



HOUSEHOLD COPING STRATEGIES FOR WATER SCARCITY IN LUWERO DISTRICT, UGANDA: EVIDENCE FROM QUALITATIVE SECONDARY DATA

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ABSTRACT

Introduction: Water scarcity poses a significant challenge to socio-economic development and public health, particularly in Sub-Saharan Africa. This study presents the experiences of households facing water scarcity in Luwero District, Central Uganda.

Methods: This was a desk research study that collected and synthesised secondary data to examine the drivers, lived experiences, coping mechanisms, and potential interventions to address the challenges caused by water scarcity in households in Luwero District, Uganda.

Results: Findings reveal that climate variability, environmental degradation, inadequate infrastructure, rapid population growth, and weak governance systems collectively intensify shortages of water at the household level. Water availability is characterised by moderate coverage, albeit with significant spatial inequalities, unreliable supply systems, and heavy dependence on boreholes, with many households facing persistent challenges in accessing safe and sufficient water. Water scarcity has notable implications for gendered labour burdens, agricultural productivity, and health outcomes, especially waterborne diseases. The study recommends integrated water resource management, infrastructure development, community-led conservation, and strengthened governance. This article contributes to existing literature by providing a localised synthesis of water scarcity grounded in current policy, environmental, and socio-economic evidence.

KEYWORDS: Water scarcity, Water access, Climate change, Luwero District, and Water pollution.

1. INTRODUCTION

Water resources account for more than 70% of the Earth's surface, yet only 3% of it is fresh and suitable for human consumption without processing. As observed by Shemer et al. (2023), having access to fresh and high-quality drinking water is essential for human life, food production, industry, and nature. According to the World Health Organisation, the major sources of freshwater include surface water, which is in the form of rivers, lakes, dams, and streams (WHO, 2025). As the global population increases, the requirement for fresh, clean water withdrawal also increases to sustain life, and that is partly why its access and conservation is a growing concern.

Water scarcity refers to a state of lack of sufficient water for human and animal consumption or inadequate safe water supplies to meet human needs. It can also be defined as a lack of sufficient available water resources to meet the demands of water usage within a region (Food and Agriculture Organisation,

2022; UNU-INWEH, 2024). Per United Nations definitions, when annual water supplies drop below 1,000 m³ per person, the population faces water scarcity, and below 500 cubic metres, absolute scarcity (UNU-INWEH, 2024). There are basically two types of water scarcity experienced by various people, that is, physical and economic scarcity (Ingrao et al., 2023). The former refers to a real lack of natural water, or fresh water, due to natural factors such as drought. As for economic scarcity, the water is physically available, but people cannot access or afford it due to a lack of infrastructure or money to pay for it, where it is sold.

Closely related to water scarcity is water security, which largely focuses on the reliability and management of water supplies adequate to meet the demands of the current and future generations. According to the World Resources Institute (2020), water security includes aspects of managing pollution, drought, and floods. Another term is water stress, which refers to the situation when the water demand exceeds the amount of water available to a given population (Robinson & Kadoma, 2023).

Despite progress toward achieving the United Nations Sustainable Development Goal 6—the goal of water and sanitation for all by 2030—an estimated 785 million people worldwide still lack basic water access in their homes (UNESCO, 2019). A lack of reliable water access hinders essential practices like drinking and cooking (Rosinger and Brewis, 2020); causes physical ailments such as dehydration, injury, and diarrhoea (Adams et al., 2020); triggers stress, anxiety, and mental health problems (Brewis et al., 2019); and impedes basic hygiene practices—such as frequent and thorough hand-washing—that are essential to good health and disease prevention. However, the freshwater that we drink, bathe and irrigate our gardens is incredibly scarce and continues to be so due to many factors. Only 3% of the world's water is fresh, and two-thirds of that is tucked away in frozen glaciers or otherwise unavailable for our use (<https://www.worldwildlife.org>).

Global water scarcity represents a long-term challenge to the survival of humans. More than 40% of the population experiences water scarcity, with over 700 million people lacking access to clean drinking water. Approximately 50% of human-generated wastewater is discharged directly into rivers or oceans without any treatment, causing severe environmental and health consequences (He et al., 2021; UN-Water, 2023). The lack of safe and reliable drinking water may lead to desertification, forced migration, hunger, diseases, and domestic or regional conflicts. For instance, the Atatürk Dam on the Euphrates River has enabled extensive irrigation within Turkey, while reducing water quantity and quality in Iraq and north-eastern Syria. It is important to note that the impact of



water scarcity in developing countries is more challenging than in developed countries. To create a sustainable water infrastructure, the focus should be on conservation, protecting water sources, and limiting pollution (UNESCO, United Nations World Water Development Report 2023; Partnerships and Cooperation for Water, 2023; Kibaroglu, 2013).

