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ALINAFE FAVOUR KANYIMBO

EXAMINING HOUSEHOLD COPING STRATEGIES FOR WATER ACCESS CHALLENGES IN INFORMAL URBAN SETTLEMENTS: THE CASE OF CHINSAPO #1, LILONGWE CITY, MALAWI

Defended on 13 /04/2025 before the following committee

Chair	Prof. Andrew Ako Ako	Ministry of Scientific Research and Innovation
Supervisor	Dr. Andy Kusi-Appiah	Carlton University
External Examiner	Prof. Jabulani Gumbo	Bindura University of Science Education
Internal Examiner	Dr. Taha Amine Terki Hessaine	University Of Tlemcen

PAN AFRICAN UNIVERSITY INSTITUTE FOR WATER AND ENERGY SCIENCES including (CLIMATE CHANGE)

EXAMINING HOUSEHOLD COPING STRATEGIES FOR WATER ACCESS CHALLENGES IN INFORMAL URBAN SETTLEMENTS: THE CASE OF CHINSAPO #1, LILONGWE CITY, MALAWI.

A Research Thesis Submitted in Partial Fulfilment of the Requirements for the Award of the Degree of Master of Science in Water Policy of Pan African University Institute of Water and Energy Science (including climate change) Tlemcen, Algeria

By

ALINAFE FAVOUR KANYIMBO

SUPERVISOR

Andy Kusi-Appiah, PhD.

Dept. of Geography & Environmental Studies,

Carleton University, Ottawa, Canada

Email: andykusiappiah@cunet.carleton.ca

DEDICATION

I dedicate this work to my family and my friends, who supported me in every aspect I needed their aid.

STATEMENT OF AUTHOR

I, **Alinafe Favour Kanyimbo,** hereby declare that this thesis is my original work. I have diligently adhered to the ethical standards and thesis guidelines of the Pan African University Institute for Water and Energy Sciences (PAUWES), including Climate Change. Furthermore, I affirm that all materials and references used in this work have been properly acknowledged.

Alinafe Favour Kanyimbo……………………….…………………………….25th/03/2025

Student Signature Date

Approved by

andykusiappiah

Dr Andy Kusi-Appiah………………………………………………………………25th/ 03/2025

Supervisor Signature Date

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ACRONYMS AND ABBREVIATIONS

JICA:	Japan International Cooperation Agency
LCC:	Lilongwe City Council
LWB:	Lilongwe Water Board
NGOs:	Non-Governmental Organizations
NSO:	National Statistical Office
NWRA:	National Water Resources Authority
UNICEF:	United Nations for Children's Fund
USAID:	United States Agency for International Development
SDGs:	Sustainable Development Goals
SPSS:	Statistical Package for the Social Sciences
SSI:	Semi-Structured Interviews
WHO:	World Health Organization
WWA:	Water Works Act

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ABSTRACT

Access to safe water is vital for human health and environmental sustainability. However, in informal settlements, persistent water access issues are widespread, prompting residents to develop various coping mechanisms to sustain their livelihoods. This study explored the coping strategies employed by residents of Chinsapo 1# in Lilongwe to overcome water access challenges. A mixed-methods approach was used, combining both qualitative and quantitative research designs with simple random and purposive sampling techniques. Semi-structured questionnaires were administered to 82 households, 30 in-depth interviews were conducted with Chinsapo 1# residents, and 8 key informant interviews were held with representatives from the Ministry of Water and Sanitation, Lilongwe Water Board, and Malili Water Users Association. Data analysis was performed using SPSS and Excel to generate descriptive statistics, while thematic analysis was applied to identify key themes in the qualitative data. The findings indicated that the majority of residents (96.2%) relied on water kiosks due to financial barriers preventing direct piped water connections. However, issues such as inconsistent supply and limited financial resources led residents to adopt alternative coping mechanisms, including sourcing water from unprotected rivers and neighboring areas and reducing overall consumption. The Lilongwe Water Board's limited production capacity of 100m³/day, compared to the required 150m³/day, resulted in rationing, exacerbating access challenges. These issues disrupted daily activities, imposed additional financial burdens, posed health risks, and necessitated long-distance travel to access water. The study emphasizes the urgent need for improved water access in Chinsapo 1# and recommends increasing funding to expand water treatment plant capacity, as well as subsidizing piped water connections for low-income households to ensure a more reliable and affordable water supply.

Keywords: informal settlements, water access, coping strategies, water challenges.

1. INTRODUCTION

1.1 Background of the study

Global population growth and rapid urbanization have led to the proliferation of informal settlements (Global Steering Group, 2022; Lagardien & Muanda, 2014). These settlements are typically characterized by high population density, disorganized infrastructures, and inadequate access to essential services such as roads, sanitation, and potable water (Veiga, 2021; Lagardien & Muanda, 2014).

Access to safe drinking water is critical for both public health and environmental sustainability (Mustari & Karim, 2016). The lack of potable water poses severe risks, particularly in developing regions, where water scarcity affects more than 40% of the global population (Shemer *et al.,* 2023). According to the World Health Organization (WHO, 2022), approximately 2.2 billion people worldwide lack access to safe drinking water at home, with the majority residing in developing countries, particularly in sub-Saharan Africa and Central- South Asia. In sub-Saharan Africa, only 30% of the population has access to safe drinking water services (WHO, 2022). This deficiency has dire consequences, contributing to the deaths of approximately 400,000 children under the age of five each year due to waterborne diseases such as cholera, diarrhea, and dysentery, which are prevalent in informal settlements (UNICEF, 2023).

Informal settlements face unique challenges in accessing clean water due to financial constraints, weak political representation, lack of land ownership, and limited job opportunities (Harris, 2021). Residents often struggle with inadequate housing, governance, and infrastructure, further exacerbating their vulnerability (Harris, 2021). Water utility providers frequently overlook these settlements, either due to unclear mandates or a lack of legal authority to extend services to them (Nchor & Ukam, 2024). As a result, households adopt various coping strategies to mitigate the risks associated with unreliable water supplies (Senna, 2021).

Malawi, a landlocked country in Southeastern Africa, has a population of approximately 20.93 million as of 2023, with an annual growth rate of 2.5% (World Bank, 2024). As one of the world's fastest-growing urban populations, Malawi has witnessed a rapid increase in informal settlements, where residents often depend on alternative water sources due to unreliable and intermittent supply (Adams, 2018). Over 70% of the urban population lives in informal settlements, with many households experiencing chronic water insecurity. In Lilongwe, the capital city, more than 76% of residents in informal settlements lack access to potable water and rely on unsafe sources such as dug wells and rivers (Lilongwe City Council, 2020).

Chinsapo #1, an informal settlement in Lilongwe City, faces significant challenges in accessing potable water, forcing residents to depend on unprotected rivers and shallow wells (Lilongwe City Council, 2020). This study examines the coping strategies employed by households in Chinsapo #1 to address water access challenges in this informal urban settlement.

1.2 Problem Statement

Reliable access to potable water is crucial for public health, environmental sustainability, and socioeconomic development (Oskam, 2021). Grady and colleagues (2014) define potable water as "water that does not contain biological or chemical agents that are directly detrimental to human health" (Grady *et al.,* 2014, p. 38). Limited access to potable water poses severe risks to communities and impedes sustainable development (Anam, 2024). Although the United States Agency for International Development (USAID, 2022) reports that approximately 80% of Malawi's population has access to improved drinking water sources, achieving Sustainable Development Goal 6 - universal access to safe water by 2030 - remains uncertain.

Lilongwe, Malawi's capital, has expanded predominantly through informal settlements rather than planned urban growth (Lilongwe City Council, 2020). The city comprises 26 informal settlements, including Chinsapo #1, where approximately 76% of the population faces chronic water shortages and unreliable service delivery (Lilongwe City Council, 2020; Adams, 2018a). Although Malawi's National Water Policy (2005) aims to ensure equitable access to quality water, residents in informal settlements continue to experience significant challenges in obtaining potable water (Strachan *et al.,* 2021). Chinsapo #1, characterized by inadequate water infrastructure, high population density, and limited formal service provision, exemplifies these challenges (Strachan *et al.,* 2021; Lilongwe City Council, 2020).

While previous studies have examined water access issues in Malawi's informal settlements (Phiri & Velmurugan, 2024; Akpabio *et al.,* 2022; Vidal, 2022; Mpakati & Mkandawire, 2018), limited research has explored how residents cope with these challenges. This study aims to address this gap by investigating household coping strategies and the difficulties they encounter in accessing potable water in Chinsapo #1.

1.3. Main Objective

The main objective of the study was to examine household coping strategies for water access challenges in informal urban settlements: the case of Chinsapo #1, Lilongwe City, Malawi

1.4 Research Questions

This study seeks to answer the following research questions:

1) What factors influence access to potable water in the informal settlement of Chinsapo #1, Lilongwe?
2) What challenges do residents of Chinsapo #1 face in accessing potable water?
3) What coping strategies do residents of Chinsapo #1 adopt to address water access challenges

1.5 Research Objectives

The objectives of this study are:

1) To examine the factors influencing access to potable water in the informal settlement of Chinsapo #1.
2) To identify the challenges faced by residents of Chinsapo #1 in accessing potable water.
3) To explore the coping strategies adopted by Chinsapo #1 residents to mitigate water access challenges.

1.6 Significance of Study

Access to safe drinking water is a fundamental human right, yet many communities, including Chinsapo #1, face persistent challenges in obtaining potable water. Understanding how residents navigate these challenges is essential for informing policy and intervention strategies. This study contributes to existing knowledge by examining the potable water access issues in Chinsapo #1 and the coping mechanisms employed by its residents. The findings provide valuable insights for researchers, government agencies, and non-governmental organizations (NGOs) to develop strategies for improving water service delivery. Additionally, the study offers practical recommendations for households facing unreliable water supply.

By addressing these issues, this research aligns with Sustainable Development Goal 6 (Target 6.1), which aims to achieve universal and equitable access to safe and affordable drinking water for all by 2030 (UN, 2022).

2. LITERATURE REVIEW

2.1 Introduction

This chapter provides a critical review of the literature on water access in informal settlements in urban centers of sub-Saharan Africa. It explores key concepts, including informal settlements, urban water supply in Malawi, policy frameworks, and coping strategies for accessing potable water.

2.2 Informal Settlements

Informal settlements are areas where residents lack legal tenure over the land or housing they occupy, often living under precarious conditions without formal planning or public services (UN, 2015). Kovacic and colleagues (2016) define informal settlements as "settlements requiring municipal planning and having little or vague provision of public amenities" (Kovacic *et al.,* 2016, p. 12).

The growth of informal settlements is driven by rapid urbanization, population growth, and climate-induced displacement (Tjipetekera *et al.*, 2022). While the global percentage of urban populations living in informal settlements decreased from 28% in 2000 to 23% in 2014, the absolute number of residents increased from 792 million to approximately 880 million (UN, 2019). In sub-Saharan Africa, informal settlements remain widespread, housing over 80% of the urban population (UN, 2019; Adams, 2018a).

The expansion of informal settlements in sub-Saharan Africa has led to various challenges, including unregulated urban growth, poor infrastructure, and inadequate access to essential services such as potable water (Kumbikano, 2022; Tjipetekera *et al.*, 2022). In Malawi, urbanization is driven by high population growth and rural-to-urban migration (Government of Malawi, 2019). The urban population is primarily concentrated in Lilongwe, Blantyre, Mzuzu, and Zomba, collectively accounting for 15% of the national population (Government of Malawi, 2019).

