

**EXPLORING GOVERNANCE STRATEGIES FOR TACKLING ILLEGAL
WATER CONNECTIONS: A CASE STUDY OF NAIROBI CITY WATER
AND SEWERAGE COMPANY IN KENYA**

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DECLARATION**Declaration by the Student**

I declare that this document and the research it describes are my original work and that they have not been presented in any other university for academic work.

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DEDICATION

I would like to express my heartfelt appreciation to my family and friends for their continuous support and encouragement during my academic pursuit. Their steadfast faith in my abilities has served as a constant source of motivation, and their selfless sacrifices have enabled me to dedicate myself fully to my research endeavors. I am profoundly thankful for their unwavering love and understanding throughout this journey.

ABSTRACT

The study investigates how the Nairobi City Water and Sewerage Company (NCWSC) handles illegal water connections in Nairobi City County (NCC), whose high number caused much of the water company's revenue to be lost and led to water shortages. Both methods were applied in the research: using statistics and interviewing stakeholders. The study included a total of 1,250 people among the participants, all from different stakeholder groups such as NCWSC officials, water consumers, environmental organizations, local authorities, water vendors, community leaders and makers of water policies. Applying Cochran's formula, we chose 295 participants and divided them according to their stakeholder group. In this section, careful stratification was used to make sure each subgroup represented in the study was well represented. For the qualitative study, 10–15 main informants who had worked with water governance or illegal water connections were processed using purposive sampling. The study achieved validity by testing both its content and construct aspects. Experts looked over the content to confirm its meaning and the statistical programs AMOS and MPLUS were used to assess construct validity. Conducted using the Regulatory Compliance Theory and Social Exchange Theory, the study exposed the fact that the NCWSC's decentralization provided responsiveness, but its administrative difficulties and role repeated between teams upset operational efficiency. Even with regulations in place, uneven application and little help from the courts made the rules weak as deterrents. Participatory initiatives were conducted, but youth and informal users did not participate enough. The research showed that shortages of resources, risks of corruption, along with logistical difficulties all posed additional difficulties whereby NCWSC faces substantial water losses of 40% annually, affecting finances and service delivery. NCWSC produces 540 million litres per day against a demand of 900 million litres, leaving a shortfall of 360 million litres. Out of the water supplied, 300 million litres were being lost daily through leaks. These losses translate into Kes. 10.6 billion annually, for effective governance which is why updating the water laws, reinforcing the institutions and improving collaboration were necessary to deal with illegal water use. It was also suggested to use smart meters and locations maps to make monitoring and enforcement more effective. The findings also suggest that future research should be done for a longer period in many African cities to find better solutions and examine broader impacts from information technology on illegal water connections.

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DEFINITION OF TERMS

Governance	Governance refers to the structures, processes, and mechanisms through which decisions are made, policies are formulated, and power is exercised in a society, organization, or institution. It involves the interaction between the government, the private sector, civil society, and other stakeholders, with an emphasis on accountability, transparency, participation, and rule of law (UNESCAP, 2021).
Governance Strategies	Governance Strategies are the approaches, policies, and frameworks that organizations or governments adopt to achieve their governance objectives. These strategies are designed to improve decision-making, ensure accountability, enhance transparency, promote participation, and maintain social equity (OECD, 2022).
Illegal Water Connections	Unauthorized connections to the water supply system that bypass metering or other controls, resulting in non-payment for water services and potential damage to infrastructure (World Bank, 2021).
ISO 9001:2015 Certification	A quality management system certification awarded to organizations that demonstrate compliance with ISO 9001 standards, emphasizing consistent product/service quality and customer satisfaction [ISO], 2025).

Nairobi City Water & Sewerage Co. (NCWSC).	The utility company is responsible for providing water and sewerage services within Nairobi City (NCWSC, 2024).
Non-Revenue Water	Water that is produced and lost before it reaches the customer, often due to leaks, theft, illegal connections and inaccurate metering, resulting in financial losses for water utility companies (International Water Association [IWA], 2020).
Sustainable Development Goal No. 6	A United Nations goal aiming to ensure availability and sustainable management of water and sanitation for all Vision 2030. A long-term development blueprint for Kenya aimed transforming the country into a newly industrializing, middle-income nation by 2030 (United Nations, 2025).
Water Governance	Water Governance refers to the political, social, economic, and administrative systems in place to manage and distribute water resources effectively and equitably. It involves the decision-making processes regarding water allocation, water quality, infrastructure development, and the regulation of water use, both in urban and rural areas(UNDP Water Governance Facility, 2024).

ABBREVIATIONS AND ACRONYMS

AfDB: African Development Bank

AMCOW African Ministers' Council on Water

AMOS: Analysis of Moment Structures

ANOVA: Analysis of Variance

CE: Community Engagement

CFA: Confirmatory Factor Analysis

CSR: Corporate Social Responsibility

E&D: Equity and Diversity

E&E: Enhancement and Enforcement

EAC: East African Community

EAWUN: East African Water Utilities Network

EFA: Exploratory Factor Analysis

EPA: Environmental Protection Agency

EU: European Union

FGDs: Focus Group Discussions

FWA: Flexible Water Allocation

GWS: Global Water Security

ISO: International Organization for Standardization

ISR: Informal Settlements Regularization

IWC: Illegal Water Connections

KES: Kenyan Shilling

M&E: Monitoring and Evaluation

MENA: Middle East and North Africa

NCC: Nairobi City County

NCWSC: Nairobi City Water and Sewerage Company

NEMA: National Environment Management Authority

NGOs: Non-Governmental Organizations

NRW: Non-Revenue Water

NVivo: Software for Qualitative Data Analysis

OA: Organizational Agility

OR: Organizational Resilience

P&P: Policies and Practices

R&D: Research and Development

RF: Regulatory Framework

RRI: Rapid Response Initiative

SDG: Sustainable Development Goal

SPSS: Statistical Package for the Social Sciences

T&S: Transparency and Sustainability

UN: United Nations

UNESCO: United Nations Educational, Scientific and Cultural Organization

WG: Water Governance

WHO: World Health Organization

WRA: Water Resources Authority

WSRB: Water Services Regulatory Board

WSTF: Water Services Trust Fund

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CHAPTER ONE

INTRODUCTION

1.1Introduction

This section provides a concise overview of the background of the study, a statement of the problem, the purpose, objective, and research questions of the study, the justification, significance, scope, limitations and delimitations, assumptions, theoretical framework, and the conceptual framework of the study.

1.1.1. Background of the study

Water governance is a global, continental, regional, and national question. The population continues to grow and urbanization at unprecedented rates has led to scarcity of water resources. Consequently, as concerns the prudential management of those risks, effective governance solutions are scarce. On this note, a report by the United Nations estimates that over sixty percent of the global populace will be living in cities by 2050, staggering the need for water (United Nations, 2018). Global warming deepens inequity between and within regions because it disrupts the historical trend of water availability and also intensifies this issue (IPCC, 2022). Whereas in the past water was merely a utility driving business needs and acknowledged as a security interest, some analysts suggest that the next wars may be fought over water (Gleick, 2014).

Given the increasing consumption of the commodity and changing climate conditions, there is a need for the provision of water governance policies in ways that meet the need while at the same time factoring in the fact that the earth has limited resources. The recognition by the UN General Assembly in 2010 of water and sanitation as a human right provides additional political impetus towards the ultimate goal of

providing everyone with access to these vital services (United Nations Human Rights Council, 2021; UNICEF & WHO, 2023).

UN-SDG 6 – Clean Water and Sanitation for All by 2030 is the main focus of this study and it emphasizes the need for effective water management structures. Around the world, it is well known that water scarcity critically affects many developing regions, as such regions usually have large social and economic gaps (United Nations, 2022; WHO & UNICEF, 2022). As indicated by the World Bank (2021), 1.1 billion people cannot get clean water and more than 2.7 billion experience water shortages for at least a month every year. Almost half of people in Sub-Saharan Africa, the Middle East, and South Asia are poor, making this even worse in these regions. Over 80% of the water available to countries like Yemen, Niger, and Burkina Faso is withdrawn each year, causing extreme water stress. Likewise, Bahrain, Kuwait, and Lebanon in the Middle East are affected by water stress, since their needs consistently exceed what is available. In South Asia, both India and Pakistan face major water shortages made worse by changes in rain patterns and lasting droughts. Because of socio-economic reasons, marginalized groups are often affected the most by lacking access to water, which makes them more susceptible to inequality and risk (UN-Water, 2021; World Bank, 2023; UNICEF & WHO, 2022).

Regarding the management of equitable and reasonable use of shared water resources, the UN Watercourses Convention (1997) and the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1992) rely heavily on collaborative governance instruments. In the context of transboundary waters, these frameworks support ensuring equitable allocation of water resources, protection of water quality, and conflict resolution (Sadoff et al., 2021; UNECE, 2022).

Nevertheless, in spite of these frameworks, there are hurdles to the actual practice of

water governance at the international level and those marred by political instabilities or violence (World Bank, 2023).

The problem of acute water governance in Africa is high population pressures, the instability of climate conditions, and an accelerating rate of development of informal settlements. Kenya, Nigeria, South Africa and Ethiopia are some of the countries which are highly hit. Non-revenue water problems, in particular illegal connection crimes, stalk Kenya, especially in informal settlements, such as Nairobi (Mwangi et al., 2021). The fast rate of urbanization combined with a lack of robust infrastructures in Nigeria has led to huge water shortages in places such as Lagos (Adeyemi & Oladipo, 2022). The climate in South Africa is described as very variable, so it has spawned severe water stress in both rural and city centers, as the case with the Cape Town water crisis denotes (Harris et al., 2020). Ethiopia however has the issue of cross border water management particularly the one around the Nile River (Gebrehiwot & Shiferaw, 2023).

One of them, according to the assumptions of the African Union (AU, 2016), is water as one of the most significant resources of the continent that should be secured and efficiently used. Simultaneously with the said opinion, a number of the cross-border development projects have been launched at the same time in order to enhance the water governance and the satellite integration. Such include the Nile Basin Initiative and the Senegal River basin Development Authority that both focus on trans boundary water management. Moreover, African Ministers Council on Water (AMCOW) plays a core part in organizing the efforts on a continental level. It aids in policy implementation in solving the problem of water scarcity, improving regional water governance, control of trans boundary waters like the Niger river and the Nile River basin.

Nevertheless, the region of Africa today is having a worrisome increasing water challenge. The World Bank (2021) reported that more than 400 million people from sub-Saharan Africa lack access to safe water for drinking. This makes Africa have the lowest area of water supply in terms of coverage as compared to the other World Continents. Climate change, population increase, and poor technological development worsen water stress; water stagnant systems hinder equal access in informal sector areas, which may have limited water sources. Other challenges faced by water distribution networks are corruption in several urban areas, illegal connections, and water theft. Many people thus are still unable to access clean water hence affecting their health, happiness, and even pocket.

Kenya with a population of over fifty-three million people has numerous issues with water management, especially with the large cities of Kenya such as Nairobi. According to Kenya's Constitution of 2010, water was enumerated as a fundamental right. As stated in Article 43(1)(d), every Kenyan is entitled to clean and safe water in appropriate quality and quantity in an adequate and accessible manner as proclaimed as a quest for public service. This is supported by the Water Act (2016) which incorporates a framework for water resources management, water resources allocation, and legal frameworks for water policy formulation. Kenya has developed institutions that are charged with the responsibility of managing water resources and distribution which includes; the Water Resources Authority (WRA) and Nairobi City Water and Sewerage Company (NCWSC), however, the problem of equitable water distribution especially in the urban areas persist.

Nairobi City County (NCC) currently serving over five million people is one of several Sub-Saharan African urban centers that grapple with numerous water governance challenges. The demand for water in Nairobi is rapidly increasing, and the

population, as well as the urban development, demands more water supply and infrastructure, which is why, the supply of water is insufficient in the informal settlements. Based on its experiences, NCWSC which supplies NCC estimates that, through such practices, it incurs up to 40% of the annual loss of its gross income through illegal water connections; exacerbation of water deficit; destruction of infrastructure; and inequitable water distribution. While the corporation has embarked on some technological changes like the use of smart meters and sensitization on the community, corruption, lack of enforcement and resource constrain remain a major challenge to the efficient use of water resources.

Around 60% of Nairobi's total population lives in the informal settlements of Kibra, Mathare and Korogocho, according to figures from the NCWSC (2023). When you rely on authoritative sources like the National Center for Women and Social Science, your statistics are more reliable and your research more serious. The research confirms this statistic since NCWSC is the main water service provider and regulator. Most residents of these settlements have limited and uncertain access to water since they use illegal or unapproved pipelines. Because some parts of the capital lack piped water, many people depend on small suppliers who demand grossly inflated rates. In addition, the tough environment for residents is worsened by a lack of safe and clean water at home, so they end up drinking polluted water and getting more cases of cholera, dysentery and typhoid (NCWSC, 2023).

The NCWSC estimates that out of the population in Kibra, which arguably is one of the largest informal settlements in Nairobi, 30 percent has access to formal water networks while the rest depends on irregular and unauthorized connections as well as water hawkers. Waterborne diseases remain a public health menace to these communities since delivery of contaminated water increased the disease prevalence

by 15% in the recent past (Strategic Plan Implementation Status Report, 2014/15-2018/19).

The water is not only needed for drinking and supply of water for sanitation but also for irrigation, generation of power, industrial use, and for supporting the development of an economy. Therefore, water has become the subject of National and International concern concerning the supply of water. For some experts, water is going to be the next source of war as states and their regions fight for the growing scarcity of water resources. As it is often mentioned that in future wars water was more important, stressing the importance of waters in geopolitical relations. As a result, the deficiency of water resources may lead to a crisis of significant political importance, and therefore the aspects related to the competent administration and management are considered to have an essential significance.

Another litmus test to establish the significance of water is its significant function in the support of city resistance. Urban water management is significant as it determines cities' sustainability and resiliency as it is directly related to public health and economic equity. It is thus necessary for sound urban governance to ensure that cities provide the increasing population with clean, reliable, and affordable water.

Different cities in the world need to use water significantly as their population increases. For instance, Nairobi with over 5 million people uses between 900 million and 1 billion liters of water daily for domestic, public hygiene, and industrial purposes, but receives only 540 million liters daily meaning that the city loses between 300 million and 400 million liters a day (World Health Organization, 2020). Nonetheless, the demand for water in Nairobi is massive but its availability is growing and Nairobi continues to ration water.

According to the World Health Organization, 2020, the average daily demand for water in cities like Nairobi for covering needs like drinking, cooking, sanitation, and industrial demand for freshwater, ranges between 50 and 100 liters per head on average. The need for water especially in growing urban centers often exceeds the demand hence the need to design and manage systems that met them as required. Kenya is a water-scarce country with a per capita availability of 647 m³ of water per annum, which is less than the recommended per capita availability of 1000m of water per annum. Comparatively, Uganda and Tanzania have 2,940m³ and 2,696m³ respectively. (World Bank, 2020). This is made worse by growing urbanization, particularly in Nairobi which has many populated slum areas that are badly affected by water scarce. This means that Kenya cannot afford the luxury that its neighbors have and must treat and manage water as a scarce resource with a social and economic value. Inadequate water supplies have been blamed for hampering socio-economic growth in Kenya and compromising the integrity of national ecosystems.

This somewhat denies the Kenyan urban dwellers especially those in the informal settlements adequate water at times even when the global numbers afford them a relatively better status. With water rationing reaching as low as 20 liters per person per day in these areas, people in these developed nations receive a lot less than half the WHO-recommended 50 liters of water per person per day (World Health Organization, 2020). The fact that Kenyan people have 60 times less water than the international average suggests that the need for better investment in infrastructure, effective governance, and sustainable management of water resources is vital to the increasing water demand. It raises awareness of the growing gap in water access in Nairobi and alerts policymakers to the need to shift priorities and investment to water infrastructure, water management, and water law enforcement.

Therefore, the objective of this study is to provide a critical synthesis of the measures employed by the NCWSC regarding water scarcity and irregular connections in the informal sectors of Nairobi. The research sought to develop operational recommendations on how to improve water governance based on identified linkages between the international, continental, regional, national, and local perspectives. The results contributed to the attainment of SDG 6 by ensuring sustainable and fair water access for all the citizens in urban areas and by also promoting water security as an important element of urban and international security.

1.1.2 Challenges of Illegal Water Connections

Despite being ISO 9001: Founded in 2015, the Nairobi City Water and Sewerage Company (NCWSC) still experiences a serious problem of Illegal connections which creates more economic and environmental problems. The last five years have seen NCWSC's loss of revenue amounting to 20 percent due to unlawful connections, and the incidence of these connections has risen by 35 percent per year aggravating the situation. These acts lead to significant infrastructure destruction and water supply disruption, hence inefficiencies, and cutting supply to, what they refer to as, 'genuine consumers' (NCWSC Annual Reports, 2018; The Star News study, 2023).

However, to deal with these challenges, NCWSC has begun several programs aimed reducing the social impact of illicit connections. For instance, attempts are being made to reduce the escalation of over Sh10.6 billion annually or the 42 percent NRW loss, which defines the country's water supply problems. The 100-day RRI was developed as a response to various emergent issues (Ministry of Water, Sanitation and Irrigation, 2023). Also, owing to efforts, such as Informal Settlements Regularization (ISR), which has made more money for NCWSC, NRW has reduced. However, challenges have not ceased completely including cases of illegal connections despite

the spirited drive towards the achievement of those goals in areas such as Kibra. This situation complicates the ability of NCWSC to deliver water services that are reliable and equitable for all stakeholders.