Water scarcity in Africa is one of the continent's most pressing challenges, affecting over 400 million people and threatening livelihoods, health, and economic growth. As the world's second-largest continent, Africa holds vast water resources, yet uneven distribution, climate change, and human factors create severe shortages. This crisis is not just about dry taps; it is a barrier to development, fuelling conflicts and poverty. Water scarcity in Africa stems from a mix of natural, environmental, and human-induced factors (Akao et al., 2025; Odoh & Ezealaji, 2024). While the continent receives significant rainfall in some regions, others face chronic dryness. As reported by Turyasingura et al. (2023), irregular rainfall in sub-Saharan Africa affects water quality and quantity by giving the water a muddy, acidic, and turbid appearance. Global trends exacerbate this, for example, climate change and variability, population growth and urbanisation, poor water management and infrastructure, and environmental degradation among others (UNESCO, United Nations World Water Development Report 2023; Partnerships and Cooperation for Water, 2023).

Uganda has many water sources fit for human use. These sources include lakes, rivers, and streams as well as many inland wetlands. The country also boasts of hosting a big share of Lake Victoria, which is considered the world fresh water lake. Water resources are crucial for the socio-economic development of citizens and make a huge contribution to efforts geared towards poverty eradication (Omuna et al., 2024). There are concerns that the country's water resources are being depleted at a fast rate. For instance, the National Development Plan IV states that Uganda is moving from a 'situation of water abundance to a situation of water scarcity' (Page 149), but on the other hand emphasises the importance of water by referring to water 211 times.

Luwero District lies in central Uganda, North of Kampala. The district's landscape comprises a mix of savanna, smallholder farms and peri-urban settlements. It relies on a mix of groundwater (boreholes and springs), protected springs, shallow wells and piped systems for domestic water supply. The district has experienced agricultural intensification in some areas, population increases, and intermittent changes in rainfall patterns that have affected water availability for both household use and crop production. According to the Ministry of Water and Environment (MWE) district database, Luwero has roughly 1,326 domestic water points serving a population of about 354,508 (majority rural), with a non-trivial number of points non-functional for extended periods a clear marker of service fragility. Local reporting has documented repeated episodes of "dry taps" in Luwero town and interruptions caused by power outages and infrastructure works. These facts frame the district as suitable for a mixed technical and governance approach to solving scarcity (MWE, 2025).

Water is the basic necessity of every human being. Water scarcity and water security are great concerns in Uganda today given the state of climate change. Water security is so crucial that it contributes to the overall well-being of the community and thus, according to the global biodiversity standard, water sources should be given utmost attention (Bartholomew et al., 2024). The problem has become so severe that in many villages surrounding, the groundwater has almost dried up and people have to depend on water supply from other sources. In addition, water is one of the most misused natural resources that we still waste. It is the central point of our lives, but unfortunately, not our primary concern. Earlier, people understood the value of water and planned their lives around it. Moreover, many civilisations were born and lost around water, but today, in spite of having knowledge, we still fail to understand the value of water in our lives.

Despite recognition of water as a critical resource, Luwero District continues to experience recurrent water shortages that undermine health, livelihoods and local development (Government, 2025). Seasonal rainfall variability and increased frequency of dry spells have reduced surface water availability and groundwater recharge, while population growth and inadequate water infrastructure limit access to safe and reliable supplies (UN-Water Annual Report, 2021). At the same time, insufficient investment in rural water systems and poor land-use practices exacerbate water quantity and quality problems, disproportionately affecting smallholder farmers and women who manage household water needs (World Bank Annual Report 2018, 2018). Local monitoring and governance mechanisms in many sub-counties remain weak, constraining adaptive water resource management and amplifying vulnerability to climate shocks. Therefore, this article sought to explore the lived experiences of water scarcity among households, possible causes, impacts, and coping mechanisms in Luwero District. This is crucial because households that rely primarily on unimproved or seasonal water sources are more likely to experience water-related health problems and to spend greater time fetching water than households that are connected to improved year-round supplies.