2.3 Water Access in Informal Urban Settlements

Water access lacks a universally accepted definition (Kanjin *et al.*, 2023). Many scholars commonly define it in terms of availability, reliability, distance to sources, waiting time, and affordability (Darling & Welsh, 2022; Dinka, 2018). According to Dinka (2018) describes accessibility to water as having a consistent and reliable water supply that is readily available near the point of use, including homes, schools, workplaces, and public spaces (Dinka, 2018).

Grady and colleagues (2014) define potable water as "water that does not contain biological or chemical agents that are directly detrimental to human health" (Grady *et al.*, 2014, p. 5). The lack of access to potable water poses serious risks to public health and the environment (Okafor, 2024). In 2023, the United Nations reported that inadequate access to potable water and sanitation contributes to approximately 400,000 deaths annually among children under five (UN, 2023).

Water access challenges remain significant across sub-Saharan Africa, including Malawi (Kanjin *et al.*, 2023; UN 2023; WHO, 2022). In urban informal settlements, limited water infrastructure and financial constraints exacerbate these challenges (Tjipetekera, 2022; Adams, 2018; Muzondi, 2014). Poor sanitation and unreliable water supply contribute to the spread of waterborne diseases such as cholera, schistosomiasis, dysentery, hepatitis, diarrhea, and typhoid (Kavish, 2021). Moreover, financial limitations hinder access to potable water, exposing informal settlement residents to health risks (Burt, 2021; Nanle *et al.*, 2022).

2.4 Urban Water Supply in Malawi

2.4.1 Urban Water Infrastructure in Malawi

Foreign aid, particularly from organizations like the World Bank, has contributed to improvements in Malawi's water sector (Cassivi *et al.*, 2020). However, studies indicate that aid allocations often favor areas with better infrastructure, neglecting regions where water needs are greatest (Cassivi *et al.*, 2020; Oates & Mwathunga, 2018; Chowns, 2014).

According to the 2018 Malawi Population and Housing Census, 10.3% of the population accessed piped water at home, 61.7% relied on boreholes, and 8.1% used community standpipes (NSO, 2019). Although USAID (2022) and NSO (2019) report that approximately 80% of Malawi's population has access to improved drinking water sources, rapid urbanization and population growth continue to strain water supply infrastructure (NSO, 2019; USAID, 2022;). Studies by Lungu and colleagues (2019) highlight persistent water access challenges in informal settlements (Lungu *et al*., 2019). Communal water kiosks, commonly used in these areas, suffer from low water pressure, leading to periodic shortages (Adams & Smiley, 2018).

2.4.2 Malawi's Urban Water Policy and Institutions

To address urban water supply challenges, Malawi has implemented various policies and established key institutions. The main policy frameworks include:

1) Waterworks Act (WWA) of 1995 – Established five national urban water boards.
2) The Water Resources Act (WRA) of 2013 – Regulates water supply and resource management (Chunga *et al.,* 2022).
3) The National Water Policy (NWP) of 2005 seeks to ensure equitable water access for all Malawians by providing water of acceptable quality in sufficient quantities (Government of Malawi, 2005).

These policies align with Malawi's Vision 2063, which aims for sustainable water resource management (Government of Malawi, 2019).

The five national water boards responsible for urban water supply are:

1) Lilongwe Water Board (LWB) – Serves Lilongwe City and surrounding areas.
2) Blantyre Water Board (BWB) – Serves Blantyre City.
3) Northern Region Water Board (NRWB) – Serves northern Malawi.
4) Central Region Water Board (CRWB) – Serves central Malawi.
5) Southern Region Water Board (SRWB) – Serves southern Malawi (Adams & Smiley, 2018).

However, weak coordination, lack of political will, poor investment, and institutional inefficiencies have hampered policy implementation (Adams & Smiley, 2018).

2.5 Strategies for Accessing Potable Water

Ojo (2018, p. 27) defines coping strategies as "ways in which households seek to protect their survival and sustainability in times of risk." Similarly, Endler and Parker (1990) describe coping strategies as "cognitive and behavioral efforts to manage internal and external demands." In the context of informal settlements, residents employ various strategies to mitigate water access challenges. These strategies can be broadly categorized into individual/household strategies, community-based approaches, and institutional interventions.

2.5.1 Individual and Household Coping Strategies

At the household level, residents adopt various measures to ensure access to potable water despite infrastructure and affordability challenges. These include:

a) Water Storage Practices – Due to intermittent supply, households often store water in large containers or tanks to ensure availability during shortages (Senna, 2021; Ojo, 2018). However, improper storage can lead to water contamination and related health risks (Lungu *et al.*, 2019).

b) Purchasing Water from Vendors – In many informal settlements, households buy water from private vendors, particularly when communal water sources are unreliable (Adams & Smiley, 2018). However, vendor-supplied water is often expensive and unregulated, raising concerns about both affordability and quality (Kanjin *et al.*, 2023).

c) Utilizing Alternative Water Sources – Some residents resort to drawing water from unprotected wells, rivers, or streams, despite the associated health risks (Tjipetekera *et al.*, 2022).

d) Rainwater Harvesting – Although not widely practiced due to unpredictable rainfall and limited storage capacity, some households harvest rainwater for domestic use as a supplementary source (Makwiza *et al.*, 2018).

2.5.2 Community-Based Coping Strategies

In response to water challenges, communities often develop collective strategies, including:

a) Formation of Water User Associations (WUAs) – These community-led groups coordinate water distribution, resolve conflicts over access, and engage with local authorities for improved services (Chowns, 2015).
b) Shared Communal Water Points – Some informal settlements establish shared boreholes or community standpipes to enhance access (Adams & Smiley, 2018). However, overcrowding at these points often leads to long waiting times and conflicts among users (Lungu *et al.,* 2019).
c) Self-Help Initiatives – Some communities collectively contribute funds to maintain or construct small-scale water infrastructure, such as wells or storage tanks (Kumbikano, 2022).
d) Advocacy and Engagement with Authorities – Community-based organizations and local leaders often advocate for improved water services by engaging government agencies and NGOs (Cassivi *et al.*, 2020).

2.5.3 Institutional Interventions and Policy Responses

Government agencies, NGOs, and international organizations play a critical role in addressing water access challenges through:

a) Subsidized Water Services – In some urban informal settlements, governments provide subsidized water tariffs for low-income households (Andres *et al.,* 2019*).* However, inefficient implementation and corruption often undermine these initiatives (Adams & Smiley, 2018).
b) Expansion of Water Kiosks and Boreholes – Some local governments and NGOs install additional communal water kiosks and boreholes to enhance accessibility (Tjipetekera *et al.,* 2022). However, operational challenges, such as low water pressure and irregular supply, persist (Lungu *et al.,* 2019).
c) Public-Private Partnerships (PPPs) – Partnerships between governments and private companies have been explored as a means to improve urban water supply infrastructure

(Makwiza *et al*., 2018). While PPPs have enhanced service provision in some regions, concerns about affordability and commercialization remain (Oates & Mwathunga, 2018).

d) NGO-Led Water and Sanitation Programs – International organizations, including UNICEF and WaterAid, have implemented projects to improve water accessibility in informal settlements (WHO, 2022). These interventions often include hygiene promotion and infrastructure support (UN, 2023).

The literature review highlights that water access in informal settlements remains a critical challenge due to inadequate infrastructure, financial constraints, and governance issues. While various coping strategies exist at household and community levels, structural interventions are necessary for sustainable solutions. Effective water governance, investment in infrastructure, and policy implementation are essential to improving water access in informal settlements, aligning with Sustainable Development Goal 6 (UN, 2022).

3. RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents a comprehensive outline of the research methodology employed in this study. Research methodology refers to the systematic framework of principles, techniques, and procedures used to carry out a study, which guides the researcher in collecting, analyzing, and interpreting data (Igwenagu, 2016). The purpose of this chapter is to provide a transparent, reproducible, and structured approach to how the research was conducted, ensuring that the findings are reliable and valid.

The following key aspects of the research methodology are discussed in detail in this chapter:

a) Study Area Description: A thorough explanation of the geographical, cultural, or institutional context in which the study was conducted.
b) Research Design: The overall framework adopted for the study, including whether it was qualitative, quantitative, or mixed methods.
c) Sampling Techniques: The strategies used to select participants or units of analysis, ensuring that the sample is representative and suitable for answering the research questions.
d) Data Analysis: A description of the methods and tools used to process and interpret the data, including any software or statistical tests employed.
e) Ethical Considerations: A discussion of the ethical guidelines followed throughout the research process, ensuring the protection of participants' rights and confidentiality.
f) Study Limitations: A candid account of potential weaknesses or constraints faced during the research, including challenges in data collection or analysis that may affect the study's outcomes.

3.2 Study Area

Malawi (Figure 1), a landlocked country in Southeast Africa, is bordered by Zambia to the west, Tanzania to the north, and Mozambique to the south and east. The country covers an area of 118,480 km² and is characterized by a diverse landscape, including lakes, plateaus, and valleys (JICA, 2024). The country's major urban centers include Lilongwe (the capital city), Blantyre, Mzuzu, and Zomba.

Lilongwe, the capital city of Malawi, is located in the central region of the country within the East African Rift Valley. The city sits at an elevation of 1,050 meters above sea level, on a plateau (Lilongwe City Council, 2020). Covering an area of 474 square kilometers, Lilongwe is situated at coordinates 13° 58’ 0.91” S and 33° 47’ 14.10” E (NSO, 2019; Lilongwe City Council, 2013).

Lilongwe City’s growth has been rapid, with its population increasing nearly tenfold between 1980 and 2015. As of 2018, Lilongwe's population was recorded at 989,318, with an annual growth rate of 4% (Strachan *et al.,* 2021; NSO, 2019). According to the World Population Review (2025), the current population is estimated at 1,393,010.

Lilongwe is divided into four main sectors: Old Town, Capital Hill, Kanengo, and Lumbadzi (Lilongwe City Council, 2013). However, the city faces significant challenges due to rapid urbanization. The demand for basic services, particularly potable water, is increasing, with informal settlements bearing the brunt of the strain. These areas often lack adequate infrastructure, governance support, and water security. The Lilongwe Water Board (LWB), responsible for the City's water supply, meets only 65% of the water demand. The city requires 120,000m³ of water per day, but the LWB produces just 81,250m³ per day (Lilongwe City Council, 2020). This gap in supply makes access to clean water increasingly difficult for residents, particularly those in underserved areas.

The study focuses on Chinsapo #1, one of the informal settlements located in Lilongwe City. Situated approximately six kilometres northwest of the city center, Chinsapo #1 lies along the Lilongwe and Chankhandwe rivers (Kamwendo, 2012). Chinsapo #1 covers 512 hectares (JICA, 2010), and as of 2022, it had an estimated population of 24,271 people (Malawi Electoral Commission, 2022).

Chinsapo #1 (see Figure 1) is marked by significant socioeconomic challenges, with widespread poverty and low living standards affecting the majority of its residents (Mwanandi, 2022). The community struggles with chronic water shortages, which are exacerbated by inadequate infrastructure and a lack of efficient water distribution systems. To cope with these shortages, residents rely on alternative water sources, including streams and dug wells. However, these sources often lack reliability and pose health risks (Lilongwe City Council, 2020).