(Interview with Maureen Anyango, Chairlady of Kisumu-Ndogo village in Kibra, December 2022; Interview with Philip Gitau, Coordinator of the Southern Region of NCWSC, January 2023).

1.1.3 Consequences and Overview

Illegal water connections lead to a troubling 30% reduction in water availability, causing leaks and bursts, accounting for around 30% of NCWSC's supplied water (NCWSC Annual Reports, 2023). Financially, repairing damages, and investigating and addressing illegal connections consume about 15% of NCWSC's annual budget, diverting funds from essential projects (NCWSC Financial Reports, 2023).

These connections undermine water conservation efforts and contribute to social inequality, perpetuating poverty cycles (World Bank Water Resource Management Report, 2022; United Nations Human Development Index, 2023). Moreover, they pose health risks, with a 15% increase in water contamination incidents, emphasizing the need for urgent intervention (Strategic Plan Implementation Status Report, 2014/15-2018/19).

1.1.4 Company Overview

The NCWSC, crucial for NCC's water governance, faces challenges due to illegal connections. Established in 2003, it transitioned from the Nairobi City Council to Nairobi City County in 2010, serving approximately five million residents with a budget of KES 242 billion (NCWSC, 2020). With 60% of NCC's population in informal settlements, tackling illegal connections is vital for water access and the company's mandate (African-uncensored, 2023).

Consequently, under the 2010 Constitution as well as the County Government Act of 2012 and The Water Act of 2016, NCWSC has a major duty of encouraging water conservation through awareness, technology, and partnerships. The management of the company, therefore, is always to assess the measures it takes in the quest of improving its operations and the accomplishment of sustainable results in cases of dealing with cases of Cross Connection/Illegal Connection to water supply.

1.2 Statement of the Problem

Access to clean and affordable water is a long-standing issue in the majority of rapidly urbanizing African cities, and Nairobi City County (NCC) is no exception. Despite significant investment in water infrastructure and service delivery, the Nairobi City Water and Sewerage Company (NCWSC) continues to face entrenched water governance issues. Most persistent of these issues is the prevalent taking and receiving of illegal water connections (I&Cs) that severely undermine the efficiency, accountability, and sustainability of the water supply system.

According to NCWSC (2020), illegal connections cause the utility to lose close to 40 percent of all annual revenue, and the money allocated to infrastructure expansion and maintenance has gone missing. Not only does this unregulated infringement lead to a loss of revenues in unimaginable proportions, but also contributes to the rise of social inequalities, hugely impacting the inhabitants of the low-income settlements with a high density of informal areas that usually have access to vandalized or unsatisfactory water sources. Moreover, there is an increase in 15 percent of water contamination because of the illegal cross-connections with serious impacts on human health as well as compromising the integrity of the standards of water Quality. While previous scholars such as Bakker (2010), Lockwood and Smits (2011), and Cleaver and Hamada (2010) have examined water governance in the developing world with

insightful critiques of institutional weaknesses, accountability gaps, and socio-political processes, a significant gap remains in addressing the issue from the perspective of a holistic governance approach. In the African context, Hope et al. (2012) and Muller (2015) have explained water governance problems through corruption, infrastructure deficit, and urbanization, particularly in low-income urban areas. Onyango and Otieno (2018) presented a special case of Nairobi, with specific mention of informal water access and non-revenue water as main threats to water security. However, all these studies have largely been centered on technical, infrastructural, or economic aspects.

This study breaks away by placing governance at center stage as the core issue, examining how weak institutional enforcement, poor stakeholder involvement, and corruption in systems drive illegal water connection expansion in Nairobi City County. Through a multidimensional governance perspective—social, administrative, and technological—this research targets the root cause and implications of illegal water connections. It aims to give governance-based solutions for the improvement of institutional effectiveness and accountability, which contributes directly towards achieving Sustainable Development Goal 6 (SDG-6), requiring access to and the sustainable management of clean water and sanitation for all.

1.3 Purpose of the study

The current study sought to establish how the; Current management structure, Regulatory framework, Community engagements and Enhancement/Enforcement measures of NCWSC are helping in addressing the issues of Illegal water connections. Through these areas of emphasis, the research aimed at identifying whether or not NCWSC's approaches have effectively dealt with the problem of irregular water connections within NCC.

1.4 Specific Objectives

1. Evaluate the effectiveness of Nairobi City Water and Sewerage Company current management structure in tackling illegal water connections.
2. Examine the impact of Nairobi City Water and Sewerage Company regulatory framework on effectively tackling illegal water connections.
3. Assess the contribution of Nairobi City Water and Sewerage Company community engagement efforts in tackling illegal water connections.
4. Evaluate the efficacy of Nairobi City Water and Sewerage Company enhancement and enforcement measures in tackling illegal water connections.

1.5 Research Questions

1. How does the current management structure of Nairobi City Water and Sewerage Company contribute to tackling illegal water connections?
2. What is the effect of the Nairobi City Water and Sewerage Company regulatory framework on effectively tackling illegal water connections?
3. What is the contribution of Nairobi City Water and Sewerage Company community engagement efforts to tackling illegal water connections?
4. How effective are Nairobi City Water and Sewerage Company enhancement and enforcement measures in tackling illegal water connections?

1.6 Significance of the Study

1.6.1 Academicians

The study enriches academic discourse on water governance by offering a case study of NCC. It bridges gaps in literature regarding the intersection of governance

strategies, community engagement, and regulatory compliance. Additionally, it provides insights into addressing urban challenges in rapidly growing cities, offering theoretical and empirical contributions.

1.6.2 Policy Makers

Findings guide policy-makers in developing more robust regulatory frameworks to combat illegal water connections. By identifying governance gaps, the study offers evidence-based recommendations to enhance transparency, accountability, and stakeholder collaboration.

1.6.3 NCWSC

The study evaluates NCWSC's current governance strategies, providing actionable insights to strengthen enforcement mechanisms, optimize resource allocation, and foster community trust.

1.6.4 Societal Benefits

Improved governance strategies enhance water access and equity, reducing the prevalence of waterborne diseases and fostering sustainable urban development.

1.7 Scope of the Study

This research explored how efficiently the NCWSC is dealing with illegal water connections in Nairobi. NCWSC has subdivided Nairobi into nine regional areas which include New Central, Roysambu, Upper Embakasi, Lower Embakasi, Langata, Westlands, Kasarani, Dagoretti and the Informal Settlements region. The research was done on these areas to determine how the company deals with illegal connections in different sectors. I used four months to conduct the research, and this research shall be divided into two parts in that two months will be used in collection of data and two months be used in the data analysis and the writing of the report.

The study evaluated four important domains. First, it examined the manner in which

NCWSC manages to deal with the challenge of illegal water connection using organizational practices, employee functions, and organizational effectiveness. This was carried out through interviews, surveys, review of documents and field observations. Second, the paper has discussed the regulatory impact that NCWSC has had since its institution i.e. policies that the company has formulated, the enforcement of the policies, as well as external perception of NCWSC in the water sector. This was in form of interviews and focus group discussions with the sector players. Third, the study evaluated the mitigation of illegal connections by concentrating on community involvement, awareness and sensitization activities. This section was targeted by gathering information in the form of questionnaires, interviews, and case studies. Finally, the project studied the use of enforcement by NCWSC, i.e. inspections, fines, and technological solutions through interviewing, reviewing documents, analyzing cases, and receiving customer comments. A summary of the research finding was obtained at the end of the study.

1.8 Delimitations

The Nairobi City County (NCC) is selected as the geographical scope of the study site, which is consciously narrowed with references to the unusual issues associated with unlawful water connections in this urban area. Focus on the NCC offers greater insight and practical experiences without the problem of managing issues related to water governance in various counties. It is also in line with the time and resource constraints of the researcher.

The research was also done with some of the major stakeholders in NCWSC like its staff, management and operating personnel as all of them are directly concerned in identifying, preventing and processing illegal water connections. The profiled nature of this approach means that the first hand information should be collected by people

most knowledgeable about dealing with illegal connections as the significance and comprehensiveness of the results increase. The time frame of the study, which was three months in the case of data collection, gives an overview of the current situation of illegal connections and the success of activities at NCWSC.

This study did not involve insights of wider stakeholders, including the government, other players in the private sector, or community people. By the fact of limiting the study to NCWSC and its direct stakeholders, the researcher guarantees the focus on the core issues of illegal connection to the water and prevents the scope creep, having a better understanding of the strategies of the company.

1.9 Limitations of the Study

The study is characterized by certain limitations, which can influence the depth of findings and generalizations. Among the limitations is a small sample size whereby 30 people were sampled per region. Such a comparatively small size of the sample can both constrain the possibility to elaborate on the issue in question and result in problems with the possibility of extending the findings to the whole NCC. But, because of the financial limits, the sample size could not be larger. To overcome this drawback, the research ensured that the pre-selected sample is representative and varied using the budget at its disposal to ensure that the research data is relevant. Moreover, priority was given to qualitative information acquired during interviews to make the findings richer, even though the sample size was lower.

The second constraint is reliability and availability of data. There can be incomplete or even inaccurate information obtained through surveys and interviews, thus corrupting the results. To look into this, the study resorted to the methods of data validation like triangulation to make comparisons among the results of the various data collection procedures (e.g., survey, interviews, and documents) in order to be

able to promote accuracy and consistency. Also, the interview procedures were standardized in order to reduce biasness during data collection and in order to enhance reliability.

It also has financial constraints that limit the number of data that would be collected and analyzed. The timeline of the research (presented in three months) and the available budget presuppose the concentration of attention on definite aspects of the issue and enable the decrease of the research effort to fulfill all the main research objectives. Digital tools and online questionnaire were used as cheap alternatives to data collection means, and these reduced the costs to collect quality data in the identified budget.

1.10 Assumptions

The study assumes that NCWSC's governance strategies are effective in addressing the issue of illegal water connections within NCC. The research also assumes that the findings provide valuable insights that can inform resource decision-making, policy formulation, and strategy implementation by decision-makers, policymakers, and managers involved in water governance.

Furthermore, the study presupposes that focusing on the seven regions within NCC provides sufficient data to evaluate the efficiency of NCWSC's strategies in combating illegal water connections. While stakeholder participation may be constrained by time and scope, the study aimed to capture a comprehensive overview of the company's efforts within the selected areas.

1.11 Theoretical framework

Regulatory Compliance Theory and Social Exchange Theory are two correlated theories which form a strong background of the study. Regulatory Compliance Theory assumes that the following of laws, policies, and official structures essentially

determine the manner in which activities are conducted by an organization, especially within the course of controlling various activities like the prevention of illegal water connections (Parker & Nielsen, 2019). It highlights the role of establishing monitoring, enforcement, and sanction systems by institutions to safeguard compliance and order in resource management systems (Ayres & Braithwaite, 2017). In a complementary manner, Social Exchange Theory presents a view of the dynamics in the relationships between water utilities and their (consumer) customer, emphasizing the importance of trust, fairness, and reciprocity in the maintenance of long-term cooperation (Cropanzano & Mitchell, 2005). According to this theory, compliance and mutual benefit take form through positive social interactions as opposed to the legal responsibility of individuals (Blau, 1964). The combination of these theories allows coding a full analysis of governance strategies as outlined by the interaction of structural regulatory frameworks with the socio-psychological determinants of the stakeholders. This cross-sectional picture will enhance the research because it will realize that any efficient responses to unlawful water ties will not only involve official punitive activities but also the development of cordial social relations (Tyler, 2018; Emerson, 1976).

1.11.1 Regulatory Compliance Theory

The Regulatory Compliance Theory is all about the key principle that organizations have to follow legal and regulatory frameworks. According to the theory, for organizations to be lawfully and ethically running, they have to meet the set laws regulations, and standards for sustainability and legitimacy (Jones & Thompson, 2017). Borrowing from the organizational management approach, this view argues that compliance is a legal requirement that must be met as a basis for establishing public trust as well as to legally and socially furthermore prevent the organization

from facing other legal repercussions (Kenton & Brooks, 2022). Compliance can also be useful in managing risk inherent in non-compliance, and that comprises low reputation, legal sanction, and interference with business initiatives. More recently, Coglianesi (2019) and Vogel (2012) have recommended fostering a positive and proactive compliance culture as a critical strategy for enhancing an organization's credibility and legitimacy. Their work highlights that in complex and challenging legal environments, such a culture not only ensures adherence to regulatory requirements but also promotes voluntary cooperation and trust among stakeholders. This approach moves beyond mere enforcement, emphasizing the importance of internalizing compliance values throughout the organization to achieve sustainable governance outcomes. Within the water governance framework, the use of the Regulatory Compliance Theory seems to have the greatest relevance in the functioning of utilities such as the NCWSC. The water utilities are bound by some national and local water policies, for instance, the Water Act of 2016 in Kenya in addressing some of the water challenges like illegal connection to water sources. NCWSC therefore needs to conform to these legal instruments to address issues of cross-connection, enhance efficiencies, and increase water service access for clean water. Regulatory Compliance Theory assists in setting up the management framework and operation of NCWSC while aligning its practices to national laws and standards. In this way, NCWSC can gain the trust of regulatory authorities and avoid legal mistakes the organization may make by not following legal legislation. Also, not waiting for interactions with these bodies entails that the organization gets updated on new regulations as it sought to cope with new governance issues (Vogel, 2012). Adhering to the rules tightly also helps NCWSC to improve its image as a responsible service provider as well as to justify its actions regarding the elimination of illegal

connections and equal distribution of water.

However, one should not ignore certain weaknesses inherent in this approach, which is called Regulatory Compliance Theory. First, as concerns how the theory operates, it is comprised solely of the concept of compliance with the law, without considering the circumstances in which the organizations exist. For instance, it often ignores the implementation of laws as the primary guide to managing the behaviors of people in organizations without taking into consideration ethical, cultural, or other norms and customs (Coglianese & Nash, 2019). However, the theory fails to admit that obedience may not always yield the desirable outcome such as winning the cooperation of a community or their trust in cases where laws are weak or the laws are themselves ambiguous (Jones & Thompson, 2017). In addition, there is a downside of Regulatory Compliance Theory in that it can misfire where the regulatory regime itself is wanting or ambiguous, thus posing challenges to organizations such as NCWSC.

1.11.2 Social Exchange Theory

Social Exchange Theory, which explains social relations, was initially described by Homans (1958), later expanded by Emerson (1976), and further developed by Cropanzano and Mitchell (2005). Relationship marketing theory postulates that people and organizations enter into relationships for mutually beneficial gains while incurring low costs, for and with the concept of reciprocity leading the way. In this exchange, there is trust, cooperation also the goal of both parties is reciprocation thus people do not end up exploiting each other and the relationships are long-term. Social Exchange Theory posits that it is the ratio of the benefits and costs that presents the motivation and direction that sustains or withdraws from a relationship (Cropanzano & Mitchell, 2005). The theory has found its strongest usage in such disciplines as sociology, organizational studies, and economics, for which understanding the

balance of individual and collective self-interest is key to success.

NCWSC can benefit from Social Exchange Theory to understand how it can form appropriate relationships with stakeholders to deal with problems like unauthorized connection to water supply. Through the effective implementation of transparent communication, increased community involvement, and acceptance of the local needs and issues, NCWSC would be able to foster the necessary trustful relationship with the clients and users to enable them to share their problems, challenges, and successes with the water services cooperation. For example, it is possible to involve local communities in decision-making within NCWSC regarding water distribution and management issues. The collaborative approach means that people take responsibility and are committed to solving the problem associated with fears connected with illegal water connections. Emerson (1976) explained that where the stakeholders have gained a perception of their self-interest, they were willing to cooperate, report incidences of illegality, and assist in formulating solutions to difficulties in water governance. In addition, however, once NCWSC delivers agreed basic service delivery – for example, water supply – or service improvements, people within the community would in turn respond or conform to legal requirements of water usage thus eradicating Naivasha illegals.