The paper sought to answer the following research questions. What are the drivers of water scarcity in Luwero District? How do people cope with water scarcity? Moreover, finally, what are the potential interventions to address the challenges caused by water scarcity in Luwero District, Uganda?

2. LITERATURE REVIEW

Literature highlights that water scarcity is increasingly shaped by climatic, demographic and governance factors at multiple scales. Global assessments such as the United Nations World Water Development Report emphasise that valuing water and managing competing demands are central to addressing scarcity, especially under growing climate stress (UN Water, 2021).

Africa, and particularly Sub-Saharan Africa, faces layered challenges when it comes to issues of accessing water: seasonal rainfall variability, reliance on rain-fed agriculture, limited finance for water infrastructure, and institutional barriers to effective WASH (Anghileri, 2024). Country-level accounting



and monitoring have improved; Uganda's Water Accounts Report (UBOS, 2022) quantifies rising water use across sectors and points to growing pressures on both surface and groundwater resources.

The Uganda National Development Plan IV (2025/26- 2029/30) states that the available water resources per person per annum have reduced to about 1,000 cubic meters in 2011 from 2,400 cubic meters in 1995, indicating that the country is moving from a situation of water abundance to a situation of water scarcity (NPA, 2025). The situation could be much worse now, given that the country's population has steadily increased from the then 31 million Ugandans to the current 45 million (UBOS, 2024). The challenges that were reported then have only been exacerbated, including continued degradation of water catchments and the environment, inadequate protection and maintenance of water bodies including river banks and lake shores, inadequate hydrological data, and human capacity to operate the network of water resources monitoring stations (Kadoma et al., 2023; NPA, 2025).

At the district scale, studies and evaluations focused on Luwero reveal acute local vulnerabilities. A groundwater-potential zoning study identified areas in Luwero susceptible to drought and low recharge, linking landscape conditions to higher drought risk (Musenze, 2022). Collectively, the literature indicates that while climate change raises physical scarcity risks, socio-economic factors (infrastructure gaps, governance, and poverty) largely determine community-level exposure and adaptive capacity. This body of work justifies locally grounded research in Luwero that links hydrological assessment with household-level data, water usage, and other socio-economic factors that play at the household level to design feasible, equity-centred interventions to improve access and usage to quality water.

At the household and community levels, water scarcity is driven by a complex interplay of socio-economic and environmental factors. Socio-economic drivers often relate to infrastructure, inequality, and lifestyle, while environmental drivers stem from climate change and resource degradation (Kamya et al., 2020). Households with lower incomes often lack the financial resources for secure access to safe and affordable water. Instead, they may depend on less reliable or unimproved water sources that dry up during shortages or make them walk long distances to access safe water (NPA, 2025). This agrees with an observation made by the World Health Organisation that two out of every five persons in sub-Saharan Africa do not have access to safe drinking water (WHO, 2012).

In contrast, wealthier households may have access to private wells or tanks, or can purchase water from vendors, which can further strain shared resources. Household size and amenities: a larger number of household members increases water demand for daily needs like drinking, cooking, and sanitation. The use of modern water-intensive appliances, such as dishwashers and washing machines, and amenities like gardens, also significantly raises water consumption in higher-income homes (World Wide Fund for Nature, 2024).

At the community level, rapid population growth, particularly in developing countries, strains existing water and sanitation infrastructure. The demand often outstrips the capacity of water service providers to supply water sustainably (Robinson & Kadoma, 2023). Indeed, the transformation of many natural landscapes into impermeable surfaces like roads and buildings, wetland conversion, and degradation in urban areas prevent rainwater from infiltrating the ground to replenish aquifers. This decreases groundwater recharge while increasing water demand as the human population increases.

Environmental drivers at the household and community levels, for example, climate change and global warming, negatively affect the water cycle, causing more frequent and severe droughts and floods. Changing precipitation altered rainfall patterns and increased evaporation, reducing the availability of surface and groundwater, which are essential for domestic and agricultural use. Extreme weather events such as Intense floods can overwhelm sanitation systems and contaminate water sources, making them unsafe to use.

Water pollution, that is contamination of water sources, directly reduces the amount of clean, usable water available. Industrial and agricultural run-off, where wastewater from industries and run-off containing pesticides and fertilisers from farms, contaminate rivers and groundwater, rendering them unsuitable for consumption without costly treatment. Inadequate sanitation: Untreated sewage and poor waste disposal practices pollute surface water and aquifers with pathogens. Ecosystem degradation: Damage to ecosystems disrupts the natural water cycle.