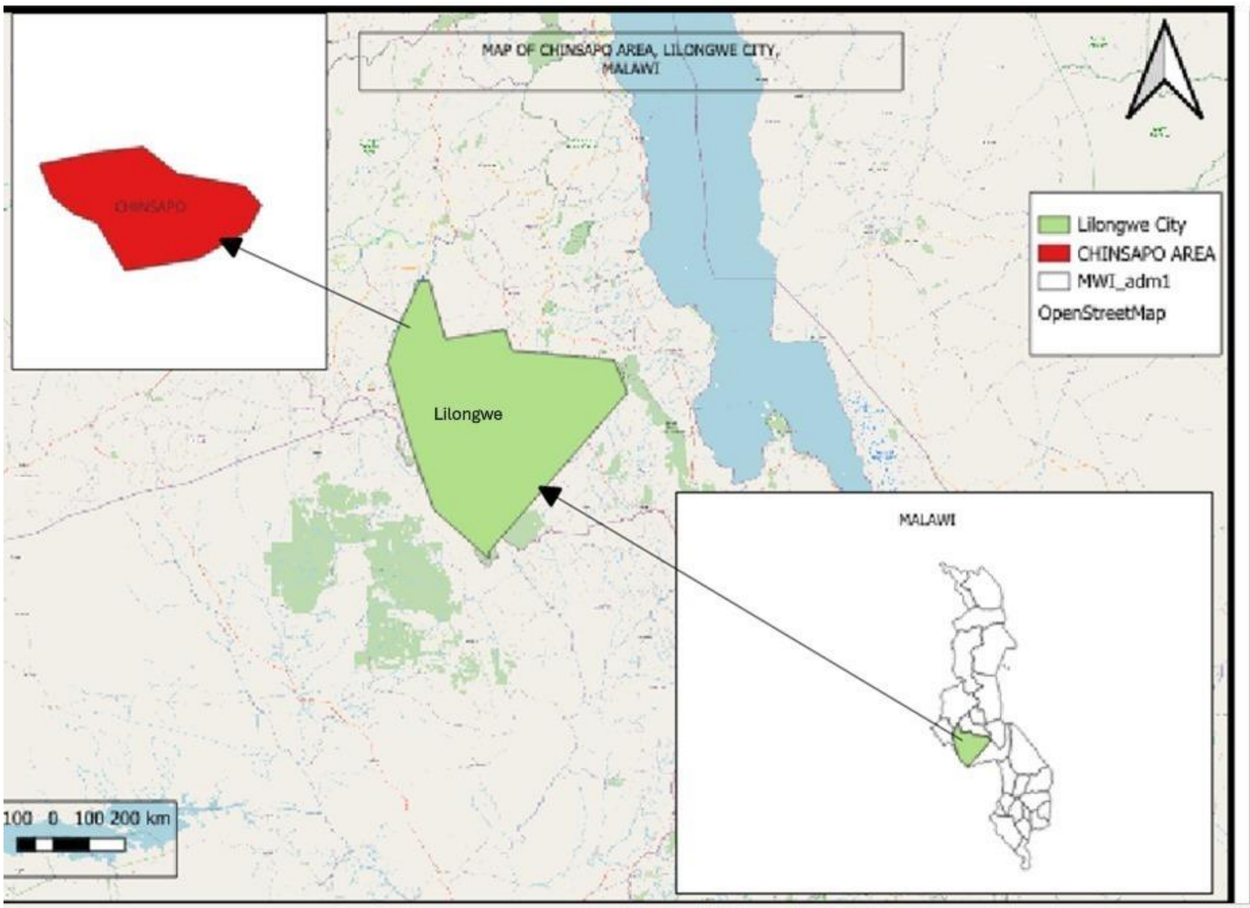

Figure 1: Map of Lilongwe, showing Chinsapo #1

(Source: Author, 2025)

3.3 Research Design

Research design is a structured framework of methods and techniques selected by a researcher to systematically integrate different aspects of a study, ensuring the effective resolution of the research problem (Khanday & Khanam, 2019). The selection of a research design plays a crucial role in shaping the study's structure and determines how data will be gathered, interpreted, and analyzed (Verma *et al.,* 2017). Generally, three main types of research designs are identified: qualitative, quantitative, and mixed methods (Verma *et al.,* 2017).

Qualitative Research Design

This approach focuses on exploring the essence of phenomena by examining ideas, opinions, and subjective perspectives (Ugwu & Eze*, 2023*; Kanjin *et al.*, 2023). It provides rich, in-depth insights into complex issues.

Quantitative Research Design

Quantitative research, in contrast, involves the use of numerical data to measure variables, analyze relationships, and identify patterns (Sharma, 2023, 2021; Verma, 2012). It is focused on objectivity and measurable outcomes.

Mixed Methods Research Design

A mixed-methods design combines both qualitative and quantitative approaches, allowing for cross-referencing of diverse data sources to provide a more comprehensive understanding of the research topic (Sharma, 2023).

This study adopted a mixed-methods research design, which integrates both qualitative and quantitative methodologies. This approach is particularly effective for exploring multifaceted issues like water access challenges, enabling the researcher to capture both the subjective experiences of individuals and measurable patterns related to the phenomenon of interest (Nchor & Ukama, 2023). By using both approaches, the study aimed to provide a well-rounded perspective on the challenges faced by households in accessing potable water.

The qualitative aspect of the research explored the underlying factors that influence participants' access to potable water, as well as the challenges they face and their coping strategies. Data was collected through in-depth interviews (IDIs) and key informant interviews (KIIs). These methods allowed for a deeper exploration of participants' lived experiences, providing insights that could not be captured through numerical data alone.

The quantitative component focused on quantifying variables related to household water access. Data was gathered through a household survey, where structured questionnaires were administered to randomly selected heads of households in Chinsapo #1. This survey employed a formal, objective, and systematic approach, enabling the analysis of numerical data to identify trends and relationships in the study population's water access patterns (Mohajan, 2020).

By utilizing both qualitative and quantitative methods, the study not only captured the personal experiences of individuals but also provided a broader, data-driven perspective on the issues at hand.

3.4 Sampling Techniques and Sample Size

Sampling refers to the process of selecting a subset of individuals or units from a larger population to represent the whole population in a study (Verma *et al.*, 2017). The primary objective of sampling is to ensure that the selected sample is representative of the population, allowing for generalizations or insights to be drawn from the data.

Sampling techniques are typically categorized into two main types: probability sampling and non-probability sampling (Verma *et al.*, 2017).

Probability sampling methods involve the random selection of participants, where each member of the population has a known and non-zero chance of being selected (Verma *et al.*, 2017). This ensures that the sample is representative of the broader population, reducing bias and increasing the reliability of the findings. Common probability sampling techniques include:

Simple Random Sampling: Every individual in the population has an equal chance of being selected. This method is ideal for obtaining an unbiased sample (Noor *et al.*, 2022).

Stratified Sampling: The population is divided into subgroups or strata based on certain characteristics, and participants are randomly selected from each stratum. This ensures that all key subgroups are represented in the sample (Makwana *et al.,* 2023).

According to Makwana and colleagues (2023), probability sampling methods are commonly employed in quantitative research due to their ability to produce statistically reliable and generalizable results (Mak*wana*, 2023).

Non-probability sampling methods, on the other hand, do not provide each individual in the population with an equal chance of selection (Makwana *et al.*, 2023). These methods are often used in qualitative research to explore specific phenomena or experiences in-depth. Common non-probability sampling techniques include:

Purposive Sampling: Participants are selected based on specific characteristics or experiences that are relevant to the research question. This method allows researchers to focus on individuals who can provide rich, meaningful information (Friday & Leah, 2024).

Snowball Sampling: Initial participants are selected and then asked to refer other individuals who meet the criteria for the study. This method is useful for accessing hard-to-reach or hidden populations (Friday & Leah 2024).

These non-probability methods are particularly suitable for qualitative research, as they allow for an in-depth understanding of complex or specific issues that cannot be captured through random sampling alone (Verma *et al.,* 2017).

The sample size refers to the number of participants or units selected for the study. The ideal sample size depends on various factors, including the research design, the type of data collection methods used, and the desired level of precision. In quantitative research, the sample size is typically determined using statistical methods to ensure the results are statistically significant and generalizable. In qualitative research, the sample size is often determined based on the principle of data saturation, where data collection continues until no new information or insights emerge.

3.4.1 Qualitative Sampling

A qualitative sampling methodology was employed to gather rich, contextual data regarding the experiences and perspectives of participants. To select participants for qualitative data collection, a purposive sampling technique was utilized, allowing the researcher to choose individuals who could provide relevant insights into the study's objectives. Purposive sampling involves selecting participants who meet specific criteria and are believed to possess valuable knowledge or experiences (Isaac, 2023).

For the qualitative component, eight (8) key informants [KIIs] were purposively selected from the following organizations and groups: the Lilongwe Water Board (LWB), the Ministry of Water and Sanitation, community leaders, and the Malili Water Users Association. Key informant interviews are described as "qualitative interviews conducted with individuals who possess expert knowledge of a particular subject" (Pahw*a et al.*,2023). The interview guides were used for the interviews (see Appendix D). These individuals provided specialized knowledge and insights that helped contextualize the research findings.

The socioeconomic characteristics of the KIIs are summarized in Table 1. The KIIs comprised an equal number of males and females (4 males and 4 females), with ages ranging from 37 to 52 years. The distribution of their ages is as follows: two participants (one male, one female) were between the ages of 37 and 41, four participants (two males, two females) were between 42 and 46, and two participants (one male, one female) were between 47 and 52. Regarding their education level, 3 participants (2 females and a male) had primary education, 1 had secondary education, and 4 had tertiary education.

The group included officials from the Ministry of Water and Sanitation (2), the LWB (2), community leaders (2), and members of the Water Users Association (2). These interviews contributed to the contextual depth of the study and helped validate the research findings.

In-depth interviews (IDIs) are a qualitative research technique used to conduct detailed, one-on-one interviews with a small number of participants to gain deeper insights into their experiences (Rutledge & Hogg, 2020). In this study, 30 participants were purposively selected for the IDIs. Interview guides were used for the IDIs (see Appendix E). The sampling strategy aimed for gender parity, ensuring an equal representation of males and females, and sought to capture a diverse range of socio-economic statuses (SES) to provide a comprehensive understanding of the challenges related to water access. The 30 IDI participants included 15 males and 15 females, with ages ranging from 24 to 53 years. The age distribution of participants is as follows:

i. 12 participants (5 females, 7 males) were aged between 30 and 35 years
ii. 6 participants (2 females and 4 males) were aged between 36 and 41 years
iii. 5 participants (4 females and 1 male) were aged between 24 and 29 years
iv. 5 participants (3 females, 2 males) were aged between 48 and 53 years
v. 2 male participants were aged between 42 and 47 years

Regarding occupation, among the females, 9 were petty traders (selling vegetables, second-hand clothes, charcoal, and gin distilling), while 6 were unemployed. Among the males, occupations included security guard (3), *kabaza* operator (bicycle taxi driver) (6), gin distillers (known as kachasu in Malawi) (5), and cleaner (1). Regarding marital status, all but one of the participants (29) were married, while 1 female participant was a single parent. In terms of education, 20 participants (13 females and 7 males) had completed primary education, while 10 participants (2 females and 8 males) had secondary education.

In-depth interviews were conducted using an unstructured questionnaire to allow participants to share their experiences freely (See Appendix E). Some of the questions asked during the in-depth interviews were:

i. What is your main source of potable water?
ii. What challenges do you face when accessing potable water?
iii. Are you satisfied with your current access to potable water supplied by the Water Board?
iv. What are the causes of limited access to potable water?
v. What coping strategies do you employ to address potable water access challenges?