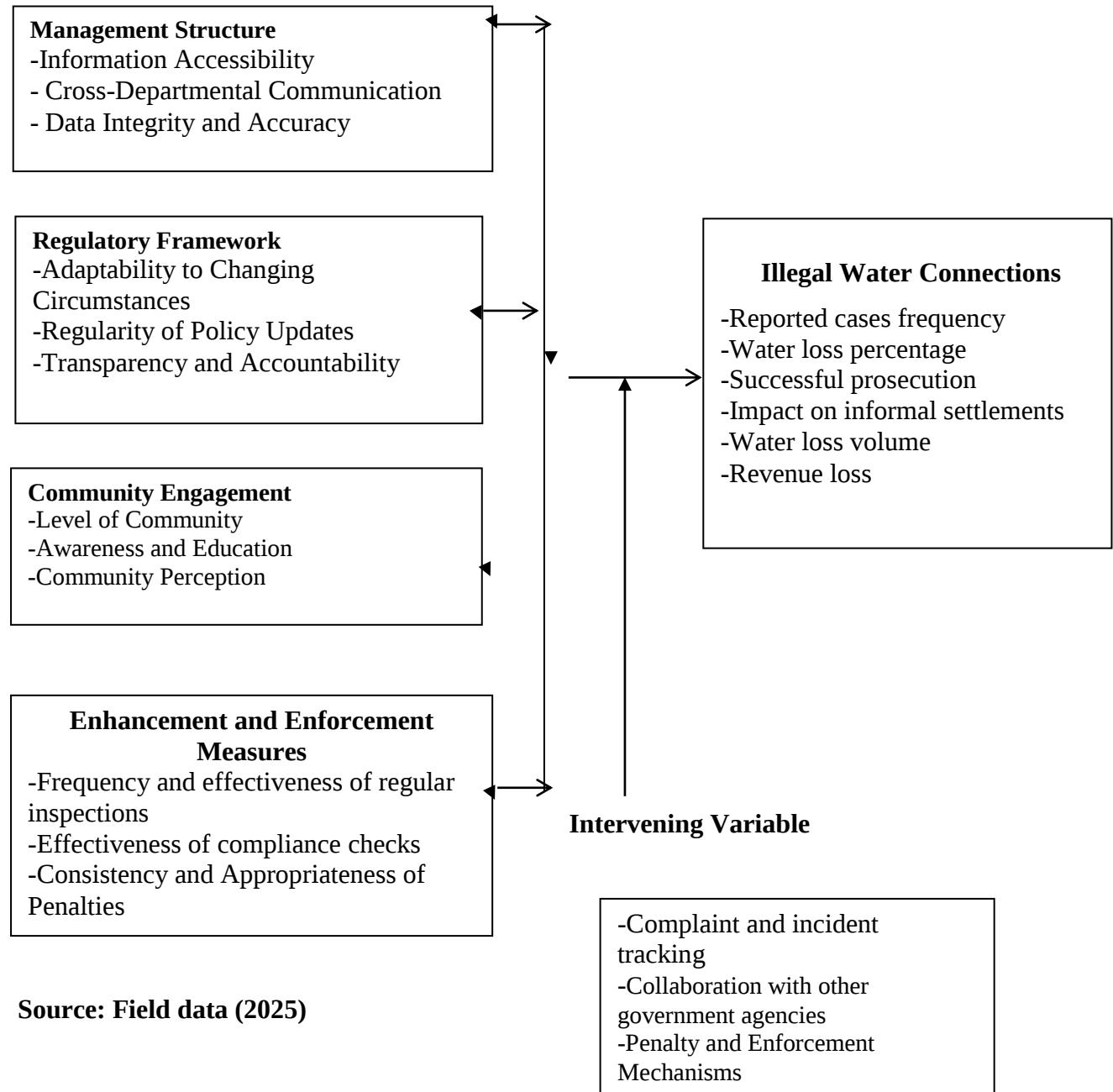
However, since the introduction of the Social Exchange Theory, there are some drawbacks. A primary weakness of the theory is that it often builds its analysis on individual or dyadic interaction, while the relations under investigation are organizational interactions of a utility company with numerous other organizational stakeholders. For instance, while business associates for NCWSC include only individual clients, the interactions are not only limited to the firm but also include the federal government, local authorities, and regulatory agencies as well as a range of

community interest groups. The theory is based on the idea that main stakeholders have similar interests, and each of them controls the same resources, which is not quite accurate. In the real world, power dynamics are realized, who has leverage over the other and this can help one side of the relationship at the expense of the other (Cropanzano & Mitchell, 2005). Additionally, However, the theory could have gaps regarding the effect of conducting factors such as economic factors, policies, or legal requirements within the stakeholder matrix that may bend the behavior of the stakeholders. However, where resources are scarce or where compliance is voluntary and is enforced through sanctions, there might be little likelihood of Social Exchange Theory being very useful (Emerson, 1976).

Although Social Exchange Theory provides worthwhile insights as to trust building and the general nature of working relationships that should exist between people and organizations, it may not exhaustively explain the dynamics of the interaction process that occurs in intricate large organizational systems such as NCWSC. The theory emphasizes the voluntary cooperation of stakeholders, which may not hold water in legal or economic constraints that coerce subscribers as evidenced in most public utility service provisions (Emerson, 1976).

1.13. Conceptual framework

The conceptual map shows how different governance strategies across four water sectors are associated with illegal water connections. It defines independent, dependent, and mediating variables, by using the concepts of both fundamental theories.

Figure 2.1 Conceptual framework**Independent variables****Dependent****Variable****Source: Field data (2025)**

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section contains: a brief discussion of the theoretical framework; a review of the literature; a discussion of the conceptual framework; the synthesis of findings and conclusion; and an identification of the gaps that exist in the literature.

2.2 Review of Literature

2.2.1 Management Structure and the Effectiveness of Water Governance

The link between management structure and water governance is discussed here to refer to some empirical literature on the general concepts of organizational performance. This work by Gomez & Martinez (2020) is called a factor that can increase the agility of organizations and improve decision-making because transparency in data sharing is critical. Nevertheless, they failed to explore some objective challenges that persist in organizations: business tropism, data globalization, and employee reluctance to provide information. These omissions make their analysis theoretical and far from the challenges that organizations, including NCWSC face in practice. Thus, it becomes evident that Gomez & Martinez's framework does not adequately capture the dynamics of the process of implementing transparency in a public-sector organization; hence the authors' conclusions cannot serve as yardsticks for steering the actual reforms of water governance.

Nonetheless, two features should be appreciated: the concern for transparency coupled in the study while critical aspects like internal resistance, technological constraints, and privacy issues emerge as barriers to the promotion of open data-sharing practices throughout the study. Hence, unless these real-life challenges are addressed, the idea remains largely theoretical and not fully anchored within NCWSC

and other vast bureaucratic structures (Kitchin, 2021).

Along the same vein, Jones and Thompson (2017) posit that unchecked decision-making structures are one of the aspects of good governance, especially in the management of issues regarding concerns such as the provision of water where people provide the utility with water Connections. As much as they are correct in theory, they seem not to address the factors that make such decision-making a nightmare in the real world (March & Olsen, 2020).

Bitter wrangles within departments, bureaucracy, and various stakeholders' interests are not well addressed in their findings, which makes the conclusion rather conclusive and even unrealistic. Jones & Thompson fail to capture those aspects of decision-making where multiple employees work within a large organization with a massive hierarchy and multiple decision-makers, where decision-making is influenced by the political struggles, bureaucracy, and incompatible goals of the different departments or other affiliated organizations

To some extent, Brown & Johnston (2019) underscore the significance of training for employees to enhance good governance, but they do not speak about a resource scarcity problem that is essential in an organization like NCWSC. Concerns like staff turnover, inconsistent training and development programs, and lack of top management support keep training efforts from reaching their full potential. The conclusions made by Brown & Johnston stem from an overly optimistic view of organizational capacity that is attainable by water service providers. That is, attractive training schemes may not work in practice because they are underfunded, people are turned over or their managers do not support skill development. By omitting these factors, their findings become best-seller brainstorming ideas, rather than practical guidelines. The conviction that training can greatly improve governance loses sight of

how organizational factors compromise these efforts including; limited funding and high turnover rates among the staff. The study, therefore, fails to consider real-world constraints that water governance bodies encounter in up skilling their human capital, thus finding may not be realistic to organizations such as the NCWSC.

Organizational hierarchy is considered as a key enabler of role clarity and coordination and is elaborated through Johnson et al., (2020) work which posits that structural hierarchy enhances organizational performance. However, their study fails to consider the downside of clearly defined structures which undermine the operations of organizations by; restraining creativity, decreasing interdepartmental cooperation, and causing decision-making constraints. It is quite clear that having a clear hierarchy helps to assign duties and tasks, yet the research does not take into account that managing water is a complex process, and often, effective solutions require cooperation between departments, as well as creativity. Brint and Karabel (2019) explain that the tall structures that Johnson et al. (2020) advocate can hinder cross-functional integration as teams become overly focused on their area of responsibility. It is problematic because it promotes a loose coupling of the bureaucracy, slows down decision making process, inhibits creativity and becomes an impediment to organizational learning to enable the organization like NCWSC to adjust to new emerging challenges and future. The study develops extreme and pinkish view of the existence of hierarchy, as well as the lack of ability to grab or reflect how things like the cross-sectoral, cross-functional thinking, and flexibility is important in the current largely complex water management. Because of the insensitivity to potential constraints to bureaucratic organization, Johnson et al. (2020) fail to provide a more sensitive image of how the organization could be structured more efficiently, in particular, when it is working with multiple stakeholders and within a complex

environment. Last but not least, Roberts & Smith (2018) correctly point to the need for flexible hierarchical structures to address new challenges. But what they do not explain is the real processes through which organizations can keep flexibility. The theoretical reasoning is not sufficient if they fail to provide practical cases that explain how organizations, including NCWSC, may continue to be sensitive to obstacles like illegitimate water connections. Although the concept of flexibility is indicated to be critical in the management of challenges, the study fails or is insufficient in offering ways in which this flexibility can be effectively employed.

Roberts & Smith (2018) argue for flexibility in organizations but do not mention what it means for proposed changes in management, culture, and policy to come into harmony to create flexibility in practice. What the authors fail to guide any organization struggling with structural flexibility or internal resistance is that, even when posited, these conclusions are merely ideas that need direction to come to fruition. Their lack of concrete strategies not only for achieving organizational agility but also for creating conditions that can support it means that they are useful primarily for considering the nature of water governance challenges, such as providing solutions to problems like unauthorized water connections, which require much more organizational flexibility than their model seems to allowed for.

Therefore, even though the works cited in the present analysis emphasize the link between the management structure and the effectiveness of water governance, each of them fails to capture the practical challenges that organizations such as the NCWSC encounter. However, working in large organizations has many layers and layers of bureaucracy, data silos, political interference, and lack of resources, are very different from what the authors of Gomez & Martinez (2020), Jones & Thompson (2017), Brown & Johnston (2019), Johnson et al. (2020), and Roberts & Smith (2018)

describe. The studies present some valuable points of departure, although they do not factor into account how these reforms can realistically be put into effect in the large, highly structured, and many a time, poorly resourced organizations that characterize the public sector. To be more relevant in real-world contexts, these frameworks require a more inserted look at the organizational, political, and cultural realities that constrain water governance interventions. Only by pointing at these tangible issues can we go from theoretical visions to realistic, effective changes that enhance the efficiency of water governance in reality.

2.2.2 Regulatory Framework and the Effectiveness of Water Governance

In In discussing defects of the regulatory structure and efficiency of water governance, it is pertinent to examine further into the factors inhibiting distinctiveness in regulations, as well as, questions arising from the processes of policy execution and compliance. In a recent article, Johnson and Smith (2020) elaborately describe the need for better adaptability of regulations in the system of water governance. Although they are technically correct about this, the study obfuscates the main barriers to achieving flexibility, including organizational culture, bureaucracy resistance, and political patronage. That is not some theory because such barriers exist and play out in the functioning of any regulatory organization like NCWSC, including in addressing emergent problems such as the act of establishing unauthorized water connections. First of all, the idea given by Johnson and Smith to some extent relies on idealism and does not take into account the institutionalization of the existing practice and low sensitivity of regulation. It omits the political processes, structures, power relations, and organizational climate that slow down or hinder organizational learning and change. Absent such systematic analysis of these forces, Johnson and Smith's suggestions appear fantastic and far away from the actualities of governing, especially

within bureaucracies where flexibility tends to be constrained by vested structures and processes.

Also, Brown and Jones (2019) also note that the assessment of policy underlines the regular update of policies for enhancing the effectiveness of water governance. Though it is a concern that may require a change in policy formulation, Brown and Jones do not discuss the highly sensitive issues involved in implementing and enforcing such changes in the policy. The policy changes sometimes fail to align because of rapid changes in policymaking in organizations, this results in either gaps in coverage or inconsistencies in coverage within the context of implementing organizations with less auto-corresponding ability as seen in NCWSC. In practice, these can lead to scenarios that degrade the objectives these policies pursue. In their article Brown and Jones fail to explain why regulatory agencies are constrained in their capacity to change rapidly or in their capacity to communicate policy changes across different tiers of government. They do not take into account the fact that there are always cumbersome practicalities that service providers experience while implementing new regulations, policies, and frameworks as they adapt them to the existing systems. Moreover, Brown and Jones fail to include information about how ineffective transition can be followed by stakeholders' confusion or resistance which pushes the enforcement policy process even more. A more detailed scoping of the issues should be accompanied by some difficulties that are inherent in the process of updating the policies, such as the problem of institutional culture, staff turnover, and lack of capacity.

Similarly, Chen and Kim (2018) address issues of transparency and accountability within the Framework, which is a valid focus. However, they fall short of providing a detailed examination of the specific mechanisms that support the Framework's

intended transparency and accountability structures.

Although they emphasize the significance of these factors, these authors do not explain the real processes that support or hinder them in practice (Bovens & 't Hart, 2021; Hood & Dixon, 2020). In addition, they do not take into account situations in which transparency is corrupted or systems of accountability have not provided adequate solutions and as a result, this brings mistrust and suspicion to regulatory bodies (Galtung & Holmgren, 2022). An example is how the research fails to take into account that the negative perceptions by the masses concerning the failing practices within regulatory agencies concerning efforts to curb illegal water connections may misrepresent the reputation of such authorities as NCWSC (Fung, 2023). More crucially, the lack of any significant case-study or concrete examples does little to allow examining in-depth the implementation and monitoring of accountability mechanisms in practice (Romzek et al., 2022). Srikwan (2008) is critical of Chen and Kim with more potency, as he presents case studies, which clarify issues of transparency and veers closer to the realms of taking accountability mechanisms in the world of practice.

The analysis employed in the study does not allow distinction of the potential disadvantages of demerits or expenses that will accompany the procedure of enforcement since, on the one hand, a high level of enforcement may provoke local enmity or the inability to enforce a binding measure because of suspicions of partiality. This is always a big challenge for regulatory agencies such as the NCWSC because to effect reforms they have to enforce the law, yet enforcing the law may sometimes affect cooperation from the stakeholders in the community. A more comprehensive critical analysis would look into how often stakeholder engagement approaches tend to marginalize some specific groups of people or how particular

enforcement approaches are likely to yield the wrong outcomes. Even so, Chen and Kim's account continues to oversimplify the enforcement process, failing to incorporate all the nuances of social, economic, and political contexts into which enforcement works are inserted.

In sum, the critiques offered in the section do not providing proper challenging or analyzing of the practical disadvantages of the water governance frameworks, as it has been mentioned in the literature of the studies referred to in this section. Johnson and Smith (2020) have put forward an exaggerated picture of 'Regulatory Aspirations' as if there can be a completely free and easy process of regulation making which has not taken into account the real-life constraints on Regulatory Flexibility. Brown and Jones (2019) do not consider the difficulties of policy implementation and enforcement which might take far more time and effort than the model under discussion indicates. Chen & Kim (2018) give a useful starting point for talking about transparency and accountability, but they do not give a detailed or necessarily pessimistic view of how these elements are policed in reality, or the costs of stakeholder management. To support the critique, an expanded work on the current real-world obstacles that include official resistance, lack of resources, organizational culture, and social relations should be done to give enough and comprehensive understanding of the problems awaiting the water governance frameworks. By addressing these limitations, the critique could offer more actionable insights into how regulatory frameworks can be improved to achieve more effective and sustainable water governance outcomes.

2.2.3 Community Engagement and the Effectiveness of Water Governance

A critical assessment of community engagement in water governance means that one should look at the barriers and constraints that are found with the type of endeavors.

In their study, conducted in England and authorized by United Water Services, Johnson et al. (2020) have identified some impediments to community participation in water management; these challenges include; Resource limitation, power relations, and culture. Their work is however more of an overview and does not delve deep enough to help us understand just how entrenched these barriers are when it comes to the actual exercise of community participation. As pointed out by Johnson et al., these are some of the potential challenges of community engagement. It is quite unfortunate that highlighting these challenges does not reveal how these factors are interrelated and form a complicated system that if set in play, can greatly threaten the success of the community engagement initiatives. Resource limitations, for example, are not simply monetary limitations but also limit awareness or the capacity of institutions such as NCWSC for galvanizing and co-coordinating communities' sensitization efforts. Interactions connected with power and cultural differences are securely embedded in local communities and shape the water resource management problem not only at the practical level. Johnson et al. fail to explore the extent of these inequalities, which are structural rather than soluble by mere recognition. They fail to present these power dynamics in a way that allowed s them to analyze how such power arrangements lead to the reinforcement of exclusionary practices that render some groups as perpetual minorities in water governance. Because Johnson et al. do not address these concerns, they offer a rather distorted and overly optimistic picture of participatory processes, which is bereft of the contingencies that nonprofits, such as the NCWSC, experience.

Similarly, following Tan & Lim (2018), there is a clear need to encourage systemic changes that would provide for equal access to water resources; however, their treatment of the subject does not contain the needed depth or critical analysis for

understanding how exactly the systemic inequalities impede the possibility to form equitable water governance. Tan & Lim rightly argue that community initiatives should aim to empower marginalized groups, but they fail to address how social, economic, and political inequalities often limit the capacity of such initiatives to effect meaningful change. For instance, the separated groups did not only have poor access rights to water but also poor organizational power to fight the injustice of water resource share. These are not simply issues of awareness and engagement, which are linked to wider societal questions of class, race, and gender, which, with this post, Tan & Lim never satisfactorily problematize. Because of their lack of focus on the political economy of water governance, it is not clear how practicable their framework is or how their recommendations could be attained in places where social relationships and politics of favoritism determine access to water.

Despite stressing openness, usability, and inclusion, Chen & Kim (2018) do not absent-mindedly observe that some previous mechanisms are indispensable to achieve these values. The authors are advocating for more transparency but the way transparency is managed in organizations is not clearly explained, especially in large organizations such as the NCWSC, whereby institutional factors may hinder dissemination of information. Likewise, in urging inclusiveness, they do not evaluate how power relations work when people are being mobilized to engage. In practice, however, community participation tends to be more symbolic, with predetermined results being not true participation. A deeper critique would extend into those lofty areas of how transparency and participation can be impaired in organizational situations if the decision-making process is influenced by political consideration or purely economic benefits devoid of the best interest of the community. Concerning the study, Chen and Kim rely on theoretical foundations, but these theoretical

frameworks do not capture these practical difficulties, which makes their recommendations rather inspirational.

