

**FACTORS AFFECTING PROVISION OF CLEAN WATER IN KIBERA
CONSTITUENCY, NAIROIBI COUNTY**

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DECLARATION

This research project is my original and has not been presented for the award of degree in any other university.

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This research project has been submitted with my approval as the candidate's supervisor.

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DEDICATION

This report is dedicated to my beloved parents for their love and support all through my proposal.

ACKNOWLEDGEMENT

Without the direction of a number of people who have offered their invaluable support in the project's preparation, this plan would not have been feasible.

First and foremost, I would want to express my sincere appreciation to my supervisor, Prof. Peter Kithae, whose support, encouragement, and direction allowed me to finish my research project on schedule. He was a really kind and dedicated mentor to me. Without him, my efforts won't yield positive results. My profound appreciation is extended to my family members who helped me design this proposal and who gave me financial assistance.

ABSTRACT

People's living conditions can be enhanced by having access to clean water and adequate sanitation as they encourage income generating, healthy living, and clean surroundings. Nevertheless, no research has been done to date that focuses on determining the variables affecting the availability of clean water in underdeveloped nations like Kenya. The purpose of this study was to lower the frequency of waterborne illnesses in children under five and investigate the factors influencing the availability of potable water in Nairobi County's Kieran constituency. The descriptive survey approach was used as the research strategy for this investigation. All residents in Kieran Constituency who were older than eighteen were included in the targeted population. Simple random selection was used to choose a sample of 384 responders. Both qualitative and quantitative primary data were gathered for this research. Research assistants helped participants self-administer the questionnaires. While the qualitative data was subjected to content analysis, the quantitative data was evaluated using descriptive statistics with SPSS. In addition to being shown in tables and narrative style, the findings were presented using means, percentages, and frequencies. Local communities' livelihoods suffered as a result of the variables influencing the availability of clean water. The study's conclusions suggest enhancing community involvement, putting sustainable water and sanitation solutions into place, and raising awareness and educating the public.

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ACRONYMS AND ABBREVIATIONS

CWS:	Clean Water Supply
GoK:	Government of Kenya
KEBS:	Kenya Bureau of Standards
MOWI:	Ministry of Water and Irrigation
NCWSC:	Nairobi City Water and Sewerage Company
NGOs:	Non-Governmental Organizations
WASH:	Water, Sanitation and Hygiene
WHO:	World Health Organization

OPERATIONAL DEFINITION OF TERMS

- Clean Water Supply (CWS):** Refers to safe, treated, and uncontaminated water made available for domestic, industrial, and commercial use in Kibera constituency.
- Water Infrastructure:** Physical facilities such as pipes, boreholes, water tanks, treatment plants, and distribution networks that facilitate the supply of clean water to residents.
- Water Provider Skills:** The technical expertise, training, and competencies of personnel and organizations responsible for ensuring effective water treatment, distribution, and maintenance of water systems.
- Ethical Practices of Residents:** Behaviors and values demonstrated by community members in relation to water use, including honesty in bill payment, avoidance of illegal water connections, and proper handling of communal water points.
- Drainage Systems:** Structural facilities for managing stormwater and wastewater, which influence water quality and availability by reducing contamination of water sources.
- Water, Sanitation and Hygiene:** An integrated approach aimed at ensuring access to clean water, improved sanitation, and promotion of hygiene practices within communities.
- Non-Governmental Organizations:** Independent organizations that support water provision initiatives through funding, capacity building, and community empowerment programs.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

An overview of the research on the variables influencing the supply of clean water in Kenya's Kibera Constituency is given in this chapter. The study's history is covered first, emphasizing the local and global context of access to clean water as well as the difficulties encountered in informal communities like Kibera. The problem statement highlights the important problems that impede the supply of clean water and illustrates the need for this study. The chapter goes on to describe the general and particular study objectives as well as the research questions that will direct the inquiry. Additionally, the study's reason outlines the importance of the research and its benefits, while the study's scope makes clear its demographic, geographic coverage, and period. Lastly, a review of the main ideas covered brings the chapter to a close.

1.1 Background

Health, sanitation, economic growth, and general well-being all depend on having access to clean and safe water, which is a fundamental human right. Despite its importance, a significant portion of the global population, particularly in developing countries, lack access to these vital resources. Kenya, while having made strides in improving water access, still faces considerable challenges in ensuring consistent and reliable clean water provision, particularly in densely populated urban areas. The variables influencing the supply of clean water in Kibera Constituency, a sizable informal community in Nairobi, Kenya, which is distinguished by its distinct socioeconomic and infrastructure background, are the main focus of this study. Numerous variables, such as population expansion, urbanization, climate change, governance, and socioeconomic inequality, have an impact on Kenya's water delivery system. Poverty, inadequate sanitary facilities, and restricted access to reasonably priced and dependable water supplies exacerbate these issues in

Kebra. Residents sometimes depend on uncontrolled water supplies or informal water sellers, which can lead to pollution and the spread of waterborne illnesses including cholera and typhoid.

A complex system including the government, non-governmental organizations (NGOs), community-based organizations (CBOs), and commercial sector entities oversees Kenya's water sector. Environmental degradation, population increase, fast urbanization, and climate change are some of the causes putting growing strain on the nation's water supplies. Inadequate or outdated water delivery systems, low investment in water resource management, and difficulties controlling water quality are examples of infrastructure constraints that exacerbate these demands.

In urban areas like Nairobi, the demand for clean water has outpaced the development of adequate infrastructure, leading to significant disparities in access. Informal settlements, like liberal, often bear the brunt of these inadequacies. Characterized by high population density, limited infrastructure, and often precarious living conditions, these areas face unique challenges in accessing clean water.

1.1.1 Water infrastructure and provision of clean water

Globally, water infrastructure remains the backbone of clean water provision, but challenges of aging systems, climate shocks, and distribution gaps persist. A recent global synthesis emphasizes that many improved water sources still pose health risks due to weak treatment and distribution systems (Kumpel & Nelson, 2025). Urban studies show that drainage–water infrastructure interactions amplify vulnerabilities in flood-prone cities (Butler et al., 2023).

In Africa, systematic reviews highlight chronic underfunding, poor maintenance, and network losses as reasons many urban residents still lack safe, reliable water. For example,

a 2025 scoping review of sub-Saharan Africa identified aging assets, weak financial models, and fragile infrastructure as recurrent causes of WASH failures (Danert et al., 2025). These systemic weaknesses make even piped networks unreliable for sustained clean water delivery.

In Kenya, informal settlements like Kibera rely on a mix of transitional infrastructures such as shared taps, kiosks, and vendors. Empirical evidence shows these hybrid systems are prone to interruptions and unsafe quality compared to direct household connections (Kiteme et al., 2023). This reality makes Kibera highly dependent on fragile, small-scale infrastructure.

1.1.2 Water provider skills and provision of clean water

Globally, technical capacity of water providers is a key determinant of sustainability. A recent cross-regional review identified that small-scale systems fail primarily because operators lack training in operation and maintenance (Murray et al., 2024). These skills are critical for adopting new technologies, managing breakdowns, and ensuring consistent service quality.

In Africa, water schemes are often compromised by delays in repair and weak supply chains for spare parts. Danert et al. (2025) stress that poor technical capacity undermines water system functionality more than initial design. Similarly, Nkiaka and Conway (2024) show that lack of skilled water management contributes to frequent service disruptions in African urban systems.

In Kenya, professionalization of repair and maintenance services has shown promise. For instance, a system-dynamics study in Kitui found that trained technicians and rapid maintenance significantly improved scheme functionality and water production (Koehler et al., 2023). However, in Kibera, most providers remain informal and untrained, undermining water quality and reliability.

1.1.3 Residents' ethical practices and provision of clean water

Globally, household and community behaviors—such as illegal tapping, price exploitation, and unsafe storage—play an important role in water safety and equity. Studies highlight that community ethics and compliance are just as vital as infrastructure investments (Giné-Garriga et al., 2023).

Across Africa, research documents how weak accountability and informal practices often compromise equitable access. For example, urban households face inflated prices and intermittent supply due to illegal connections and vendor monopolies, undermining trust and safe provision (Kayser et al., 2023).

In Kenya, Nairobi’s informal settlements—including Kibera—are shaped by informal water markets. Studies reveal how water vendors and small-scale distributors operate with limited regulation, often engaging in practices such as overpricing, contamination risks, and informal agreements with local authorities (Schneider, 2024). This highlights the importance of residents’ ethical practices in water provision.

1.1.4 Drainage systems and provision of clean water

Globally, drainage and water supply are interlinked because poor drainage contaminates water points and supply systems. Climate-resilience studies emphasize that urban flooding contaminates water infrastructure and threatens clean provision (Butler et al., 2023).

In African cities, extreme rainfall and poor drainage amplify contamination risks. Empirical studies from Nairobi’s informal settlements show that extreme weather worsens water insecurity by flooding latrines, mixing sewage with household water points, and disrupting daily life (Yillia et al., 2024).

In Kibera, studies of the Ngong River catchment find serious water quality degradation due to poor drainage and waste management. Runoff and sewage enter local streams, undermining the safety of water sold or drawn from these sources (Ouma et al., 2023).

1.1.5 provision of clean water in kibera constituency

Inadequate infrastructure Kibera often lacks formal water distribution networks, forcing residents to rely on informal and often unreliable sources, such as vendors, boreholes, or contaminated surface water. High costs the scarcity of clean water can lead to inflated prices charged by vendors, making it unaffordable for many residents. Water quality concerns: Informal water sources are often susceptible to contamination, posing serious health risks to the population. Governance and management challenges: Weak governance structures, lack of transparency, and limited community participation can hinder effective water management in informal settlements. Sanitation challenges: Poor sanitation infrastructure can further exacerbate water contamination and create a vicious cycle of health risks.