These in-depth interviews (IDIs) provided nuanced insights into the coping strategies, factors influencing access to potable water, and the challenges faced by participants in securing adequate water for their households.

Table 1: Overview of the socio-economic status of the IDIs and KIIs participants in Chinsapo #1

Interview type	Category	Frequency	Age
In-depth interviews			
Age range (years)	24–29	5 (4 females and 1 male)	
	30–35	12 (5 females and 7 males)	
	36–41	6 (2 females and 4 males)	
	42–47	2 (both males)	
	48–53	5 (4 females and 1 male)	
Sex	Males	15	
	Females	15	
Occupation (Females)	vegetable seller	3	24-29 (1) 30-35 (1) 36-41 (1)
	second-hand clothes vendor	2	24-29 (2)
	Charcoal vendor	2	30-35 (2)
	gin distiller	2	30-35 (2)
	Not employed	6	24-29 (1) 36-41 (1) 48-53 (4)
Occupation (Males)	Security Guards	3	24-29 (1) 42-47 (2)
	Bicycle taxi	6	30-35 (2) 36-41 (3) 48-53(1)
	gin distillers	5	30-35 (4) 36-41 (1)

	Cleaner	1	30-35 (1)
Marital Status	Females: Married	14	24-29 (3) 30-35 (5) 36-41 (2) 48-53 (4)
	Females: Single Mother	1	24-29 (1)
	Males: Married	15	24-29 (1) 30-35 (7) 36-41 (4) 42-47 (2) 48-53 (1)
Education	Primary 20 (13 females and 7 males)	13 females 7 males	24-29 (4) 30-35 (3) 36-41 (2) 48-52 (4) 24-29 (1) 30-35 (2) 36-41 (2) 48-52 (1) 42-47(1)
	Secondary	10 (2 females and 8 males)	30-35 (2 females) 30-35 (5 males) 36-41(2 males) 48-53 (1 male)
Key informant interviews			
Age range	37-41 42-46 47-52	2 4 2	1 female, 1 male 2 males and 2 females 1 male and 1 female
Sex	Female Male	4 4	
	Ministry of Water and Sanitation Lilongwe Water Board Water Users Association Community leaders	2 2 2 2	37-41 (1 female) 47-52 (1 male) 42-46 (1 female) 37-41 (1 male) 42-46 (1 male and 1 female) 42-46 (1 female) 47-52 (1 female)
Education level	Primary Secondary Tertiary	3 1 4	42-46 (1 male and 1 female) 47-52 (1 female) 42-46 (1 female) 37-41 (1 female and 1 male) 42-46 2 (1 female) 47-52 (1 male)

Source: (Author, 2025)

3.4.2 Quantitative Sampling

Quantitative data for this study was collected using a simple random sampling technique. Simple random sampling ensures that every element in a population has an equal and independent probability of being selected, thereby minimizing selection bias (Pandey & Pandey, 2015). This technique helps ensure that the sample is representative of the population, leading to more reliable and generalizable findings (Kalton, 2022).

To determine the sample size for the household survey, Taro Yamane's formula (1967) was applied, which is commonly used in social research for sample size calculation:

$$\boldsymbol{n = N/(1 + N(e)2)}$$

Where:

-**n** is the sample size

-**N** is the total number of households in the study area (456 households)

-***e*** is the margin of error (8%), and the confidence level is set at 92%

Using this formula, the required sample size was calculated to be 82 households. This approach ensured an even distribution of the sample across the study area, reducing selection bias, improving data collection efficiency, and achieving the target sample size without redundancy.

The quantitative component of this study focused on identifying the coping strategies, factors influencing potable water access, and the challenges faced by residents of Chinsapo #1 in relation to water access in Lilongwe City, Malawi. A semi-structured questionnaire was developed to collect data on these aspects. The questionnaire was administered to household heads, and the responses were collected for further analysis. The semi-structured questionnaire, which is provided in Appendix B, was divided into four sections:

i. Household demographic data
ii. Factors influencing access to potable water
iii. Challenges in potable water access
iv. Coping strategies for water access

The survey targeted household heads who were responsible for water access decisions in their households. The questionnaires were administered in Chichewa, a widely spoken local language, to ensure clear communication and accurate responses (Appendix C).

The target population for the quantitative study was the informal dwellers of Chinsapo #1, including both households connected to piped water and those without such access. The target population refers to the specific subset of the larger population that the research aims to study (Willie, 2023). The socioeconomic characteristics of the respondents were considered, including age, sex, household head, average monthly household income, occupation, marital status, and education level, as detailed in Table 1.

The demographic breakdown of the survey respondents is presented in Table 2. Key findings from the survey data include:

i. Gender Distribution: 81.7% of the participants were females, reflecting the gender distribution in the study area.
ii. Household Head: A majority (74.4%) of the households were male-headed, which aligns with traditional societal norms where men are generally considered the primary breadwinners.
iii. Age Distribution: A significant proportion of respondents (30.5%) fell within the 30 to 35 years age group.
iv. Household Size: The majority of households (53.7%) comprised 3 to 5 members, followed by 37.8% with 6 to 9 members.
v. Education Level: The study revealed low levels of education, with 72% of respondents being primary school dropouts, while 22% had attended secondary school.
vi. Income Level: The average monthly household income was low, with 51.2% of households earning between Mk 50,000 and Mk 100,000 (USD 28–57) and 42.7% earning less than Mk 50,000 (USD 28) per month.

These demographic insights were essential for understanding the socio-economic context in which the water access challenges and coping strategies were being examined.

In conclusion, the integration of both qualitative and quantitative methods provided a comprehensive understanding of the study's objectives. The qualitative methods, including in-depth interviews (IDIs) and key informant interviews (KIIs), allowed for an in-depth exploration of the factors influencing potable water access, the challenges faced by residents of Chinsapo #1, and their coping strategies. On the other hand, the quantitative approach enabled the quantification of the prevalence of these coping strategies and challenges through survey data, providing a broader view of the situation.

By combining these methodologies, the study not only offered a richer, more nuanced understanding of the research topic but also strengthened the research design. This dual approach enhanced the validity and reliability of the findings, offering a more robust and comprehensive perspective on the issues surrounding potable water access in Chinsapo #1. Integrating both qualitative and quantitative methodologies allowed for a deeper, more holistic analysis of the research question, providing valuable insights that would not have been possible through a single methodological approach.

Table 2: Demographic characteristics of the survey participants in Chinsapo #1

Variable	Category	Frequency	Percentage
Sex	Male	15	18.3
	Female	67	81.7
Age group	18-23	8	9.8
	24-29	15	18.3
	30-35	25	30.5
	36-41	8	9.8
	42-47	5	6.1
	48-53	13	15.9
	54 above	8	9.6
Household Head	Female-headed	21	25.6
	Male-headed	61	74.4
Household Size	1-2 people	7	8.5
	3-5	44	53.7
	6-9	31	37.8
Education level	Primary	59	72
	Secondary	18	22
	No formal education	5	6
Occupational level	Employed	4	4.9
	Unemployed	33	40.2
	Business	40	48.8
	Piecework	5	6.1
Marital status	Single	3	3.7
	Married	67	81.7

	Divorced	4	4.8
	Widow	8	9.8
Household income level	Less than Mk 50,000 (USD 28)	35	42.7
	MK 50,000 to MK 100,000 (USD 28 and USD57)	42	51.2
	Mk100,000 to MWK 200,000 (USD 57 and USD 115)	5	6.1
	More than Mk 200,000 (USD 115 above)	None	None

Source: (Author, 2025)

3.5 Data Analysis

Quantitative data was analyzed using SPSS version 21 and Microsoft Excel (2016). Descriptive statistics, including percentages and frequency distributions, were used to summarize participants' demographic characteristics and quantification of the results related to specific objectives. The results were presented in tables (Tables 1, 2, and 3).

Qualitative data from the interviews were transcribed, coded, and analyzed thematically to identify recurring patterns in line with the study's specific objectives. This approach added depth to the analysis by capturing contextual factors and lived experiences. Thematic analysis is a qualitative research technique used to systematically organize and interpret complex data sets (Dawadi, 2020). This method allowed for a more nuanced understanding of the phenomena by identifying themes related to household coping strategies for water access challenges. It further enhanced the credibility and validity of the findings through rigorous examination and interpretation of the qualitative data.

3.6 Ethical Considerations

Ethical approval was obtained prior to the commencement of data collection for both the household survey and the one-on-one interviews (see Appendix A). Participants were informed about the study's purpose and benefits and provided informed consent. Confidentiality was ensured through the anonymization of responses. Given the sensitive nature of water accessibility in informal settlements, additional measures were implemented to foster trust with respondents. These measures included collaboration with the community leader of Chinsapo #1, who facilitated introductions and assured participants of the confidentiality of their responses. Participants voluntarily took part in the study at their convenience. Authorization to carry out the study was granted by the Pan African University.

3.7 Study Limitations

Despite meticulous planning, the study faced some limitations. First, conducting research in the informal settlement of Chinsapo #1 required careful attention to ethical issues, particularly concerning privacy and confidentiality. Trust issues regarding the confidentiality of responses led some participants to decline participation. To mitigate this, assurances were provided regarding the anonymity of responses, and respondents who opted out were promptly replaced to maintain the sample size. Second, the study's focus on Chinsapo #1 means that its findings may not directly apply to other informal settlements with different socio-economic or environmental contexts. Consequently, future research should broaden the geographical scope to assess whether similar challenges and coping strategies are observed in other regions.

Lastly, the relatively small sample size may affect the generalizability of the findings. While the data collected provided valuable insights into household coping strategies for water access challenges in Chinsapo #1, the limited number of participants may not fully capture the diversity of experiences across the broader population. Future research with a larger and more representative sample could offer more comprehensive and generalizable results.

4. RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the study's findings, along with a detailed discussion of the results. The findings are organized according to the study's objectives, offering a clear and structured presentation of the results.

As highlighted in Chapter 1, the primary objectives of the study are:

1) Examining key factors influencing access to potable water in Chinsapo #1
2) Determining the challenges faced by Chinsapo #1 residents in accessing potable water
3) Examining the coping strategies adopted by Chinsapo #1 residents to address water challenges

4.2 Factors Influencing Access to Potable Water in Chinsapo #1

4.2.1 Financial Limitations

The study revealed that financial constraints were a barrier to accessing potable water in Chinsapo #1. The high cost of initial water connection fees was a common concern among participants. Respondents reported that the cost of connecting to the potable water system was prohibitive. As a result, households relied on water kiosks, which were affordable due to subsidies.

> *"The cost of connecting the potable water system is just too high for many of us. Even though we would like to have it, the initial fee is out of reach for most households here."* (IDI#14)

Similarly, 51.2% of respondents in the survey reported earning low incomes (between Mk50,000 and Mk100,000, or equivalent to $28 to $57), which made it difficult to afford water bills from the Lilongwe Water Board (LWB). Another participant explained her financial struggles:

"I connected a tap through the LWB, but due to financial struggles, I couldn't pay the water bill for the past three months. As a result, the water board disconnected the supply, and now we rely on communal kiosks, which makes it difficult to pay for daily use." (IDI #12)

Emphasizing the challenge of managing both household and water needs with a limited income, a female participant said:

"I'm a sole breadwinner, relying on a gin distilling business, which earns less than Mk60,000 a month, and that is not enough to cover basic needs, including buying water. Therefore, we end up fetching insufficient water." (IDI #2)

This underscores the financial limitations that prevent many households from securing reliable water access, forcing them to rely on alternative and sometimes unsafe sources such as rivers and shallow wells.