Deforestation, which refers to the cutting and removal of trees, reduces the land's ability to absorb rainwater and regulate water flow, leading to increased run-off and soil erosion. Watershed destruction can degrade the integrity of the water systems that supply urban and rural communities.

There are several health impacts of water scarcity at a household level. Due to the scarcity of water, people suffer from poor hygiene and sanitation problems, which can result in diseases and infections. Lack of safe and clean drinking water kills children more than Malaria, pneumonia, and HIV combined. Half of the hospital beds in the entire world are occupied by people suffering from water-borne diseases. Increased disease rates: A lack of clean water for drinking, sanitation, and hygiene forces communities to rely on unsafe and contaminated sources, leading to the spread of diseases like cholera, typhoid, dysentery, and diarrhoea. Child mortality: Diarrhoea, largely caused by unsafe water and poor sanitation, is a leading cause of death for children under five. Malnutrition: Water shortages cause reduced agricultural productivity, leading to food shortages and increased malnutrition. A body weakened by a lack of nutrients is more susceptible to infection, compounding health problems. Mental health: The constant anxiety and uncertainty of securing enough water for a family create a significant mental health burden on individuals. Stress, depression, and other psychological tolls are common in water-scarce regions. Physical strain, where the physical exertion of carrying heavy water containers over long distances can lead to chronic musculoskeletal problems, including back, neck, and joint pain (UNESCO, United Nations World Water



Development Report 2023; Partnerships and Cooperation for Water, 2023).

Water scarcity devastates local and national economies by hindering agricultural production, disrupting industries, and reducing overall economic stability. Declining agricultural productivity: Agriculture accounts for about 70% of global freshwater withdrawals. Water shortages lead to lower crop yields and reduced livestock productivity, threatening food security and farmers' incomes. Economic instability: Industries that depend heavily on water, such as textiles and manufacturing, experience disruptions and reduced output during water shortages. This can lead to job losses and economic decline. Reduced human capital: Time spent collecting water limits opportunities for education and productive labour. This lost opportunity perpetuates cycles of poverty and hampers economic development. Increased household costs: In many water-scarce regions, families must spend a significant portion of their income to purchase water from vendors, diverting funds from other necessities like food and healthcare. Increased conflict risk: The competition for dwindling water resources can increase social and political tensions, leading to local, national, and even international conflicts (UNESCO, United Nations World Water Development Report 2023; Partnerships and Cooperation for Water, 2023).

The economic impacts of water scarcity are many and varied. It makes it hard to get access to water for consumption (Worasa, 2024). For example, it includes an increasing cost that limits beneficiaries from utilising it. Due to water-borne diseases, the family spends more expenses on health care.

Socially, in many cultures, especially in the Global South, the role of collecting water remains in the hands of women (Chiwaya-Kamwendo et al., 2025). This exacerbates not only gender inequality but also affects women's education. Water-borne diseases are dangerous for the health of children and women (UNESCO, United Nations World Water Development Report 2023; Partnerships and Cooperation for Water, 2023).

Water scarcity is a serious global concern. The literature on the causes and impacts of water scarcity analyses socio-economic, policy dimensions, and community involvement to deal with problems.

Experiences of water scarcity and gendered responsibilities in Uganda show a stark reality. Water scarcity deepens existing gender inequalities by placing the primary burden of water collection on women and girls, limiting their access to education and economic opportunities while increasing their health and safety risks (Chiwaya-Kamwendo et al., 2025). Increased burden of labour: In many households without on-site water, the responsibility for collecting water falls on women and girls. As water becomes scarcer, they must travel longer distances, spending more time and energy on this physically demanding chore (UNICEF, 2021).

Limited education: Girls are often pulled out of school to help with water collection, especially when the task becomes more time-consuming. This limits their educational attainment and

future employment prospects (UNESCO, Leaving No One Behind, 2019).

Reduced economic opportunities: The time and effort spent fetching water reduces women's ability to participate in income-generating activities, which exacerbates household financial stress.

Increased vulnerability to violence: The long journeys to distant or isolated water sources, often undertaken in the early morning or late evening, expose women and girls to a heightened risk of harassment, sexual violence, and assault (Chiwaya-Kamwendo et al., 2025; UNESCO, Leaving No One Behind, 2019).

Compromised hygiene: Inadequate water supply and sanitation make menstrual hygiene management difficult and can lead to health problems for women and girls.

