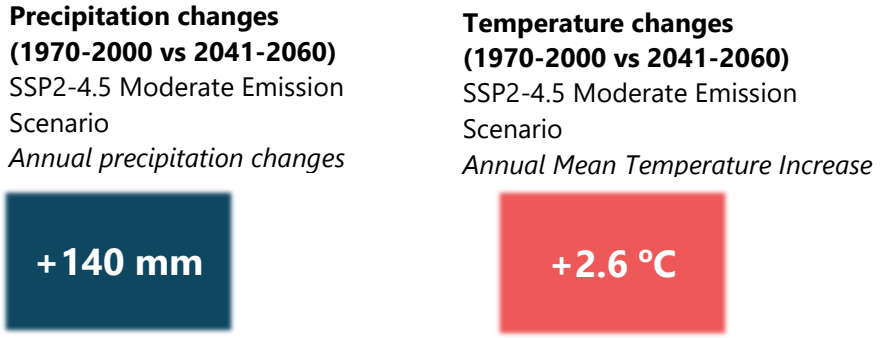


Figure 4: Annual precipitation and temperature changes in Kyegegwa District.

Temperature

Mean annual temperature is projected to rise from **21.2°C** in the historical baseline to **23.8°C** by **2041-2060.** Both minimum and maximum temperatures show substantial increases. The strongest warming (up to **2.63°C**) is expected in **Kigambo, Kakabara and Rwentuha**.

An increase in mean temperature during both the **warmest months (+2.2°C)** and **driest quarter (+2.8°C)** indicates more intense heatwaves particularly during already dry periods. This combination heightens **heat stress for people, crops and livestock, greater evapotranspiration, and reduced soil-moisture retention**.

An increase in mean temperature during both the **coldest months (+2.9°C)** and **wettest quarters (+2.1°C)** indicates a **general warming across seasons**, including periods that are typically cooler. This suggests reduced seasonal cooling and more persistent heat throughout the year.

These impacts pose challenges for **crop production, livestock, and human health** particularly in areas with limited vegetation cover, including parts of Kyaka II Refugee Settlement.

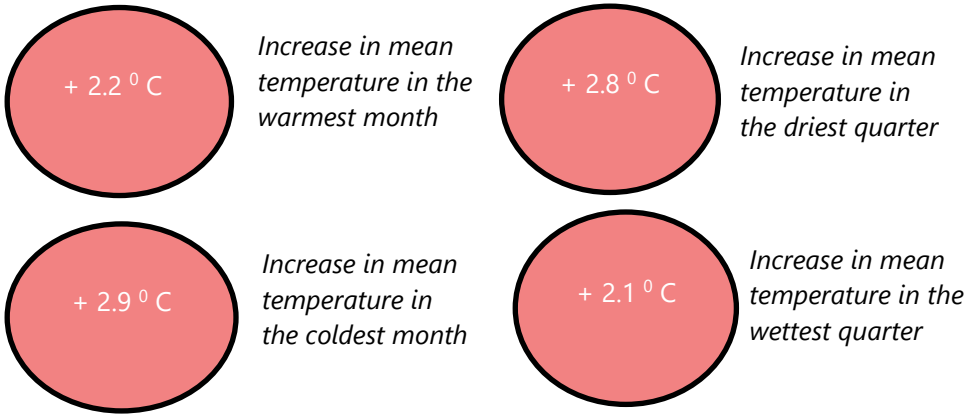


Figure 5: Projected changes in temperature in bioclimatic variables.

Precipitation

Mean annual rainfall is projected to increase from **1,086 mm to 1,226 mm** by mid-century. However, the distribution of rainfall gains is uneven across the district. The largest precipitation increases **(147-149 mm)** are expected in **Kakabara, Kigambo and Hapuuyo** while areas such as **Ruyonza, Rwentuha and Mpara** show smaller increases (128- 138 mm).

An Increase in precipitation of the **wettest month (+8.8 mm)** and **coldest quarter (+54.4 mm)** indicates intensifying rainfall during already wet and cold periods. This may lead to more frequent and intense floods, waterlogging, with potential impacts on agriculture, settlements and access to services.