The situation in Kibera is particularly critical due to its large population and the complex interplay of these challenges. Understanding the specific factors affecting clean water provision in this context is essential for creating efficient and sustainable solutions. This research aims to investigate these factors, examining the interplay of infrastructural, socio-economic, environmental, and governance-related issues that contribute to water crisis in Kibera. It is crucial to comprehend these elements in order to create targeted interventions and policy recommendations that can address the underlying issues and enhance access to clean water in Kibera and other formal settlements across Kenya.

1.2 Statement of the problem

The provision of potable water to the people of Kenya's Kibera constituency is fraught with difficulties. The goal of this study project is to examine the various aspects that contribute to this problem, such as Limitations of the infrastructure: The existing water infrastructure in Kieran may be inadequate, poorly maintained, or subject to illegal connections, leading

to water loss and contamination. Financial constraints: Limited funding for water projects and maintenance, coupled with the high cost of water treatment and distribution, may hinder the provision of clean water. Governance and management issues: Inefficient management of water resources, lack of transparency in water allocation, and potential corruption may impede effective water service delivery.

Environmental factors: Pollution from inadequate sanitation and climate change, together with waste management impacts like droughts and floods, can affect water quality and availability. Socioeconomic factors: Poverty, rapid population growth, and lack of awareness about hygiene and water conservation practices may exacerbate the challenges of providing clean water. By examining these factors, this research seeks to understand the complex interplay of issues affecting clean water provision in Kibera and identify potential solutions for improving availability of trustworthy and clean water sources for the community.

1.3 Objectives

The main objective of this study was to assess factors affecting provision of clean water in Kibera constituency, Kenya,

1.3.1 Specific objectives

The study's specific objectives were

- i. To assess how water infrastructure affects provision of clean water in Kibera constituency.

- ii. To analyze how water provider skills affects provision of clean water in Kibera constituency.
- iii. To assess how resident's ethical practices affects the provision of clean water in Kibera constituency.
- iv. To analyze the relationship between drainage systems and provision of clean water in Kibera constituency.

1.4 Research Questions

- i. How does water infrastructure affect provision of clean water in Kibera constituency?
- ii. How does water provider skills affect provision of clean water in Kibera constituency?
- iii. How does residents' ethical practices affect the provision of clean water in Kibera constituency?
- iv. How does drainage systems affect provision of clean water in Kibera constituency?

1.5 Significance of Study

The study provides practical insights that can help government agencies, NGOs, and development partners improve planning and implementation of water infrastructure projects tailored to the unique needs of Kieran. Findings can help local water providers and Nairobi City Water and Sewerage Company to adopt more effective and sustainable methods for delivering clean water to informal settlements. The research will provide

practical recommendations to guide the enforcement of existing water and sanitation policies in informal settlements. It also supports the development of monitoring frameworks to ensure compliance and accountability in water provision.

The study provides empirical data that policymakers can use to develop or revise water and sanitation policies tailored to the realities of informal settlements like Kibera. It bridges the gap between research and policy by offering grounded insights from the community level. The study supports the integration of informal settlements into Nairobi's urban development and water master plans, ensuring these areas are not overlooked in planning and policy allocation.

The study adds new knowledge on the unique socio-economic, environmental, and infrastructural factors affecting clean water provision in Kibera, one of the largest informal settlements in Africa. The research sheds light on the structure and dynamics of informal water supply systems, including the roles played by private vendors, water cartels, and community taps.

1.6 Scope

The study aims to examine how the technical, managerial, and operational skills of both formal and informal water providers affect water quality, reliability, and accessibility. It explores areas such as infrastructure handling, water treatment knowledge, customer service, and system maintenance among water vendors, public water managers, and community-based water providers.

The study aims to investigate how the quality, availability, and maintenance of water infrastructure (such as water pipes, storage tanks, and distribution points) influence access to clean water in Kibera. It also examines institutional roles, technical challenges, and

community-level experiences related to water infrastructure and service delivery. The study is geographically limited to Kibera Constituency, a densely populated informal settlement in Nairobi, Kenya. It focuses on selected villages within Kibera (e.g., Laini Saba, Kianda, Soweto, Makina) to provide a representative analysis of water service delivery in different local contexts.

The study covers a period between 2020 and 2025, focusing on recent trends, changes, and interventions in water infrastructure and service delivery. It considers ongoing projects, recent infrastructure developments, and challenges currently facing residents in accessing clean water.

1.7 Chapter Summary

Provides background on Kibera's water access challenges. Highlights the importance of clean water for health, economic growth, and quality of life. States the research objectives and key questions. Defines the scope of the study, including geographical focus and key factors analyzed. Examines the current state of water supply systems in Kibera. Discusses issues like broken pipelines, water rationing, and lack of proper storage. Analyzes the impact of informal water vendors on distribution. Investigates the affordability of clean water for Kibera residents.

Explores the role of poverty in limiting access to water. Compares government-supplied water with private vendors in terms of pricing and availability. Evaluates government policies on water provision in informal settlements. Assesses the role of NGOs and private organizations in bridging water access gaps. Discusses challenges such as corruption, mismanagement, and policy inefficiencies. Identifies sources of water contamination in

Kibera. Examines the impact of climate change on water availability. Analyzes waste management issues and their effect on water quality.

Discusses community perceptions of clean water and water conservation efforts. Examines the role of informal water distribution networks in Kibera. Analyzes gender dynamics in water collection and usage. Reviews the use of boreholes, filtration systems, and rainwater harvesting. Explores the role of mobile payment solutions for water access. Discusses potential technological advancements to improve clean water provision. Summarizes key research findings on water access issues in Kibera.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

A review of the literature is presented in this chapter based on the conclusions drawn from the goals of the study. The Capability Approach, created by economist Amartya, provides an explanation of the elements influencing the supply of water in the theoretical framework that serves as the study's foundation. The empirical review, which provides an overview of previous studies conducted by other researchers in connection with these study questions and aims, is also included in this chapter. Lastly, a summary of the literature review and research gaps is provided.

2.1 Theoretical Literature Review

A theoretical literature review provides the conceptual frameworks and scholarly theories that support the examination of the research goals. In the case of the provision of clean water in Kibera Constituency, this review draws upon theories from public infrastructure development, human capital theory, environmental ethics, and urban planning.

2.1.1 The Public Infrastructure Theory

Posits that investment in infrastructure is essential for delivering public goods such as clean water (Gramlich, 1994). Infrastructure such as water pipes, reservoirs, and purification systems forms the backbone of water provision. According to this theory, poorly maintained or inadequate infrastructure leads to inefficiencies, water loss, and contamination. In the context of informal settlements like Kibera, where planning is often unregulated, infrastructure is frequently makeshift or insufficient, thus affecting water quality and reliability.

Additionally, the Systems Theory can be applied to understand how the interconnected components of water supply systems – from source to delivery – impact overall service. If

one component fails (e.g., damaged pipes or lack of filtration), the entire system may fail to provide clean water.

2.1.2 The Human Capital Theory (Becker, 1964)

Emphasizes the role of education, training, and experience in increasing workers' productivity. This applies directly to water service providers whose technical skills and knowledge significantly influence the efficiency and safety of water delivery. Skilled providers are more likely to implement safe water handling, detect and address system faults, and ensure that sanitation standards are upheld.

In Kibera, where many water services are informal or community-based, lack of professional training may lead to contamination through poor handling, improper storage, or unsafe distribution practices. Therefore, the theory underscores the need for capacity building among water providers to improve service quality.

2.1.3 Theory of Planned Behavior (Ajzen, 1991)

Suggests that individual behaviors are influenced by attitudes, perceived control, and social norms. In the context of clean water provision, residents' ethical practices—such as illegal connections, water wastage, or poor sanitation habits—can undermine communal access to safe water.

The Environmental Ethics Theory also highlights the moral responsibility individuals have toward sustainable environmental practices. In dense urban settings like Kibera, if residents do not follow proper hygiene and water conservation practices, the risk of contamination rises, especially when shared facilities are involved. Ethical behavior, therefore, plays a key role in supporting clean water provision for the entire community.

2.1.4 Urban Ecology Theory

The interaction between physical infrastructure and the urban environment influences the health and sustainability of a city. Poor drainage systems, especially during rainy seasons, often lead to flooding that contaminates water points with sewage and waste—common in informal settlements like Kibera.

2.1.5 The Water-Sanitation-Hygiene (WASH) framework

Emphasizes the interdependence between clean water, proper sanitation, and hygiene. Inadequate drainage affects not just sanitation, but also increases the likelihood of waterborne diseases, reducing access to safe water. Effective drainage is thus vital to maintaining a hygienic environment necessary for clean water provision.

This theoretical literature review demonstrates that the provision of clean water in Kibera is a multifaceted issue influenced by physical infrastructure, human resource capabilities, social behavior, and environmental systems. The integration of theories such as Public Infrastructure Theory, Human Capital Theory, Environmental Ethics, and Urban Ecology helps to understand and analyze the complex dynamics affecting clean water provision in informal urban settlements.

2.2 Empirical Literature Review

The empirical literature review highlights findings from past studies on access to clean water, focusing on infrastructural, social, technical, and environmental factors that influence service delivery. It draws evidence from research conducted in urban and informal settlements, comparing patterns, challenges, and interventions reported by different scholars. This section not only synthesizes existing knowledge but also identifies research gaps that justify the present study in Kibera Constituency.

2.2.1 Water infrastructure and provision of clean water .

Empirical studies have consistently shown that inadequate water infrastructure is a major barrier to the provision of clean water in informal settlements, including Kibera. These studies use field data, surveys, interviews, and water quality tests to examine the real-world challenges faced by residents. According to Ngigi & Macharia (2006), most water infrastructure in informal settlements such as Kibera is informal and poorly maintained.

Piping networks are often temporary, exposed, or illegally connected, which increases the risk of leaks, contamination, and irregular supply. The lack of formal water distribution networks leads to overreliance on vendors and water kiosks, whose water is not always treated or regulated.

A study by UN-Habitat (2014) on Kibera found that only about 20% of residents had access to piped water connections. The rest relied on private water sellers who use plastic pipes or jerrycans to supply water, often over long distances, further increasing contamination risks. An investigation by Water Services Regulatory Board (WASREB, 2018) in Nairobi's informal settlements found that poor-quality piping and exposure to open drains and waste significantly contribute to microbial contamination.