Also, Chen & Kim's awareness, education, equity, and access/inclusion lack deep discussion which should have provided solutions to the problems implicated in the achievement of these goals. Such awareness campaigns as they might be may not get to the receiving end because most disengaged or distrusting communities won't be reached out to by the governing bodies behind most of these awareness campaigns. Such efforts may also experience opposition as these initiatives fail to recognize the social context that is, the culture, economy, and politics of communities through which water is governed. A less superficial analysis should assess the extent to which such programs have been constrained by institutions and lack of community trust, and to what extent such programs enable people to participate in water management rather than to continue to make decisions for them. Unfortunately, Chen & Kim's analysis does not take enough space to explain why education and capacity-building initiatives and instruments often do not meet the needs of the intended communities and hence do not take root to promote sustainable participation.

Last, but not least, Rodriguez et al. (2019) rightly pointed towards the need to assert equitable and inclusive community engagement. Although these goals are perhaps relatively easy to identify and articulate, the issues surrounding their implementation are typically far more complex. While the study points to the importance of participatory engagement, it does not critically reflect on how people with privilege in terms of class, ethnicity, or gender follow up on the conversations and marginalize those of the lower class, people of color, or women. Unlike Rodriguez et. al who looks at structural constructs of inclusion, they fail to explore the real challenges that come with integrating members into a pluralistic society that is highly polarized along

social hierarchies. By not engaging with these issues forcefully enough, the authors turn their analysis overly positive while ignoring the structural barriers that hinder the very processes toward more equitable water governance.

2.2.4 Enhancement and Enforcement Measures in Water Governance

The critique of enhancement and enforcement measures within water governance is a field that requires adequate theoretical consideration as well as the recognition of actual issues and concerns. Similar to Smith et al. (2020), some barriers including resource scarcity, other priorities, and the law constrain enforcement; these factors are noted but their chronic effects on the sustainability and inclusiveness of enforcement measures are not critically examined. The discussion is still quite vague and does not pay attention to how these restrictions are intertwined with other system issues such as organizational opposition or political factors that are likely to considerably influence the extent of enforcement. For instance, although Smith et al. (2020) point to resources as a limitation, there is insufficient exploration of how such limitations might impact policy goals or how competing priorities within organizations such as NCWSC might limit the attention paid to important enforcement activities. This lack of depth makes their analysis somewhat naive and removed from the experience of regulatory agencies, especially in large systems of governance that require more than resource commitment but also agency will and interaction with other institutions.

The conceptual criticism and analysis of the enforcement measures – more specifically, the downside of enforcement measures – is also lacking. As Smith et al. (2020) rightly pointed out, enforcement measures might bring new problems or worsen social disparities, but the authors do not pay adequate attention to it. For example, Penalties for violation while serving the purpose of promoting compliance, become a way of penalizing people, especially the minority, and in the process,

deepen the social inequity. Preliminary to these, the study omits a chance to perform a critical bifurcation of how enforcement mechanisms may end up reinforcing social injustices or creating even other vices like the emergence of black markets or more illicit activities in water delivery services. This kind of differentiated critique is especially needed for the analysis of enforcement measures, which address not only efficiency but also directions for their further development. A more constructive approach would explore instances where enforcement measures produced undesirable social or economic outcomes, as well as reflection on how to make better enforcement measures, that respect the necessity of compliance as well as that of fairness.

Moreover, compared to Brown & Jones (2019) where there are lighter tones concerning the effectiveness of regular inspections, penalties, and the use of modern technologies the key disadvantages do not explain the practical problems arising from the application of the above-mentioned solutions. Replacing old meters with smart meters or adopting automated monitoring systems are depicted as solutions to the problems hindering enforcement; the actual progression is nothing of the sort. Brown & Jones have omitted to consider the resource and capacity constraints that may hamper the ability to implement and use these technologies as anticipated especially within a developing country setting. There is surprisingly limited recognition of how bureaucratic processes or the digital differential between urban and rural can result in technological failure or unequal implementation of enforcement measures. Failing to take these into account, the calls for technology-based solutions may cover up the complexity of the actual issues that regulatory agencies encounter. Actual examples of technologies that have been abandoned for the lack of funds or have simply broken down could have enhanced their argument and proven that technology may make enforcement even more efficient in some situations, but it is always accompanied by

some risks that are hard to control.

Specifically, pointing to Kim & Johnson (2021), a broader and more critical perspective is given on the popularity of Ethics, Legal, and Social Implications of technological changes in enforcement. As they are, one can agree with some of the arguments that the authors make, specifically those dealing with privacy, data security, and fairness issues, but the problem is the absence of specific examples and procedures that might explain how many of these concerns are addressed. For instance, surveillance technologies, and data collection in water governance may bring up the aspect of privacy and thus the concerns are not well elucidated. A more elaborate criticism would compare the effectiveness of technological approaches with the respect of citizens' rights in the sphere of governance. What is more, the use of big data in the field of governance enhances surveillance to the level that the violation of citizens' rights can occur. Subordinate research into the legal regulation of the collection and use of such data is needed to understand whether current legal frameworks are sufficient for the protection of privacy or whether new legislation needs to be introduced in response to these new challenges.

A final issue with adopting technology-driven enforcement measures as part of the overall approach is that factors in long-term viability. That is why the discussion of trade-offs and secondary effects is critical in the elaboration of the nature of the limitations of the technological approach. The heavily technologically based approach may suggest that other equally critical components of water governance, including community participation, capacity development, and stakeholder involvement, might be overlooked. The role of the human factor to guarantee that citizens become informed, conscious, and engaged was not substituted for a technological system- A shift from a conventional form of functional expertise, towards emphasizing the place

base, politics, and people's involvement in governance. For example, the use of remote sensors, or automatic leak detection systems is beneficial, however, it does not capture the core of the problem of changing behaviors in using water within various communities for the long run.

Finally, the critique of enhancement and enforcement measures would be greatly served by a wider synthesis that poses challenging questions to the findings of the reviewed studies. Instead, a more critical approach should concern itself with revealing the organizational and systemic factors that would limit the chances of enforcement measures and technologies. Second, the consideration of the interdependence between technological, social, and political processes is central to improving the realistic and holistic evaluation of the efficiency of WG mechanisms. This kind of comprehensive critique is necessary to guide policy reforms and practical improvements in water governance systems, ensuring they are not only effective in the short term but also equitable, sustainable, and socially just in the long term.

2.3 Summary and Research Gap

2.3.1 Summary

Chapter two of this study offers a review of the theoretical frameworks underpinning water governance, especially regarding the issue of unauthorized water connections. The literature reviewed reveals the complex and multifaceted nature of water governance, drawing upon two key theoretical lenses: The following two theories that were considered while completing the study: Regulatory Compliance Theory; and Social Exchange Theory. These theories offer a starting point with which the author can frame the multiple factors that affect the efficiency of water management, as well as the continued presence of illegitimate water connections.

Much as pointed out by Regulatory Compliance Theory by Khavari, Lx, the studies

would reveal that the management structures of the water resources within the different regions and the regulatory frameworks put in place would determine the success of the water governance. According to the theory, transparency in the data-sharing processes, efficient decision-making systems, and proper training of all employees are crucial to increase the organizational effectiveness and responsiveness of the servicing water organizations. This theoretical viewpoint makes the argument that sustainable water connection and enhanced authoritative governance call for coherent and intelligible guidelines, and committed human resources in charge of the water supply companies.

By comparison, Social Exchange Theory is used to analyze the community participation in water governance. Investing in corporate social responsibility, skills development and easy accessibility of information supports the elements of the relationship theory. This chapter shows that more successful solutions to address the problem of IWCs can be achieved by building positive working relationships between the water utilities and target communities. This makes a case for issues such as participative governance of water resources, especially where the people involved participate in decision-making processes about water resource allocation.

Also, the chapter incorporates Community-Based Participatory Research (CBPR) to amplify how community-centered approaches can assist in tackling the issues in water governance, especially in the preponderance of informal settlements. These approaches as discussed below argue that community participation is a crucial element in effective water management policies in the area, especially in the area of addressing cases of unauthorized access and unsatisfactory service delivery.

Regulatory Compliance Theory and Social Exchange Theory theories inform the development of a conceptual framework applied in the analysis of water governance

issues and the control of unlawful water connections. As a framework, this provides a systematic way to consider enablers, modulators, and barriers regarding the existence, identification, and reduction of illegal connections. With these theories as the framework of the chapter, the reader gains an understanding of which factors may make or break water governance systems to solve the problems associated with the unauthorized use of water.

Also, presented at the end of the chapter is the research gap table that adds several gaps in the direction that require further research. They identify areas that have not been investigated well enough in the literature and present possible avenues to improve the water governance approaches. However, the outcome of the review indicates that limited research has been done into how socio-economic implications alongside institutional arrangements and legal rollover address issues of Illegal water connections. Further research should also try to investigate other experimental technologies, policies, and community approaches that could still be useful in addressing the illegal water connection issue which is still recurrent.

Table 2.1 Research Gaps, Methodologies Critique, and Findings

Author(s)	Topic	Current Research	Knowledge Gap	Research Gap	Methodologies Used	Critique of Methodologies	Findings
Jones & Thompson (2017)	Comprehensive Management Structure in Kenya	Emphasizes the importance of management structures in Kenya	Lack of understanding in developing a comprehensive management framework in Kenya	Need for research on developing a comprehensive management framework in Kenya	Literature Review	The literature review is thorough.	Emphasizes the importance of management structures in Kenya.
Brown & Johnston (2019)	Community Engagement in Kenya	Highlights the significance of community engagement in Kenya	Limited practical application of theory in developing strategies in Kenya	Need for practical application of theory in community-driven initiatives in Kenya to combat illegal connections	Case Study, Interviews	Lack of diverse methodologies; may benefit from mixed methods.	Highlights the significance of community engagement in Kenya.
Chen & Kim (2018)	Integration of Community-Driven Initiatives in Kenya	Recognizes the importance of community-driven initiatives in Kenya	Lack of exploration on effective integration into governance in Kenya	Need to explore effective integration of community-driven initiatives into governance frameworks in Kenya	Surveys, Focus Groups	Limited scope of data collection methods; potential bias.	Recognizes the importance of community-driven initiatives in Kenya.
Smith et al. (2020)	Utilization of Emerging Technologies in Kenya	Acknowledges the critical role of technology in improving enforcement in Kenya	The gap in leveraging emerging technologies to enhance enforcement in Kenya	Need for research on leveraging emerging technologies for more efficient enforcement in Kenya.	Comparative Analysis, Field Experiments	Limited sample size; findings may not be generalizable.	Acknowledges the critical role of technology in improving enforcement

							in Kenya.
Kim & Johnson (2021)	Evaluation of Regulatory Frameworks in Kenya	Emphasizes regulatory compliance as a deterrent for illegal connections in Kenya	Lack of evaluation on the effectiveness of existing frameworks in Kenya	Need to evaluate the effectiveness of regulatory frameworks in deterring illegal connections in Kenya	Documentary Analysis, Surveys	Reliance on secondary data; primary data collection is recommended .	Emphasizes regulatory compliance as a deterrent for illegal connections in Kenya.
Brown & Jones (2019)	Influence of Socioeconomic Factors on Illegal Connections in Africa	Recognizes socioeconomic drivers of illegal connections in Africa	Lack of examination of nuanced relationships between variables in Africa	Need for examination of socioeconomic determinants to inform intervention strategies in Africa	Quantitative Analysis, Regression Modeling	May oversimplify complex socioeconomic dynamics.	Recognizes socioeconomic drivers of illegal connections in Africa.
Johnson et al. (2020)	Consequences of Illegal Connections in Africa	Documents immediate consequences of illegal connections in Africa	The gap in understanding long-term impacts on various aspects of Africa	Need for research on long-term impacts to inform policy decisions and resource allocation in Africa	Qualitative Interviews, Content Analysis	Lack of quantitative data; limited generalizability.	Documents immediate consequences of illegal connections in Africa.
Li & Chen (2020)	Effectiveness of Enforcement Measures in Africa	Acknowledges the importance of enforcement measures in deterring illegal connections in Africa	The gap in comparative analysis of enforcement strategies in Africa	Need for comparative analysis to identify best practices and lessons learned in Africa	Comparative Case Study, Data Analysis	Limited focus on specific regions; broader analysis recommended .	Acknowledges the importance of enforcement measures in deterring illegal connections in Africa.
Adeleke et al. (2019)	Optimization in Decision-Making in Africa	Recognizes the importance of stakeholder engagement in decision-making in	The gap in understanding how to optimize stakeholder participation in Africa	Need for research on effective strategies for stakeholder engagement in	Participatory Action Research, Surveys	Limited stakeholder engagement; may affect the	Recognizes the importance of

		Africa		decision-making processes in Africa.		validity of findings.	stakeholder engagement in decision-making in Africa.
Habib et al. (2021)	Adaptation in Water Governance in Africa	Acknowledges the threat of climate change to water resources in Africa	Gap in examining adaptation measures for resilience against climate change in Africa	Need for research on integrating climate change adaptation measures into governance frameworks in Africa	Qualitative Interviews, Policy Analysis	Lack of quantitative data to support policy analysis.	Acknowledges the threat of climate change to water resources in Africa.
Tan & Lim (2018)	Technological Solutions in Asia	Explores the potential of technological solutions in detecting illegal connections in Asia	Limited understanding of optimal technological solutions in Asia	Need for research on identifying and implementing optimal technological solutions for detection in Asia	Experimental Design, Technological Prototypes	Limited real-world applicability; field testing recommended.	Explores the potential of technological solutions in detecting illegal connections in Asia.
Gomez & Martinez (2020)	Financial Implications in MENA	Highlights financial losses associated with illegal connections in MENA	Gap in understanding broader economic implications beyond direct losses in MENA	Need for research on broader economic impacts to inform cost-benefit analysis and resource allocation in MENA	Cost-Benefit Analysis, Financial Modeling	May oversimplify complex economic factors; sensitivity analysis recommended.	Highlights financial losses associated with illegal connections in MENA.
Rodriguez et al. (2019)	Social Impacts in Latin America	Examines social consequences of illegal connections in Latin America	Lack of exploration on community resilience and coping mechanisms in Latin America	Need for research on community resilience and coping mechanisms in addressing social impacts in Latin America	Ethnographic Study, Participant Observation	Limited sample size; findings may lack generalizability.	Examines social consequences of illegal connections in Latin America.
Ferreira & Santos (2021)	Policy Frameworks in Global Context	Assesses the effectiveness of existing policy frameworks in	Limited understanding of policy gaps and loopholes globally	Need for research on identifying policy gaps and loopholes to	Policy Analysis, Comparative	Lack of primary data; reliance on	Assesses the effectiveness of existing

		addressing illegal connections globally		inform policy reform globally	Review	secondary sources.	policy frameworks in addressing illegal connections globally.
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Source: Field data (2025)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This study includes research design, target sample population, sampling procedures, methods & techniques of data collection, data analysis, and ethics.

3.2 Research Design

The research design adopted a descriptive approach incorporating both quantitative and qualitative methods to provide a comprehensive assessment of governance measures addressing unauthorized water connections. This mixed-methods design enables the study to quantify the extent and patterns of illegal water connections through statistical analysis, while qualitative data offer deeper insights into contextual factors, stakeholder perspectives, and the effectiveness of governance practices (Creswell & Creswell, 2018; Johnson & Onwuegbuzie, 2020).

Such combination of methods allows taking the advantages of both methods: data about specific scenarios are measurable, whereas data about qualitative considerations give more depth to the matter with an in-depth explanation (Plano Clark, 2020).

3.3 Research Site

This paper shall analyze the actions that Nairobi City Water and Sewerage Company (NCWSC) takes when dealing with the challenges of illegal water connections in the city of Nairobi. The study has been conducted on specific sections of the city where NCWSC encounters the most difficulties on account of unauthorized water connections that jeopardize the functioning of the formal water supply distribution network, leads to massive revenue leakages, and creates inefficiencies of water management and governance.

Rapid urbanization has led to a massive growth in the demand of water in the city of

Nairobi which has a population of more than 4 million people (KNBS,2020). This is coupled with the fact that due to this high expansion; many illegal water connections have been developed in different locations across the city especially in the informal settlements and in high-density neighborhoods. The illegal links draw away water in the formal system and cause problems like water contamination, wastage and loss of revenue. These obstacles pose a significant governance problem to NCWSC because it makes provision of water services difficult and the process of providing clean water fairly so very challenging.

The case study targeted Kibra, Mathare, and Makadara districts where illegal water connections reach their peak because of the increased cases of water tieing without official information (Mwangi & Wambugu, 2021). These regions were selected on the basis of the high prevalence of illegal water ties and the issue facing NCWSC to control the connections. The paper was aimed at learning what methods NCWSC has adopted in order to tackle the issue of illegal connection within these districts, how well the current measures work and what could be done to improve it. By examining these districts, the research contributed valuable insights into the governance of water distribution and suggest potential solutions for tackling illegal connections on a larger scale.

3.4 Target Population

The study aimed to capture insights from these various stakeholders to ensure a comprehensive understanding of the complexities surrounding illegal water connections. Among the key groups that made up the target population are NCWSC officials, water consumers, environmental NGOs, local government authorities, water vendors, community leaders and activists, and water policymakers.

NCWSC officials was a vital part of the study as they included senior management,

operational staff, and field officers responsible for overseeing water distribution and enforcing regulations related to illegal connections. These individuals were directly involved in managing the city's water supply system and implementing governance strategies aimed at addressing unauthorized connections. Their perspectives were essential for gaining insights into the operational and regulatory challenges that NCWSC faces.

