

**AN INVESTIGATION INTO THE ROLE OF GOVERNANCE IN  
NONREVENUE REDUCTION WATER AMONG WATER SERVICE  
PROVIDERS IN KENYA**



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**MASTER OF SCIENCE IN DEVELOPMENT FINANCE**

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**MAY 2025**

## DECLARATION

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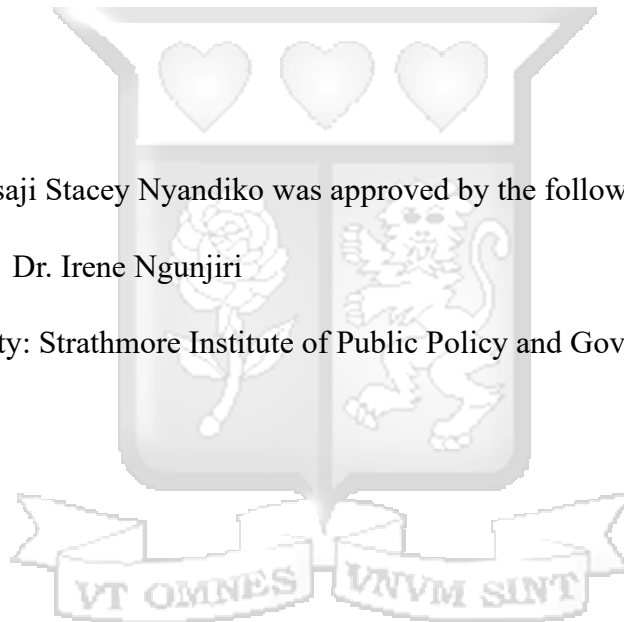
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## ABSTRACT

This study investigated the role of governance in reducing Non-Revenue Water (NRW) among the water service providers (WSPs) in Kenya. Non-revenue water, which refers to the significant amount of water lost within water utilities, presents severe challenges to operational efficiency and financial sustainability. Because over half of the water produced in Kenya is lost, there are profound economic implications, with some utility recovery at a rate as low as 2% of the operational costs. Therefore, this study filled a noticeable gap in research concerning the governance factors that can influence the management of non-revenue water in the Kenyan context. The study established three primary objectives: to examine how regulatory frameworks influence NRW levels, determine the effect of institutional accountability on NRW, and evaluate the influence of leadership commitment on non-revenue water for water utilities in Kenya. To achieve these objectives, the study adopted quantitative approaches, including an exploratory research design incorporating insights from WSP staff. The primary data was collected using survey questionnaires issued to senior-level water utilities staff. The findings of the data re expected to provide actionable recommendations for policymakers and regulators that helped enhance water service efficiency and sustainability in Kenya. Additionally, the study addresses the persistent challenges in managing NRW and improving the financial viability of water utilities in the face of increasing water demand and climate variability. The findings revealed that governance plays a significant role in NRW reduction among Kenyan water utilities. Descriptive statistics indicated that regulatory frameworks, institutional accountability, and leadership commitment all positively contribute to NRW management, with institutional accountability showing the highest influence. Correlation analysis confirms strong positive relationships between these governance factors and NRW reduction effectiveness. Regression analysis further supports this, with an overall model explaining the variance in NRW reduction. Among the individual predictors, institutional accountability has the strongest impact, followed by leadership commitment and regulatory frameworks. Additional diagnostic tests confirmed the reliability of the model, showing no significant issues with normality, multicollinearity, heteroscedasticity, or autocorrelation. Thus, Water utility managers should enhance institutional accountability, leadership commitment, and technology adoption to improve NRW reduction, alongside fostering stakeholder engagement and performance-based incentives. Policymakers must strengthen regulatory enforcement, promote smart water management technologies, encourage public-private partnerships, and raise consumer awareness to support sustainable NRW reduction efforts. Future research should conduct a comparative analysis of WSPs in Kenya to better understand the factors contributing to varying levels of NRW, investigate the effectiveness of emerging technologies, and socio-economic factors influencing NRW management in Kenyan utilities.