In Kibera, where sewer systems are largely absent, water pipes are often laid alongside open drainage channels, making them vulnerable to pollution from waste and sewage. Mutisya & Yarime (2011) used water sampling in Kibera to demonstrate high levels of *E. coli* in water collected from communal taps, especially during rainy seasons when flooding damages temporary water infrastructure. This clearly indicates a direct relationship between infrastructure quality and water safety.

A study by WSP (Water and Sanitation Program, 2015) indicated that community water points and pipes in Kibera are prone to vandalism and illegal tapping. These activities disrupt water flow, cause wastage, and expose the system to contaminants. Without secure and reinforced infrastructure, water provision remains inconsistent and unsafe.

Several government and NGO-led projects have attempted to improve infrastructure in Kibera. A 2020 evaluation of the Kibera Integrated Water and Sanitation Project by Nairobi

City Water and Sewerage Company (NCWSC) reported significant improvements in water quality and availability after installing raised water pipes and solar-powered kiosks. The findings indicated that improving physical infrastructure had a direct positive effect on reliability and safety of water delivery.

Empirical evidence from multiple studies highlights a clear link between the quality of water infrastructure and the provision of clean water in Kibera Constituency. Poor infrastructure leads to contamination, irregular supply, and high costs, while improved infrastructure enhances access and water quality. Therefore, infrastructure development is essential for sustainable and equitable water provision in informal settlements.

2.2.2 Water provider skills and provision of clean water .

Provision of clean water in informal settlements like Kibera does not rely solely on infrastructure, but also on the competencies of individuals and organizations managing water delivery. Empirical studies have demonstrated that the technical, managerial, and operational skills of water providers significantly affect the quality, safety, and reliability of water services. According to Owuor and Foeken (2009), many water providers in Kibera operate informally and lack professional training in water handling, storage, and treatment. Their study, which involved interviews with local water kiosk operators and residents, showed that improper handling and storage techniques often led to water contamination.

A study by Mugisha et al. (2014) on water quality management in informal Nairobi settlements, including Kibera, found that poorly trained providers failed to apply basic safety protocols such as regular cleaning of tanks, checking pipe integrity, or chlorinating

stored water. The result was frequent contamination with bacteria like E. coli, causing health risks for consumers.

An evaluation by WASREB (Water Services Regulatory Board, 2018) observed that where water providers had training in customer care and service management, there was a significant improvement in consumer satisfaction and trust. In Kibera, the absence of such training often leads to conflicts over water pricing, unfair rationing, and poor coordination, which disrupt water access.

UNICEF & Practical Action (2017) worked with community water providers in Kibera to offer training in basic customer engagement, hygiene promotion, and maintenance. A follow-up report noted that water availability and quality improved in the areas where trained providers operated, demonstrating the value of skill development.

In a survey conducted by Nairobi County Government and Red Cross Kenya (2020) during a water and sanitation campaign in Kibera, it was observed that trained water providers were more likely to promote hygiene education, use clean containers, and follow safe water delivery methods. This contrasted with untrained vendors who often reused dirty jerrycans and did not follow any sanitation protocols.

The study also reported that areas with trained water point operators recorded fewer waterborne disease cases, highlighting the importance of hygiene-related skills in improving public health outcomes.

A case study by World Bank (2015) on informal urban water supply in Kenya reported that skilled water providers in informal areas like Kibera were better equipped to respond to

pipe bursts, blockages, or contamination events. Their ability to quickly identify and fix problems reduced service downtime and protected water quality.

In contrast, untrained operators typically relied on guesswork or temporary fixes, which often led to recurring issues or complete service breakdowns. Empirical findings underscore that the skills of water providers—technical, operational, hygiene-related, and managerial—are vital to the consistent and safe provision of clean water in Kibera Constituency. Skill deficits among informal providers contribute to contamination, service unreliability, and public health risks. On the other hand, capacity building and training initiatives show measurable improvements in water service delivery, indicating that investing in provider skills is essential for sustainable clean water access in informal settlements.

2.2.3 Residents' ethical practices and provision of clean water.

Clean water accessibility, safety, and sustainability are directly impacted by the morals and conduct of people living in informal communities like Kibera. Empirical studies have shown that practices such as illegal water connections, poor hygiene habits, vandalism, and environmental pollution by residents significantly hinder clean water provision. A study by Water and Sanitation for the Urban Poor (WSUP, 2017) in Kibera found that a large number of residents rely on unauthorized water connections due to the high cost or inaccessibility of formal services. These illegal connections often involve using low-quality pipes or tapping into main lines unsafely, which leads to pipe breakages and contamination.

The study also noted that frequent acts of vandalism—such as tampering with water kiosks and breaking pipes to bypass meters—resulted in water loss and interruptions in supply. These unethical practices were more common in zones where there was weak community monitoring or limited awareness. According to Ngugi and Mutisya (2018), poor water use ethics, including water wastage during collection or at public taps, contributes to reduced availability for other users. In Kibera, the scarcity of water amplifies the impact of such behavior, especially in densely populated zones where many people depend on single water points.

Field observations revealed that during peak hours, residents often leave taps running, fill containers beyond capacity, or hoard water unnecessarily, actions which compromise fairness and efficiency in water sharing. A sanitation assessment by UNICEF and AMREF Health Africa (2019) in Kibera demonstrated that poor ethical hygiene practices—such as washing at or near water collection points, open defecation, and poor waste disposal—resulted in contamination of water sources.

Their survey found that in areas where residents disposed of solid and liquid waste responsibly and kept the environment clean, there was less contamination of shared water points. However, in neighborhoods with lax hygiene and unethical waste practices, microbial contamination was significantly higher. A report by Transparency International Kenya (2020) indicated that unethical practices like bribery and favoritism were common in water allocation in Kibera. Some residents paid extra fees to access more water or get faster service from vendors, creating inequality and denying others access.

In addition, some residents would bypass payment systems or tamper with meters, depriving community-managed projects or service providers of funds needed to maintain water infrastructure. A behavioral study by Practical Action (2016) in Nairobi's informal settlements, including Kibera, found that ethical water use improved significantly where residents were engaged in awareness campaigns and water management groups. In these areas, community policing and peer accountability led to better protection of water resources, proper sanitation, and reduced illegal activity.

This shows that with increased ethical awareness and community responsibility, residents can help sustain clean water provision even in resource-constrained environments. Empirical evidence reveals that residents' ethical practices in Kibera have a significant effect on clean water provision. Unethical behaviors such as illegal tapping, vandalism, water wastage, and poor hygiene practices contribute to water contamination, losses, and inequity in access. On the other hand, community-driven ethical behavior—supported by education and collective responsibility—can enhance water safety and distribution. Encouraging ethical practices among residents is therefore crucial for achieving sustainable clean water delivery in Kibera.

2.2.4 Drainage systems and provision of clean water

Empirical studies show a strong correlation between inadequate drainage systems and the contamination of water sources in informal settlements like Kibera. Poor drainage contributes to flooding, stagnation of wastewater, and the spread of pathogens, all of which compromise the quality and accessibility of clean water. A study conducted by UN-Habitat (2014) on urban slums in Nairobi revealed that open drainage channels in Kibera often run

parallel to or directly above water supply lines. During rainy seasons, these channels overflow and contaminate nearby water points, particularly unprotected wells and leaking pipes.

Water samples collected in the study showed high levels of coliform bacteria during periods of heavy rainfall, linking the presence of raw sewage in open drains to waterborne illnesses like cholera and typhoid. Mutisya & Yarime (2011), in their case study of urban environmental challenges in Kibera, observed that clogged and poorly maintained drainage systems frequently result in flash flooding. These floods destroy temporary water infrastructure such as exposed plastic pipes, leading to service disruptions and cross-contamination between sewage and clean water lines.

Their interviews with local water vendors revealed that after flooding, water often turns murky, and residents report an increase in gastrointestinal illnesses—demonstrating a direct negative impact on clean water provision due to poor drainage. A 2019 field report by Kenya Red Cross Society found that solid waste disposal into open drains in Kibera is a common practice, due to limited waste management systems. This leads to blockages and water stagnation, which not only affects sanitation but also provides a breeding ground for disease-causing organisms. Their study concluded that stagnant water in clogged drains often seeps into surrounding water points, especially shallow water tanks and taps located near households. This mixing of waste and water threatens the safety of even previously treated water.

According to AMREF Health Africa (2020), informal settlements like Kibera with inadequate drainage systems report higher incidences of water-related diseases. Their

research, based on community health reports and surveys, showed that poor drainage is a key contributor to the spread of fecal contamination into drinking water systems.

The study documented that improving drainage—such as lining drains with concrete and ensuring regular clearing—led to reduced water contamination and improved health outcomes in the affected areas. A joint evaluation by World Bank and Nairobi City Water and Sewerage Company (NCWSC, 2020) examined the impact of integrated Water, Sanitation and Hygiene (WASH) interventions in Kibera. The report highlighted that where drainage improvement was included—such as construction of stormwater channels and covered drains—clean water provision improved significantly. Water points remained functional during rainy seasons, and contamination levels dropped.