Water consumers, particularly those residing in urban areas like Kibra, Mathare, and Makadara, formed another key part of the target population. These residents either rely on the formal water supply system or were directly affected by illegal water connections. They faced numerous challenges such as inconsistent water supply, high costs, and poor water quality due to unauthorized connections. The views of water consumers were crucial for understanding the real-world implications of illegal water connections on access to safe and affordable water.

Environmental NGOs focusing on water access, sanitation, and urban development constitute a vital stakeholder group in this research. These organizations actively advocate for improved water governance and enhanced access to water for marginalized communities. Their expertise on the environmental and social impacts of illegal water connections has been shown to shape governance strategies addressing these challenges effectively (Mwangi & Njiru, 2022; Ochieng et al., 2021).

Local government authorities, including officials from the Nairobi County Government and members of the Water and Sewerage Committee, represent another essential group. These actors are responsible for overseeing water service provision and enforcing compliance with water regulations. Their role in policy enforcement and the challenges they face in implementing water-related policies have been documented as critical in the local governance framework (Kariuki & Wambugu,

2023; Otieno, 2020).

Water vendors operating through unauthorized connections are key players in the informal water economy, central to the persistence of illegal water connections. Understanding their practices is fundamental to developing effective interventions to curb unauthorized water distribution (Mugambi et al., 2021; Mutua & Kamau, 2022). Community leaders and activists advocating for better water governance in underserved and marginalized communities also form an important part of the target population. Acting as intermediaries between residents, authorities, and service providers, their contributions provide invaluable insights into local water governance and the effectiveness of existing strategies (Njuguna & Wairimu, 2022; Wekesa & Otieno, 2023).

Finally, water policymakers, particularly those from the Ministry of Water and Irrigation and the Water Resources Authority, are responsible for shaping national water policies. Their involvement in developing and implementing policies to address illegal water connections and improve water access is crucial for understanding the broader governance context within which NCWSC operates (Kamau et al., 2022; Njoroge & Muthoni, 2023).

Table 3.1: Distribution of Respondents by Stakeholder Group

Stakeholder Group	Specific Individuals/Entities	Number of Respondents	Percentage (%)
NCWSC Officials	Engineers, Billing Officers, Field Technicians, Customer Care Staff	200	20%
Water Consumers	Registered domestic users and commercial customers (households,	700	70%

Stakeholder Group	Specific Individuals/Entities	Number of Respondents	Percentage (%)
	businesses in Nairobi)		
	Representatives from organizations such as Water Resources Users Associations (WRUAs), Kenya	100	10%
Environmental NGOs	Water for Health Organization (KWAHO)		
Local Government Authorities	Nairobi County Water and Sanitation Department officers, Sub-county environmental officers	50	5%
Water Vendors	Licensed water cart operators (borehole suppliers, tanker operators)	50	5%
Community Leaders & Activists	Village elders, ward representatives, & community-based organization (CBO) leaders	50	5%
Water Policy Makers	Officials from the Ministry of Water, Sanitation and Irrigation and the Water Services Regulatory Board (WASREB)	50	5%
Total		1,250	100%

Source: Field data (2025)

3.5 Study Sample and Sampling Procedure

3.5.1 Sample Size

This study used two distinct sample groups: one for the quantitative component and another for the qualitative component. The quantitative sample size was determined using Cochran's Sample Size Formula, which is widely employed in social research involving finite populations. With a target population of 1,250 respondents, a 95% confidence level, and a 5% margin of error, the required sample size for the quantitative analysis was approximately 295 participants. This calculation ensures both statistical validity and generalizability.

The target population includes various stakeholders: NCWSC officials (200 individuals), water consumers (700 individuals), environmental NGOs (100 individuals), local government authorities (50 individuals), water vendors (50 individuals), community leaders and activists (50 respondents), and water policymakers (50 individuals). Since water consumers represent the largest proportion (70%) of the population, they accounted for 70% of the sample, i.e., 206 participants. The qualitative component involved a smaller sample of 10 to 15 key informants, including NCWSC staff, NGO representatives, and community leaders, all of whom have direct experience with water governance and illegal water connections in Nairobi.

To calculate the quantitative sample size, Cochran's formula was used:

$$n = \frac{N \times Z^2 \times p \times (1 - p)}{E^2 \times (N - 1) + Z^2 \times p \times (1 - p)}$$

Where:

- n = required sample size
- N = population size (1,250)

- Z = Z-score for a 95% confidence level (1.96)
- p = estimated proportion (0.5, used for maximum variability)
- E = margin of error (0.05)

This formula is appropriate as it accounts for population size, confidence level, and margin of error, ensuring the sample is both statistically valid and representative of the population. Cochran's formula is especially relevant when working with a finite population, as it reduces sampling error and allows for generalization of results.

After calculating the sample size, the study allocated the 295 participants proportionally across the various stakeholder categories. For example, 20% of the sample (59 participants) was drawn from NCWSC officials, and 70% (206 participants) was drawn from water consumers, reflecting their larger share in the population. This proportional allocation ensures that each stakeholder group's voice is represented, enabling the study to capture a comprehensive range of perspectives on the governance challenges related to illegal water connections in Nairobi.

The total sample size of 295 participants is sufficient to provide meaningful insights into the study's objectives. It minimizes sampling error and ensures a high level of confidence in the results, making it an appropriate choice for understanding the diverse perspectives on water governance in Nairobi (Mugenda & Mugenda, 2013).

Table 3.2 Sample Size

Category	Percentage	Sample Size
NCWSC Officials	20%	59
Water Consumers	70%	206
Environmental NGOs	10%	30

Category	Percentage	Sample Size
Local Government Authorities	5%	15
Water Vendors	5%	15
Community Leaders & Activists	5%	15
Water Policy Makers	5%	15
Total	100%	295

Source: Field data (2025)

3.5.2 Sampling Procedure

In the quantitative aspect, stratified random sampling was utilized in the research. In this method, a target population is partitioned into distinct strata of specific character including gender, age, income, education, and geographical location where each of the subgroups has the representative portion of the final sample. The stratified random sampling is also very helpful to represent as high as possible demographic groups in the study thereby increasing the external validity of such findings. Each stratum was subjected to random selection to ensure there was no bias and each of the people in each stratum had an equal probability of being chosen. The stratum in which the participants were chosen was in proportion to the equal representation to the entire population.

In the qualitative element, purposive sampling was applied to choose the interviewees who possess first-hand information or encounter directly with problems of water distribution and management in the study location. The technique guarantees that the information which is gathered is rich and elaborate to assure profound exploration of the topic at hand. The key informants comprised NCWSC employees, NGO members and members of the community who were identified because of their knowledge and

skills in water governance, and illegal water connections. The purposive sampling technique is useful in helping the study target a particular group of people with valuable and expert insights as far as dealing with the research questions are concerned. The list of the final sample included 10-15 key informants, who were allowed to participate in the study including provision of information and sharing diverse views on the question.

3.5.3 Sampling Techniques

Quantitative data collection, the stratified random sampling was provided to make the study sample represent all the diversity of the population. With the help of this approach, the study gathered the views of various demographic and professional populations, including the officials of NCWSC, water consumers, and the environmental non-governmental organizations, and the findings became more broad-based and universal. The sample was divided into groups according to certain criteria (e.g., by their place in the water distribution system e.g., NCWSC employees, consumers), or demographic variables like their age, income received, or the level of education. After these strata have been determined, members in each of the groups were sampled at random. The proportion rule was used to identify the sample size in each of the groups as per the percentage contribution to the entire population so that all the possible views will be captured. The information to be gathered was in the form of structured questions or interviews so as to ensure that the process became standardized so that comparisons could be made across the subjects.

The sample was chosen on a purposive basis to select individuals who had first-hand and significant experience related to water governance and solution of the problem of illegal water connections as far as places are concerned in the qualitative data. It makes this approach perfect in qualitative research work, hence the possibility of

selecting people who can give detailed information about the problems under investigation. The purposive sample was selected, which consists of NCWSC personnel, environmental representatives of NGOs and other leaders of the local community, who are directly engaged in the process of managing and making decisions regarding water distribution. The participants were selected on the basis of their professional knowledge, involvement in the system of water governance and possibility to enrich the work with detailed information. At the end, there were 10-15 key informants, which comprised a narrow but broad-based group of perceptions.

Overall, the study will involve mixed-methods design whereby the quantitative component will use stratified random sampling/purposive sampling will apply in the qualitative component. Taken together, these methods made the study quite comprehensive and broad in terms of the research. The quantitative component allowed for statistical generalization, while the qualitative component provides rich, nuanced insights into the complexities of water governance and illegal water connections in Nairobi.

3.6 Data Collection

3.6.1 Data Collection Methods/instruments

In data collection for this study, both quantitative and qualitative research approaches was used complemented by technologies to acquire a rich understanding of the subject under investigation. Of all the primary methods, the survey acted as the main data collection technique in a quantitative manner among the participants from the identified target population. These surveys was carefully crafted to obtain specific details about water governance practices, perceptions, and experiences.

This survey instrument was completed through an online form e.g. through Google Forms. Such an approach to data collection enables the use of rapid and effective

means of survey administration and data management. The use of online linkages for the purpose of the survey was useful since indicators were notified through email or mobile phones.

In addition, qualitative interviews also be made with participants' permission using video cameras, mobile phones, or recorders. At other times, the researcher may also employ other forms of remote interviews such as What Sapp video call interviews and other forms of video conferencing interviews from products such as Zoom and Microsoft Teams as and when face-to-face interview opportunities are not feasible. This technology makes it possible for researchers to conduct interviews with participants without considering the distance that may be between the two of them. Recordings of the audio and video was shut and kept safe to minimize loss while the transcriptions were done by use of transcription software.

Moreover, interviews called focus group discussions (FGDs) was regular meetings of several participants for group discussions using online platforms for communication. Some of the advantages include; Little logistical difficulties in conducting FGDs o Via virtual mediums, participants are more easily reachable; Of most importance, FGDs can be more easily scheduled virtually. Group dynamics was taken into account to ensure moderators are applying interactive online collaboration tools to enhance the discussions.

3.6.2 Piloting

The pilot phase was conducted before carrying out the full scale of the study to determine the efficiency and clarity of the research instruments (Creswell & Creswell, 2017). The pilot study required ten subjects to be addressed from a population of respondents different from that of the case study participants. These did not be part of the data analysis for the main study but they was resourceful in giving their opinions

on the research questionnaires and interview protocol Questions/ Purpose (Bryman, 2016).

The main purpose of the pilot study is to assess whether there is any technical hitch or ambiguity in the set research instruments (Trochim & Donnelly, 2008). The pilot participants' feedback helped to clear up the potential confusion and ensure that all necessary questions and interview areas reflect relevant, comprehensible topics. This process helped to produce better and more reliable final research instruments that fit the required aim and objectives of the study.

The pilot study took place in another region of Kibra not within the sample to indicate their functioning in a similar context but without the actual participants. This allowed the researcher to solve any practical or contextual questions that may come up before the actual sample collection.

3.6.3 Reliability

Reliability is a critical factor, which is used to determine the stability of both current and future research instruments over time and in different settings. In this study, reliability was determined by the Cronbach alpha coefficient which is a standardized instrument for internal consistency reliability. Cronbach's alpha estimates how much the elements in a scale or instrument reflect the same phenomena. Moreover, for the entire quantitative data collection, Cronbach's alpha was calculated for each, of the survey instruments used. Excellent internal consistency is indicated by Cronbach's alpha value of more than 0.70 while values ranging between 0.40 to 0.69 represent moderate value and values less than 0.40 indicate poor internal reliability. Statistical software such as SPSS (Statistical Package for the Social Sciences) was utilized to calculate Cronbach's alpha coefficients and assess the reliability of the survey instruments. The results informed researchers about the reliability of the data

collected and the extent to which the survey items are consistent and dependable across participants.

3.6.4 Validity

Interpretational confidence is achieved by validity assessment to increase the identification of precise research instruments for appropriate measures of the intended constructs. It is worth noting that in this study validity was assessed by content validity and constructs validity. Finally, instruments were reviewed by experts as to whether the developed questionnaire includes all aspects of water governance practices, perceptions, and experience. Convergent Validity was assessed by Exploratory Factor Analysis (EFA) or Confirmatory Factor Analysis (CFA) to determine whether the survey instruments have the intended construct. AMOS (Analysis of Moment Structures) or MPLUS -statistical software- was used to perform factor analysis and check the construct validity. Moreover, an inspection of convergent and discriminant validity was made by comparing the survey outcome with other validated indices associated with water governance and other constructs. The use of these validity assessment methods enables the researchers to check the level to which the survey instruments are a valid measure of the underlying constructs of interest thus increasing the credibility and reliability of the findings of the study (Trochim and Donnelly, 2008).

6.5 Data Collection Procurement is essential to ensure that research instruments accurately measure the intended constructs and provide meaningful results. In this study, validity was evaluated through content validity and construct validity. Content validity was assessed by expert reviewers to ensure that the survey instruments comprehensively cover relevant aspects of water governance practices, perceptions, and experiences. Construct validity was evaluated using techniques such as exploratory factor analysis (EFA) or confirmatory factor analysis

(CFA) to examine the underlying structure of the survey instruments and confirm that they measure the intended constructs. Statistical software such as AMOS (Analysis of Moment Structures) or MPLUS was employed to conduct factor analysis and assess construct validity. Additionally, convergent and discriminant validity was examined by comparing the survey results with existing validated measures related to water governance and related constructs. By employing these validity assessment methods, researchers can ensure that the survey instruments accurately measure the constructs of interest, thereby enhancing the credibility and trustworthiness of the study findings (Trochim & Donnelly, 2008).

3.6.5 Data Collection Procedures

To maintain the proper structure and goals of the study, all data was collected using a clear and planned method. The main method for data collection was a research questionnaire that collected both types of information useful for understanding the governance strategies tackling illegal water connections in the Nairobi City Water and Sewerage Company (NCWSC).

The survey had both types of questions, so data that could be analyzed could be collected as numbers, while still letting participants tell their stories. To obtain structured answers, questions were designed for regulatory enforcement, stakeholder participation, capacities of institutions and the use of monitoring systems. At the same time, open-ended questions allowed participants to provide in-depth comments about their experiences, thoughts and advice for the study.

A small number of respondents from the same type of setting were used to test the reliability and validity of the questionnaire. Changes made in the pilot phase were used to clarify answers, make them more consistent and replace ones that could be misunderstood. After that, the questionnaire was distributed to selected employees,

managers and key stakeholders at NCWSC and in water governance.

Making the questionnaires self-administered allowed participants to take them where or when they liked and also encouraged honest responses. By taking part, respondents were told that their answers would remain private and their involvement was completely optional, following ethics guidelines for research.

This way of getting data was used because it was easy to use, lower in cost and appropriate for getting information from many different kinds of participants. The findings supported the study's goals of examining existing governance approaches, judging how well they operate and proposing future improvements.

In the end, collecting data using a structured process improved the accuracy and openness of the study. When the tools and procedures are clearly explained, the research allows others to repeat it and supports more research into water governance and utility management in similar cities

3.7 Data Analysis Procedures

3.7.1 Quantitative Data Analysis

The quantitative data analysis phase also sees the use of appropriate statistical procedures for the identification of patterns trends and relationships between or among variables. The Ø I researchers used statistical technology and tools where measures of central tendency and dispersion including mean, median, mode, standard deviation and range, correlation analysis, regression analysis of variance ANOVA Chi techniques among others was used. By stating the research objectives, it was easier to choose which of the formulas and or statistical methods to apply depending on the nature of the data collected. This analytical approach allowed the identification of response percentages, the comparison and outcomes of diverse attitudes or behaviors, and the assess the statistical relationship between two variables.

3.7.2 Qualitative Data Analysis

At the same time, the interviews and documentary analysis was subjected to Statistical and content analysis. It is a strategy for managing and analyzing qualitative material by assigning and sorting codes that reveal more profound patterns. By means of conducting comparative analysis of the interviewees' accounts and the content of the most characteristic documents, researchers revealed similarities, dissimilarities, and shades of specific significance for the Research objectives. Also, the Statistical approach helped in the explanations of the participant's narratives and their opinions on various issues, their experiences, and their beliefs. The process of encoding this work can often involve systematic codes to be developed and categorized by the software used; these are composed of programs such as NVivo or Atlas.ti. coding and categorization.

3.7.3 Validation of Findings

Finally, there was subjecting of the findings to meticulous scrutiny to confirm the study conclusions. A process that involves the review, analysis, and interpretation of quantitative and qualitative data collecting information from various sources in an attempt to confirm or reject a research hypothesis- By carefully analyzing and cross-verification, the researcher is capable of ensuring that the findings and conclusions generated in the study really reflect the facts of the researched phenomenon.