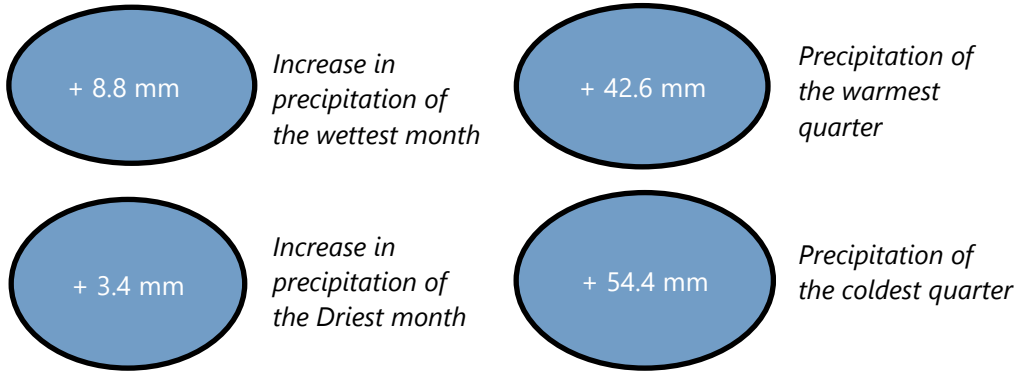
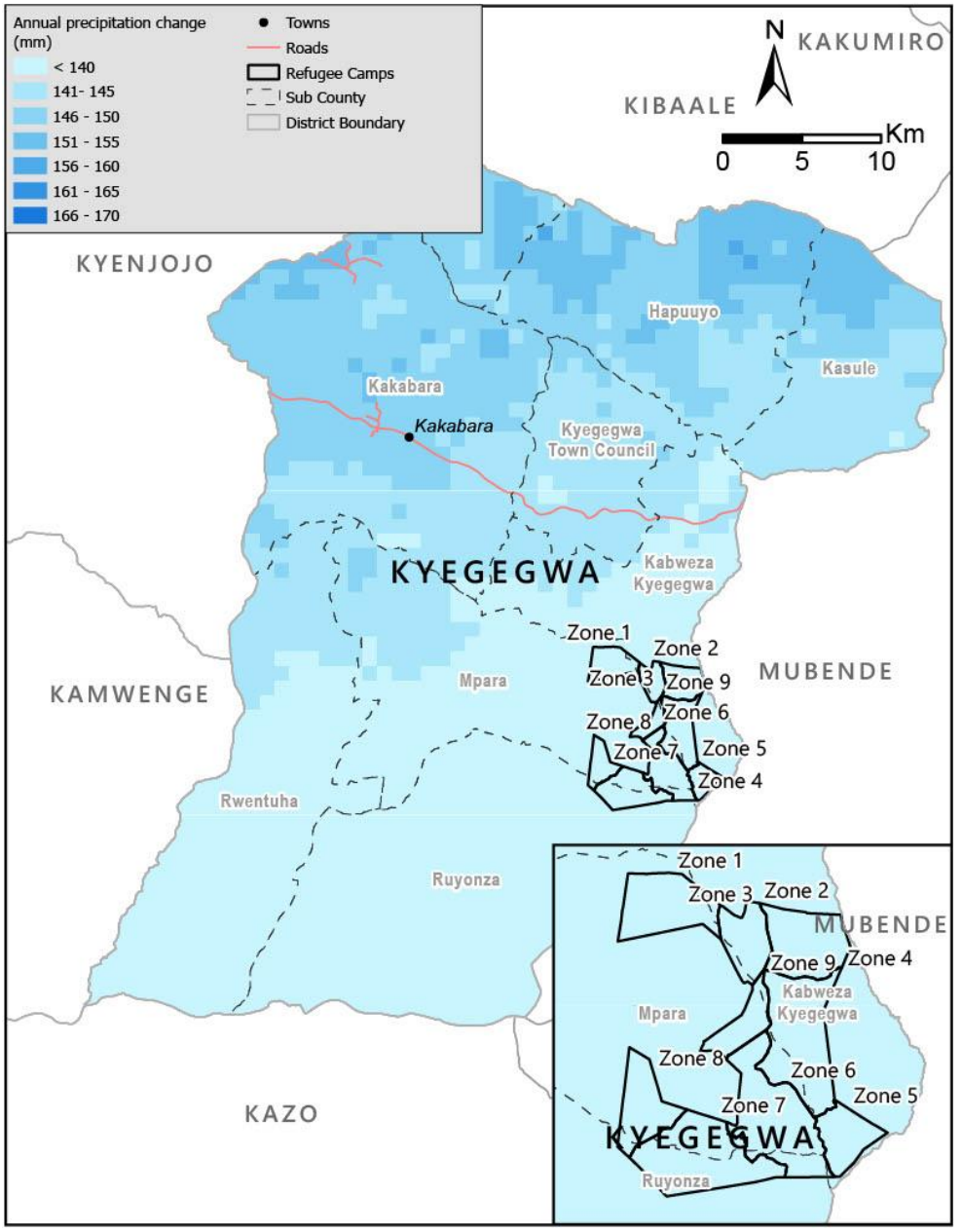


Figure 6: Projected changes in precipitation in bioclimatic variables

An increase in precipitation during the **driest month (+3.4 mm)** and the **warmest quarter (+42.6 mm)** indicates **a shift toward wetter conditions outside the traditional rainy season**, suggesting more evenly distributed rainfall across the year. This means dry-season water scarcity will persist, even under wetter annual conditions. This change **reflects increasing seasonal variability, with implications for agricultural planning, water management, and flood risk during periods that were previously drier or hotter.**



Map 5: Map showing Projected Precipitation Changes from the Baseline (1970-2000) to the Near Future (2041-2060).

Rainfall seasonality also remains largely unchanged, continuing Kyegegwa District's dependence on two distinct rainy seasons. That said, these seasons become increasingly unpredictable in their timing and intensity.

Implications

The combination of rising temperatures, changes in dry-season rainfall, and moderate increases in annual precipitation creates a complex climate-hazard profile for Kyegegwa District. **Increased evapotranspiration may reduce the benefits of higher annual rainfall, limiting improvements in soil moisture and water availability.** Areas with fragile vegetation cover or high settlement density such as Kyaka II refugee settlement are likely to face rising exposure to heat stress, seasonal drought and water scarcity.

Northern Kyegegwa, which already experiences drier conditions, may face heightened vulnerability to climate-related shocks compared to the rest of the district which receives larger rainfall gains. These shifts have significant implications for agriculture, livestock production, water systems, and community resilience.

These projections align closely with broader national and East African climate patterns. According to the Uganda Third National Communication to the UNFCCC[23] and the IPCC Sixth Assessment Report[24], temperatures across Uganda are expected to rise by 1.5-2.5°C by mid-century, while rainfall is projected to increase with greater variability and intensity. The projected warming and rainfall changes observed in Kyegegwa District fall within these ranges, indicating that the district is experiencing climate shifts consistent with regional trends.

This comparison reinforces the need for targeted adaptation measures, as increased rainfall intensity, elevated flood risk, and intensified heat stress may further affect agriculture, water resources, and overall livelihood resilience.