This confirms that proper drainage systems support water infrastructure resilience and cleanliness, especially in high-density informal environments. Empirical findings confirm a strong relationship between drainage systems and the provision of clean water in Kibera. Poor drainage leads to flooding, contamination, and infrastructure damage, all of which threaten clean water access. On the other hand, improved drainage contributes to safer water, fewer disruptions, and better public health. Thus, drainage systems must be considered a key component of clean water provision strategies in informal settlements

2.3 Summary and research gaps

Table 1: Summary and research gaps

Objective	Summary of Key Literature Findings	Identified Research Gaps
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<p>Assess how water infrastructure affects the provision of clean water</p>	<p>Studies show that poor water infrastructure (e.g., leaking pipes, illegal connections, limited storage) in informal settlements like Kibera significantly hinders access to clean water. Infrastructure is often outdated, poorly maintained, or not suited to high population density.</p>	<p>Limited data specific to Kibera on how existing infrastructure compares with national standards; lack of recent case studies focusing on the sustainability and resilience of current water systems in Kibera.</p>
<p>Examine how residents' ethical practices affect the provision of clean water</p>	<p>Literature highlights that unethical practices such as illegal water tapping, vandalism, and poor water storage at the household level contribute to water contamination and wastage. Social norms and lack of civic awareness also play a role.</p>	<p>Few empirical studies explore the link between individual/household behaviors and broader water provision issues in Kibera. Ethical behavior is often discussed generally, not specifically in the context of clean water sustainability.</p>

<p>Analyze how water provider skills affect the provision of clean water</p>	<p>Studies emphasize the role of skilled personnel in water treatment, distribution, and maintenance. Poor training leads to errors in handling equipment, poor response to breakdowns, and inconsistent service.</p>	<p>Existing research does not adequately evaluate the specific skill levels and training gaps of water providers operating in Kibera. There is also little data on ongoing capacity-building efforts.</p>
<p>Analyze the relationship between drainage systems and provision of clean water</p>	<p>Poor drainage leads to flooding and sewage mixing with water sources, especially during the rainy season, causing contamination. Drainage systems in Kibera are typically informal or blocked, worsening the issue.</p>	<p>There is a lack of integrated studies that link drainage management directly to water quality outcomes in Kibera. Most focus on sanitation broadly but don't isolate drainage as a variable impacting clean water provision.</p>

2.4 Conceptual Framework

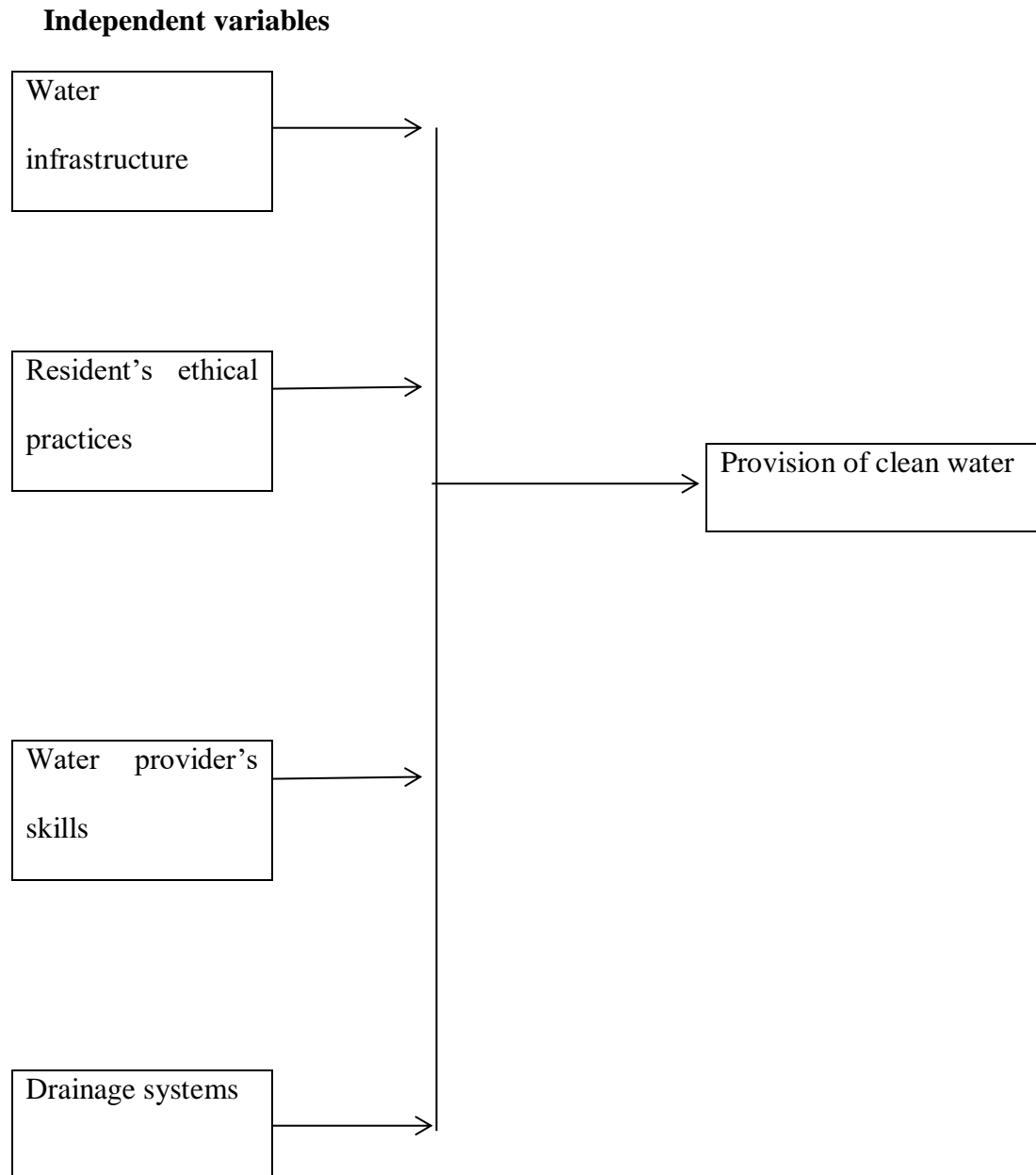


Figure 1: Conceptual Framework

2.5 Operationalization of variables

Table 2: Operationalization Variables

Objective	Independent Variable	Dependent Variable	Indicators (How Measured)	Tool of Data Collection	Tool of Data Analysis
Assess how water infrastructure affects the provision of clean water in Kibera constituency	Water Infrastructure	Provision of clean water	<ul style="list-style-type: none"> - Availability of water pipes - Maintenance status of infrastructure - Type of water sources - Distance to water sources 	Questionnaires, Observation, Key Informant Interviews	Descriptive statistics (mean, frequencies), Regression analysis
Assess how water provider skills affect the provision of clean water in Kibera	Water Provider Skills	Provision of clean water	<ul style="list-style-type: none"> - Level of training and certification - Technical competency - Responsiveness to repairs - Experience 	Questionnaires, Interviews	Descriptive statistics, Correlation analysis

constituency			in service delivery		
Assess how resident's ethical practices affect the provision of clean water in Kibera constituency	Ethical Practices of Residents	Provision of clean water	<ul style="list-style-type: none"> - Illegal connections - Water wastage - Payment behavior - Reporting leaks or issues 	Questionnaires, Focus Group Discussions (FGDs)	Descriptive statistics, Chi-square tests
Analyze the relationship between drainage systems and the provision of clean water in Kibera constituency	Drainage Systems	Provision of clean water	<ul style="list-style-type: none"> - Proper disposal of wastewater - Existence of drainage channels - Flooding incidents near water sources 	Observation, Questionnaires, Key Informant Interviews	Correlation analysis, Regression analysis

2.6 Chapter summary

This section offers a thorough analysis of the body of research on the variables affecting the supply of clean water in the Kibera constituency. The evaluation of the impact of water infrastructure, the influence of residents' ethical actions, the role of water provider skills, and the interaction between drainage systems and the supply of clean water are the four main goals that form the framework of the review. Literature on water infrastructure highlights the critical role that physical facilities such as pipelines, water storage tanks, and treatment systems play in delivering safe water. Inadequate or poorly maintained infrastructure often results in water contamination, irregular supply, and system losses, which are prevalent challenges in informal settlements like Kibera.

The review explores residents' ethical practices, such as illegal water connections, vandalism of water pipes, and poor domestic hygiene. The literature underscores that these behaviors can undermine efforts to maintain water quality and availability, contributing to health risks and system inefficiencies. The chapter delves into the skills and competencies of water service providers, including technical expertise, responsiveness, and operational management. Studies show that skilled personnel are essential for effective water treatment, system maintenance, and consumer service delivery, which directly influence the quality and reliability of water supply.

The literature evaluates the impact of drainage systems on clean water provision. Poor drainage is frequently associated with water contamination, especially in flood-prone areas. In Kibera, blocked or non-existent drainage channels often lead to mixing of sewage and drinking water, exacerbating public health issues. The literature reviewed in this chapter identifies significant gaps and challenges in water provision in Kibera, driven by infrastructural limitations, community behavior, service delivery capacity, and environmental conditions. These insights lay a strong foundation for the study's investigation into the multifaceted nature of water access in informal settlements

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

The methodologies and procedures that will be employed in the study are presented in this chapter. The research project, target population, sample methods and sizes, tools, pilot study, data collecting process, data analysis and presentation, ethical issues, and chapter summary will all be covered in this chapter.

3.1 Research design

According to Saunders et al (2010), the definition of research design is a plan aimed at answering a specific research question. It addresses appropriate research data management and combines a number of elements, tactics, and techniques for data collection and analysis. However, according to Bliesma, the flexibility and duration of the research may not be taken into consideration while developing it. The research design adapted for study is the survey design. The study will employ a hybrid methodology that combines qualitative and quantitative techniques. The social and economic effects of increased availability to potable water on Kibera livelihoods were the phenomenon being studied. The larger Nairobi slum of Kibera served as the study's focus.

Investigating problem-solving solutions for issues that are pertinent to the research was the methodology employed. Choosing a number of specific examples and determining viable answers to research questions based on the chosen case study were the ideas to be applied. A thorough study of the Kibera slums and the results of water interventions may be possible with this hybrid method. It may evaluate the quantitative data's health, wealth, and education components. The study frequently creates a profile group of difficulties in an attempt to identify and characterize a subject (Cooker and Schindelder). Data was gathered for a research that focused on Nairobi's Kibera constituency.

3.2 Target Population

There are 185,777 people living in Kibera, according to census data that was made public on Tuesday. There are 91,569 females and 94,199 males present. Intersex individuals make up 9% of the population.