4.2.2 Lack of Home Ownership

Another significant barrier to water access in Chinsapo #1 was the lack of home ownership. Households, particularly tenants, were unable to obtain direct water connections. Participants explained that it was the landlord's responsibility to initiate and finance the installation of water connections, a process over which they had little control.

"I cannot connect the piped water system on the premises because I am a tenant, and it is the landlord's responsibility to apply for the water connection, hence relying on kiosks." (IDI #5)

Another IDI participant echoed the above sentiment:

"I wish I could have a tap in my house, but my landlord, perhaps because of financial constraints, is unable to invest in a connection, hence depending on water kiosks." (IDI #15)

However, fetching water from kiosks added significant time and effort to the daily routines of households, particularly those with working or school-going members.

> *"Fetching water from the kiosk takes a lot of time and delays everything. If we had a tap at home, it would be so much faster, and we wouldn't have to waste hours every day just to get enough water."* (IDI #9)

This reliance on landlords for water connections creates logistical and financial challenges, exacerbating the struggle for access to potable water in informal settlements.

4.2.3 Delay in Piped Water Connection

The study also discovered that one of the challenges preventing households from securing piped water is the prolonged delay by the Lilongwe Water Board (LWB) in processing and installing water connections. Respondents expressed frustration over the lengthy waiting period, with some waiting for up to three months without any progress. A male participant shared his experience:

> *"We applied for a piped water connection about three months ago, but the water board is delaying the process. That's why we still don't have a tap in our home." (*IDI #3)

The delay forced many households to continue relying on kiosks or other unreliable water sources, which added to the challenges of daily water access.

> *"The delays are frustrating because, for the past three months, we have struggled to access reliable water for our daily needs without a piped connection."* (IDI #20)

The LWB attributed these delays to the informality of the settlement, which made it difficult to install pipelines in some areas. The LWB Distribution Supervisor stated:

> *"Supplying water to informal settlements in Lilongwe remains a major challenge due to the informal nature of the plots."* (KII #1)

4.2.4 Theft of Piped Water Systems

The theft of water meters and valves has become a significant issue in Chinsapo #1, with many residents facing repeated theft of their water installations. Participants reported theft as one of the barriers to water access. A female participant described her experience:

> *"My meter got stolen 4 months ago, and it's discouraging to reinstall because it's costly."* (IDI #18)
>
> Another male participant also shared his frustration:
>
> *"I installed a tap before, but it was stolen. Reinstalling feels pointless since it might be stolen again, costing me money."* (IDI #14)

The frequency of these thefts led to significant frustration among residents

"We've had to replace our water meter several times this year because it keeps getting stolen. It's frustrating because every time we fix it, the problem happens again." (IDI #3)

The Chinsapo #1 community leader emphasized the widespread impact of this issue:

> *"The theft of meters and valves has become a huge problem in our area. It's not just an inconvenience; it's a financial burden on every household."* (KII #6)

4.2.5 Skepticism About the Legitimacy of Free Tap Installation Programs

The government of Malawi introduced a free water connection program, but many residents in Chinsapo #1 were skeptical about its legitimacy. Some believed the program was a political promise rather than a genuine effort to improve water access. As a result, many households did not apply for the program.

"We thought the free connection program was a false promise, so we didn't apply. Now, seeing our friends benefit from it, we regret not registering and ask the government to reintroduce the program." (IDI #9)

One of IDI participant echoed her sentiments:

"Because we did not register for the free water connection program, we do not have a tap at our house, hence requesting the government to re-introduce the program again." (IDI #28)

The Chief Groundwater Development Officer at the Ministry of Water Development acknowledged the issue when he said:

"Many people are skeptical about the legitimacy of the free connection program. However, we are committed to overcoming these barriers." (KII #3).

4.3 Challenges Faced by Chinsapo #1 Residents in Accessing Potable Water

4.3.1 Inconsistent Water Supply

A significant issue identified by residents in Chinsapo #1 is the inconsistent water supply. According to the survey data, 42.7% (Table 3 below) of respondents mentioned water inconsistency as a major challenge. The water supply is frequently interrupted, with many residents reporting that water is unavailable for hours, sometimes even days. The unreliability of water affects daily routines and creates difficulties for women, who are primarily responsible for fetching water, as well as for school children, who face delays due to long queues at water points. A resident of Chinsapo #1 voiced her frustration:

*"One of the primary reasons we find ourselves dissatisfied with water infrastructures is the ongoing issue of water inconsistency and the unreliable nature of the supply." (*IDI#13)

Residents often must wait for several hours for water to flow, especially in the morning, which negatively impacts their ability to go to work or school on time. One female respondent highlighted the daily struggle:

*"I wake up at 5:45 am to fetch water from the kiosk, but the water isn't flowing often. When I'm in a hurry, I go to the kiosk approximately 450 meters away, but it's always crowded, causing delays, especially for my children, who go to school. Sometimes, women fight over water, breaking each other's buckets, which is troubling." (*IDI#15)

The cause of these water interruptions is linked to the Lilongwe Water Board's (LWB) limited production capacity. The water treatment plant can produce only 110 cubic meters per day, while the demand is 150 cubic meters per day. This imbalance results in rationing, with water being supplied in scheduled blocks. The LWB network engineer explained:

> *The water treatment plant produces 110 cubic meters daily, but demand is 150 cubic meters, forcing us to ration supply."* (KII#2)

4.3.2 Limited Water Infrastructure

The water supply infrastructure in Chinsapo #1 is inadequate to meet the growing demand. There are not enough water kiosks, and those that exist are often unreliable and located far from residents' homes. Approximately 19.5% (Table 3 below) of respondents noted the inadequacy of the water infrastructure in the area as a major challenge. The growing population in the area has further strained the existing resources, making it difficult for residents to access potable water. A woman shared her perspective:

> *"More people are still coming to this area, making the number of kiosks inadequate because many of us depend on kiosks for water due to financial limitations."* (IDI#29)

Another resident explained:

> *"It's common to see long queues at the water kiosks due to the limited number of kiosks in the area."* (IDI#18)

A member of the Malili Water Users Association in Chinsapo #1, also stressed the shortage of kiosks:

> *"The kiosks are not enough to meet the demand in the area. The shortage of water kiosks (*KII#7)

4.3.3 Heavy Leakages and Pipe Damage

Another major challenge identified was broken pipes and leakages in the water distribution system. Approximately 29.3% (Table 3 below) of survey participants cited this as an issue. Residents pointed out that tampering with pipes and illegal water connections were common, leading to frequent damage. Broken pipes are often not repaired on time, exacerbating the problem and forcing residents to rely on unsafe water sources like rivers.

> *"The high cases of broken pipes and leakages due to tampering of the pipes and illegal water connections often damage the system, leading to frequent pipe breakages."* (IDI#14)

As highlighted by Chinsapo #1 another resident;

> *"The lack of a reliable water supply disrupts our daily routines. We end up fetching water from the rivers because the pipes are broken for days, which makes it difficult to access clean water for basic needs." (*IDI#12)

The LWB Distribution Supervisor acknowledged that unauthorized connections and aging pipes cause significant problems:

> *"Unauthorized water connections and aged pipes are a major problem the board is facing. They disrupt the functioning of the water system and make it hard to provide consistent water, which affects the entire community."* (KII#1)

4.3.4 Low Pressure

Low water pressure is another challenge affecting the residents of Chinsapo #1. Low pressure leads to delays at kiosks, as residents have to wait longer to fill their containers. This delay interferes with their daily activities and disrupts time management, especially for those who need to attend school or work.

> *"The low water pressure at the kiosks in the morning is a real problem. We have to wait much longer to collect water, which messes up our schedules for the day."* (IDI#8)

Another participant pointed out that;

> *"We experience extremely low water pressure at certain times, especially in the morning. This causes delays in fetching water and affects our time management for school and work."* (IDI#23).

The underlying cause of low pressure is the LWB's limited production capacity, which prevents the treatment plants from meeting the demand. the LWB network engineer confirmed this challenge:

> *"Due to the limited capacity of the water distribution systems, LWB often experiences low water pressure challenges."* (KII#2).

4.3.5 Time Spent Fetching Water and Distance to Water Source

As indicated in Table 3 below, about 57.3% of households in the survey reported spending between 30 minutes to 1 hour on water collection, while 40% spent less than 30 minutes. Additionally, 5.1% of households indicated that they were spending between 1 to 2 hours each day fetching water (Table 3 below). A female respondent explained;

> *"We spend more than 30 minutes every day fetching water. Some of us spend up to an hour each day collecting water."(*IDI#30)

Another female respondent added;

> *"Due to the limited number of kiosks in the area, I spend more than 40 minutes fetching water, which disturbs my schedule."* (IDI#28)

A significant portion of residents (52.4%) travel between 100 to 500 meters to the nearest water kiosk, while 36.6% travel between 500 meters to 1 kilometer (see Table 3). This distance adds to the physical effort and time required to collect water, making it more difficult for those living farther away.

> *"To fetch water, I travel a distance of more than 500 meters, and some have to walk even farther, up to a kilometer." (*IDI#16)

4.3.6 Poor Road Conditions During the Rainy Season

In Chinsapo #1, roads become muddy and slippery during the rainy season, which makes it difficult for women, in particular, to carry water without falling. This has resulted in physical injuries, and some individuals require medical attention, according to one of the male participants:

> *"The roads are in poor condition, especially during the rainy season; they become muddy and slippery, making it dangerous to carry water, especially for women." (*IDI#22)

The community leader also corroborated the above sentiment when she said:

> *"The bad roads add to our struggles. Not only do we have to deal with physical risks, but we also have to spend money on hospital bills, which is a heavy burden for many of us." (*KII#5).

4.3.7 Time Limits for Opening and Closing the Kiosks

The water kiosks have strict operating hours: from 6:00 am to 10:00 am and 4:00 pm to 6:00 pm. These restricted hours complicate water access for residents with demanding schedules or those with large water needs. Respondents also mentioned that long queues during these hours add further challenges, especially for those who cannot fetch water before the kiosks close.

> *"The kiosks close too early in the morning, and by the time I return from business in the evening, they are already closed."* (ID1#20).

Another participant added;

> *"There are too many people fetching water at the same time. Sometimes, I wait in line for an hour, and before my turn comes, the kiosk attendants announce that they are closing."* (IDI#5).

A water kiosk attendant also voiced their challenges when delivering their services.

> *"We limit the opening hours to prevent overuse and reduce the water bills. At the same time, we don't have enough attendants to keep the kiosks open for longer hours, which makes it challenging to meet the demand." (*KII#8).

These challenges highlight the complex and multifaceted nature of water access issues in Chinsapo #1, impacting both daily life and the well-being of the community.