SEASONAL DROUGHT HAZARD ASSESSMENT

Kyegegwa District is **increasingly vulnerable to seasonal drought and erratic weather**, as rainfall patterns have become less predictable and more variable. This undermines the reliability of rain-fed agriculture, something most households depend on. Like many parts of western and central Uganda, farmers here have reported changes in rainfall onset and duration, increased dry spells, and unpredictable precipitation. All of this constrains crop growth and pasture regeneration, increasing climate risk for smallholder farmers.[25] Local vulnerability assessments highlight that climate change and variability are key risks for agricultural production across districts, including in Kyegegwa. This is because subsistence and mixed farming systems dominate livelihoods[26] Kyegegwa's economy is largely agricultural, meaning shifts in rainfall and prolonged dry periods directly undermine food security and household incomes.

These climatic pressures combined with human-linked environmental changes, such as land degradation and resource pressures, are constraining agricultural productivity and heightening the vulnerability of households that depend on farming and livestock as their primary livelihood in both host and refugee communities.

This analysis applies the *Standardized Precipitation Index (SPI),* a precipitation-based indicator that measures precipitation/rainfall anomalies by comparing observed rainfall to historical averages and the *Vegetation Condition Index (VCI)*, an NDVI2 (Normalized Difference Vegetation Index) based indicator that shows crop biomass and vegetation health responses to precipitation anomalies/moisture stress. Together, these indices capture both meteorological drought conditions and their impact on vegetation, providing an integrated understanding of drought occurrence and severity.

Prolonged dry conditions in Kyegegwa District have caused water shortages and stress on crops and pastures, threatening local livelihoods. Communities face acute water scarcity, often shared with livestock, increasing health risks and undermining food security. These challenges highlight the urgent need for long-term investment in seasonal drought preparedness, climate-resilient agriculture, and improved water management to support both host and refugee communities.

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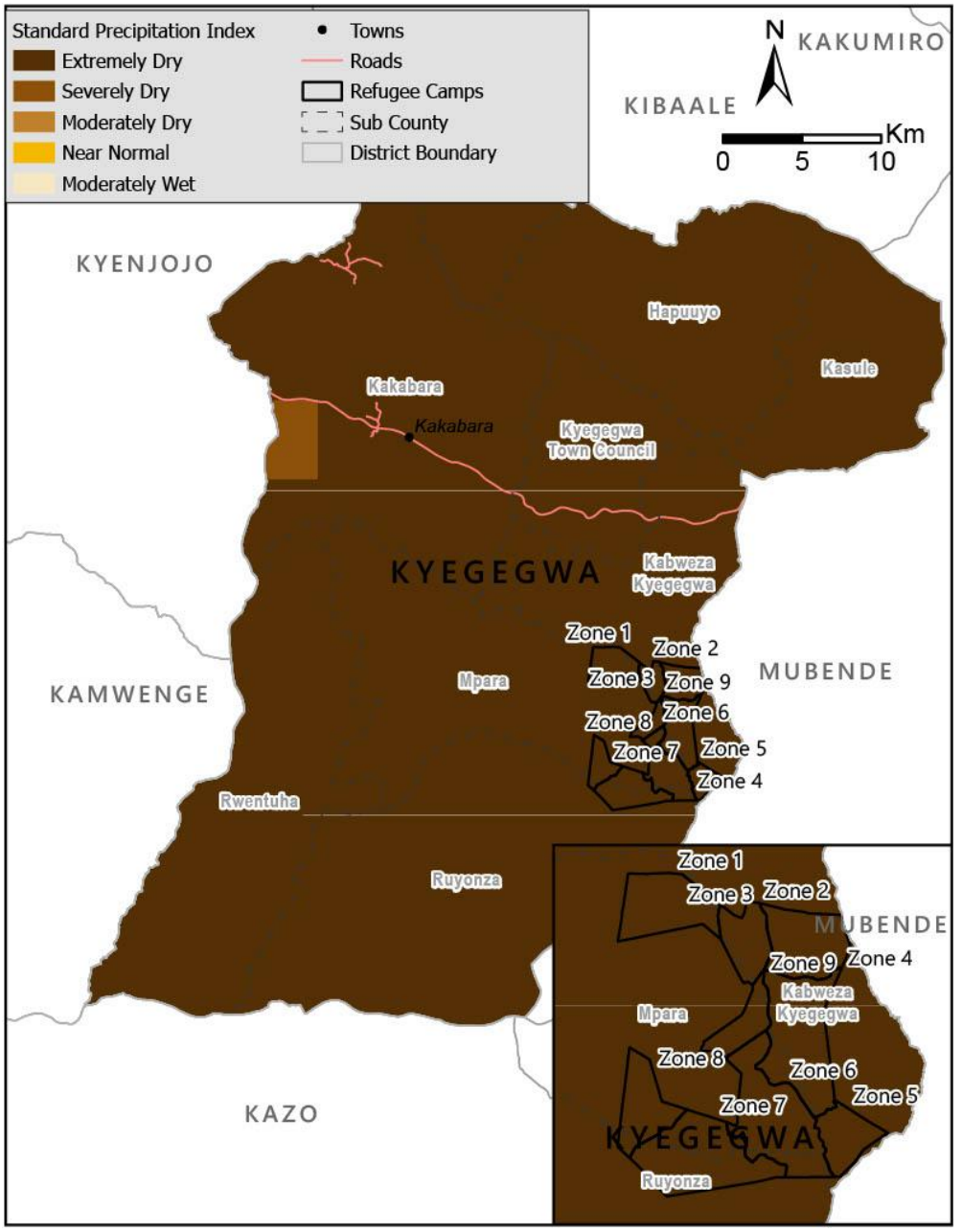


Map 6: Map showing the SPI Index.