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## LIST OF ABBREVIATIONS AND ACRONYMS

NRW	Non-revenue Water
WSP	Water Service Provider
SDG	Sustainable Development Goal
WASREB	Water Services Regulatory Board
DMA	District Metered Areas



## DEFINITION OF KEY TERMS

**Non-Revenue Water:** refers to water that has been produced and is lost before it reaches the customer or is not billed for any reason. It includes physical and apparent losses.

**Water Service Provider:** (WSP) is an entity licensed to provide water supply and sanitation services to consumers within a defined area.

**Water Service Regulatory Board:** (WASREB) is a national regulatory agency in Kenya established under the Water Act, responsible for overseeing the provision of water and sanitation services by WSPs.

**Sustainable Development Goal 6:** (SDG 6) “Ensure availability and sustainable management of water and sanitation for all.” It is one of the 17 global goals adopted by the United Nations in 2015 as part of the 2030 Agenda for Sustainable Development



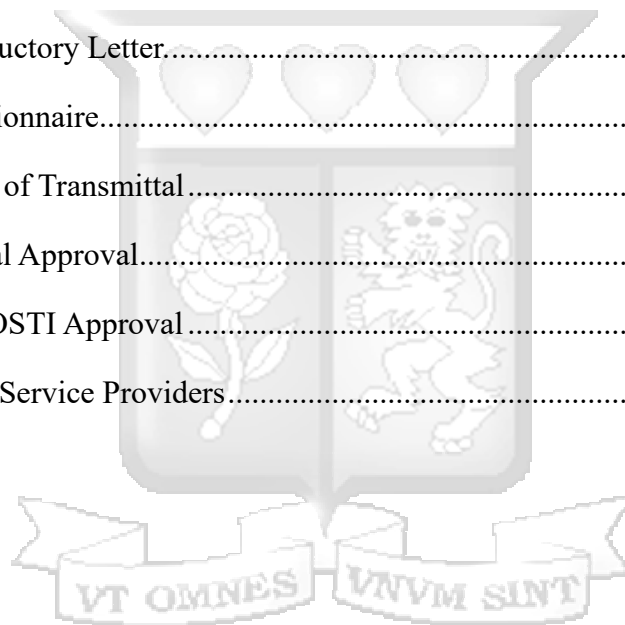
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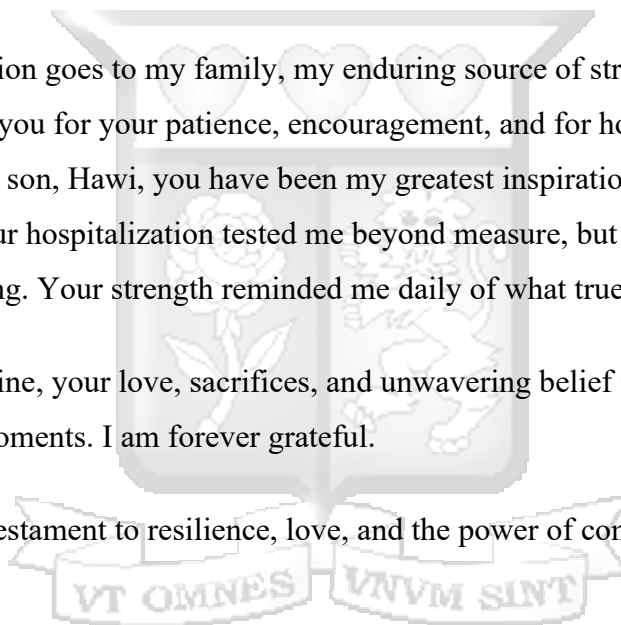
The writing of this dissertation has been a transformative journey marked by intellectual growth and personal resilience amid profound emotional and physical challenges. Its completion would not have been possible without the unwavering support of those who stood by me during one of the most difficult seasons of my life.