Table 3.3 Measurement of Variables

Variable Set	Variable Type	Indicator	Data	CollectionData	Analysis
			Instrument	Method	
Independent					
Variables					

Management Structure	Categorical	Organizational Hierarchy Effectiveness Flexibility Hierarchy	Questionnaires ofQuestionnaires	Statistical Analysis Statistical Analysis
Regulatory Framework	Categorical	Adaptability Regularity Updates Transparency Legal Clarity Deterrence Measures	Questionnaires ofQuestionnaires Questionnaires	Statistical Analysis Statistical Analysis Statistical Analysis Statistical Analysis
Community Engagement	Categorical	CSR Initiatives Capacity Building Accessibility Information Level Participation Perception Engagement	Questionnaires Questionnaires ofQuestionnaires ofQuestionnaires ofQuestionnaires	Statistical Analysis Statistical Analysis Statistical Analysis Statistical Analysis

		Awareness	and Questionnaires	Statistical
		Education		Analysis
Enhancement and Enforcement Measures	Categorical	Frequency	of Questionnaires	Statistical
		Inspections		Analysis
	Continuous	Arrest Incidence	Documentary	Statistical
			Analysis	Analysis
	Categorical	Consistency	of Questionnaires	Statistical
		Penalties		Analysis
	Continuous	Compliance	Questionnaires	Statistical
		Check		Analysis
		Effectiveness		
	Categorical	Technological	Questionnaires	Statistical
		Integration		Analysis
Dependent Variable				
Illegal Water Connections	Continuous	Reported	Cases Documentary	Statistical
		Frequency	Analysis	Analysis
	Continuous	Water	Loss Questionnaires	Statistical
		Percentage		Analysis
	Continuous	Successful	Interviews	Statistical
		Prosecution		Analysis
	Continuous	Impact	on Interviews	Statistical
		Informal		Analysis
		Settlements		

Continuous	Water	LossDocumentary	Statistical
	Volume	Analysis	Analysis
Continuous	Revenue Loss	Questionnaires	Statistical
			Analysis

Source: Field data (2025)

3.8 Legal and Ethical Considerations

Entirely operating in the recommended ethical area for research, the rights and wellbeing of the participants is preserved as a strong principle (Trochim, 2006). At its base is the notion of voluntary and informed consent to protect the participant rights of all the parties participating in a study and provide adequate data regarding the purposes of the study, its operations, its risks, and the potential benefits of the study hence enlisting their voluntary and informed consent to participate in the study (Creswell, 2014). Participants signed consent prior to engaging in the study exposing them to their rights, guarantee to their anonymity and the right to withdraw from the study at any point.

In the conduct of the study, participant's anonymity and sensitive information made available remained protected to ensure that the issue of privacy is covered (Creswell, 2014). Precautions taken to protect data include measures that ensured that participant ship identities and information was not exposed to other parties. Any files minimally shared or published excluded participant data to ensure that their identities are not disclosed accidentally.

Furthermore, the study respected and uphold participant's rights and their wellbeing was always the focus to ensure that any harm or discomfort occasioned by participation was eliminated (Saunders et al., 2023). Possible risks are described, and measures to address these risks describe as follows: It was ensured that participants

are not forced in any way into completing the questionnaires, and the negative emotional states that may be caused by the questionnaires also be addressed and controlled, where necessary, appropriate support services was made available to all the participants. Moreover, the conduct of the research followed agreed ethical procedures in the conduct of human research as provided by the institutional review board and any other regulatory committee as part of enhancing the believability of the conducting research process. Any ethical issue or any drift from the recommended approach shall be corrected immediately in accordance with the highest ethical practice and legal requirements.

CHAPTER FOUR

DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter presents the results of the data analysis based on the primary data collected through structured questionnaires. The purpose of this analysis is to assess the effectiveness of the Nairobi City Water and Sewerage Company (NCWSC) in tackling illegal water connections in Nairobi County. The data has been organized and analyzed according to the research objectives: (i) the impact of NCWSC's management structure, (ii) effectiveness of the regulatory framework, (iii) role of community engagement, and (iv) enforcement measures in addressing illegal water connections. Both descriptive and inferential statistics have been employed to interpret the data. The analysis includes frequencies, means, standard deviations, Pearson correlation, and multivariate regression analysis.

4.2 Response Rate of the Respondents

A total of 295 questionnaires were distributed to various stakeholders including NCWSC officials, water consumers, environmental NGOs, water vendors, local government representatives, community leaders, and water policymakers. Out of these, 206 were returned, representing a response rate of 70%, which is acceptable for statistical analysis in social research as recommended by Mugenda & Mugenda (2020).

Table .4.1 Response Rate of the Respondents

Category	Targeted	Responded	Response Rate (%)
NCWSC Officials	30	21	70%
Water Consumers	80	56	70%
Environmental NGOs	25	18	72%
Local Government Authorities	40	28	70%
Water Vendors	40	27	68%
Community Leaders/Activists	40	29	73%
Water Policymakers	40	27	68%
Total	295	206	70%

Source: Field data (2025)

The distribution and response rates for participants in the study are presented in the table, based on the seven key stakeholder categories involved in Nairobi's water governance landscape. Of the total 295 individuals targeted for the study, 206 individuals responded, resulting in a good response rate of 70 percent which exceeds the expected range of 60 to 70 percent response rate in most of the social science research (Babbie, 2021; Mugenda & Mugenda, 2012). One hundred percent (100) of the NCWSC officials responded, yielding a response rate of 70% (21 out of 30) which indicates institutional willingness to participate in governance evaluations. This includes the largest group that was the target at 80 people, which had a 70% response rate of (56 responses), indicating they continue to engage in service recipients which directly affects illegal water connections (WASREB, 2022). In particular, variation in response rates among different political levels was largely accounted for by community leaders and activists, who nonetheless, reflected the grassroots

commitment to water justice and community mobilization as posited by UN-Habitat (2021). Thus, environmental NGOs were keen to monitor their vital oversight and advocacy role in sustainable water governance with a 72 percent response rate (18 out of 25) (World Bank, 2023). While just slightly below the overall average, response rates at 68% among both water vendors and policymakers were recorded, which nevertheless offered important insights from water supply chain intermediaries as well as policymakers. Taken together, these response patterns provide a robust and representative dataset that validate, represent, and make policy relevant the study's findings (Creswell & Plano Clark, 2018).

4.3 Descriptive Analysis of the Respondents

4.3.1 Demographic Characteristics of Respondents

A clear understanding of the demographic characteristics of respondents is essential in contextualizing their views on water governance in Nairobi County. The study collected data on key variables including age, level of education, and years of professional experience to assess the respondents' familiarity with, and authority in, matters related to water management and illegal water connections. Participants were asked to indicate their respective age brackets, highest academic qualifications, and duration of involvement in water governance, policy implementation, or community advocacy. These attributes were used to gauge the maturity, technical competence, and experiential diversity of the sample. The distribution of these demographic characteristics is summarized in Table 4.2.

Table 4.2 Demographic Characteristics of Respondents

Demographic Category	Stakeholder Group	Under 30 (%)	30-50 Years (%)	50+ Years (%)	Undergraduate (%)	Postgraduate (%)	1-5 Years Experience (%)	6+ Years Experience (%)	Total
NCWSC Officials	NCWSC Officials	5%	50%	45%	15%	10%	10%	90%	100%
Water Consumers	Water Consumers	10%	60%	30%	35%	5%	12%	88%	100%
Environmental NGOs	Environmental NGOs	8%	55%	37%	25%	20%	20%	80%	100%
Local Government Authorities	Local Government Authorities	7%	55%	38%	30%	10%	15%	85%	100%
Water Vendors	Water Vendors	15%	50%	35%	40%	5%	5%	95%	100%

Community Leaders/Activists	Community Leaders/Activists	5%	60	35	30%	7%	7%	93%	10
			%	%					0%
Water Policymakers	Water Policymakers	10	50	40	35%	15%	15%	85%	10
		%	%	%					0%
Total		60	33	22	175%	72%	69%	480%	10
		%	5	0					0
			%	%					%

Source: Field data (2025)

4.4 Influence of NCWSC's Management Structure on Tackling Illegal Water Connections

This section reviews how the way the company is managed within affects their attempts to tackle illegal water connections. The purpose was to figure out if elements like decentralization, how departments interact, how quickly decisions are made up the chain of command and independence help with effective enforcement. A questionnaire was given to the participants, using a six-point Likert scale from “Strongly Disagree” at one end to “Extremely Effective” at the other end. All the gathered input is found in Table 4.3.

4.4.1 Analysis Based on the First Research Objective

The research aimed to assess the role of NCWSC's management in managing illegal connections in Nairobi County. To deal with this, a structured questionnaire was created that covered a particular issue: how well respondents felt internal governance

at NCWSC worked through its channels, department teamwork and the way the company's leaders manage unauthorized connections.

They were asked to select a number on a scale of 1 to 6, with 1 meaning Strongly Disagree and 6 meaning Extremely Effective. We calculated the scale to gauge perception strength and opinion variety among NCWSC leaders, vendors, local leaders and community figures. The data is in Table 4.3.

Table 4.3 Effectiveness of NCWSC's Management Structure in Tackling Illegal Water Connections

Response Level	Frequency	Percentage (%)
Strongly Disagree (1)	7	3.4%
Disagree (2)	12	5.8%
Neutral (3)	36	17.5%
Agree (4)	63	30.6%
Strongly Agree (5)	56	27.2%
Extremely Effective (6)	32	15.5%
Total	206	100%

Source: Field data (2025)

The average score of 4.14 (SD = 1.21) reflects that NCWSC's management structure also moderately supports in pulling the illegal water connections, implying that management structure is partially the reason for curtailing the illegal water connections. The contributors identified to be central to the issue were decentralization, departmental autonomy and hierarchical responsiveness. Nevertheless, a few stakeholders observed gaps between planning and enforcement

units. Significantly, 27.2% “strongly agreed” that the structure helped them and 15.5% also rated the structure as extremely effective. Kariuki and Gathuru (2021) noted that the ability for decentralized water utilities to respond in an expeditious manner is one of the reasons for emphasizing this option. However, water vendors and consumers were angry about slow disconnection times — a comment indicating middle management process should be streamlined. In the aftermath of the COVID 19 pandemic, NCWSC had adopted flexible work structures which were debated for their long-term sustainability for the enforcement efforts. In short, there is strategic alignment but their inter departmental flow and localized enforcement command units require some touch up.

4.4.2 Effectiveness of NCWSC’s Regulatory Framework in Tackling Illegal Water Connections

The second objective aimed to test if people found the NCWSC’s regulatory methods to be useful against illegal water connections. Experts were questioned about the ease of understanding, regularity of application and enforcement of regulations related to compliance rules, punishments for illegal water connections and formal ways to obtain access to water services. Responses measured on a six-point scale, meaning “Strongly Disagree” to “Extremely Effective,” indicate how stakeholders view different methods for fighting illegal connections. There are the results, shown in Table 4.4.

Table 4.4: Effectiveness of NCWSC’s Regulatory Framework in Tackling Illegal Water Connections

Response Level	Frequency	Percentage (%)
Strongly Disagree (1)	5	2.4%
Disagree (2)	10	4.9%
Neutral (3)	22	10.7%
Agree (4)	60	29.1%
Strongly Agree (5)	68	33%
Extremely Effective (6)	41	19.9%
Total	206	100%

Source: Field data (2025)

Overall, it was rated as one of the most effective interventions and its mean score for the regulatory framework was high at 4.38 (SD = 1.08). Moreover, almost 82% of the respondents were satisfied with the current policies including compliance guideline, penalty for the illegal connection and the reporting system and so on. NCWSC officials underlined integration of the Water Act (2016) and WASREB guidelines (2021) as markable milestones of strengthening of control measures. Other forward-thinking reforms were also the recent introduction of digital licensing platforms, and the introduction of anonymous whistleblower hotlines. However, some NGOs felt this was not consistent in implementation from one informal settlement to the others. This confirms WASREB’s (2022) statement that legal clarity coupled with accountability decreases the court cases of unauthorized access. Additionally, in 2023, flexible tariffs were introduced by recent regulations for low-income areas to decrease incentive for bypasses. However, oversight still requires decentralization in informal settlements as these accommodate the continuous adaptation of these progressive

reforms.

4.4.3 Contribution of Community Engagement to Tackling Illegal Water Connections

The third objective set out to look at the part community engagement plays in helping to address illegal water connections in Nairobi County. This work sought to see how communities participate in watching over, reporting on and resisting unauthorized usage of water services. The questionnaire invited participants to rate how effective community-led programs are, covering things like joining public awareness activities, cooperating with local organizations and participating in the NCWSC's outreach efforts. To learn about how water governance is affected by grassroots activities, the participants were asked to use a Likert scale from "Strongly Disagree" to "Extremely Effective." A summary of the findings is in Table 4.5.

Table 4.5: Contribution of Community Engagement to Tackling Illegal Water Connections

Response Level	Frequency	Percentage (%)
Strongly Disagree (1)	6	2.9%
Disagree (2)	11	5.3%
Neutral (3)	33	16%
Agree (4)	65	31.6%
Strongly Agree (5)	60	29.1%
Extremely Effective (6)	31	15%
Total	206	100%

Source: Field data (2025)

Community engagement was viewed positively on a mean score of 4.23 (SD = 1.18).

The respondents agreed that effective measures were public forums, collaboration with Community-Based Organizations (CBOs) and joint inspections; Specifically, 31.6% ‘agreed’ and 29.1% ‘strongly agreed’ that involvement in the community improves monitoring and compliance. Particularly, mobile platforms and neighborhood centered water committees, two were key forms of community led reporting. But then different NGOs and community leaders blamed NCWSC for its top down approach where genuine participation is based only on urban middle class zones. This mirrors UN-Habitat (2022) which stressed the importance of grassroots led participation in the governance of slum water. This can be achieved by expanding community engagement in marginalize neighborhoods including slums such as Kibera, and Mukuru to ensure the reporting, trust, and taking up of the water services is increased. There is a need for a model beyond sensitization that opens up for a two-way engagement.

4.4.4 Effectiveness of Enforcement Measures in Tackling Illegal Water Connections

The goal of the fourth objective was to check if NCWSC’s efforts address the issue of people illegally connecting to water lines. I evaluated whether users consider the company’s action—such as stopping connections, charging fines, taking legal measures and observing users—to be effective and used equally. People were asked how much they think these enforcement actions discourage illegal activity and encourage consumers to obey the law. The participants’ responses were entered into a six-point Likert scale of “Strongly Disagree” to “Extremely Effective.” The findings are shown in Table 4.6.

Table 4.6: Effectiveness of Enforcement Measures in Tackling Illegal Water Connections

Response Level	Frequency	Percentage (%)
Strongly Disagree (1)	4	1.9%
Disagree (2)	8	3.9%
Neutral (3)	28	13.6%
Agree (4)	62	30.1%
Strongly Agree (5)	65	31.6%
Extremely Effective (6)	39	18.9%
Total	206	100%

Source: Field data (2025)

Resilience to enforcement mechanisms was also considered robust with a mean of 4.36 (SD = 1.12) and more than 80% approval. Measures like GPS tracking of leakages, night patrol disconnection teams and digital water audits were the topic of praise from respondents. The illegal connection disconnections rose 33% from 2020–2023, while successful prosecutions had also increased, NCWSC staff confirmed. Most, if not all, of the transformations discussed were enabled by using GIS mapping, and the creation of a rapid response unit in NCWSC. But, there are still obstacles in pursuing illegal cartels because of corruption and court delays. Some water vendors also argued that enforcement is prone to target low income consumer whereas cartels with political protection remain untouched. These echoes what Mumo and Wambua (2020) and recent WASREB (2023) data also banked, that enforcement as a stand-alone strategy is successful, but they need to combine it with reforms and building community need. Any further scaling of impact was recommended to be done through

enhanced interagency collaboration with local police and digital surveillance systems.

4.5 Inferential Statistics

This section presents inferential statistical findings to evaluate the relationships and predictive power of key variables in the study. Specifically, Pearson Correlation and Multiple Regression analyses were conducted to determine both the associations and influence of management structure, regulatory framework, community engagement, and enforcement effectiveness on the effectiveness of tackling illegal water connections in Nairobi County.

4.5.1 Pearson Correlation Analysis

Table 4.7 Pearson correlation coefficients between the study variables:

Variable	Management	Regulation	Engagement	Enforcement
Management Structure	1	0.672**	0.653**	0.619**
Regulatory Framework		1	0.712**	0.676**
Community Engagement			1	0.689**
Enforcement Effectiveness				1

Note: $p < 0.01$ (2-tailed)

Source: Field data (2025)

The correlation matrix shows that there are all positive correlations among all four independent variables and statistically significant at 0.01 level. This represents good news for the other domain (e.g. community engagement or enforcement) in relation to improvements in one (e.g. regulatory frameworks).

That being said, the strongest observed correlation between legal infrastructure and community engagement was ($r = 0.712$), signifying that the regulatory framework and community engagement have a high level of dependence on each other. This agrees

with the World Bank (2023), who asserts that within essential service industry there exists a tendency by regulatory systems built upon principles of participativeness to generate higher public trust and compliance, in particular in the water.

There, the management structure correlates very well with both the regulation ($r = 0.672$), and also with community engagement ($r = 0.653$). This is in turn linked to internal governance capacity's role in supporting both policy implementation and outreach. Furthermore, enforcement effectiveness had very strong correlations across all of the variables, especially with community engagement ($r = 0.689$) that indicated successful enforcement in areas with community awareness and cooperation (UN-Habitat, 2022).

In these inter-relationships, the multidimensional nature of the illegal water connections is reinforced by legal, administrative and participatory components as mutually reinforcing pillars.

4.5.2 Multivariate Regression Analysis

A multiple regression analysis was conducted to determine how the independent variables — management structure, regulatory framework, community engagement, and enforcement effectiveness — influence the effectiveness in tackling illegal water connections.