SPI Findings

The *Standardized Precipitation Index (SPI)* analysis shows that March–May 2024 was a critical period for assessing seasonal drought, coinciding with the flowering season of first-season crops. In Kyegegwa District, **all sub-counties** including Hapuuyo, Kasule, Kakabara, Kyegegwa Town Council, Mpara, Rwentuha, and Ruyonza experienced **extremely dry precipitation conditions**. The Kyaka II Refugee Settlement also fell within the extremely dry category.

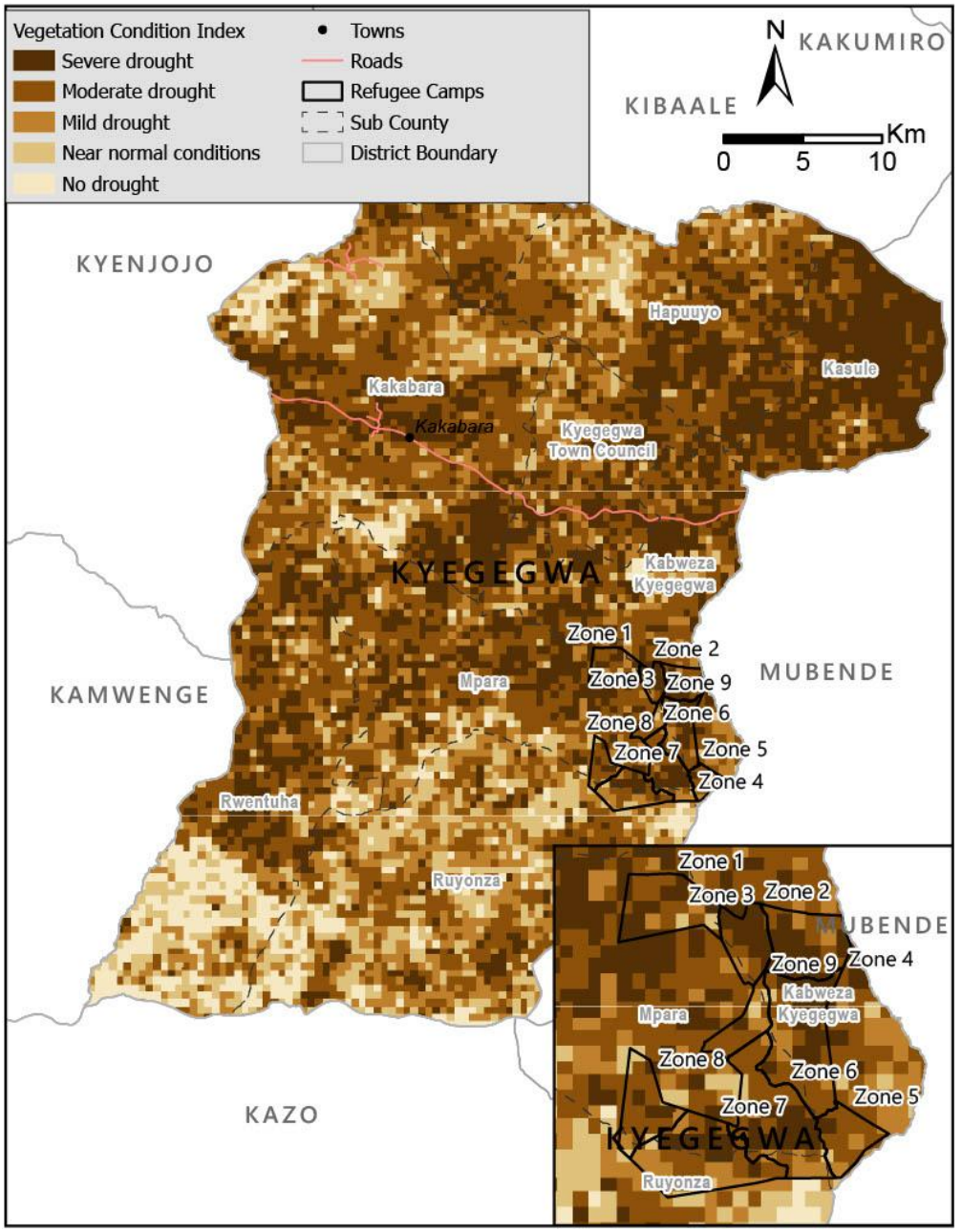
These extremely dry conditions indicate serious impacts on soil moisture, crop growth and yield, pasture regeneration, and water availability, particularly for communities and refugee populations that rely on rain-fed agriculture and livestock. Reduced rainfall during this critical cropping period may lead to lower crop yields, diminished forage for livestock, and increased pressure on domestic and agricultural water supplies, highlighting the vulnerability of both host and refugee communities to prolonged seasonal drought.

VCI Findings

The *Vegetation Condition Index (VCI)* results indicate **widespread vegetation** stress across Kyegegwa District, corresponding closely with SPI-detected rainfall deficits. Grasslands provide the clearest signal of drought severity because they are shallow-rooted and highly sensitive to rainfall variability. Croplands show varying stress depending on crop type, seasonal planting schedules, and land management practices, while forests buffer short-term drought due to deeper root systems and higher biomass. Built-up areas give less reliable signals because of limited vegetation cover.

The **most affected areas, including Hapuuyo, Kasule, Kakabara, Kyegegwa Town Council, Mpara, and the Kyaka II Refugee Settlement**, show severe to moderate vegetation drought, represented by the darker brown tones on the map. These areas combine mid-altitude elevations, rainfall deficits, and intensive land use, including grasslands and croplands, which together reduce soil moisture, limit vegetation growth, and contribute to very poor vegetation health, declining pasture availability, and early signs of crop stress. Forest cover and built-up areas offer limited buffering.