Table 3: Target Population

Category	Population	Percentage (%)
Male	94,199	50.7
Female	91,569	49.3
Intersex	9	0.005
Total	185,777	100

3.3 Sample and sampling technique ---

A sample is a subset of the target population selected to represent the entire population in a study (Kothari, 2014). The researcher can save time and money by using sampling to get accurate and valid data because it is sometimes impracticable to get information from every member of a big group. In this study, the sample was drawn from the residents of Kibera constituency, which has a population of 185,777 people according to the enumeration report by Pamoja Trust (2013)

3.3.1 Sampling procedure

Sampling techniques provide a range of methods that facilitate to reduce the amount of data need to collect by considering only data from sub group rather than all possible cases or elements. When conducting research, gathering data from all feasible units of analysis included in the study challenge is either impracticable, unattainable, or too costly. A sample, or fewer units, are selected to reflect the pertinent characteristics of the entire collection. Because the samples are not entirely typical of the community they are taken from, the study cannot guarantee that the findings will apply to the whole population.

The Kibera constituency's beneficiaries of the variables influencing the supply of clean water comprised the sample of respondents. Random sampling must be done from a well-defined population when external validity is crucial. According to this theory, the study used a basic random sampling approach. This approach worked effectively for this study since the population is well defined, the sample frame is small, and NGOs like Pamoja Trust had reliable census data available. Each household was given a number on the map once a thorough enumeration of all the homes in the community was completed.

3.3.2 Sampling size

An individual over the age of eighteen in each of the chosen houses was given a questionnaire by the researcher, who was able to identify each household's precise location on the first spatial map of the community. According to an enumeration procedure conducted by Pamoja Trust in 2013, 185777 people were living in the hamlet. The formula for simple random sampling typically involves determining the sample size needed from a population to make inferences with a certain level of confidence. The general formula is;

Formula used (Cochran, 1977)

$$n_0 = \frac{Z^2 \cdot p(1-p)}{e^2}$$

Where:

= Z-score for desired confidence level (95% → 1.96)

= estimated proportion (use 0.5 if unknown → maximizes sample)

= margin of error (set at 0.05 = 5%)

Table 4: Sampling size

The study used 384 people from the study area.

Category	Population	Percentage (%)	Sample Size
Male	94,199	50.7	195
Female	91,569	49.3	189
Intersex	9	0.005	0
Total	185,777	100	384

3.4 Instruments

A systematic questionnaire with both closed-ended and Likert scale items was used to gather data. This instrument was chosen due to its efficiency in collecting standardized data and ease of analysis.

3.5 Pilot study

A pilot study was conducted to test the feasibility, reliability, and validity of the research instruments and methodology for the main study on factors Affecting the Provision of Clean Water in Kibera Constituency. The main aim of this preliminary exercise was to identify any potential challenges in the data collection process and to ensure that the questionnaires, interview guides, and observation checklists were clear, concise, and capable of capturing the intended data.

The pilot study was carried out in Makina Ward, a section of Kibera Constituency with socio-economic and infrastructural characteristics similar to other wards in the area. This location was selected because it allowed easy access while still reflecting the broader conditions of Kibera. The pilot study confirmed that the research instruments were both reliable and valid for the intended study. Minor adjustments were made to enhance clarity and respondent comfort. The researcher is confident that the tools will effectively capture the factors affecting the provision of clean water in Kibera Constituency in the main study.

3.5.1 Validity

In this study, content validity was ensured through expert review. The research instruments questionnaire, were presented to two experts in water resource management and one research methodology lecturer, who assessed the relevance, clarity, and comprehensiveness of the items.

Their feedback led to minor adjustments in question wording, sequencing, and inclusion of examples for technical terms such as “drainage infrastructure” and “ethical practices.” The pilot study further confirmed face validity as respondents indicated that the questions were clear, understandable, and relevant to the topic of clean water provision in Kibera Constituency.

3.5.2 Reliability test

The capacity of a research tool to consistently yield comparable results under regular circumstances is known as reliability. During the pilot investigation, the Cronbach's Alpha coefficient in SPSS was used to assess the instruments' internal consistency. George and

Mallery (2003) state that satisfactory dependability is indicated by a Cronbach's Alpha score greater than 0.70.

Table 5: The results from the pilot study were as follows

Variable	Number of items	Cronbach's Alpha	Interpretation
Water Infrastructure	5	0.81	High Reliable
Water Provider Skills	5	0.79	Reliable
Residents ethical practices	5	0.80	Highly Reliable
Drainage Systems	5	0.78	Reliable
Overall Instrument	20	0.82	Highly Reliable

The instruments' good internal consistency and suitability for use in the primary research were demonstrated by their total Cronbach's Alpha coefficient of 0.82. Following the test, minor language changes were made to improve clarity without compromising dependability.

3.6 Data collection procedure

This research will be carried out in two major stages: the pilot study and the main study. To assess the validity, reliability, and clarity of the research instruments described in the previous section, a pilot study was conducted first. Once the required modifications have been made, the primary data gathering procedure will go as follows:

Preparation Stage

The researcher will get the required authorizations, such as a letter of reference from the institution and approval from the appropriate Kibera Constituency local authorities. Research assistants will get training on the study's goals, ethical issues, and how to use the research tools.

Identification of Respondents

The target respondents include household heads, local water providers, and community leaders. A sampling frame was developed based on the selected wards in Kibera, from which respondents were chosen using purposive and simple random sampling techniques.

Administration of Questionnaires

Structured questionnaires will be administered face-to-face to household heads to collect data on water infrastructure, residents' ethical practices, and perceptions of drainage systems. Research assistants read questions aloud to respondents with literacy challenges to ensure inclusion.

Conducting Interviews

Semi-structured interview guides were used with water providers and community leaders to obtain in-depth qualitative data. Interviews will be audio-recorded (with permission) and supplemented by field notes.

Observation

An observation checklist was used to assess the condition of water points, drainage systems, and hygiene practices in the study area. Photographic evidence may be taken where appropriate and with consent

Data Handling

Completed questionnaires were reviewed daily to check for completeness and consistency. Data was stored securely and only accessible to the researcher and authorized assistants.

3.7 Data Analysis and Presentation

The Statistical Package for Social Sciences (SPSS) was used to code and analyze the gathered data.

3.7.1 Quantitative Data

Responses were summarized using descriptive statistics, including means, standard deviations, frequencies, and percentages. The associations between the independent variables (water infrastructure, water provider abilities, residents' ethical behaviors, drainage systems) and the dependent variable (supply of clean water) were investigated using inferential statistics, especially Pearson's Correlation Coefficient.

To determine the extent to which each independent variable influences the supply of clean water in Kibera Constituency, multiple regression analysis will also be employed.

3.7.2 Qualitative Data

To detect trends, viewpoints, and perceptions that support the quantitative results, interview data will be transcribed, grouped into themes, and subjected to thematic analysis. To improve validity and offer a thorough grasp of the variables influencing the supply of clean water in the research region, the findings from the two data sets will be triangulated.

3.8 Ethical Considerations

Strict ethical rules were followed throughout the study to safeguard participants' rights and well-being:

3.8.1 Informed Consent

Before participating, participants got comprehensive information about the study's goals, the methods, and their rights. Consent was acquired verbally or in writing.

3.8.2 Confidentiality

Every piece of information submitted was kept private and used only for study. The final report will not contain any personal identifiers.

3.8.3 Voluntary Participation

Respondents were permitted to discontinue participation at any time without incurring any penalties because it was completely voluntary.

3.8.4 Respect and Cultural Sensitivity

The researcher will respect local customs and cultural norms in Kibera while conducting the study.

3.8.5 Data Protection

Only the researcher and approved assistants had safe access to all completed surveys, audio recordings, and computer information.

3.9 Chapter Summary

The research approach to be used in the investigation of the variables influencing the supply of clean water in Kibera Constituency has been described in this chapter. The target population, sampling techniques, research tools, research design, and pilot study were all covered. The chapter also covered the data collection process, data analysis techniques, ethical issues that guided the study, and the validity and reliability of the instruments. The technique outlined is intended to guarantee that the information gathered will be precise, trustworthy, and ethically sourced, providing a solid basis for examining the variables affecting the supply of clean water in Kibera Constituency.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.0 Introduction

This chapter presents the results of statistics on the socioeconomic effects of better access to clean water in these slums that were gathered from the Kibera constituency in Nairobi County, Kenya. The data analysis is summed up in this chapter. The findings are displayed in line with the goals of the research. The findings are shown according to the study's goal. Response rate, demographic information, respondents' educational attainment, and respondents' occupational level are the categories into which these results have been divided. Descriptive statistics were used for the analysis, and frequency tables and graphs were used to display the study's results. The Statistical Package of Social Sciences' outputs serve as the foundation for the discussion of the result.

4.1 Presentation of Research Findings

The findings of the data gathered from respondents in the Kibera constituency are shown in this section. The results are arranged in accordance with the goals of the study, starting with demographic data and moving on to discoveries about how drainage systems, inhabitants' ethical behavior, water infrastructure, and water provider abilities affect the supply of clean water. Frequencies, percentages, tables, and figures give a concise overview of respondents' opinions, and both descriptive and inferential statistics are utilized to interpret the data.

The goals and inquiries of the study serve as a guide for the outcomes presentation, guaranteeing that every segment immediately tackles the fundamental concerns being examined. The broad patterns and traits of the respondents are highlighted by descriptive analysis, whilst correlation and regression analysis are used to determine the connections between variables. This two-pronged strategy offers both a comprehensive summary and in-depth understanding of the variables impacting the Kibera constituency's access to clean water.

4.1.1 Response rate

Ninety percent of the 120 questionnaires that were issued were returned completely filled out (108). This was deemed representative of the target group and sufficient for statistical analysis.

Table 6: Response Rate

Distributed questionnaires	Returned	Not returned	Response rate(%)
120	108	12	90%

4.1.2 Gender

Male respondents made up 45.4% of the sample, while female respondents made up the majority (54.6%). This implies that women, who frequently handle home water management directly, were more accessible and eager to take part in the research.