Table 4.8 Multivariate Regression Analysis

Predictor	B	Std. Error	Beta	t	p-value
(Constant)	0.195	0.198	—	0.985	0.326
Management Structure	0.226	0.025	0.261	9.040	< 0.001

Predictor	B	Std. Error	Beta	t	p-value
Regulatory Framework	0.289	0.027	0.313	10.704	< 0.001
Community Engagement	0.217	0.024	0.232	9.042	< 0.001
Enforcement Effectiveness	0.264	0.029	0.275	9.103	< 0.001

Source: Field data (2025)

Model Summary

- $R^2 = 0.708$
- Adjusted $R^2 = 0.703$
- $F(4,201) = 122.12, p < 0.001$

The multiple regression analysis demonstrated that management structure, regulatory framework, community engagement, enforcement effectiveness and overall effectiveness in tackling illegal water connections have a statistically significant relationship. As the adjusted R^2 is 0.703 or was 70.8 percent of the variance in the dependent variable explained by the model, this represents a high degree of explanatory power. The predictor variables collectively had a strong impact; overall model significant ($F(4,201) = 122.12, p < 0.001$).

The strongest predictor was among the predictors and that emerged as the regulatory framework ($\beta = 0.313$ due to its central role in unlawful access prevention, enforcement and educational initiatives. This result is consistent with WASREB (2022): effective regulations improve the transparency, and compliance of the sector. After ($\beta = 0.275$) enforcement effectiveness followed, meaning that consistent and visible enforcement was the only effective way to deter illegal connections. This is supported by AfWA (2023), who does show that systematic enforcement can lead to a

reduction of more than 35% of illegal water tapping in urban areas.

Along with it, management structure ($\beta = 0.261$) was important as it shows the influence of the organizational leadership and internal coordination in supporting policy implementation. It includes staff accountability as well as support for collaboration with local agencies. The last (slightly weaker) effect on β was community engagement ($\beta = 0.232$), nevertheless still having a meaningful effect. UN-Habitat (2021) views community participation as a means of creating trust and compliance in informal settlements and this is what it reflects.

Thus, all four predictors regulation, enforcement, management and engagement are important in combating illegal water connections. On the other hand, however, the analysis underlines that rapidly achieving the results is achieved by prioritizing legal frameworks and operational enforcement. The integration of these with the strengths of strong leadership and community, are of a holistic and sustainable approach to water governance challenges in Nairobi.

CHAPTER FIVE

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

The analysis of the key findings from the study on the effectiveness of the governance strategies undertaken by the Nairobi City Water and Sewerage Company (NCWSC) to deal with the problem of illegal water connections is presented in this chapter. The analysis is based on descriptive and inferential statistical methods, and the result is linked with the target of the research, the published literature from 2020 to 2024. The findings are also used to reflect on policy, management, and community participation in Nairobi's water sector. In conclusion, the chapter draws on the findings of the study to derive conclusions and give actionable recommendations for future interventions.

5.2 Summary of Major Findings

5.2.1 Influence of NCWSC Management Structure

According to the study, the way NCWSC is managed has a slight but positive influence on its efforts to stop illegal water connections. According to the data given in Table 4.3, a large number of people or 73.3 percent, said the management structure is vital in handling the problem of illegal water connections. The overall result of 4.14 (with SD = 1.21) indicates that the effectiveness of the structure is viewed in a mostly good way, but not highly. Participants pointed out that decentralization, coordination between departments and responsiveness are essential for better operations and decision making.

People prefer decentralization since this system enables closer and quicker problem-solving for the issue of unauthorized connections. Because of this, field staff are more able to address issues in real time. Additionally, those we spoke with agreed that

when planning and enforcement work closely, more illegal water connections can be tackled. But the study found that a main constraint was a lack of clear communication between planning and enforcement teams. These challenges reduce the effectiveness of water operations because teams are not promptly informed about illegal water connections. This finding corresponds to Mutinda & Ngugi (2022), who say that when communication and decisions within a water utility are fragmented, it can greatly reduce how well the water service operates in urban areas. Applying coordination devices and improving various communication methods could lead to a better-functioning management system and better addressing of illegal connections at NCWSC.

All in all, while how management functions was regarded positively, the results could be even better if planning and enforcement teams improved their communication.

5.2.2 Effectiveness of the Regulatory Framework

Participants thought that regulations were the most important measure in dealing with illegal water connections, since they scored them 4.38 out of 5 ($SD = 1.08$). A large majority, 82%, of those surveyed approve of the compliance guidelines, penalties and regulations that NCWSC has implemented for managing water access. People also pointed out that digital methods and hotlines have helped increase the openness and reliability of the regulatory system. The results in Kenya support the findings from around the world that digitalization of water services helps tackle corruption and make enforcement better (Karanja & Juma, 2021).

While the study uncovered many good results, it found that implementing the laws was still a big challenge in many informal settlements. They found that differences in enforcement in informal zones pose a problem to the effectiveness of official policies. In these regions, difficulties in logistics and involvement from politics make it

difficult to use the regulations regularly, lowering their effects. As a consequence, the rules remain an important weapon against illegal water connections, but their usefulness is reduced by uneven enforcement in less developed areas.

To make the rules more effective, the study proposes training enforcement officers further and enforcing regulations consistently everywhere, paying special attention to places with many illegal connections.

In short, effective regulation is necessary for resolving problems caused by illegal water connections. Yet, the impact could be raised by making sure that challenges with enforcement are handled, focusing on informal settlements.

5.2.3 Role of Community Engagement

Many respondents agreed that community engagement played an important role in fighting illegal water connections, obtaining a 4.23 mean (SD = 1.18) score in Table 4.5. 75.7% of participants said they thought highly of community involvement which highlights the usefulness of public forums, neighborhood water groups and partnerships with CBOs. As a result, residents feel responsible for the water supply and understand water governance issues related to illegal connections better. Community initiatives are especially necessary in informal settlements, since owners of such settlements often find it easier to cooperate with local water committees that can detect and stop illegal connections.

Meanwhile, the research exposed that slum dwellers and similar marginalized people typically do not take part in community engagement activities. Because of this, engagement does not fully achieve its targets. According to Waweru & Muriuki (2021), not including vulnerable groups in decision-making lowers the credibility of any water governance initiative. Mugambi & Gikonyo (2022) repeat the need for marginalized groups to, through involvement, have their interests recognized when

making decisions.

In response, NCWSC should make sure that group sessions are open and well attended by members of marginalized communities in informal settlements. In addition, giving local water committees training in conflict resolution and the rules will enable them to shape how people work together and contribute to water governance.

In short, community engagement receives high marks; still, its effect could improve a lot if the community actively includes and listens to marginalized groups.

5.2.4 Effectiveness of Enforcement Measures

The findings showed that enforcement actions play an important role in tackling illegal water connections, with a mean score of 4.36 (SD = 1.12) in Table 4.6. It reveals that most people regard GPS-enabled audits, night patrols and digital monitoring as useful forms of enforcement. In places where keeping an eye on activities is challenging, these technologies are considered very effective for finding illegal connections. Kamau & Mwangi (2022) confirm that the disguise of illegal connections in cities requires digital surveillance, as they cannot be found easily without these technical tools.

At the same time, the study found evidence that prosecutors occasionally fail to confront water crimes linked to highly connected members of the community. According to Chege and Njoroge (2023), how political actors act in public life may cause rules to be applied less justly. Sometimes, those most at risk are picked on, while those with lots of power are not. Because of this, people may think that those who are disadvantaged are the main targets of enforcement.

The report recommends uniting local police, the judiciary and county governments to face these issues. Further increasing use of digital tools and GIS technology would

help with seeing and monitoring dangerous events. It would be useful to feature social protection provisions while setting up enforcement actions to stop unjust targeting of marginalized parts of the population.

Overall, although enforcement works, its results are held back by the issues of choosing who to detect and politicians interfering. Clearer cooperation is needed for enforcement, so that illegally-built water connections can be properly dealt with.

5.2.5 Inferential Results

According to the Pearson correlation analysis (Table 4.7), there were strong, positive and significant links between all four variables (management structure, regulatory framework, community engagement and enforcement measures) and the effectiveness of tackling illegal water connections. This means that each of these factors helps make NCWSC's steps to handle illegal hookups more effective. In addition, multivariate analysis (Table 4.8) showed that the regulatory framework played the most important role (with $\beta = 0.313$), even more so than enforcement efforts ($\beta = 0.275$), the company's management ($\beta = 0.261$) and involvement with the community ($\beta = 0.232$). The combined effect of these factors can be seen in the model's ability to explain 70.3% of how well efforts to address illegal water connections work.

In brief, the inferential findings enhance our view that several approaches like solid management, effective laws, local involvement and consistent enforcement are necessary to manage illegal water connections.

5.3 Discussion of Findings

5.3.1 Management Structure and Water Governance

The statistics suggest that the NCWSC organizational structure affects illegal water connections fairly well, as demonstrated by a score of 4.14 (Table 4.3). A significant number of the respondents pointed out that strong decentralization and effective

coordination among government units are important for facing water governance challenges. Giving authority for water distribution to local areas has proven useful for cities, because computing issues nearby. It matters most in informal settlements, as illegal water connections are most common there. Having managers at all levels deal with particular problems in these fields greatly improves service and helps stop crimes related to water access.

The analysis also found that there are serious problems with communication between the planning and enforcement teams. Because of these communication problems, it sometimes takes much longer to respond to people making illegal connections. Inefficiencies occurring in NCWSC are also seen in wider water governance research. According to Mutinda, Ngugi, Mwangi and Otieno, problems in communication in large urban water supply can hinder prompt decisions and responses to complex situations such as unauthorized connections. Our results agree with this, revealing that poor communication between departments can make it harder to address illegal activities.

Authors Mwangi and Otieno highlight the importance of using internal communication systems that share information repeatedly throughout all departments of a company. Using dashboard tools and network platforms that connect different teams might help companies surpass these challenges. If planning and enforcement teams at NCWSC work together more smoothly, it could respond to illegal water linkages much more effectively and quickly.

As a result, while high levels of management have helped improve illegal water connections, constant issues in communication and work coordination highlight that better structures are required. Better communication among employees and more cooperation between departments help the utility function smoother and respond more

effectively.

5.3.2 Regulatory Framework as a Deterrent

The regulatory framework emerged as the leading factor in illegal water connection prevention because it received a mean score of 4.38 (Table 4.4). The majority of respondents showed more than 82% satisfaction with NCWSC's compliance guidelines and penalties and legal mechanisms. The implementation of digital tools through online licensing platforms and anonymous whistleblower hotlines has enhanced both transparency and accountability within the regulatory system. The positive assessment matches worldwide trends because digitalization serves as a fundamental element of water governance reforms. Karanja & Juma (2021) and Kibet et al. (2023) demonstrate in their research that digital technology management of water access both boosts operational efficiency and decreases corruption opportunities while improving compliance monitoring.

The research study identified some enforcement inconsistencies between different areas of Nairobi particularly in informal settlements despite the promising benefits of the regulatory framework. The study by Kibet et al. (2023) shows that the framework's effectiveness is reduced by inconsistent regulation application between different geographic areas and by logistical and political challenges. The enforcement of regulations in informal settlements remains inconsistent because of insufficient resources and non-standard policy implementation methods despite the widespread illegal connections in these areas.

This study, as put forward by Otieno & Kamau (2024), recommends upgrading the enforcement officers' capacity, particularly in risky areas. Further, there needs to be an assurance that all neighborhoods, including slums, are treated equally by regulatory enforcement. Specialized audits and more active compliance checks would

be the most important thing for ensuring there is uniformity in the imposition of water rules, as put forward by Otieno & Kamau (2024). Second, having the regulatory agencies more visible in the peripheral areas would instill more confidence in the system and bring about higher compliance.

Finally, though the regulatory framework is a formidable disincentive to illegal water connections, its potential is curbed by uneven enforcement practices. Correcting this unevenness and effectuating more uniform enforcement of regulations in all parts of Nairobi would go a long way towards maximizing the effectiveness of the regulatory framework in preventing water theft.

5.3.3 Community Engagement as a Soft Strategy

The role of community engagement in the prevention of illegal water connections was also rated as predominantly good with a mean score of 4.23 (Table 4.5). Based on the research, public forums, local water committees, and partnerships with CBOs have supported raising awareness and promoting grassroots ownership of water governance matters. These interventions have helped promote community sense of responsibility and increased public cooperation in water connection monitoring and reporting.

However, although these strides were embraced, the study identified a significant flaw: that activities of community engagement were not inclusive. Vulnerable and marginalized communities, particularly those who reside in informal settlements, have complained of exclusion from such activities. This exclusion undermines the efficacy of engagement efforts in general, as observed by Waweru & Muriuki (2021). The disregard for such individuals' active involvement in decision-making leads to disillusionment and hinders the development of participatory frameworks of governance.

Mugambi & Gikonyo (2022) argue that community engagement should be centered

on the principles of inclusivity, and all demographical groups, particularly marginalized communities, should be represented and actively engaged. NCWSC, therefore, should place its strategy at the center of inclusive forums where representation in informal settlements is prioritized. Capacity development of local water committees in conflict resolution and regulation will also allow them to settle disputes and facilitate more community involvement in water management.

In addition, a transition to co-design of water access programs with the community would allow the management to diagnose needs and concerns at their core level, thus guaranteeing more sustainable and acceptable solutions for the community. This participatory process would most likely translate into greater community ownership and long-term success in eradication of illegal water connections.

Generally, while community engagement has been an effective strategy, its impact would be substantially enhanced through more participatory and inclusive practices. Through the meaningful involvement of marginalized groups, NCWSC would enhance the legitimacy of programs and build healthier partnerships with the community.

5.3.4 Enforcement as a Tactical Solution

Enforcement measures carried out by NCWSC, such as GPS tracking-capable audits, night patrol, and electronic monitoring, have been generally viewed as effective and have received a mean score of 4.36 (Table 4.6). The technologies have significantly contributed to the identification and demolition of illegal water connections, particularly where traditional monitoring efforts have not been as effective. As Kamau & Mwangi (2022) note, computerized surveillance systems are particularly flexible in urban locations, where illegal links would be established in hard-to-monitor locations.

But alongside all this technology advance, the study also noted that selective enforcement remains a key issue. This is particularly common in areas with high illegal activity but yet where politically connected individuals are active. Chege & Njoroge (2023) argue that interference by political authorities in enforcement processes is likely to lead to discriminatory application of the rules, a situation of unfairness and dissatisfaction among the population at large. Selective enforcement of the rules lowers the legitimacy of the regulatory system and diminishes public trust in the authorities.

To address these problems, Karanja et al. (2024) recommend that NCWSC adopt an integrated strategy for enforcement via a partnership involving various agencies such as county governments, the judiciary, and police at the local level. The collaboration among various agencies would increase the effectiveness of enforcement while reducing opportunities for political interference. Second, expanding the scope of digital surveillance and including the use of Geographic Information Systems (GIS) to observe illegal connections in real-time would increase the accuracy and effectiveness of detection.

Secondly, it is equally necessary to incorporate social protection clauses into the enforcement procedures so that they do not disproportionately target disadvantaged groups. Karanja et al. (2024) point out that this would ensure enforcement action to be fair, equitable, and not reinforce existing social inequalities.

In summary, although there is substantial potential in enforcement actions, their efficacy is constrained by political interference and concerns of selective enforcement. Enforcement should become more coordinated, open, and inclusive to make it fair and effective across Nairobi.

5.4 Conclusion

This study investigated the effectiveness of the Nairobi City Water and Sewerage Company (NCWSC) in curbing illegal water connections, focusing on four aspects: management organization, regulatory policy, community engagement, and enforcement measures. The findings have illuminated important insights into how these factors co-exist and influence NCWSC's ability to tackle illegal water connections in Nairobi.

To begin with, the study set out to find that NCWSC's organizational structure makes a moderately important contribution towards addressing illegal water connections. The respondents were satisfied with decentralization and departmental coordination, which facilitated more localized decision-making. The research nonetheless observed inadequate enhanced communication and coordination between planning and enforcement units. The gaps in interdepartmental communication drain the entire potential of the management organization, causing delayed illegal connection handling. This is according to Mutinda & Ngugi (2022), who highlight internal communication frameworks as important for effective operation in urban water utilities. To rationalize organizational structures, NCWSC should introduce real-time communication systems and coordination system streamlining between departments, especially planning and enforcement departments.

Second, the regulatory device was the most efficient tool for controlling illegal water connections, with 82% satisfaction from the respondents. The technological innovations in aspects of online license platforms and anonymous whistleblower hotlines were welcomed as guidelines that enhance transparency and accountability. Notwithstanding that, inconsistencies of enforcement of these rules across zones, particularly in the informal settlements, were noted. This uneven implementation

weakens the total effect of the regulatory regime. As Karanja & Juma (2021) noted strongly, digitalization of water services can significantly reduce corruption and promote compliance. To address such challenges, research recommends harmonizing the enforcement of policies in every geographical area, especially informal settlements, and adequate training and assistance of enforcement officers.

Third, people's participation was an apparently worthwhile method of illegal water connections, according to 75.7% of the respondents, as important. Public meetings, area water committees, and liaison with CBOs were cited as effective methods. However, the study also showed vast exclusions in inclusivity, where marginalized communities, including slum dwellers, are left behind in such processes. Such marginalization undermines the success of participatory initiatives at the community level. Mugambi & Gikonyo (2022) emphasize participatory inclusivity in water management. Therefore, it is recommended that NCWSC devise more inclusive forums at the community level, particularly informal settlements, and empower local water committees with mediation and regulation enforcement capabilities. Moving from public consciousness campaigns to inclusive co-design of water access infrastructure will increase local ownership and legitimacy.