Meanwhile, southwestern parts of Rwentuha and southern Kabweza exhibit moderate to mild vegetation stress, indicating relatively better environmental performance. Localized higher rainfall and remaining forest cover help sustain vegetation, although



Map 7: Map showing the VCI Index.

cropland expansion and human activity continue to exert some pressure. The *VCI Map* demonstrates a clear gradient of vegetation drought from the heavily stressed northern, central, and refugee settlement zones to the moderately affected southern and western areas.

These findings illustrate that vegetation health across much of Kyegegwa District was significantly constrained during this period, particularly in areas with intensive land use and settlements. This has important implications for croplands, grazing areas, and the livelihoods and food security of both refugee and host communities, especially within the Kyaka II Refugee Settlement, highlighting the need for climate-smart agriculture, improved natural resource management, and livelihood diversification.

Implications

The combined SPI and VCI analyses for Kyegegwa District highlight the **significant impact of seasonal drought on both vegetation and livelihoods**. Northern sub-counties, including Hapuuyo, Kasule, and Kakabara, fall within the *Midwest Victoria Crescent Robusta Coffee Banana Maize and Cattle Zone*, while central and southern sub-counties, including Kyegegwa Town Council, Mpara, Rwentuha, and Ruyonza, lie within the *Central and Southern Cattle Cassava Maize Zone*. **All these areas exhibit extremely dry SPI conditions and severe to moderate vegetation stress, indicating high vulnerability during periods of rainfall deficit.**

In 2024, erratic rainfall and extended dry periods during the critical March–May cropping season disrupted crop growth and reduced soil moisture availability across Kyegegwa District. Farmers in northern sub-counties, growing coffee, bananas, maize, and cassava, and those in central and southern sub-counties, focusing on maize, cassava, and cattle, report below average yields for these staple and cash crops. These conditions directly mirror the combined SPI and VCI findings, resulting in lower food availability, diminished household incomes, and weakened resilience among both host and refugee communities, particularly within the Kyaka II Refugee Settlement.

The implications extend beyond crop production. **Persistent soil moisture deficits, degraded vegetation cover, and pressure on grazing and water resources reduce the district's capacity to cope with future climatic shocks.** These pressures are particularly acute within the Kyaka II Refugee Settlement, where population density and dependence on natural resources amplify seasonal drought impacts. The findings underscore the urgent need for climate-smart agriculture, sustainable water management, and improved natural resource practices to safeguard livelihoods.

From a preparedness and response perspective, the findings highlight **the need for early warning systems, climate-smart farming, water harvesting and storage, and improved management of natural resources.** Incorporating SPI and VCI monitoring into district-level planning can support evidence-based decision-making, provide timely alerts during seasonal drought events, and guide more effective allocation of resources for both immediate relief and long-term climate resilience in Kyegegwa District.

Photo 1: Dry spell in Kyegegwa, Business focus Photo Credit; Taddewo William Senyonyi

In June 2025, farmers in Kyegegwa District and neighboring western Uganda districts experienced intermittent showers and thunderstorms, marking the gradual establishment of the first rainfall season. Rainfall remained unpredictable, affecting crops like maize, beans, and coffee, while limited irrigation options made planting challenging. Agricultural experts recommended soil testing, proper fertilizer use, and crop insurance to reduce risks.
Rainfall is expected to stabilize by mid-June in most districts, with near-normal to slightly above-normal totals anticipated for the season.

Source: Dry Spell To Run Up to Mid-August Over Most Parts of Uganda As Detailed Breakdown Of Forecast By District Revealed » Business Focus

FLOOD HAZARD ASSESSMENT

Flood susceptibility refers to how likely an area, community, or system is to experience harmful impacts from flooding, based on physical, environmental, and socio-economic factors. Several factors determine how an area exposure to flood is ranked from low to high. These factors include hydrological (e.g. intensity and duration of rainfall), geographical (proximity to rivers, soil type, and topography), land use and community livelihood types.

For this assessment thirteen indicators were analysed by ranking into five score levels to flood risk. The score rank of the thirteen indicators was summed and ranked into three levels of risk.[27]

1. Distance to Permanent water ranked from higher risk to lower risk at 100 meters, 250 meters, 500 meters, and 750 meters.[28]
2. Elevation above sea level ranked from higher risk to lower risk at 600 meters, 700 meters, 800 meters, and 1000 meters.[29]
3. Slope of the area in degrees ranked from higher risk to lower risk at 2, 5, 10, 15.[33]
4. Landcover from higher risk to lower risk as built-up, cropland (including water, flooded vegetation), grassland, shrub and forest.[30]
5. Topographic Position Index ranked from higher risk to lower risk at -8, -6, -4, -2, 0.
6. Normalized Difference Vegetation Index (NDVI) ranked from higher risk to lower risk at 0.2, 0.4, 0.6, 0.8.[31]
7. Normalized Difference Water Index (NDWI) ranked from higher risk to lower risk at 0.6, 0.2, -0.2, -0.6.
8. Flood Return period ranked from higher risk to lower risk at 10 years, 20 years, 50 years, 100 years, 200 years.[32]
9. Rainfall Intensity as average maximum annual rainfall ranked from higher risk to lower risk at 33 mm, 31 mm, 29 mm, 27 mm.[33]
10. Monthly Number of Days with Rainfall ranked from higher risk to lower risk at 13 days, 10 days, 7 days, 3 days.[34]
11. Frequency of -days with continuous Rainfall ranked from higher risk to lower risk at 2, 1.2, 0.8, 0.4.[35]
12. Height Above Nearest Drainage (HAND) ranked from higher risk to lower risk at 2 meters, 5 meters, 10 meters, 20 meters.[36]
13. Soil texture ranked from higher risk to lower risk with (clay, clay loam, silty loam), (silty clay, silty clay loam), (sandy clay, sandy clay loam), (loam, sandy loam), (loamy sand, sand).[37]