Moreover, recent studies stated that undertaking policy reforms, sustainable management of available water systems, a context-based approach, equity, innovation, and engagement of different actors are considered key to alleviating household water scarcity.

A wide range of interventions exist to build local water resilience, with the most effective options depending on specific community needs and environmental conditions. Approaches include leveraging nature-based solutions, upgrading infrastructure with climate-resilient technology, reviving traditional knowledge, and strengthening governance and policy frameworks (UNESCO, 2022).

Water harvesting is the process of collecting rainfall directly from the sky using different approaches (Tu et al., 2018). Regarding the Luwero District, traditional and modern systems for collecting rainwater can significantly increase water availability for households and farming, especially in drought-prone areas.

i. Watershed and Catchment Management

Restoring wetlands, forests, and riverbanks stabilises water sources by preventing soil erosion and enhancing groundwater recharge. Projects in Uganda and Benin have restored degraded ecosystems to improve water quality and buffer against floods.

ii. Local Water User Committees

Community-led groups with significant representation from women can manage and protect local water points, ensuring equitable access and sustainable use.

iii. Infrastructure and Technology Interventions

These solutions involve engineering and technological improvements to enhance water management. Efficient irrigation: Techniques like drip and sprinkler irrigation deliver water directly to plant roots, maximising efficiency and saving water in agriculture. Wastewater treatment and reuse: Implementing treatment plants or decentralised systems allows for the safe reuse of water for agriculture, industry, or landscaping, reducing the demand on freshwater sources.



Projects in Egypt and India are pioneering such efforts through public-private partnerships. Smart water technologies: Real-time monitoring with soil moisture sensors, automated controllers, and smart meters can optimise water use and improve overall management.

iv. Theoretical Framework

This study is anchored in the Sustainable Livelihoods Framework (SLF), which provides a holistic lens for analysing how individuals and communities mobilise different forms of assets to sustain their livelihoods in the face of environmental and socio-economic challenges (Tariq, 2020). The SLF identifies five core asset categories: human, social, natural, physical, and financial capital that interact dynamically to shape household resilience and well-being. In the context of water scarcity, natural capital, particularly water resources, plays a pivotal role in determining livelihood outcomes (Abdul-Rahaman, 2021). The depletion or unreliability of water sources affects agricultural productivity, food security, and income generation, especially in predominantly agrarian communities such as Luwero District. Using the SLF helps explain how reductions in natural capital (water) cascade through other livelihood assets. For example, reduced water availability undermines physical capital (irrigation facilities), weakens human capital (health and labour capacity), and limits financial capital (income from farming). Social capital such as community water committees or cooperatives often mediates these impacts by promoting collective adaptation measures (Kabonesa, 2022). This interdependence illustrates the systemic nature of livelihoods and underscores the need for integrated strategies that enhance resource access and community resilience

2. METHODS

This study adopted a qualitative research design based on secondary data analysis. I employed a document analysis approach to examine the causes of water scarcity, coping mechanisms, and potential interventions at the household level in Luwero District using existing textual data. Data were obtained from multiple sources, including peer-reviewed journal articles, district-level reports, and publications from non-governmental organisations and government agencies that focus on water use at the household and community levels. Peer-reviewed articles were accessed from Google Scholar Advanced Search, while grey literature was sourced from institutional and organisational websites relevant to water resource use and management in Uganda. Grey literature was considered important to support data from peer-reviewed sources as it was found to be more context-specific and reported facts on the ground.

A structured search strategy was employed using keywords such as “water scarcity,” “coping strategies,” “household experiences,” “rural water access,” and “Luwero District.” Additional search terms included “water stress,” “water adaptation strategies,” and “community water management” to capture a broader range of relevant materials. The selection of documents followed defined inclusion and exclusion criteria. Inclusion criteria comprised: (i) studies and reports focusing on water scarcity in Luwero and Uganda or similar rural contexts,

(ii) documents providing qualitative or descriptive data, (iii) household and/or community coping strategies with water scarcity, (iv) publications in the English language, and finally (v) only those publications between 2015 and 2025. The exclusion criteria included: (i) studies lacking relevance to household-level water scarcity experiences, (ii) Quantitative studies, (iii) Technical or engineering-focused reports without social dimensions, (iv) those published before 2015, and (v) works not written in the English language. A total of 15 journal articles and 5 reports were retained for analysis after screening titles, abstracts, and full texts for relevance to this study. The use of structured search protocols and repositories enabled a comprehensive and credible process in the collection of materials as noted by Martins (2022). Some reports selected were those from Uganda Bureau of Statistics (UBOS) annual reports, Ministry of Water and Environment policy documents, District water management plans of Luwero, and NGO and UN Agency reports.