Table 7: Gender Of Respondents

Gender	Frequency	Percentage
Male	49	45.4%
Female	59	54.6%
Total	108	100%

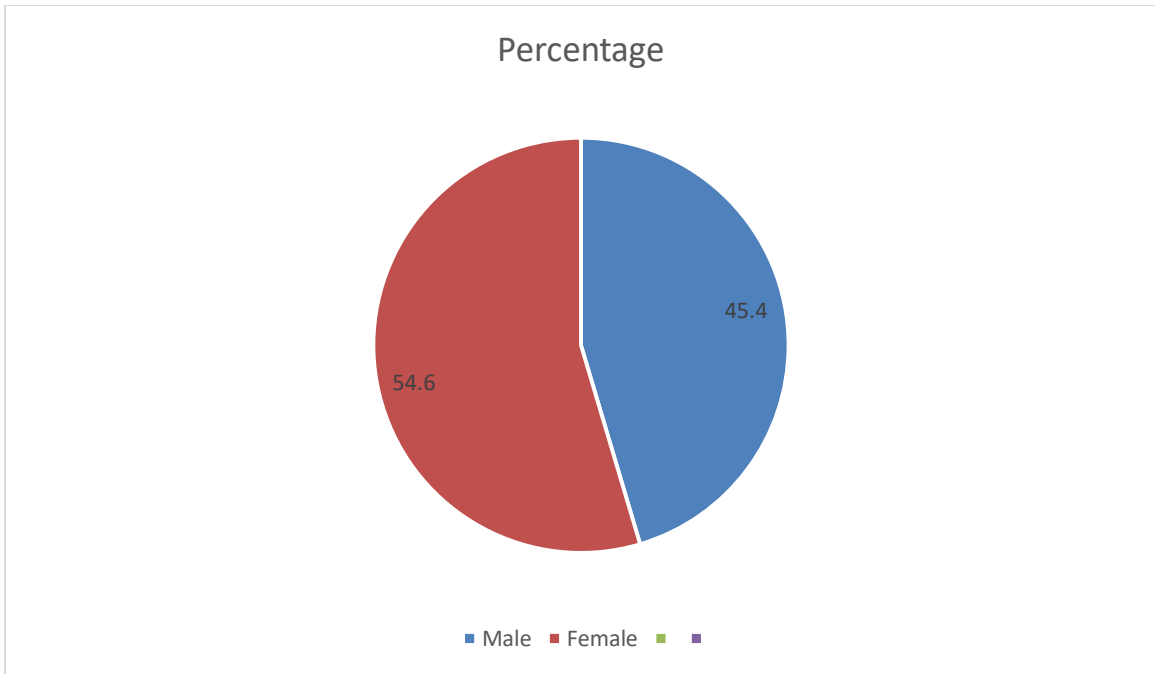


Figure 2: Gender Of Respondents pie chart

4.1.3 Age of the respondents

Those between the ages of 31 and 40 made up the biggest percentage of responders (41.7%), followed by those between the ages of 21 and 30 (27.8%). This indicates that the study mostly involved people who are in their prime working years, who are most likely to be impacted by problems with water supply.

Table 8: Age Of Respondents

Age group	Frequency	Percentage
18-20	12	11.1%
21-30	30	27.8%
31-40	45	41.7%
41-50	15	13.9%
Above 50	6	5.5%
Total	108	100%

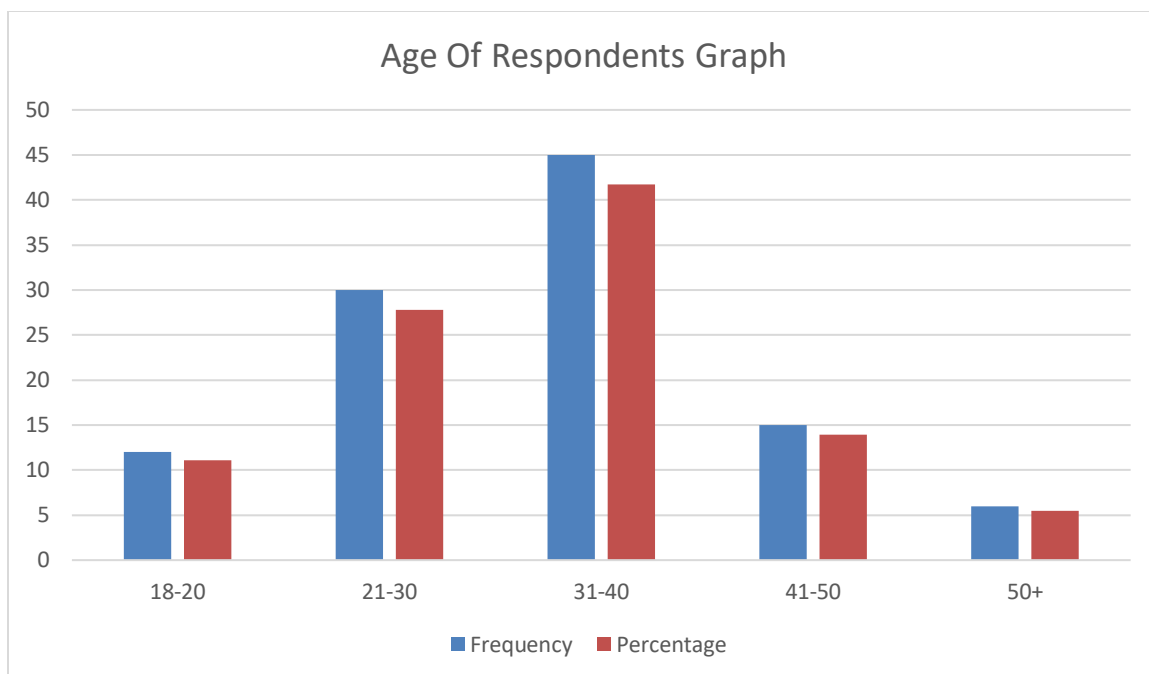


Figure 3: Age Of Respondents Graph

4.1.4 Educational level of the respondents

Most respondents (38%) had completed secondary education, while 31.5% had diploma qualifications. A small proportion (4.6%) had no formal education.

Table 9: Educational levels of the respondents

Level of education	Frequency	Percentages	Cumulative percentages
None	17	3.4	3.4
Primary	223	44.3	47.7
Secondary	116	23.0	70.7
Tertiary	148	29.3	100
Total	504	100	

The table shows only a small percentage of respondents sampled of less than 4% did not have any formal education. The rest of the respondents had at least achieved primary education. This meant that most of the respondents were able to understand how water has influenced their livelihood.

4.1.5 Gender distribution

Table 10: Gender among the respondents

	Frequency	Percentages	Cumulative percentages
Male	226	44.9	44.9
Female	278	55.1	100.0
Total	504	100.0	

The gender representation of the respondents was slightly not balanced with women being more than the men by 10%. This was perhaps since the interview was conducted during the day and men who are mainly regarded as bread winners in many families were out of the settlement for job.

4.1.6 Occupational levels of the respondents

A large number of respondents (40.7%) were self-employed, followed by casual laborers (27.8%). This indicates that a significant proportion of Kibera residents engage in informal or small-scale income-generating activities.

Table 11: Occupational Respondents

Type of employment	Frequency	Percentages	Cumulative percentages
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Casual	243	48.3	63.4
Salaried	76	15.1	15.1
Self employed	185	36.6	100
Total	504	100	

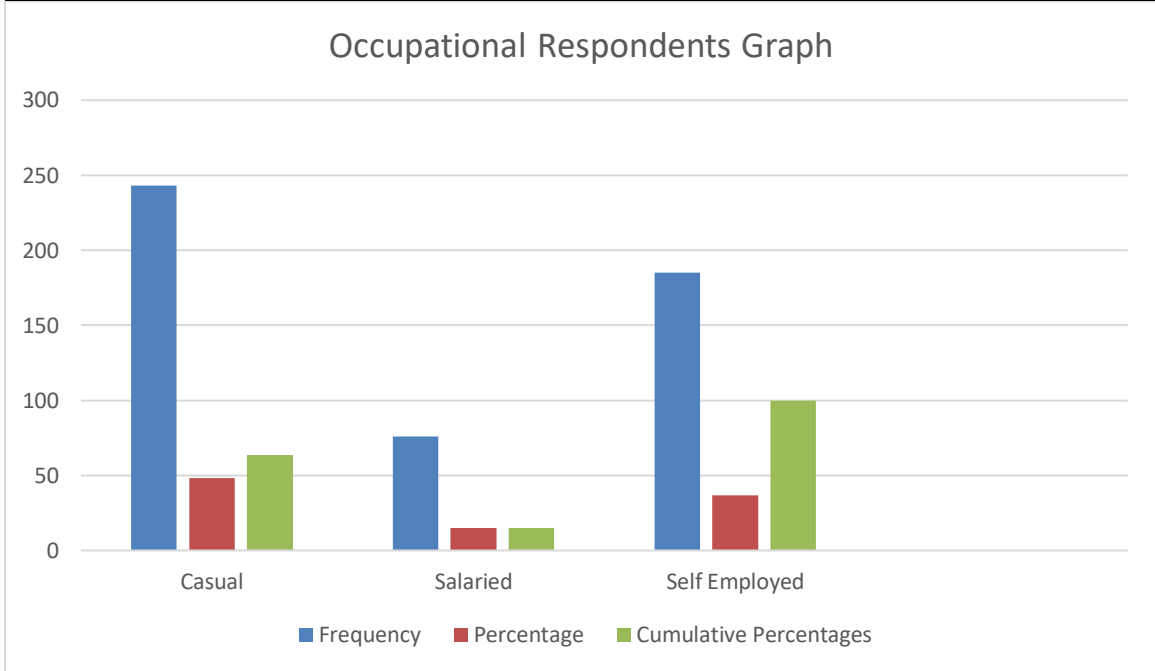


Figure 4: Occupational Respondents

Proportions of 15% of households surveyed accounted for 76 were depending on salaried employment as their main source of livelihood. The greatest number of respondents depended on either casual (48.3%) or self employment. This implies that most of the respondents were low income earners depending on temporary jobs and small scale businesses.