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# CHAPTER ONE

## INTRODUCTION

### 1.1 Background of the study

Water security remains one of Africa's most pressing development challenges, exacerbated by population growth, rapid urbanization, poor infrastructure, and the growing effects of climate change. According to UNICEF (2022), in metropolitan areas, half of the population lacks access to essential hygiene services, and two out of every five people lack access to safely managed drinking water, sanitation, or both. The situation is even more dire in rural regions, where three out of four people lack clean sanitation, four out of five lack access to safe drinking water, and seven out of ten lack access to essential hygiene services. In this context, achieving Sustainable Development Goal (SDG) 6; ensuring availability and sustainable management of water and sanitation for all remains a top priority for African governments.

Kenya, like many other Sub-Saharan African countries, continues to face significant water governance challenges. Despite constitutional provisions under Article 43(1)(d) of the 2010 Kenyan Constitution guaranteeing access to clean and safe water, and substantial policy efforts such as the Water Act 2016, the equitable realization of these rights remains elusive. Particularly in rural areas, where natural water sources are freely available, WSPs struggle to justify tariffs for improved water services. Consequently, low customer uptake, high levels of NRW, and poor cost recovery undermine the financial sustainability of WSPs (WASREB, 2024).

Non-revenue water, defined as water that has been produced but is not billed due to physical losses and commercial, is a critical challenge for WSPs globally. In Kenya, NRW levels remain alarmingly high, with national averages estimated at over 40% (WASREB, 2024), well above the acceptable benchmark of 20% set by the International Water Association.

Empirical research globally has shown that governance plays a pivotal role in managing NRW. For example, a study by Mogaka et al. (2022) in South Africa established that weak institutional accountability and inadequate monitoring mechanisms were key contributors to high NRW levels in municipal utilities. Arregui et al (2019) found that fragmented leadership structures and policy incoherence hampered effective NRW management across utilities. These findings

echo global studies such as Zawahri et al. (2022), highlight the need for transparent reporting and institutional coordination to achieve water sustainability outcomes.

While governance-related factors such as sound policy frameworks, leadership, transparency, and accountability are intuitively expected to contribute to lower NRW, there is limited empirical evidence that disaggregates and evaluates their specific effects, especially in low- and middle-income contexts like Kenya. What remains underexplored is how these governance dimensions influence NRW performance among local WSPs. This presents a crucial research gap.

This study seeks to address this gap by investigating the role of governance in the management of NRW in Kenyan water utilities. It specifically focuses on three governance variables: regulatory framework, institutional accountability and leadership commitment. By disaggregating and analyzing these variables, the study aims to generate insights that can inform policy and improve operational efficiency among WSPs.

In doing so, the study contributed to the broader discourse on water sector governance by offering empirical evidence on how specific governance factors influence NRW outcomes in Kenya. The findings have practical implications for both utility managers and policymakers seeking to enhance water service delivery in Kenya and similar contexts.

### **1.1.1 Global and regional perspective of NRW**

Understanding the determinants of non-revenue water requires contextualizing and assessing perspectives from different areas. Generally, on a global scale, it is estimated that about a third of treated water is lost between production and reaching paying customers. Put another way, water utilities worldwide lose about a third of their revenue to water loss. Such a loss also directly threatens water security in many areas. The regional outlook shows that there is a significant variation in NRW levels. Factors like ageing infrastructure and investment levels in water management practices explain this variation. Generally, developed nations tend to have lower levels of non-revenue water than developing nations, but they also face ageing infrastructure (Kingdom, Liemberger, & Marin, 2016). These countries have invested more in water management, including leak detection technologies and more efficient metering systems.