Table 3: Summary of Water Access Satisfaction, Reliability, Fetching Time and Distance

VARIABLES	FREQUENCY	PERCENTAGE
Water Accessibility Satisfaction from LW*B*		
Very satisfied	14	17.3
Satisfied	31	38.3
Neutral	16	18.5
Dissatisfied	21	25.9
Total	82	100%
Reliability Of Water Infrastructure		
Very Reliable	37	45.1
Reliable	39	47.6
Not Reliable	6	7.3
Total	82	100%
Water Infrastructure challenges		
Water Pipe damage	24	29.3
Inconsistency supply	35	42.7
Limited Infrastructure	16	19.5
Heavy l		
None	7	8.5
Total	82	100%
Time spent fetching water.		
Less than 30 mins	31	40
30mins-1hours	46	57.3
1-2hours	5	2.7
Total	82	100%
Distance traveled to fetch water.		
Less than 100 meters	12	11.0
100meters -500meters	43	54.4
500meters-1Km	27	36.6
Total	82	100%

Source: (Author, 2025)

4.4 Water Coping Strategies Employed by Chinsapo #1 Residents

The following are the coping strategies that the Chinsapo #1 residents employed to cope with the water challenges they were facing;

4.4.1 Use of Alternative Water Sources

Many households have resorted to using alternative water sources such as wells and rivers. Although these sources are not ideal, they are often the only viable option for those unable to afford water from kiosks or those living in areas without access to piped water.

> *We have to fetch water from the nearby river even though it is not safe. We don't have a choice because buying water from the kiosk is too expensive."* (IDI #7)

4.4.2 Water Storage Techniques

In the absence of a consistent water supply, many households store large amounts of water to ensure they have enough to meet their needs. Some households have also built rainwater harvesting systems as a temporary solution during the rainy season.

> *"We store water in large containers to make sure we have enough during the dry season. It's not always enough, but it helps."* (IDI #13)

This chapter presents the primary findings on the challenges faced by Chinsapo #1 residents in accessing potable water and the various factors contributing to these challenges. The next chapter will explore the implications of these findings and provide recommendations for addressing these issues.

4.4 Coping Strategies Adopted by Chinsapo #1 Residents

Faced with these challenges, residents have developed coping strategies to manage their water access issues.

4.4.1 Fetching water from neighboring areas, mosques, and schools

The survey revealed that the majority (46.6%) of household residents heavily relied on water from the neighboring areas, mosques, and schools in times of water supply interruptions. During an occasional disruption of the water supply, most residents resorted to fetching water from close neighborhoods, mosques, and schools. However, the residents were required to walk long distances.

Additionally, it was discovered that the residents were charged for the water they collected (Mk200 to Mk400 per 20L bucket), and the prices were higher than the cost of water at the kiosks (Mk100). One of the IDI participants, explained.

> *"When the water is not flowing for 2 to 3 days, we have to go to our neighboring areas to fetch water from people's taps, paying double the water prices from the kiosk. The distance is over an hour, and carrying four buckets alone takes over four hours. This happens frequently, and it's not a good experience."* (IDI#6)

Another participant added:

> *"When the water supply is disrupted, we go to nearby neighborhoods, mosques, and schools to fetch water. The long distances make it even more difficult, and the extra cost of water adds to our financial struggles." (*IDI#14)

Residents sometimes resorted to fetching water from boreholes at a nearby mosque owned by Muslims, where they were experiencing religious bias.

> "At the mosque, *we experience religious bias, whereby the Muslims will fetch first since the borehole belongs to them, and the non-Muslims will be the last to fetch, which frequently leads to fights."* (IDI#21)

4.4.2 Fetching water from the river

The study also revealed that the residents heavily relied on the water from the Lilongwe River in times of water supply interruptions from the water board. About 21.9% of the survey respondents reported fetching water from the Lilongwe River (Figure 2) during the time of water interruption. As explained by the participants, fetching water from the river presented several challenges. A female respondent reported that the water from the river was dirty, especially during the rainy season, making it unsuitable for laundry or bathing and sometimes causing skin infections.

"The water from the river is dirty, especially during the rainy season, and it makes laundry and bathing impossible." (IDI#16)

The respondents emphasized that they had experienced waterborne disease outbreaks in the area, particularly cholera and diarrhea, due to using water from the river, which mostly affected children and women.

The participants also complained about the distance being too far, more than 1 hour on foot, which was tiresome, and that sometimes they had to hire motorbikes or bicycles, which was even more costly. The respondents further highlighted that this not only affected their health but also their finances due to spending more money on transportation.

*"Fetching water from the river takes over an hour, and the cost of hiring a motorbike to carry water is too much for most families already struggling financially." (*IDI#13)

Additionally, as highlighted by the Chinsapo #1 community leader, during the dry season, the water level could significantly fluctuate, making it an unreliable source, and when experiencing irregular water flow from the water board, it was difficult for them to depend on it, hence further exacerbating water access challenges.

"During the dry season, water levels fluctuate so much that the river is no longer a reliable source." (KII#6)

Figure 2: Showing Lilongwe River used by some Chinsapo #1 residents as their coping strategy

4.4.3 Reduce Overall Consumption

To manage water shortages and supply inconsistencies, many Chinsapo #1 residents have resorted to reducing their water consumption. Approximately 5.5% of survey participants noted that they made conscious efforts to cut back on water usage to ensure that their limited supply would last until the water flow resumed. For instance, respondents explained that they cut back on activities like washing dishes, doing laundry, and bathing twice a day. This was done to stretch the available water and prevent running out completely.

> *"We have to cut down on washing dishes and doing laundry, and instead of bathing twice a day, we bathe once, just to make sure we don't run out of water." (*IDI#13)

One of the respondents also shared that the cost of buying water from kiosks made it necessary for her household to limit their water use.

> *"We have to limit our water use because buying from the kiosk every day is costly. (*IDI#19)

Residents expressed frustration at not knowing when the water would come back, but these efforts were seen as essential for managing the situation.

4.4.4 Distribution of Water through Water Bowsers

The water board occasionally provided water bowsers (tanker trucks) to distribute water during extended supply interruptions, but this practice was inconsistent and inadequate. While the Water Board did send bowsers on some occasions, it was not guaranteed during every supply disruption.

> *"It's not every time we have water shortages that the water board brings bowsers to distribute water." (*IDI#4)

Even when water bowsers were provided, the volume of water distributed was insufficient for the needs of the entire community. Respondents highlighted that the single bowser allocated was often not enough for all households:

> *"When they bring the water bowser, it's never enough for everyone in the community." (* ID1#21)

The limited allocation of water further exacerbated tensions among residents, as they competed for access to the scarce resource, leading to conflicts. A participant highlighted the challenges posed by the limited supply:

> *"We end up fighting over the little water we get because there's not enough to share among all of us." (*IDI#30).

4.4.5 Storing Water in Buckets or Drums

To cope with the irregular water supply, 20.3% of residents reported storing water in buckets or drums. This strategy helped ensure that households had access to water during supply interruptions. Even households with taps connected to their premises practiced water storage due to the unpredictable nature of the water supply.

> *"We store water in buckets and drums, even though we have taps, just in case the water stops flowing unexpectedly." (*IDI#3)

A female participant emphasized the dual purpose of water storage. She said:

> *"We store water not just because of the unreliable supply, but also to reduce the cost of buying it daily. (* IDI#21)

By storing water in advance, families could meet their daily needs for cooking, cleaning, and other household chores. This practice alleviated the stress of water scarcity and reduced dependence on external sources. Respondents explained that storing water in advance was essential to surviving periods of water interruption:

"Having water stored in advance is the best way to survive when the supply is interrupted; it's a necessity for us." (ID1#19)

4.4.6 Dug Shallow Wells

Due to the high cost of piped water connection and the inability to afford it, 5.7% of households resorted to digging shallow wells as an alternative water source. These wells were primarily used for non-consumptive purposes like washing clothes and watering gardens. One of male participant shared that he dug a shallow well on his property to supplement his water supply, as the inconsistent flow from the water board was not reliable.

*"I have a tap connected from the LWB, but to supplement the water-inconsistent supply and to reduce the water bills, I dug a shallow well on my premises, which we normally use for laundry and watering the garden." (*IDI#1)

One of the Chinsapo#1 residents also explained that his family used a shallow well for activities like bathing, washing dishes, and laundry to cut costs on buying water from kiosks:

*"We dug shallow wells because we couldn't afford the piped-water connection fee, but the water quality is poor, so we only use it for laundry and bathing." (*ID1#7)

However, officials from the Ministry of Water and Sanitation pointed out that shallow wells and boreholes are prohibited in urban informal settlements due to the high risk of groundwater contamination from nearby pit latrines. The Senior Surface Water Officer explained:

*"The government prohibits shallow wells or boreholes in urban informal settlements due to the high risk of groundwater contamination from nearby pit latrines because of the unplanned nature of these settlements." (*KII#4)

The residents of Chinsapo #1 have developed various strategies to cope with ongoing water shortages and disruptions, such as reducing water usage, relying on water bowsers, storing water, and digging shallow wells. While these coping mechanisms help manage the immediate challenges, they also expose the inadequacies of the water supply system and the socio-economic challenges faced by residents. Addressing these issues requires significant improvements in infrastructure, consistent water distribution, and support for vulnerable populations to alleviate the strain caused by unreliable water access.

4.5 Discussion

The findings from the research on access to potable water in Chinsapo #1 reveal a complex interplay of socioeconomic, infrastructural, and policy factors that significantly influence water access. Key barriers such as financial constraints, delays in water connections, theft, and insufficient infrastructure are compounded by inconsistent water supply, creating a vulnerable scenario for residents. As noted by Nanle and colleagues (2022), informal settlements are particularly prone to water challenges due to the lack of reliable and sufficient water infrastructure (Nanle *et al.*, 2022), while UNICEF & WHO (2021) highlight that economic hardships exacerbate water access issues in these settings.

Financial Constraints and Water Access

The research indicates that financial limitations were a significant determinant of water access. High connection fees and recurring water tariffs prevented many residents from obtaining formal water connections. As a result, 96.2% of respondents relied on water kiosks, which were considered to be affordable. This finding aligns with Beard and Mitlin's (2021) study in Uganda, where residents in informal settlements, burdened by high water service fees, depended on subsidized water services. The study suggests that introducing subsidized water services or financial assistance programs could significantly ease the burden for low-income households.

The socio-economic profile of respondents further underscores the challenges. A majority of the households had low educational attainment (73%) and were engaged in small-scale businesses, contributing to unstable incomes that made water unaffordable. Household income and size, as indicated by previous studies (Solagbade *et al.*, 2024; Akoteyon, 2019), also play a significant role in determining water affordability, and larger households tend to spend more on water consumption. The study revealed that households with larger family sizes tended to spend more on purchasing potable water compared to smaller households due to increased consumption needs. Similarly, low-income households frequently reported restricting their water usage or collecting only a few buckets at a time as a result of financial constraints. These findings underscore the economic burden associated with accessing potable water and highlight how both household income and size are key factors influencing water access in informal settlements.

Water Supply Inconsistencies and Infrastructure Challenges

Inconsistent water supply emerged as a primary concern, with frequent disruptions attributed to low production capacity at the Lilongwe Water Board (LWB) treatment plant, aging infrastructure, and illegal connections. These disruptions made it difficult for residents to maintain daily routines, highlighting the need for improved infrastructure and better management practices.

Burt (2018) found that in 7 out of 15 cities studied in sub-Saharan Africa, informal settlements faced frequent water supply inconsistencies, receiving water for less than 17 hours per week. These interruptions, often caused by low pipe pressure, increase the risk of contamination and waterborne diseases.