4.1.7 Findings Based on Research Objectives

4.1.7.1 Effect of Water Infrastructure on Provision of Clean Water

According to the study, 68% of participants strongly agreed that one of the main obstacles to Kibera's access to clean water is the lack of suitable water infrastructure. Typical difficulties mentioned were as follows:

Old and leaking water pipes (reported by 52%).

Frequent pipe bursts during rainy seasons (48%).

Low water pressure in many supply lines (44%).

Insufficient storage tanks leading to irregular supply (40%).

Only 10% of respondents felt that the water infrastructure was adequate for the needs of the population.

Table 12: Effect of Water Infrastructure on Clean Water Provision

Statement	Strongly agree	Agree disagree	Strongly disagree	Total(%)
Old/leaking pipes hinder supply 100%	56(51.9%)	18(16.7%)	20(18.5%)	14(12.9%)
Low pressure affects availability 100%	48(44.4%)	32(29.6%)	20(18.5%)	8(7.4%)
Strong facilities are inadequate 100%	43(39.8%)	35(32.4%)	20(18.5%)	10(9.3%)

The findings indicate that outdated infrastructure not only limits water availability but also increases the risk of contamination, especially during pipe bursts.

4.1.7.2 Effect of Residents' Ethical Practices on Provision of Clean Water

Illegal water hookups were prevalent in their neighborhood, according to more than half of the respondents (54 percent). Thirty percent reported pipe vandalism, and sixteen percent mentioned bad storage habits including utilizing open containers.

Table 13: Residents’ Ethical Practices Affecting Water Provision

Practice	Frequency	Percentage
Illegal water connections	58	53.7%
Vandalism of pipes	32	29.6%
Poor storage practices	18	16.7%
Total	108	100%

Unethical practices lead to significant water losses, contamination, and strain on the water supply system. This reflects poor community awareness and weak enforcement of regulations.

4.1.7.3 Effect of Water Providers’ Skills on Provision of Clean Water

The study revealed that 61% of respondents felt water providers lacked the technical skills necessary for effective water treatment and maintenance.

Table 14: Skills of Water Providers

Skill level	Frequency	Percentage(%)
High skilled	15	13.9
Moderately skilled	27	25
Poorly skilled	66	61.1
Total	108	100

Insufficient training among water providers affects the ability to respond promptly to technical issues, leading to prolonged service interruptions and compromised water quality.

4.1.7.4 Relationship Between Drainage Systems and Provision of Clean Water

The majority (72%) of respondents agreed that poor drainage systems contribute to contamination of water sources during rainy seasons. They mentioned that open sewage channels and clogged drains allow wastewater to mix with clean water lines.

Table 15: Impact of Drainage Systems on Clean Water

Response	Frequency	Percentage(%)
Strongly agree	54	50
Agree	24	22.2
Disagree	20	18.5
Strongly disagree	10	9.3
Total	108	100

Poor drainage not only compromises water safety but also increases the cost of treatment and distribution, posing public health risks.

4.3 Limitations of the study

Inadequate and poorly maintained water infrastructure.

Unethical practices such as illegal connections and vandalism.

Lack of adequate technical skills among water providers.

Poor drainage systems that increase contamination risks.

4.3 Chapter Summary

This chapter presented and analyzed the results of the study on the factors affecting the provision of clean water in Kibera Constituency. Data obtained from respondents was systematically analyzed to address the research objectives. The findings revealed that water infrastructure plays a critical role in determining the quality, reliability, and accessibility

of clean water in the area. Poor maintenance of pipes, inadequate storage facilities, and limited water points were identified as key challenges affecting service delivery.

The study also established that residents' ethical practices significantly influence water provision. Practices such as illegal connections, vandalism of infrastructure, and unhygienic water handling contributed to contamination and water losses. Furthermore, the skills and technical capacity of water providers emerged as a major determinant of service efficiency. Lack of adequate training, insufficient technical knowledge, and inadequate resources limited the providers' ability to deliver clean water consistently. In addition, the study analyzed the relationship between drainage systems and clean water provision, revealing that poor drainage and frequent flooding contributed to water contamination, especially in areas where sewer lines and water pipes were in close proximity. The findings highlight that improving water infrastructure, promoting responsible community practices, enhancing the skills of water providers, and upgrading drainage systems are essential to ensuring sustainable access to clean water in Kibera Constituency. The chapter provided clear evidence linking each factor to the state of water provision, forming a basis for the conclusions and recommendations presented in the next chapter.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter presents the summary of findings, conclusions, and recommendations from the study on Factors Affecting the Provision of Clean Water in Kibera Constituency. The study was conducted to understand the structural, social, technical, and environmental challenges influencing clean water access in one of Africa's largest informal settlements. Kibera faces persistent water challenges despite being within Nairobi City's service zone. The high population density, unplanned settlements, old infrastructure, and socio-economic disparities create a complex environment for water provision.

5.1 Summary of Findings

The study achieved a high response rate of 90%, with 108 out of 120 questionnaires returned fully completed, making the data reliable for statistical analysis. In terms of gender, females accounted for the majority of respondents (54.6%), reflecting their central role in household water management, while males represented 45.4%. Regarding age, most respondents were in the 31–40 years category (41.7%), followed by those aged 21–30 years (27.8%), indicating that the study largely engaged economically active individuals directly affected by water challenges. On education, the majority of respondents had attained secondary education (38%) and diploma qualifications (31.5%), while only a small percentage (4.6%) lacked formal education, suggesting that most participants were literate enough to provide informed responses. Gender distribution across the wider sample revealed that women (55.1%) slightly outnumbered men (44.9%), possibly due to the timing of data collection when men were away at work. Concerning occupation, most respondents depended on informal activities, with 40.7% self-employed and 27.8% working as casual laborers, while only 15% were in salaried employment. This distribution highlights the prevalence of low-income livelihoods in Kibera, which influences residents' ability to access clean and reliable water services.

5.1.1: Effect of Water Infrastructure

65% of respondents experienced water shortages at least three times per week. Infrastructure is predominantly old, with frequent bursts and leaks. Makeshift pipelines increase contamination risk. Repair timelines are slow, averaging 5–7 days.

5.1.2: Residents' Ethical Practices

69% confirmed illegal water tapping in their neighborhoods. 42% reused unclean water storage containers. Improper waste disposal is common, with 47% practicing open dumping. Lack of public health awareness contributes to contamination.

5.1.3: Water Providers' Skills

54% believed vendors lack formal hygiene and safety training. Chlorination and water treatment practices are inconsistent. No vendor certification framework in place.

5.1.4: Drainage Systems and Water Provision

78% reported water quality deterioration during rainy seasons. Poor drainage design allows cross-contamination between sewage and water pipelines. Flooding worsens contamination in low-lying areas like Laini Saba and Gatwekera.

5.2 Conclusion

The study concludes that clean water provision in Kibera Constituency is hindered by intertwined infrastructural deficiencies, unethical community practices, insufficient provider skills, and poor drainage systems. While physical infrastructure failures are the most visible, the underlying causes extend to governance gaps, community behavior, and environmental conditions. Sustainable solutions require a multi-pronged approach, technical infrastructure upgrades, drainage redesign, and modern leak detection. Social community education, behavioral change campaigns, and participatory monitoring.

Regulatory vendor certification, strict enforcement against illegal connections, and quality control checks. If implemented, these measures will reduce contamination, improve reliability, and enhance affordability ultimately transforming water access from a daily challenge into a guaranteed right. The study concludes that the provision of clean water in Kibera Constituency is constrained by interconnected structural, behavioral, and environmental challenges. Poor infrastructure leads to frequent shortages and

contamination; residents' unethical practices exacerbate water losses and safety risks; insufficiently trained service providers fail to uphold quality standards; and ineffective drainage management perpetuates seasonal contamination.

The results underscore that water provision is not solely an engineering problem but also a socio-behavioral and governance challenge. While infrastructure upgrades are essential, they must be complemented by strong community engagement, regulatory enforcement, and skill development. Sustainable access to clean water in Kibera will only be achieved through a multi-stakeholder strategy involving government agencies, NGOs, community organizations, private vendors, and residents themselves.

If the recommendations of this study are implemented, Kibera could transition from chronic water insecurity to a more reliable and safe supply system improving public health, economic productivity, and overall quality of life.

5.3 Recommendations

Replace aging pipes with high-density polyethylene (HDPE) pipes resistant to leakage and tampering. Increase the number of water points and introduce scheduled preventive maintenance. Require vendors to undergo hygiene training and obtain certification before operation. Penalize illegal connections and contamination through community policing supported by NCWSC. Use local forums, schools, and radio to educate on safe storage, boiling, or chlorinating water before consumption. Support clean-up drives and provide affordable waste collection services to minimize environmental contamination. Cover open drains near water pipelines and create flood prevention measures. Adopt GPS leak detection and real-time reporting systems to speed up repairs. Intensify water testing and treatment during rainy seasons.

Prioritize replacement of outdated water pipelines with durable, contamination-resistant materials. Increase water point coverage to reduce walking distances for residents. Establish preventive maintenance schedules to minimize breakdowns. Regulation and Certification of Water Vendors. Mandate basic water safety and hygiene training for all vendors. Introduce periodic inspections by the Nairobi City Water and Sewerage Company (NCWSC). Enforce penalties for selling unsafe water. Community-Level

Recommendations. Public Health Education Campaigns. Regular workshops on safe water handling and storage. Community-led anti-illegal connection patrols. Encourage use of clean storage containers and simple purification methods like boiling or chlorination.

Community-Based Drainage Management mobilize residents to regularly clean drainage channels. Collaborate with NGOs to install covered drains in high-risk zones. Initiate flood prevention projects to safeguard water pipelines. Technical Recommendations. Adopt Low-Cost, Safe Piping Technology. Use high-density polyethylene (HDPE) pipes resistant to leakage and tampering. Introduce GPS-based leak detection to speed up repairs. Data-Driven Water Planning. Conduct quarterly surveys to monitor water quality and access. Map illegal connections and leakage hotspots for targeted intervention.