**Table 1: Global trends in Non-revenue Water**

<b>Region</b>	<b>The volume of annual NRW in Billions m<sup>3</sup></b>	<b>The yearly cost of NRW in \$ billions</b>	<b>Average Level of NRW Liters/capita/day</b>
Pacific Islands	0.2	0.1	211
Caucasus and Central Asia	2.9	0.8	152
Latin America and the Caribbean	25.4	8	121
USA and Canada	14.8	5.7	119
Middle East and Northern Africa	15	4.8	96
South Asia	23.2	6	93
Southeast Asia	6.7	2	81
Russia, Ukraine, Belarus	3.5	1.1	65
Sub Saharan Africa	5.2	1.4	64
Europe	9.8	3.4	50
East Asia	19.3	6.2	42
Australia and New Zealand	0.3	0.1	36
<b>Total</b>	<b>126</b>	<b>39</b>	<b>77</b>

Source: Liemberger, R., & Wyatt, A. (2018)

According to Table 1, the total non revenue water per year is estimated to be over 126 billion cubic meters, which is roughly three quarters of the average discharge of Niger water or half of the average discharge by the Ganges River in India. Furthermore, the litres/capita/ day unit has been used since the data on water loss per number of connections or network length was not available in most cases. The lowest litres/per capita/ day was registered by Australia and New Zealand, which at the time had implemented big water loss reduction efforts that have been going on for 15 years. In as much as Sub Saharan Africa appears among the bottom four regions, the results are mainly questionable due to a lack of reporting and enough data that can be used to accurately quantify the state of NRW in this region (Liemberger, R., & Wyatt, 2018).

Still, focusing on developing nations, the non-revenue water levels can exceed 50% in some cases due to numerous factors. These factors include poor infrastructure, leaking pipes, unreliable metering systems, or weak pressure management systems. Developing nations also face governance challenges that translate into inefficient billing and collection systems, contributing to apparent losses. Other than the developing and developed countries, a particular group is the emerging economies. These nations face fast urbanization, which means an even higher water demand. Emerging economies face challenges ranging from increasing pressure

on existing infrastructure to increasing NRW levels, while some are coming up with innovative approaches to handle the NRW (Kingdom, Liemberger, & Marin, 2016).

Emerging economies face challenges ranging from increasing pressure on existing infrastructure to increasing NRW levels, while some are coming up with innovative approaches to handle the NRW (Kingdom, Liemberger, & Marin, 2016). Water security in Africa is complex, and it continues to face constant threats from the ongoing global climate change. It is estimated that 50% of the people living in metropolitan areas cannot access essential hygiene services. At the same time, 40% of the population cannot access securely managed drinking water and sanitation services. Similarly, rural areas have 75% of the population lacking access to clean water, 80% lacking access to safer drinking water, and 70% missing out on essential hygiene services (UNICEF,2022). To this end, achieving SDG 6 is still a top priority for African governments.

In Kenya, the right to access clean water has not been equitably enjoyed despite all the constitutional and statutory provisions to guarantee access to water and sanitation. With the available freely available water sources, water utilities have difficulty convincing consumers to shift to better quality water sources or get enough revenue to cater to their operations costs. Most WSPs continue to face the challenges of financial instability due to low-cost recovery. Ernest Ngolo and Kidere (2023) estimates the NRW levels to exceed 50% in most areas. The same report highlights that Kenya is struggling with water scarcity. The report indicates that these levels are explained by solid pressure variation, which leads to pipe breakages. Additionally, there are many illegal connections and old water networks. Generally, these perspectives point toward the need to address NRW when looking into the financial health of these water service providers (Jones, Kong, Tan, & Rassiah, 2021).

### **1.1.2 The Role of Governance**

Governance plays a crucial role in determining the effectiveness of water service providers (WSPs) in reducing non-revenue water (NRW). Governance-related activities include the institutional frameworks, policies, and leadership that guide the decision-making process within the water sector. According to Vand den Berg and Danilenko (2017), institutional factors contribute significantly to the performance of water utilities. Effective governance can be in the form of setting clear objectives, having measurable targets, and financial strategies that can promote operational efficiency and service delivery. In most developing nations, governance

challenges such as weak accountability, lack of autonomy, and inadequate incentives greatly hinder the WSPs' ability to align with industrial policies and achieve desired performance outcomes.