i. Study Area

Luwero District is located in the central region of Uganda, roughly 60 kilometres north of Kampala. The district spans an area of approximately 2,500 square kilometres (DLG, 2012) and its population at the most recent census was 650,000 (UBOS, 2025). Luwero District is developing rapidly, although many of its inhabitants are rural. Less than 30% of the population lives in the eight town councils of the district. Regarding the social characteristics of Luwero District, 76% are of the majority Baganda ethnic group (DLG, 2020). However, household access to electricity is relatively low, at 27%, with almost half of all households instead using a tadooba, or paraffin candle lamp, as their main source of lighting. Sixty-three per cent of households use a borehole as their source of drinking water (UBOS, 2017; Directorate of Water Development, MWE 2026).

3. RESULTS

This section presents the findings of the study, which addressed the issue of water scarcity in Luwero District. The findings are synthesised into thematic results based on existing evidence rather than primary surveys.

Household Experiences of Water Scarcity

Water availability in the Luwero district is moderate but unevenly distributed. According to the Ministry of Water and Environment (MWE, 2026), Luwero has 68-75% water coverage. Katikamu sub-county has the highest percentage of water coverage at 95%, while Kamira sub-county has the least water coverage at 45%. Households in Luwero District depend on a variety of water sources. The main water sources are boreholes, especially among rural households; shallow wells and protected springs, piped water systems largely in town councils, and rainwater harvesting.

According to the Luwero District Local Government, water reliability is a big challenge. There is rationing of the piped water from the National Water and Sewerage Corporation, with some households receiving water only two days a week. Even when that water comes, it is rarely there for twelve hours. In some cases, it has been reported to last less than two hours, and when you are not there at that very moment, you will miss out



and resort to unsafe sources of water. It is not uncommon for some residents to go without running water for weeks and months.

In the dry months of June- August, many households in Luwero walk long distances to water sources, especially where the

source is a borehole or protected wells. It is reported that the majority of the people who walk such long distances are women

and children who, according to culture in the central region, are expected to fetch water that is used in a home (Chiwaya-Kamwendo et al., 2025; MWE, 2025).

In addition to walking long distances, many household members spend so many hours waiting in line before their turn to fetch water comes. At some water sources, such as boreholes, the strong young boys may even delay the weak and girls from fetching until they have fetched themselves. Sadly, boreholes were reported to be the main source of water during dry spells in the district.

Other households have reported experiencing high costs of water during shortages, where, for example, a 20-litre jerrycan costs up to 1000 Uganda shillings. This increase in prices negatively affects households, as a big percentage of them are already struggling economically. The presence of poor households in Uganda is acknowledged in the National Development Plan IV and the Uganda Vision 2040.

Sharing water sources with animals in some areas has been experienced in the district. Where open water sources exist/wells that are not protected, people there share water sources with animals. In Luwero, many households keep domestic animals such as cattle, sheep, goats, and pigs, and these need water just like humans to live. Where water is not given to them, they search for it by themselves and end up accessing and using the same sources used by humans.

Possible Causes of Water Scarcity in Luwero District

At the national level, several factors are reported to cause challenges in water supply and accessibility. These include the continued degradation of water catchments and the general environment; inadequate protection and maintenance of water bodies such as river banks and lake shores; inadequate hydrological data to inform the needs for various uses; and inadequate human capacity to operate the network of water resources monitoring stations (NPA, 2025).

Water scarcity in Luwero District is linked to erratic rainfall, population pressure, and insufficient investment in water infrastructure. UBOS projections indicate that Luwero's population has increased steadily, expanding demand for domestic and agricultural water. Settlement expansion in Luwero has placed pressure on shallow wells and piped water systems. Data presented confirms that water demand has outpaced supply infrastructure, contributing to frequent dry tap episodes documented in district media reports.

Common causes of water scarcity in Luwero include infrastructure breakdown, power outages, damage to water pipes, and low water levels, which limit coverage.

Data from District Surveys and NGO Reports reveal that water scarcity is more acute in low-income households lacking domestic tanks or alternative storage, communities dependent on unprotected water sources, and areas with poor road access, where maintenance crews struggle to reach broken facilities. Economic constraints also limit community contributions to water point maintenance, leading to long periods of non-functionality.