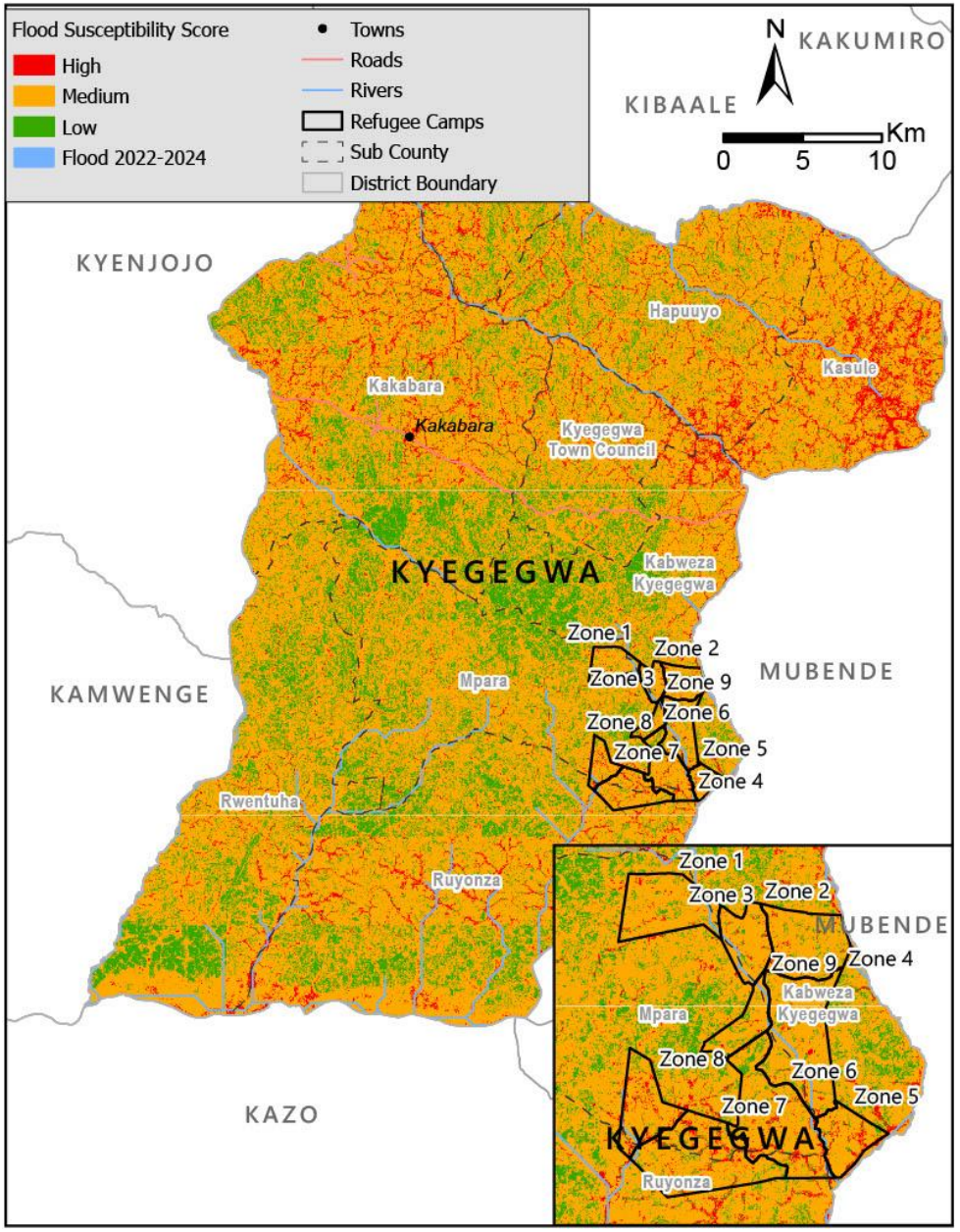
Flood susceptibility mapping relies on integrating multiple environmental, hydrological, and climatic indicators to assess risk levels. Recent literature emphasizes that parameters such as proximity to water bodies, elevation, slope, land cover, vegetation indices, and rainfall characteristics are critical determinants of flood vulnerability. Studies highlight that areas closer to permanent water sources, with low elevation and gentle slopes, are more prone to inundation. Similarly, built-up and cropland land covers tend to amplify flood risk due to reduced infiltration capacity, while vegetation indices (NDVI, NDWI) provide insights into soil moisture and vegetation health, which influence runoff and water retention. The inclusion of topographic indices like HAND and TPI further refines susceptibility mapping by capturing micro-topographic variations that affect drainage and water accumulation

Hydro-climatic indicators such as rainfall intensity, frequency of continuous rainfall days, and flood return periods are equally vital in flood risk assessment. Literature shows that extreme rainfall events, particularly when sustained over consecutive days, significantly increase flood hazards. Soil texture also plays a crucial role, with clay-rich soils exhibiting lower infiltration rates and higher runoff potential compared to sandy soils. Integrating these thirteen indicators into a composite scoring system aligns with established frameworks that rank susceptibility into multiple risk levels. Such multi-criteria approaches are widely recommended because they capture the complex interplay between terrain, hydrology, and climate, thereby improving the accuracy of flood hazard mapping and supporting disaster risk reduction strategies.