Additionally, the limited number of water kiosks and long distances to water sources intensified the challenge, with many residents spending over 30 minutes each day collecting water, contrary to the World Health Organization's recommendation that water sources be within 1 km of homes and require no more than 30 minutes per round trip (Ummah, 2019). This situation disproportionately affected women and children, who are primarily responsible for water collection, thus disrupting their daily activities, such as work and school. Poor road conditions, especially during the rainy season, further hindered water collection, putting residents, particularly women, at risk of injury while fetching water.

Coping Strategies and Health Risks

In the absence of affordable and reliable water sources, many low-income residents rely on multiple, often unreliable and unsafe water sources, including water sold by vendors at exorbitant prices (Adams & Boateng, 2018). Faced with unreliable supply and financial limitations, residents in Chinsapo #1 adopted various coping strategies, including fetching water from neighboring areas, mosques, and schools, sometimes walking over an hour to access water. Many also relied on water from the Lilongwe River, despite the risks of contamination from livestock waste, human activities, and poor water quality, particularly during the rainy season. This unclean water posed health risks, including cholera, diarrhea, and skin infections, especially among children and women. Despite these risks, residents continued to rely on the river when other options were unavailable, underscoring the lack of affordable and safe water sources.

The coping mechanisms, while necessary, highlight the significant strain on residents' time, health, and finances. The dependence on contaminated water sources exacerbates the likelihood of waterborne diseases, increasing healthcare costs and negatively impacting overall well-being. This situation calls for urgent policy interventions and improvements in water infrastructure to address these challenges effectively.

Government Efforts and Policy Challenges

The government of Malawi has implemented several initiatives to improve water access in informal settlements, including subsidized water kiosks, free water connection programs for low-income households, and the Lilongwe Water and Sanitation Project. Despite these efforts, several challenges remain, including the unplanned nature of informal settlements, financial constraints, regulatory challenges such as illegal water connections and theft, and technical limitations in water management. Additionally, outdated water policies and a shortage of skilled personnel hinder the effectiveness of water supply interventions in these areas.

Despite the government's efforts, achieving Sustainable Development Goal (SDG) 6 of universal access to safe drinking water by 2030 remains unlikely in informal settlements like Chinsapo #1. The findings from the Ministry of Water and Sanitation officials highlight that significant gaps remain in water infrastructure, which require ongoing policy revisions and investments to ensure equitable access to clean water.

Conclusion

The study of water access in Chinsapo #1 underscores the urgent need for improved water infrastructure, subsidized water services, and effective policy interventions to address residents' complex challenges. While government initiatives are a step in the right direction, overcoming the barriers of financial constraints, inconsistent supply, and inadequate infrastructure will require continued investment in water systems, stricter enforcement of regulations, and targeted support for low-income households. Only through comprehensive and sustained efforts can the goal of universal access to safe drinking water in informal settlements be realized.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the research findings, answers the research questions, and provides recommendations based on the study. The research aimed to examine household coping strategies for water access challenges in the informal settlement of Chinsapo #1, Lilongwe, by addressing the following specific objectives:

1) Identify the factors influencing access to potable water in informal settlements of Chinsapo, Lilongwe.
2) Examine the challenges faced by Chinsapo #1 residents in accessing potable water.
3) Analyze the coping strategies adopted by Chinsapo #1 residents to address water challenges.

5.2 Summary of Research Findings

The study addressed the following key research objectives:

(i) Factors influencing access to potable water in Chinsapo #1.
Findings revealed multiple barriers to potable water access, with financial constraints being the most significant. Many households struggled to afford formal water connections, while others faced delays in water board approvals. Additionally, the lack of home ownership further limited access to piped water. Other factors, such as theft of water infrastructure, skepticism about free tap installation programs, and political rhetoric, also contributed to the water crisis.

(ii) Challenges facing Chinsapo #1 residents regarding potable water access.
One of the major challenges was the unreliable and inconsistent water supply. Limited infrastructure, including an insufficient number of kiosks, population growth, low water pressure, frequent pipe breakages, and prolonged supply disruptions (sometimes lasting more than three days), intensified the crisis. These challenges significantly impacted residents' daily lives, affecting their health, education, and economic activities.

(iii) Coping strategies Chinsapo #1 residents adopt to address potable water challenges.

To manage water shortages, residents relied on various coping mechanisms, including fetching water from rivers, digging shallow wells, storing water, and reducing water consumption (e.g., limiting bathing to once a day). However, these strategies were largely ineffective due to poor water quality, long distances traveled, and the time-consuming nature of fetching water.

5.3 Summary of Findings

Through a mixed-methodology approach, this study comprehensively analyzed factors influencing access to potable water, accessibility challenges, and the coping strategies adopted by the informal settlers of Chinsapo #1 to alleviate potable water access challenges. As one of the most marginalized urban populations, Chinsapo #1 residents often resort to the use of unsafe water sources such as shallow wells and nearby rivers, leading to significant health risks and socio-economic disadvantages.

The findings revealed that water kiosks served as the primary source of potable water for most households (96.2%) due to financial constraints and lack of homeownership. However, issues such as inconsistent supply, high costs, and long distances to kiosks made water access difficult. For approximately 72% of households, even the subsidized water kiosks were unaffordable, forcing them to rely on unsafe alternatives.

Despite government efforts to provide potable water in informal settlements, regulatory challenges, inadequate infrastructure, and financial limitations have exacerbated water shortages in Chinsapo #1. Vandalism of water infrastructure, limited capacity of the distribution system, and outdated water policies continue to hinder progress.

The water crisis in Chinsapo #1 affects all aspects of residents' lives, from health and education to economic productivity. Households have adopted various coping mechanisms, but these remain inadequate, highlighting the urgent need for sustainable solutions. Ultimately, the study underscores the need for targeted interventions to improve water supply and accessibility in informal settlements.

5.4 Recommendations

To enhance access to potable water in Chinsapo #1, a multi-stakeholder approach involving the government, non-governmental organizations (NGOs), and local communities is essential. The following interventions are recommended:

(i) Expansion and Modernization of Water Infrastructure

One of the key challenges is the inadequate capacity of the Lilongwe Water Board (LWB) to meet growing water demand. The government should allocate funds to expand water treatment plants and modernize outdated infrastructure. Many existing pipelines experience frequent leakages, leading to significant water losses. Investing in infrastructure expansion and replacing old pipes will improve water supply reliability and efficiency.

(ii) Additional Water Kiosks and Storage Facilities

Given the growing population and limited number of water kiosks, additional kiosks should be installed to improve accessibility. Furthermore, constructing more water storage tanks will help mitigate supply disruptions and reduce the burden on residents, particularly during periods of low water availability.

(iii) Promotion of Rainwater Harvesting

The Ministry of Water and Sanitation, LWB, and NGOs should actively promote rainwater harvesting as a supplementary water source. Providing incentives, such as subsidies for household water storage tanks and technical assistance for rainwater collection systems, would encourage more families to adopt this practice. Harvested rainwater can serve as an alternative source, reducing dependence on centralized water supply systems.

(iv) Introduction of Subsidies and Flexible Payment Plans

Affordability remains a major challenge for low-income households that struggle to pay water connection fees. The government should introduce targeted subsidies and flexible payment options, such as installment-based payments, to enable disadvantaged families to access piped water. This approach would alleviate financial burdens and reduce reliance on unsafe water sources.

(v) Strengthening Regulation and Reducing Illegal Water Connections

Unauthorized water connections and infrastructure vandalism contribute to supply disruptions and inefficiencies. To address this issue, stronger enforcement of regulations and stricter penalties for illegal connections are necessary. Additionally, community awareness programs should be implemented to educate residents on the impact of illegal water use and the importance of safeguarding water infrastructure.

5.5 Future Research Directions

Since this study did not extensively examine existing policies governing potable water supply in informal settlements, future research should focus on evaluating the effectiveness of these policies in addressing water access inequalities. Additionally, as this study was limited to Chinsapo #1, future research should expand to other informal settlements with different socio-economic and environmental conditions to develop broader insights. Lastly, further studies should explore alternative water sources, such as rainwater harvesting, to assess their feasibility in improving water security.

5.6 Conclusion

Ensuring equitable access to potable water in informal settlements like Chinsapo #1 requires a multi-pronged approach that includes infrastructure development, policy reforms, and community engagement. By implementing the recommended interventions, stakeholders can work toward achieving Sustainable Development Goal (SDG) 6 - universal access to clean water and sanitation—ultimately improving the quality of life for Chinsapo #1 residents.

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APPENDIXES

EXAMINING HOUSEHOLDS' COPING STRATEGIES FOR WATER ACCESS CHALLENGES IN INFORMAL URBAN SETTLEMENTS: THE CASE OF CHINSAPO #1, LILONGWE CITY, MALAWI

Appendix A: Informed Consent Form

Study Title: Examining Households' Coping Strategies for Water Access Challenges in Informal Urban Settlements: The Case of Chinsapo #1, Lilongwe City, Malawi

Researcher: Alinafe Favour Kanyimbo

Institution: Pan African University Institute for Water and Energy Sciences (including Climate Change) (PAUWES), University of Tlemcen, Algeria

1. Introduction:

My name is Alinafe Favour Kanyimbo. I am conducting key informant interviews, in-depth interviews, and household surveys for a research project on households' coping strategies for water access challenges in informal urban settlements, focusing on Chinsapo 1#, Lilongwe. This research is part of my Master's degree at PAUWES, University of Tlemcen, Algeria

2. Aim of the Study:

The study aims to understand how households in informal settlements cope with water access challenges and the role of institutions in addressing these issues. It seeks to provide insights into existing policies, institutional frameworks, and potential interventions for improving water access.

Participant's Name: ___________________________

Signature: ___________________________

Date: ___________________________

Researcher's Name: ___________________________

Signature: ___________________________

Date: ___________________________

Appendix B: Household Questionnaires

Section A: Household Demographic Data

1. To which age group do you belong?
   a. 18-23
   b. 24-29
   c. 30-35
   d. 36-41
   e. 42-45
   f. 46-51
   g. 51 above

2. What is your sex?
   a. Female
   b. Male
   c. Transgender
   d. Other

3. What is your marital status?
   a. Single
   b. Married
   c. Divorce
   d. Widow

4. What is the highest education level you have completed?
   a. No formal school
   b. Primary
   c. Secondary
   d. Tertiary

5. What is your occupation status?
   a. Employed
   b. Unemployed
   c. Business d.
   d. Other(please specify)

6. What is your household size?
   a. 1-2 people
   b. 3- 5 people
   c. 6-9 people
   d. 10 or Above

7. Is your household;

a. Female-headed household
b. Male-headed household

8. What is your average monthly household income?
   a. Less than MWK 50,000
   b. MWK 50,000 - MWK 100,000
   c. MWK 100,000 - MWK 200,000
   d. More than MWK 200,000

Section B: Factors Influencing Access to Water

1. Do you have access to potable water in your home supplied by the Lilongwe Water Board?
   a. Yes
   b. b. No
2. If not, what is your primary source of potable water?
   a. Community borehole
   b. Public tap
   c. River/Stream
   d. Water from the vendor, e. Private source (borehole)
   f. Other (please specify)
3. Do you find it difficult to afford the cost of potable water?

   a. Yes
   b. b. No

4. If yes, how much do you spend to access potable water supplied by the Water Board connected to your premises?
   a. MK5000-10000
   b. b. MK11000-15000
   c. c. MK16000-20000
   d. d. MK21000 above
5. If yes, how much do you spend to access potable water supplied from private sources or community sources?
   a. MK5000-10000
   b. b. MK11000-15000
   c. c. MK16000-2000
   d. d. MK21000 above
6. How satisfied are you with your current access to potable water supplied by the water Board?
   a. Very satisfied
   b. b. Satisfied
   c. c. Neutral d.
   d. Dissatisfied
   e. e. Very dissatisfied
7. If not, why are you not satisfied with the current access to potable water?