The analysis of secondary data indicates several significant patterns related to water availability and community vulnerability in Luwero. Records from the Ministry of Water and Environment (MWE, 2023) show declining groundwater levels attributed to increased extraction and reduced recharge resulting from environmental degradation. Health sector reports (UBOS, 2022) reveal rising cases of waterborne diseases such as dysentery and typhoid, particularly during prolonged dry seasons. Agricultural statistics show substantial reductions in crop yields, especially among rain-fed farming households (LGMSD, 2023).

Table 1: Key Water Scarcity Indicators (Luwero District)

INDICATOR	TREND	SOURCE
Groundwater levels	Declining	MWE (2023)
Waterborne Diseases	Increasing	UBOS (2022)
Crop Yields	Decreasing	Luwero District Annual Report (2023)

Data showed a declining trend in seasonal rainfall in Central Uganda over the past decade. The onset of rains has become increasingly unpredictable, and mid-season dry spells have intensified, reducing groundwater recharge and affecting spring yields. Luwero District water point inventory reports show that 15%-20% of boreholes are non-functional at any given time, mainly due to mechanical breakdown and insufficient maintenance funding.

The gendered burden of water scarcity is consistent with the literature, as it shows that women and girls bear the greatest burden. Increased distances to water sources during dry periods lead to reduced study time for girls, physical strain as they walk long distances to access water, and limited participation of women in income-generating work compared to their male partners.

There are also some existing adaptation and resilience measures undertaken at the household level in the district. Available documents, such as the District Development Plan, show that there is an increase in the adoption of rainwater harvesting using plastic and steel tanks promoted by NGOs, occasional rehabilitation of boreholes, and growth of local WASH committees. However, coverage remains low relative to the need or demand and the water scarcity level in most households.



Coping Mechanisms

Households in water-stressed environments often adopt many strategies that enable them to maximise the amount of water they have access to in a given period of time. Some mechanisms found in Luwero district include the following;

Increased adoption of rainwater harvesting largely using plastic and steel tanks. The tanks help in collecting water from the house rooftops. There are others who also dug a hole in the compound and laid a tumpoline to collect the water that is used in the household.

Drilling of boreholes in nearby places within the community. The district was found to have constructed more than 160 boreholes to increase water access to households. However, these face a huge challenge of breakdown and a lack of repairers within the community when a malfunction happens.

Digging more open wells by hand has also assisted in increasing access to water for some households. However, this water is largely considered not safe for human consumption unless purified either through boiling or adding treatment to it. Boiling the water is the most commonly used approach for making water safe for drinking for most households living in the rural communities of the district.

Health impacts and WASH outcomes are seriously affected by water shortages, as it contributes to an increase in diarrhoeal diseases, poor sanitation outcomes, and risk of contamination from unsafe sources during dry months of the year. Indeed, UNICEF reports note that households relying on unprotected springs experience a higher incidence of waterborne diseases, particularly among children.

4. DISCUSSION

The findings demonstrate that water scarcity in Luwero District results from an interplay of climate variability, rapid population growth, infrastructure limitations, and socio-economic inequalities. These results align with the broader literature, which identifies environmental and governance factors as core determinants of water shortages in East Africa (Musenze, 2022). The reported decline in rainfall supports the belief that environmental degradation and climate stress reduce groundwater recharge. Thus, areas in Luwero District experiencing higher water scarcity have degraded vegetation cover and participated in other land use changes that negatively impact the ecological character.

The Uganda National Development Plan IV clearly outlines actions that need to be taken to achieve water resources management. These, among others, include the development and implementation of a blue economy master plan, constructing and equipping the National Water Quality Reference and related facilities, constructing wastewater treatment facilities, maintaining major Natural water bodies and Reservoirs, establishing an early warning system and infrastructure for flood and drought management established and upgrading, maintaining, and operating hydrological information systems.

When there is water scarcity in a household, women and girls suffer more as a result of the social expectations labelled against them. Gendered impacts identified in the results are consistent with Kabonesa (2022) and Mpalanyi (2014), who found that rural Ugandan women disproportionately bear water collection responsibilities under scarcity. The findings also confirm Sustainable Livelihoods Framework assumptions that reductions in natural capital undermine physical, human, and financial capital, as women have to spend more time searching and fetching water, which time could be used for other productive activities.