Findings

Several geographic and infrastructural factors exacerbate flood risks in the district. Kyegegwa District has a complex gently sloping landscape. In some areas the terrain is flat, while in other areas there are hilly sections, acting like a water divide to the northwest and southern part. The district also has a diverse range of sandy to sandy-clay soils, and natural drainage infrastructure supporting water infiltration and increasing surface runoff, particularly in low-lying areas and along seasonal streams and permanent rivers like Muzzi, and Katonga. **Kyegegwa is considered to have a relatively low flood risk, thanks to its landscape and river network.**

Satellite-based assessments reveal that 6.8 % of Kyegegwa District falls in high-risk flood areas. Its hilly terrain with deep valleys makes it prone to flash floods. **Kakabara, Hapuuyo, Kasule and Ruyonza Sub-counties *(Map 8*) fall within high-risk flood zones**. However, there were no more than two major reported flash and riverine flood incidences in 2018 and 2020. Their vulnerability stems from low elevation and proximity to seasonal river channels. Within the Kyaka II Refugee Settlements, areas near streams and wetlands are more susceptible to water logging and flash floods due to low elevation, downstream position and low forest cover. These zones are within areas affected by deforestation, land clearing for agriculture, and pressure on wetlands, which accumulates runoff during peak rainfall periods. This results in damage to access roads, bridges, shelters, and latrines. Such events disrupt humanitarian operations and pose significant public health risks, including water contamination.



Map 8: Map of Kyegegwa District showing Flood Susceptibility (2022-2024)

Risk on Cropland and Settlement

The land cover analysis revealed that grassland covers 58.8%, forest 20.8%, built-up areas 3.3 % while cropland covers 17.2 %. 10.9% of cropland falls within the high-risk flood zone. For build-up areas, the corresponding figure is 13.5%. Built-up areas emerge as the most affected by flooding when measured in terms of areas inundated compared to cropland. However, these estimates represent district-wide averages and therefore conceal substantial spatial concentration of impacts at local levels.

The *Land Use and Landcover Map* in *Map 3* shows that cropland cells are distributed in the northwestern, central and eastern part of the district, falling within low to high-risk flood zones, pointing to selective exposure for households cultivating around floodplains and poorly drained depressions. For households that encroached into wetlands, waterlogging can result in crop damage, delayed planting, and yield losses, likely contributing to income losses and seasonal food insecurity. **Built-up areas, which overlap with cropland around Kyaka II Refugee Settlement, are within medium- to high-risk flood zones.**

The flooding trend corresponds with periods of above-average rainfall and seasonal river overflow between March-May and September-November, implying a strong link between climatic variability and local hydrological responses. Additionally, expanding settlement and land-use changes, especially around refugee-hosting areas, have contributed to reduced infiltration and increased runoff, thereby amplifying flood recurrence.

Flood Impacts

Flooding in Kyegegwa District has had **multidimensional socio-economic and environmental impacts.** That said, **flooding is highly localized, primarily affecting the southeastern and northwestern parts of the district,** mostly along wetlands, rivers and streams. In these areas, inundations have led to damage of crops and agricultural land, disrupting food production and household income for both host and refugee communities who encroached into wetlands. Access roads and footpaths in flood-prone areas become impassable during heavy rainfall causing bridge failure, affecting mobility and access to markets, schools, and health facilities. Floods have also contaminated water sources and damaged sanitation facilities, increasing the risk of waterborne diseases.

Photo 2: Floods in Kyegegwa and Kitagwends Districts in December 2022. Photo credit: Alex Ashaba

In December 2022, heavy rainfall in Kyegegwa District severely damaged critical infrastructure, paralyzing transport in the affected areas. Roads impacted included Kakabala-Kigambo, and Hapuuyo-Kyegegwa road.

Continuous flooding made it difficult for locals to cross bridges, including Kaija bridge. Other bridges were swept away entirely so that makeshift structures had to be constructed for locals to be able to cross rivers.

The impact of the torrential rainfalls was worsened by the bad state of roads and bridges, with many due for re-construction or maintenance work.

Source: Heavy rain cuts off roads in Kyegegwa, Kitagwenda | Monitor

Environmentally, repeated flooding contributes to soil erosion, sedimentation of streams, and loss of vegetation cover, which further degrade the natural drainage systems and exacerbate future flood risk. Socially, households in persistently flooded areas often face temporary displacement, loss of shelter, and heightened vulnerability due to inadequate infrastructure and limited adaptive capacity. These cumulative impacts underline the **urgent need for integrated flood management, infrastructure improvement, and community-based adaptation strategies to enhance resilience in flood-affected areas in Kyegegwa District.**

Conclusion

The findings of this geospatial analysis highlight the substantial influence of climate-related hazards on both refugee and host communities in Kyegegwa District. Over the assessment period, the district has experienced prolonged seasonal drought conditions and recurrent localized flooding, which together **pose major risks to agricultural productivity, cattle farming, water availability, and settlement infrastructure.** The SPI and VCI analyses reveal widespread vegetation stress and rainfall deficits
Flood mapping indicates high exposure in Kakabara, Hapuuyo, Kasule and Ruyonza Sub-counties. These findings underscore the growing climate vulnerability of Kyegegwa District, emphasizing the need for targeted adaptation measures including improved water resource management, resilient agricultural practices, and settlement planning to safeguard livelihoods and enhance resilience for both refugee and host populations.

Methodology Overview

The climate hazard assessment for Kyegegwa District used a combined geospatial, remote-sensing, and climate-modelling approach integrating historical baselines, future projections, and hazard-specific analyses. Historical climate conditions (1970-2000) were derived from WorldClim v2.1 using BIO1 (Annual Mean Temperature) and BIO12 (Annual Precipitation), clipped to the district and summarised through spatial and statistical analysis. Future projections for 2041-2060 were obtained from the UKESM1-0-LL model[38] under the SSP2-4.5 scenario, processed using the same bioclimatic variables to ensure comparability with the historical baseline.[39]

Drought assessment followed UN-SPIDER protocols[40], using SPI calculated in Google Earth Engine (GEE)[4142] from CHIRPS rainfall data[43] (2014-2024) and VCI derived from NDVI time-series to measure vegetation stress. Agricultural and rangeland areas were manually delineated to improve spatial accuracy, and VCI classification followed Kogan (1995) standards.[44] Outputs were visualized and analysed in ArcGIS.