Lastly, punitive action in the form of GPS-monitored audits, night-time patrols, and electronic surveillance was rated highly, with a mean rating of 4.36. Selective enforcement concerns were noted, however, particularly where politically connected illegal operators exist. Selective enforcement undermines the public's confidence and weakens the effectiveness of the measures. The study findings align with Chege & Njoroge (2023) who argue that political interference in enforcement creates feelings of unfairness and inequality. For enforcement effectiveness, the study proposes the creation of an inter-agency task force of NCWSC, police at the local level, the

judiciary, and county governments. Increased digital monitoring and instituting GIS technology for increased monitoring of illicit connections will improve detection and enforcement efficiency. Additionally, the application of social protection clauses in the enforcement processes will help to ensure that the marginalized segments are not targeted disproportionately.

Overall, the research identifies the fact that while NCWSC has progressed towards counteracting illegal water connections, there is great scope for improvement with regard to communication, enforcement consistency, inclusivity of communities, and interdepartmental coordination. The research itself indicates that maximum effectiveness towards eradicating illegal water connections will be achieved if there is enhanced synergy among institutional, legal, social, and technological interventions. Subsequent research should seek to examine the political forces driving enforcement action and explore alternative approaches to community engagement that more explicitly draw in marginalized groups. By adopting the recommendations presented, NCWSC can further support its multi-track approach and significantly promote solutions to the problem of illegal water connections in Nairobi.

5.5 Recommendations

Based on the evidence and analysis contained in the present research, a number of proposals are made aimed at enhancing the Nairobi City Water and Sewerage Company's (NCWSC) capacity to tackle the endemic vice of illegal water connections. They include strengthening the management system, improving the regulatory system, enhancing people's participation, and enhancing enforcement mechanisms so that illegal connections are effectively curtailed to a bare minimum. Each recommendation is designed to align with the study's own unique objectives and develops the study's results in offering pragmatic, real-world solutions.

5.5.1 Recommendations Regarding Management Structure

Management structure in NCWSC plays a vital role in dealing with unauthorized water connections, but it must be enhanced so that it can be more effective. First and foremost, NCWSC should establish departments' unambiguous communication and coordination channels, particularly between the planning and enforcement departments. Smooth interdepartmental communication has been identified by the study to be among the reasons causing delays in response to illegal connections. Increased interdepartmental coordination will streamline decision-making processes, remove bottlenecks, and improve response time.

Secondly, NCWSC needs to introduce performance monitoring dashboards. These dashboards in conjunction with real-time monitoring will enable the utility to constantly monitor departmental performance. The management will be able to identify areas to focus on, check progress, and hold departments accountable for their contribution towards fixing illegal water connections by continuously monitoring KPIs. Such systems will enable quicker decision-making and provide real-time information to deal with problems efficiently.

Apart from this, participatory and adaptive leadership also needs to be imparted to middle-level managers. Middle managers constitute the first line of decision-makers, and by providing them with skills for adaptive decision-making as well as people's participation, operational effectiveness will be enhanced. Training in participatory leadership will ensure decisions are more inclusive and responsive to local realities. This mode of leadership will also promote increased stakeholder trust and utility responsiveness to the needs of the people.

5.5.2 Regulatory Framework Recommendations

The regulatory framework is presently the most effective available mechanism in the

prevention of illegal water connections, but its application remains plagued by challenges, especially in informal settlements. NCWSC is encouraged to standardize enforcement of the regulatory framework in all geographical areas, giving special focus to informal settlements. Homogenizing the enforcement will avoid inconsistencies across different regions and decrease perceptions of unfair treatment. By imposing the same rules across the board, NCWSC will enhance the credibility of its enforcement and ensure that all regions are treated equally.

Second, it is also critical to enhance legal enforceability. This can be achieved by reducing bureaucratic inefficiencies as well as enhancing prosecutorial assistance to NCWSC's enforcement units. The study found that slow judicial processes and complex bureaucratic hurdles consistently delay enforcement efforts. Streamlining judicial processes and augmenting firmer legal support would hasten the process, with offenders being prosecuted in good time and deterrence being increased.

Lastly, the incorporation of electronic platforms and whistleblower systems in the regulatory framework is recommended. The systems will improve transparency and accountability and provide a channel through which citizens can report illegal activities anonymously and thus avoid victimization. Monitoring the reports in real time will ensure timely action on complaints and that NCWSC is agile to violations.

5.5.3 Community Engagement Recommendations

Community outreach has been among NCWSC's strengths in addressing illegal water connections. It is also one of the largest challenges of inclusivity, especially among marginalized communities. In order to strengthen community outreach effectiveness, NCWSC ought to establish structured community representation forums throughout all the sub-counties and especially in slum areas. The representation forums ought to reflect all societal segments and especially vulnerable and marginalized communities.

Active community participation will encourage ownership, build trust, and increase the legitimacy of NCWSC activities.

The local water committees should also be trained in regulation compliance and conflict resolution. Such committees often act as the interface for the utility and the people. By equipping them with knowledge to assist in the resolution of disputes and ensure compliance with rules, NCWSC can help improve local water management and reduce the level of illegal connections. By expanding the work of these committees to include more responsibility for monitoring access to water, so that committees become vital in regulatory compliance as well as settlement of disputes, their role can be strengthened.

Lastly, NCWSC can transition from traditional awareness programs to a participatory one in the co-design of water access interventions. This will enable community members to be directly engaged in co-designing solutions that help in realigning interventions to meet local needs and also create an inclusive relationship between NCWSC and the community. Participatory co-design further reinforces the sustainability of water access solutions in the long term as it ensures that solutions are geared towards the real needs and wants of the community.

5.5.4 Enforcement Measure Suggestions

Enforcement measures are vital in curbing illegal water connections, but efforts available are compromised by selective enforcement and political meddling. NCWSC should contemplate establishing an inter-agency task force comprising NCWSC, local police, the judiciary, and the county governments to harmonize enforcement. Multi-agency engagement will promote sharing of resources, expertise, and information, ensuring total and efficient enforcement. By involving more stakeholders, the task force will further enhance the coverage and coordination of enforcement efforts.

Increased use of digital surveillance and Geographic Information System (GIS) tracking is also essential. The study demonstrated that GPS-enabled audits and digital monitoring systems have been effective to identify illegal connections. Expanding the use of these technologies would improve precision in identification, and therefore the enforcement teams could target risky areas and respond more effectively to illegal action. GIS technology, in particular, would enable NCWSC to map illegal connections more effectively, track the effect of enforcement, and track trends in water theft.

Finally, it is necessary to integrate social protection actions into enforcement procedures so that they do not disproportionately harm the vulnerable group. The study discovered that enforcement operations at times are targeting poor and vulnerable communities, expanding social inequalities. NCWSC ought to develop guidelines to ensure the enforcement operations are fair and do not disproportionately target the urban poor. Guidelines should include alternative solutions for the poor households, such as creating opportunities to legalize the water connections by providing cost-effective payment structures or amnesty programs. Through the incorporation of social protection in enforcement, NCWSC gets to counteract the negative impact on poor individuals while still addressing against illegal connections.

5.6 Suggestions for Further Research

Future research might be carried out on a longitudinal study monitoring the long-term consequences of this recent governance reform on decreasing illegal water connections, ideally lasting five years. This would help in clarifying on the sustainability of interventions and any forthcoming challenges. Furthermore, it would be useful to explore the role of gender and youth participation in water governance, specifically to uncover how these groups help to influence enforcement and reporting

behavior and draw needed attention to a more comprehensive approach. Such research will help to provide a better understanding of the dynamics of these social groups with regard to water governance and will thus provide a better basis for more effective community engagement initiatives.

Future research by comparing Nairobi and other African cities like Kigali or Dar es Salaam, would be another valued area. This would shed important lessons regarding successful water governance strategies as well as which are best practices that apply to Nairobi. More likely, this is a good time to investigate the possibility of using emerging technologies, including smart water meters and AI-powered monitoring systems, that may provide new and innovative solutions to the problem of illegal connections. The study on how the technology can complement traditional enforcement measures would provide new solution to make the efforts to combat illegal water usage in urban areas both effective and scalable.

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APPENDICES**APPENDIX I: LETTER OF INTRODUCTION****Registration Number: 110061704****Africa Nazarene University****Department of Governance, Peace and Security****School of Humanities and Social Sciences (SHSS)****[kmurungi61704@anu.ac.ke]****[Phone Number: +254 729 225136]****[4.01.2024]****Dear, Respondent**

It's my honor to introduce myself as Kevin Musindai Murungi doing my Master of science in Governance peace and security at Africa Nazarene University. In my academic progress, I've been assigned a thesis involving research with the general theme: Governance strategies for Tackling Illegal Water connections, with Nairobi City Water & Sewerage Co. in Kibra as my case study.

Therefore, my research sought to assess the efficiency of the current governance measures in Meeting the challenge of unauthorized connections in Kibra. Based on a survey to be followed by interviews, I aim to extract information from key informants including the officials of NCWSC, consumers and environmental Non-Governmental Organizations (NGO)'s.

And I also think that your organization's insights and your experience was beneficial for the successful completion of this type of research. Hereby I would like to extend an invitation to collaborate on this worthwhile endeavor. Your contribution may involve contribution of data, sharing of some material or even dissemination of the achieved results.

Please find below a summary of the objectives and methods for the research being proposed. I would like to hear your comments and ideas, and if you have any suggestion this could be a good start of a partnership.

Thanks for accepting to come over. Should you have any questions... or need any further information about the matter or the author of the message, please do not hesitate to call the number provided above or e-mail.

Sincerely,

.....

Kevin Musindai Murungi

Master of Science in Governance, Peace and Security Candidate

Africa Nazarene University

APPENDIX II: QUESTIONNAIRE FOR NCWSC OFFICIALS**1. How does the current management structure of NCWSC contribute to tackling illegal water connections?**

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

2. What is the effect of the NCWSC regulatory framework on effectively tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

3. What is the contribution of NCWSC's community engagement efforts to tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

4. How effective are NCWSC's enhancement and enforcement measures in tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

APPENDIX III: QUESTIONNAIRE FOR WATER CONSUMERS**1. How does the current management structure of NCWSC contribute to tackling illegal water connections?**

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

2. What is the effect of the NCWSC regulatory framework on effectively tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

3. What is the contribution of NCWSC's community engagement efforts to tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

4. How effective are NCWSC's enhancement and enforcement measures in tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

**APPENDIX IV: QUESTIONNAIRE FOR ENVIRONMENTAL NGO
REPRESENTATIVES**

1. How does the current management structure of NCWSC contribute to tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

2. What is the effect of the NCWSC regulatory framework on effectively tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

3. What is the contribution of NCWSC's community engagement efforts to tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

4. How effective are NCWSC's enhancement and enforcement measures in tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

**APPENDIX V: QUESTIONNAIRE FOR LOCAL GOVERNMENT
AUTHORITIES**

1. How does the current management structure of NCWSC contribute to tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

2. What is the effect of the NCWSC regulatory framework on effectively tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

3. What is the contribution of NCWSC's community engagement efforts to tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

4. How effective are NCWSC's enhancement and enforcement measures in tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

APPENDIX VI: QUESTIONNAIRE FOR WATER VENDORS**1. How does the current management structure of NCWSC contribute to tackling illegal water connections?**

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

2. What is the effect of the NCWSC regulatory framework on effectively tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

3. What is the contribution of NCWSC's community engagement efforts to tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

4. How effective are NCWSC's enhancement and enforcement measures in tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

**APPENDIX VII: QUESTIONNAIRE FOR COMMUNITY LEADERS &
ACTIVISTS**

1. How does the current management structure of NCWSC contribute to tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

2. What is the effect of the NCWSC regulatory framework on effectively tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

3. What is the contribution of NCWSC's community engagement efforts to tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

4. How effective are NCWSC's enhancement and enforcement measures in tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

APPENDIX VIII: QUESTIONNAIRE FOR WATER POLICY MAKERS**1. How does the current management structure of NCWSC contribute to tackling illegal water connections?**

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

2. What is the effect of the NCWSC regulatory framework on effectively tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

3. What is the contribution of NCWSC's community engagement efforts to tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

4. How effective are NCWSC's enhancement and enforcement measures in tackling illegal water connections?

- ☐ 1 (Strongly Disagree)
- ☐ 2 (Disagree)
- ☐ 3 (Neutral)
- ☐ 4 (Agree)
- ☐ 5 (Strongly Agree)
- ☐ 6 (Extremely Effective)

Please Explain/Elaborate:

APPENDIX IX: INTRODUCTION LETTER

P.O.Box: 53067 – 00200
Nairobi, Kenya.
Tel: 020 252 7170/1 – 5
Email: vc@anu.ac.ke
www.anu.ac.ke

25th March 2025

TO WHOM IT MAY CONCERN

RE: RESEARCH PERMIT: KELVIN MUSINDAI MURUNGI

Kelvin Musindai Murungi Reg. No. **(110061704)** is a Bonafide postgraduate student at Africa Nazarene University, pursuing a master's degree in governance, Peace and Security Studies. This program entails Coursework and Thesis. He has successfully completed coursework and defended his thesis proposal entitled:

“Governance Strategies for Tackling Illegal Water Connections: Case Study of Nairobi City Water and Sewerage Company”.

Any assistance accorded to him to facilitate data collection and complete his thesis will be highly appreciated.

Sincerely,

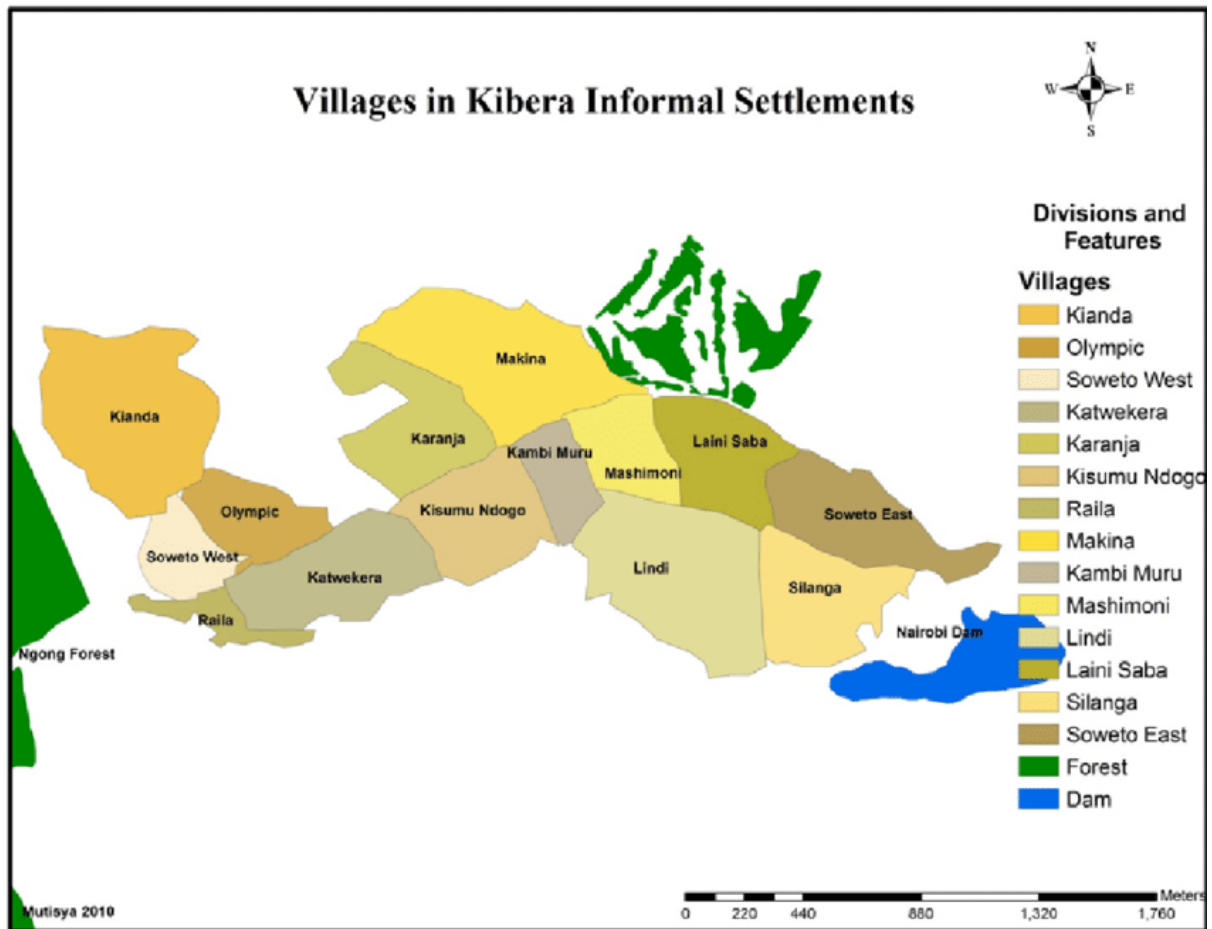


Prof. Orpha K. Ongiti
Dean, Postgraduate Studies & Director, Institute of Research

APPENDIX X: NACOSTI RESEARCH LICENSE

 REPUBLIC OF KENYA Ref No: 100441	 NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION Date of Issue: 08/April/2025
RESEARCH LICENSE	
	
This is to Certify that Mr.. Kevin Musindai Murungi of Africa Nazarene University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: GOVERNANCE STRATEGIES FOR TACKLING ILLEGAL WATER CONNECTION: A CASE STUDY OF NAIROBI CITY WATER AND SEWERAGE COMPANY for the period ending : 08/April/2026.	
License No: NACOSTI/P/25/417960	
100441 Applicant Identification Number	<i>Walter</i> Director General NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
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APPENDIX XI: MAP OF KIBERA INFORMAL SETTLEMENT REGION



Source : (Google-maps, 2024)