8. How satisfied are you with your current access to potable water other than from the LWB?
    a. Very satisfied
    b. b. Satisfied
    c. c. Neutral
    d. d. dissatisfied
    e. e. Very dissatisfied
9. How reliable is the water supply infrastructure in your area?
    a. Very reliable
    b. b. Somewhat reliable
    c. c. Not reliable
    d. d. Completely unreliable
10. How often is water available from your primary source?
    a. Everyday
    b. b. Once a week
    c. c. Twice every two weeks
    d. d. Rarely e. Never
11. What are the reasons you do not have access to potable water supplied by the Lilongwe water board?

Section C: Water Access Challenges

12. How far is the nearest source of potable water from your home?
    a. Less than 100 meters
    b. 100-500 meters
    c. 500 meters - 1 km
    d. More than 1 km
13. How much time do you spend fetching water daily?
    a. Less than 30 minutes
    b. 30 minutes - 1
    c. 1-2 hours
    d. More than 2 hours
14. What challenges do you face with the water infrastructure in your area?

    a. Broken pipes
    b. Contaminated sources
    c. Inconsistent supply
    d. Limited water infrastructure,
    e. If any, explain

15. Apart from the challenges mentioned above, what are the main challenges you face regarding the availability of water?

Section D: Coping Strategies

16. What strategies do you use to cope with water shortages or poor water quality?

a. Purchase water from vendors
b. Collect water from an alternative source (well, spring, river).
c. Reduce your overall water consumption.
d. Rely on rainwater harvesting
e. Other (Please specify)

17. If you purchase water from vendors (Q18), what is the average cost per liter?
18. If you collect water from an alternative source (Q18), how far (in minutes) do you typically travel to collect it?

a. Less than 100 meters
b. 100-500 meters
c. 500 meters - 1 km
d. More than 1 km

19. What difficulties do you face with the water coping strategies you have adopted?
20. What are some of the strategies that the government has put in place in your community to cope with water access challenges?

Appendix C: Questionnaire translated into Chichewa

Gawo A: Deta ya Za Mabanja

1. Kodi muli mu gulu liti la zaka?

a.18-23 b.

b. 24-29

c. 30-35

d. 36-41

e. 42-45

f. 46-51

g. 51 kupitilira

2. Kodi ndinu wa jenda liti?

a. Mkazi

b. Mamuna

c. Transgender

d. Zina (fotokozani)

3. Kodi mulipabanja?

a. Sindinakwatire

b. Ndakwatira c.

c. Ndasudzulidwa d.

d. Ndachoka pa ukwati

e. Mwamuna/mkazi wanga anamwalira

4. Kodi maphunziro anu munalekeza pati ?

a. Palibe sukulu

b. Sukulu ya pulayimale

c. Sukulu ya sekondale

d. Sukulu yapamwamba (tertiary)

5 Kodi ntchito yanu ndi yotani?

a. Ndili pantchito

b. Ndilibe ntchito

c. Ndili pa malonda

d. Zina (fotokozani)

6 Kodi m'banja mwanu muli anthu angati?

a. 1-2

b. 3-5

c. 6-9

d. 10 kupitilira

7. Kodi banja lanu limatsogoleredwa ndi ndani?

a. Mkazi

b. Mamuna

8. Kodi ndalama zomwe mumapeza pamwezi ndi zingati?

a. Zochepera MWK 50,000

b. MWK 50,000 - MWK 100,000

c. MWK 100,000 - MWK 200,000

d. Zoposa MWK 200,000

Gawo B: Zomwe Zimakhudza Kupeza MadziReorganize all your questionnaires

1. Kodi muli ndi madzi aukhondo okwanira omwe amaperekedwa ndi Lilongwe Water Board kunyumba kwanu?

a. Inde

b. Ayi

2. Ngati ayi, kodi mumapeza madzi kuchokera kuti?

a. Chitsime cha anthu onse

b. Tepi ya anthu onse

c. Mtsinje

d. Ogulitsa madzi

e. Chitsime cha payekha

f. Zina (fotokozani)

3. Kodi mumavutika kulipira madzi?

a. Inde

b. Ayi

4. Ngati inde, mumagwiritsa ntchito ndalama zingati kugula madzi a Water Board?

a. MK 5000-10000

b. MK 11000-15000

c. MK 16000-20000

d. MK 21000 kupitilira

5. Ngati inde, mumagwiritsa ntchito ndalama zingati kugula madzi a payekha kapena a m'dera?

a. MK 5000-10000

b. MK 11000-15000

c. MK 16000-20000

d. MK 21000 kupitilira

6. Kodi ndinu okhutira ndi madzi a Water Board?

a. Ndine wokhutira kwambiri

b. Ndine wokhutira

c. Ndilibe maganizo

d. Sindikukhutira

e. Sindikukhutira kwenikweni

7. Ngati ayi, kodi chifukwa ndi chiyani?

8. Kodi ndinu okhutira ndi madzi ena osachokera ku Water Board?

a. Ndine wokhutira kwambiri

b. Ndine wokhutira

c. Ndilibe maganizo

d. Sindikukhutira

e. Sindikukhutira kwenikweni

9. Kodi dongosolo la madzi kudera lanu ndilotani?

a. Lodalirika kwambiri

b. Lodalirika pang'ono

c. Silodalirika

d. Silodalirika kwenikweni

10. Kodi mumapeza madzi kangati?

a. Tsiku lililonse

b. Kamodzi pa sabata

c. Kawiri pa milungu iwiri

d. Zochepa kwambiri

e. Palibe

11. Kodi ndi chifukwa chiyani simuli ndi madzi a Water Board?

12. Kodi mungalongosole zomwe mumakumana nazo tsiku ndi tsiku pokatunga madzi?

Gawo C: Mavuto a Kupeza Madzi

13. Kodi gwero la madzi loyandikira kwambiri lili patali bwanji ndi nyumba yanu?

a. Pansi pa 100m

b. 100-500m

c. 500m - 1 km

d. Kuposa 1 km

14. Kodi mumakhala nthawi yayitali bwanji mukutunga madzi?

a. Pansi pa mphindi 30

b. Mphindi 30 - Ola limodzi

c. Maola 1-2

d. Kuposa maola 2

15. Kodi mumawona kuti madzi amene mumapeza ali abwino bwanji?

a. Abwino kwambiri

b. Abwino

c. Osavomerezeka pang’ono

d. Oyipa

15. Kodi muli ndi nkhawa ziti zokhudza khalidwe la madzi amene mumapeza?

16. Kodi kolite la madzi limakhudza bwanji thanzi la mabanja anu?

17. Kodi mukukumana ndi mavuto otani pokhudza madzi? a. Mapaipi osweka b. Madzi owonongeka c. Kusagwirizana kwa madzi d. Kusakwanira kwa zipangizo e. Palibe mavuto

18. Kodi pali mavuto ena omwe mumakumana nawo?

Gawo D: Njira Zothanirana ndi Mavuto a Madzi

20. Kodi mumatani ngati madzi sakukwanira kapena ali oyipa?

a. Kugula madzi kwa ogulitsa

b. Kutunga madzi ku chitsime/mtsinje

c. Kuchepetsa kagwiritsidwe ka madzi

d. Kusonkhanitsa madzi amvula

21. Ngati mumagula madzi, mumalipira ndalama zingati pa lita imodzi?
22. Ngati mumatunga madzi kwina, mumayenda mphindi zingati?

23. Kodi mukukumana ndi mavuto otani pogwiritsa ntchito njira zomwe mwapeza?

24. Kodi boma lapanga chiyani kuthandiza anthu kupeza madzi m’dera lanu?

25. Kodi mukuwona kuti boma ndi LWB angachite chiyani kuti akonze vuto la madzi ku Chinsapo?

Appendix D:Key Informant Interview (KII) Questionnaire

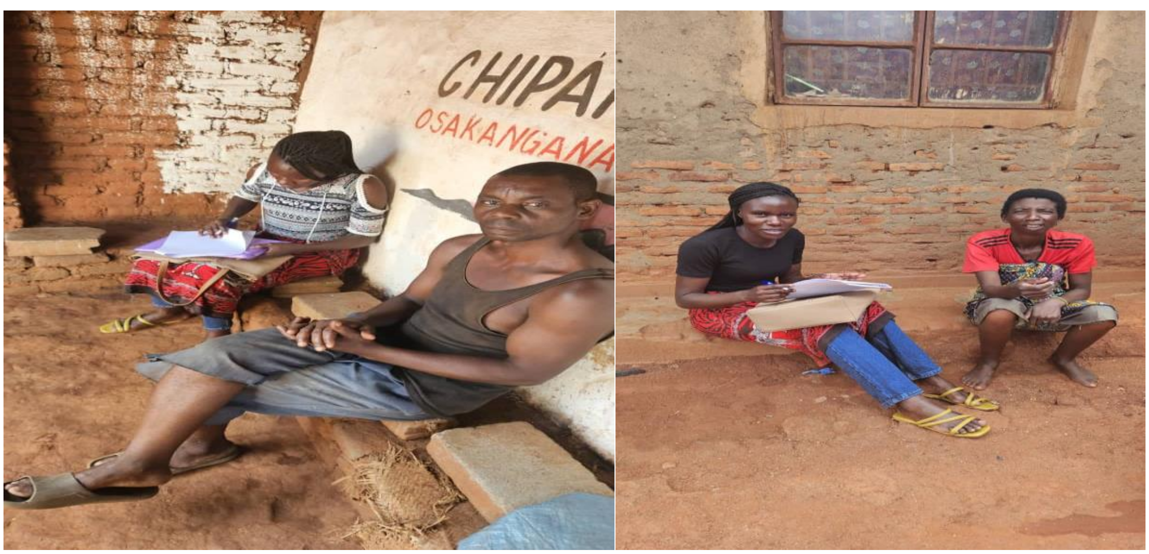
1. Can you introduce yourself and your role within your organization?
2. How long have you been working in this role/organization?
3. What is the current water crisis in Chinsapo #1 and other informal settlements?
4. What are the main challenges in supplying potable water to Chinsapo #1 and similar areas?
5. What strategies have been employed to address water concerns in Chinsapo #1?
6. What financial, technical, or regulatory barriers hinder the implementation of effective water coping strategies in the area?
7. What policies affect or influence water distribution in informal settlements, including Chinsapo #1?
8. How does the government or relevant authorities plan to sustain and expand water provision as informal settlements continue to grow?
9. What improvements or interventions would you suggest to improve water access in these communities?

Appendix E: Interview Guide For In-Depth Interviews

1. What is your main source of water?
2. What factors influence or limit your access to potable water?
3. What challenges do you face when accessing potable water?
4. How does the reliability of your water source affect your daily activities?
5. Are you satisfied with your current access to potable water supplied by the Water Board? Why or why not?
6. How do water shortages impact your daily household activities?
7. What strategies do you use to address challenges related to potable water accessibility?
8. What improvements or interventions would you suggest to improve water access in your community?

3A 3B

Figure 3: 3A and 3B showing one of the water kiosks in the study area and part of the Chinsapo #1 area



4A 4B

Figure 4A and B: Researcher conducting interviews with Chinsapo #1 residents