Flood mapping was conducted using Sentinel-1 SAR imagery processed in GEE to identify inundation for 2022-2024.[45] Annual flood layers were imported into ArcGIS, where raster summation generated a districtwide flood-frequency map. Together, the historical and projected climate datasets, SPI-VCI drought indicators, and multi-year flood mapping provide an integrated picture of climate hazards affecting both host communities and the Kyaka II refugee settlement in Kyegegwa District.

Limitations

The assessment primarily relied on remote-sensing and global climate datasets, which, while widely used, may not fully capture localized micro-climatic variations or ground-level conditions affecting vulnerability. Community-level vulnerability indicators such as coping capacity, water access constraints, and infrastructure fragility were not systematically integrated due to limited available data. Field verification of drought and flood extents was not conducted, though the satellite image processing followed established and validated UN-SPIDER protocols.

Further background information can be found in the Climate Risk Profiles for Refugee-Hosting Districts in Uganda Terms of Reference (TOR).

Note on Data Sources

Historical climate estimates in this report use both WorldClim (1970-2000 climatology) and ERA5-Land (1981-2024 reanalysis). These datasets use different observational networks, spatial resolutions and interpolation/assimilation methods and consequently report slightly different estimates of mean annual temperature for Kyegegwa (WorldClim ≈ 25.7°C for 1970-2000, ERA5-Land ≈ 24.7°C for early 1980s-2000). These differences are within the expected uncertainty range for gridded climate datasets and do not affect the overall interpretation of a warm tropical baseline and a clear recent warming trend. All historical temperatures in this report should therefore be understood as approximate values in the mid-20s (around 25-26°C) rather than exact point estimates.

To view/access the Climate Hazard Analyses for any of the following districts:

- Adjumani District
- Koboko District
- Yumbe District
- Terego District
- Madi Okollo District
- Lamwo District
- Obongi District
- Kyegegwa District
- Kiryandongo District
- Kamwenge District
- Kikuube District
- Isingiro District

Kindly click this link below to explore the full series available on the Resource Centre:
Resource Centre | Impact

Definitions

Hazards: A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation.[46]

Flood: The overflow of water onto land that is normally dry, resulting from the temporary inundation of areas due to factors such as intense or prolonged rainfall, river overflow, surface runoff, or failure of water control structures. Floods can vary in scale and duration and may cause damage to infrastructure, livelihoods, ecosystems, and human health.[47]

Flood Susceptibility: The likelihood of flooding occurring in an area based on physical, environmental, and climatic factors such as topography, rainfall intensity, and proximity to water bodies.[48]

Seasonal Drought: A temporary period of below-average rainfall within a specific season, resulting in soil moisture deficits and vegetation stress, particularly during critical agricultural periods.[49]

Meteorological Drought: A period of abnormally dry weather sufficiently prolonged to cause a serious hydrological imbalance, typically defined by a lack of precipitation relative to the long-term average[50]

Exposure: The situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas.[51]

Risk: The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity.[52]

Water Stress: Water stress occurs when the demand for water exceeds the available amount during a certain period or when poor quality restricts its use. Water stress causes deterioration of freshwater resources in terms of quantity (aquifer over-exploitation, dry rivers) and quality (eutrophication, organic matter pollution, saline intrusion).[53]

Disclaimer

This report provides an evidence-based overview of climate trends, hazards, and projected impacts in Uganda's refugee-hosting districts to support informed planning and decision-making. The analysis draws on historical climate datasets, remote sensing products, and modeled projections, all of which are subject to inherent uncertainties, assumptions, and methodological limitations.

The drought assessment presented in this report focuses primarily on seasonal drought conditions, using indicators such as the Standardized Precipitation Index (SPI) and the Vegetation Condition Index (VCI). These indicators capture short- to medium-term rainfall deficits and vegetation stress within specific seasons and should not be interpreted as representing long-term or permanent drought conditions.

Accordingly, the findings should be considered indicative rather than definitive, particularly at localized scales, where microclimatic variability, environmental conditions, and socio-economic factors may differ. While every effort has been made to ensure data accuracy, this report does not replace site-specific assessments or field verification.

The views expressed herein do not necessarily reflect those of any government, organization, or funding partner. This report should not be used as the sole basis for policy, investment, or operational decisions without further contextual analysis and validation.

Users are encouraged to complement these findings with local knowledge, stakeholder consultation, and additional data sources when designing interventions or resilience strategies.

In case of questions, feedback, or requests for tailored, area-specific remote-sensing products, kindly contact uganda@reach-initiative.org.

Endnotes

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30 NASA Shuttle Radar Topography Mission Global 1 arc second V003 – NASA Earth data
31 World Resources Institute - Research for People & Planet
32 sentinel.esa.int
33 European Commission - Joint Research Centre Data Catalogue - Global river flood hazard maps
34 CHIRPS: Rainfall Estimates from Rain Gauge and Satellite Observations – UC Santa Barbara
35 CHIRPS: Rainfall Estimates from Rain Gauge and Satellite Observations – UC Santa Barbara
36 CHIRPS: Rainfall Estimates from Rain Gauge and Satellite Observations – UC Santa Barbara
37 Yamazaki Lab – Global Hydrodynamics Lab

ABOUT REACH

REACH Initiative facilitates the development of information tools and products that enhance the capacity of aid actors to make evidence-based decisions in emergency, recovery and development contexts. The methodologies used by REACH include primary data collection and in-depth analysis, and all activities are conducted through inter-agency aid coordination mechanisms. REACH is a joint initiative of IMPACT Initiatives, ACTED and the United Nations Institute for Training and Research - Operational Satellite Applications Programme (UNITAR-UNOSAT).

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