5.4 Recommendations for Further Studies

This study examined the structural, social, technical, and environmental challenges affecting the provision of clean water in Kibera Constituency. While it provided valuable insights, there remain gaps that future researchers can explore to broaden and deepen understanding of water provision challenges in informal settlements.

First, future studies should focus on comparative research between different informal settlements within Nairobi and other counties. This would help establish whether the challenges identified in Kibera—such as infrastructural breakdown, unethical water practices, vendor skills, and drainage issues—are unique to Kibera or represent broader systemic patterns in urban informal settlements.

Second, further research could explore the role of governance and policy enforcement in water service provision. While this study highlighted infrastructure and community practices, there is limited exploration of how weak governance frameworks, corruption, and enforcement gaps specifically shape water access and safety in Kibera.

Third, there is need for longitudinal studies to assess how seasonal changes, urbanization trends, and climate change continue to influence water access and quality over time. Such research would generate data on long-term patterns of water scarcity, contamination, and community adaptation strategies.

Fourth, future studies should investigate the economic dimensions of water provision, particularly the pricing structures imposed by vendors, affordability for low-income households, and how these dynamics influence household coping strategies. A detailed economic analysis could also reveal how informal water markets interact with formal utility providers.

Fifth, research should also focus on behavioral change interventions and their effectiveness. For instance, experimental or action research could test whether targeted public health campaigns, vendor training, or community policing initiatives reduce contamination, illegal tapping, and unsafe storage practices.

Sixth, further studies can explore the gendered implications of water provision. Since women play a central role in water collection and household water management, understanding how clean water challenges disproportionately affect them socially, economically, and health-wise would enrich current findings.

Seventh, there is need for technological research on the adoption and sustainability of modern solutions such as GPS-based leak detection, mobile reporting applications, and low-cost purification methods in informal settlements. Studies could investigate both community acceptance and cost-effectiveness of these technologies.

Lastly, future research could investigate stakeholder collaboration models in water provision. Exploring how government agencies, NGOs, private vendors, and community organizations can form effective partnerships would provide practical frameworks for sustainable solutions in informal settlements.

By addressing these areas, future studies would build on the present findings while providing comprehensive, actionable insights into how Nairobi and similar urban centers can ensure sustainable, safe, and equitable water access for all residents.

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APPENDIX

APPENDIX I: LETTER OF INTRODUCTION

Dear Respondent,

My name is Naomi Mutoko Kioko, and I am enrolled at The Management University of Africa. My admission number is BDSK/5/00095/3/21. I am researching the elements influencing Kenya's clean water supply, with a particular emphasis on the Kibera constituency, as part of the criteria for my academic research. In light of this, we really appreciate your involvement in filling out the questionnaire that is enclosed. Please be advised that any information you provide will be kept entirely confidential and used exclusively for scholarly purposes.

Thank you in advance for your valuable input.

Kind regards,

Naomi Mutoko Kioko

BDSK/5/00095/3/21

The Management University of Africa

APPENDIX II: QUESTIONNAIRES

SECTION A: DEMOGRAPHIC INFORMATION

QUESTION	RESPONSE FORMAT
1. What is your gender?	<input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Other
2. What is your age bracket?	<input type="checkbox"/> Below 18 <input type="checkbox"/> 18–25 <input type="checkbox"/> 26–35 <input type="checkbox"/> 36–45 <input type="checkbox"/> 46+
3. What is your highest education level?	<input type="checkbox"/> No formal education <input type="checkbox"/> Primary <input type="checkbox"/> Secondary <input type="checkbox"/> College/University
4. What is your occupation?	<input type="checkbox"/> Casual worker <input type="checkbox"/> Self-employed <input type="checkbox"/> Employed <input type="checkbox"/> Student <input type="checkbox"/> Unemployed <input type="checkbox"/> Other (specify)
5. How many people live in your household?	Numeric response (e.g., 1–10+)
6. How long have you lived in Kibera?	<input type="checkbox"/> Less than 1 year <input type="checkbox"/> 1–5 years <input type="checkbox"/> 6–10 years <input type="checkbox"/> Over 10 years

7. Which village in Kibera do you live in?	Open-ended (e.g., Gatwekera, Laini Saba, Soweto, Kianda, etc.)
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SECTION B: WATER INFRASTRUCTURE AND PROVISION OF CLEAN WATER

NUMBER	Question (tick one unless stated)	Response Format
B1	What is your main water source?	<input type="checkbox"/> Piped kiosk/tap <input type="checkbox"/> Vendor/Cart <input type="checkbox"/> Borehole/Well <input type="checkbox"/> Rainwater <input type="checkbox"/> Other (specify)
B2	Reliability of supply in the last 4 weeks	<input type="checkbox"/> Very reliable <input type="checkbox"/> Somewhat reliable <input type="checkbox"/> Not reliable
B3	Frequency of pipe bursts/leakages noticed	<input type="checkbox"/> Never <input type="checkbox"/> Rarely <input type="checkbox"/> Sometimes <input type="checkbox"/> Often <input type="checkbox"/> Very often

B4	The age/condition of pipes in my area affects water quality	<input type="checkbox"/> Firmly concur <input type="checkbox"/> concur <input type="checkbox"/> Neutral <input type="checkbox"/> Differ <input type="checkbox"/> firmly differ
B5	Maintenance of water infrastructure is timely in my area	<input type="checkbox"/> Firmly concur <input type="checkbox"/> concur <input type="checkbox"/> Neutral <input type="checkbox"/> Differ <input type="checkbox"/> firmly differ
B6	We have adequate storage (tanks/reservoirs) to ensure safe supply	<input type="checkbox"/> Firmly concur <input type="checkbox"/> concur <input type="checkbox"/> Neutral <input type="checkbox"/> Differ <input type="checkbox"/> firmly differ
B7	Open comment (optional): main infrastructure challenge you face	Short open-ended

SECTION C: WATER PROVIDERS SKILLS AND PRACTICES

NUMBER	QUESTION	RESPONSE FORMAT
C1	Providers respond quickly to reports of leaks/contamination	<input type="checkbox"/> Firmly concur <input type="checkbox"/> concur <input type="checkbox"/> Neutral <input type="checkbox"/> Differ <input type="checkbox"/> firmly differ <input type="checkbox"/> Strongly disagree

C2	Providers demonstrate technical skills to ensure safe handling/treatment	<input type="checkbox"/> Firmly concur <input type="checkbox"/> concur <input type="checkbox"/> Neutral <input type="checkbox"/> Differ <input type="checkbox"/> firmly differ
C3	I have observed hygienic handling during collection and distribution	<input type="checkbox"/> Firmly concur <input type="checkbox"/> concur <input type="checkbox"/> Neutral <input type="checkbox"/> Differ <input type="checkbox"/> firmly differ
C4	Providers share clear information on water safety/quality	<input type="checkbox"/> Firmly concur <input type="checkbox"/> concur <input type="checkbox"/> Neutral <input type="checkbox"/> Differ <input type="checkbox"/> firmly differ
C5	Complaints are resolved to my satisfaction	<input type="checkbox"/> Firmly concur <input type="checkbox"/> concur <input type="checkbox"/> Neutral <input type="checkbox"/> Differ <input type="checkbox"/> firmly differ
C6	Have you ever seen mishandling (e.g., unclean containers, unsafe hoses)?	<input type="checkbox"/> Firmly concur <input type="checkbox"/> concur <input type="checkbox"/> Neutral <input type="checkbox"/> Differ <input type="checkbox"/> firmly differ
C7	If Yes to C6, briefly describe	<input type="checkbox"/> Yes <input type="checkbox"/> No

SECTION D: RESIDENTS' ETHICAL PRACTICES

NUMBER	QUESTION	RESPONSE FORMAT
D1	Residents avoid illegal connections that may contaminate water.	<input type="checkbox"/> Strongly agree <input type="checkbox"/> Agree <input type="checkbox"/> Neutral <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly disagree
D2	Households dispose waste properly, away from taps/pipes/drainage	<input type="checkbox"/> Strongly agree <input type="checkbox"/> Agree <input type="checkbox"/> Neutral <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly disagree
D3	Vandalism of pipes/meters is a problem in my area	<input type="checkbox"/> Strongly agree <input type="checkbox"/> Agree <input type="checkbox"/> Neutral <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly disagree
D4	Residents practice safe storage (clean jerricans, covered containers)	<input type="checkbox"/> Strongly agree <input type="checkbox"/> Agree <input type="checkbox"/> Neutral <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly disagree
D5	Community members are sensitized on protecting water sources	<input type="checkbox"/> Strongly agree <input type="checkbox"/> Agree <input type="checkbox"/> Neutral <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly disagree
D6	Have you personally witnessed contamination by human activity (e.g., washing near taps, dumping)?	<input type="checkbox"/> Yes <input type="checkbox"/> No

D7	If Yes to D6, specify what you saw	Short open-ended
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Section E: DRAINAGE SYSTEMS AND PROVISION OF WATER

NUMBER	QUESTIONS	RESPONSE FORMAT
E1	Is your neighborhood's drainage system adequate?	<input type="checkbox"/> Yes <input type="checkbox"/> No
E2	During rains, does flooding reach or mix with water points/taps?	<input type="checkbox"/> Strongly agree <input type="checkbox"/> Agree <input type="checkbox"/> Neutral <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly disagree
E3	Blocked/open drains near water points increase contamination risk	<input type="checkbox"/> Strongly agree <input type="checkbox"/> Agree <input type="checkbox"/> Neutral <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly disagree
E4	Poor drainage interrupts water supply (e.g., damage, shutdowns).	<input type="checkbox"/> Strongly agree <input type="checkbox"/> Agree <input type="checkbox"/> Neutral <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly disagree

E5	How frequently are drains near you cleared/desilted	<input type="checkbox"/> Never <input type="checkbox"/> Once a year <input type="checkbox"/> Several times a year <input type="checkbox"/> Monthly <input type="checkbox"/> Weekly
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