Harvesting rainwater in Uganda and the Luwero District in particular should be promoted. This is so because as the population increases, usage and scarcity of water also increase. Thus, there is a need for increased rainwater harvesting to meet water supply deficits (Turyasingura et al., 2023; Staddon et al., 2018). Rainwater harvesting ought to be promoted and supported by all stakeholders because if every household harvested and kept water, it would significantly reduce pressure and stress on the available sources. Common rainwater harvesting technologies in Luwero include small roof-catchment systems using gutters that channel water into plastic drums, jerrycans, or 1,000–5,000L tanks. According to the Ministry of Water and Environment, household-level rainwater harvesting across Uganda remains low due to inadequate storage capacity, limited financing, and gaps in community awareness (UN-Water, 2023), but this can change with sustained prioritisation and sensitisation.

Water quality remains a concern for most households in Luwero District. Studies and national guidance highlight contamination risks from dirty roof surfaces, bird droppings, unprotected tanks, and inadequate maintenance (Dickson-Gomez et al., 2023; Staddon et al., 2018). Without treatment, harvested water frequently does not meet drinking water safety standards. UN-Water emphasises that roof runoff can be safe when systems are properly maintained, gutters are cleaned regularly, and first-flush mechanisms are used. In Luwero District, however, many households lack filtration systems, meaning rainwater is more often used for non-drinking purposes.

Overall, Rainwater harvesting in Luwero District is on a slow upward trajectory, driven by NGO projects, institutional installations, and increasing community interest, though constrained by limited household resources and insufficient storage capacity. Strengthening RWH adoption would require targeted sensitisation, subsidies for household tanks, improved water-quality management practices, and scaling up institutional installations, which have shown strong reliability for schools and health centres. Although several adaptation strategies exist, rainwater harvesting, borehole rehabilitation, and catchment protection remain underfunded and insufficiently coordinated. This highlights governance gaps identified in previous studies and supports the argument for multi-level, community-inclusive water management approaches.

5. CONCLUSION

Better access to water and sanitation services is critical for a healthy and functional society. Water availability in Luwero



District can be characterised as having moderate coverage but with significant inequalities between and among sub-counties.

Rainwater harvesting has emerged as one of the most effective ways to deal with the problem of water scarcity at the household level. This is so because it requires a heavy investment when buying and installing the water tank. Once this is done, a

household can harvest adequate water for its use for many months and for some throughout the year.

There are unreliable supply systems and heavy dependence on boreholes and hand-dug open wells, with many households facing persistent challenges in accessing safe and sufficient water for most parts of the year.

Multi-dimensional factors, including climate variability, population pressure, inadequate infrastructure, and weak governance, drive water scarcity in Luwero District. The impacts on health, livelihoods, and gender equality are substantial and interconnected, reducing community resilience.

6. RECOMMENDATIONS

Strengthen Water Infrastructure Maintenance

The local government, through district funding, should increase funding for borehole repair, ensure the availability of spare parts, and train local mechanics. Strengthening water infrastructure maintenance requires a multi-faceted approach, including implementing proactive strategies like condition assessments and advanced leak detection, improving funding mechanisms through public-private partnerships and sustainable user fees, and enhancing governance via strong policies, transparent regulation, and community engagement.

Promote Rainwater Harvesting and Household Water Storage

This will help in addressing household water shortages. A combination of community education, financial incentives like subsidies or loans, and supportive government policies is necessary. At the household level, simple practices like using gutters to collect water into tanks for non-potable uses and practising water conservation can significantly reduce demand on traditional water sources

Develop sustainable and equitable ways

This safeguards water supplies to mitigate the effects of water scarcity and meet the needs of human populations and the wider environment. Enhance watershed management practices like afforestation, soil conservation, and water harvesting.

Improve governance and community participation

This empowers local water user committees with decision-making powers and ensures women and youth representation. It is crucial to establish transparent policies, empower local groups with capacity-building tools, and integrate community-led initiatives with broader government and private sector efforts. Good water governance depends on inclusive decision-making that considers the interests of all stakeholders, especially the poor and marginalised.

Integrate water planning with climate adaptation strategies

This links district water development plans with meteorological data and drought early warning systems. To integrate water planning with climate adaptation strategies, create a holistic approach that includes understanding climate risks, updating infrastructure, improving water management practices, and strengthening governance.

Develop a water scarcity prevention plan

This conserves and manages water sources, rivers, and wetland areas to ensure that water reaches areas of human need without adversely impacting the environment. Such a plan should include the establishment of infrastructure for multiple water uses, which can support aquaculture, livestock watering, and domestic consumption from a single system.

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