In Kenya, the governance issues manifest in mismanagement, lack of institutional accountability, and inefficient resource allocation. These factors have contributed to the unsustainable operations of these water utilities (Chepyegon & Kamiya, 2018). Furthermore, these challenges are not only limited to the community-managed project but also apparent in regulated utilities. Therefore, effective governance strategies like transparent financial management, robust regulatory frameworks, and capacity-building initiatives are essential for reducing NRW levels and enhancing visibility. Additionally, proactive leadership and clear communication channels within these water service providers can contribute positively to fostering accountability and facilitating the implementation of NRW reduction

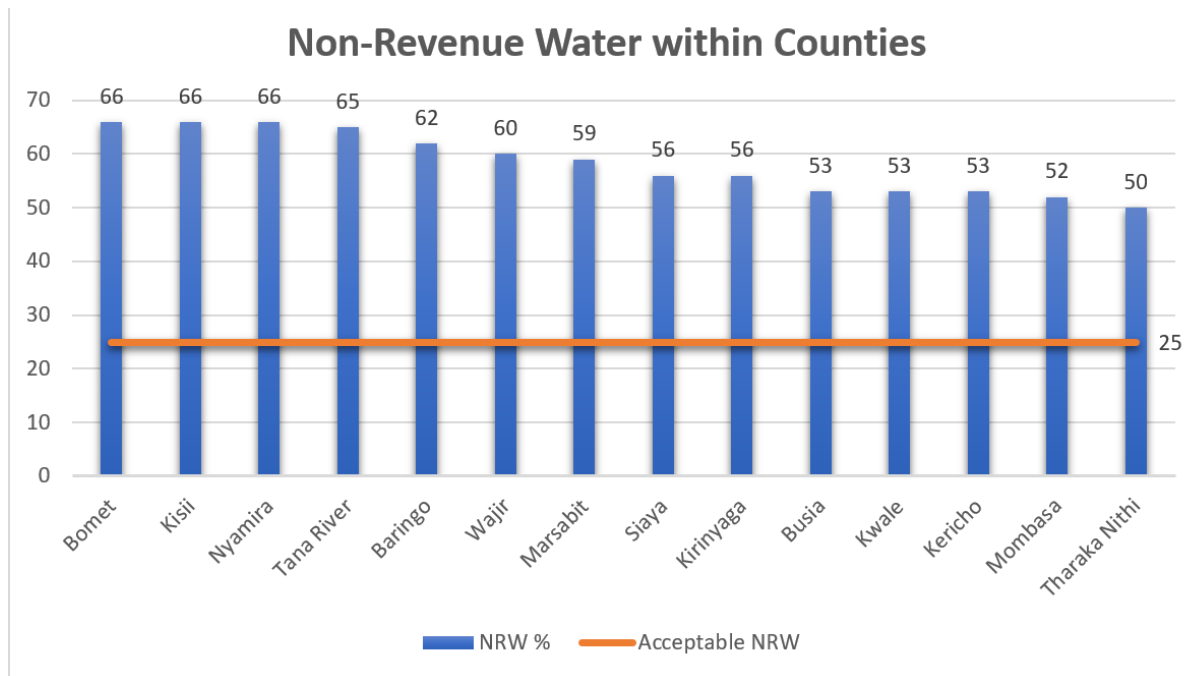
### **1.1.2 Non-revenue Water Reduction**

Reducing non-revenue water is crucial to improving water service providers' financial viability and operational efficiency. Bearing in mind that NRW includes physical losses (like pipe leakages), commercial losses (like illegal connections and metering inaccuracies), or apparent losses (like billing and administrative error). Effective NRW reduction strategies encompass investing in infrastructure through upgrading pipelines and deploying leak detection technologies, as well as operational improvements in implementing rigorous maintenance schedules and enhancing metering accuracy. Additionally, governance reforms, including enforcing regulatory compliance and improving organizational accountability, can play an essential role in reducing NRW. According to Malek et al. (2021), several connections, production quantity, and consumption quantity also significantly influence NRW levels. Addressing these determinants requires an integrated approach that combines technical, managerial, and governance interventions to ensure sustainable water service delivery.

### **1.1.3 NRW in Kenya**

Kenya's water service providers operate in a challenging environment riddled with high levels of NRW, financial instability, and governance inefficiency. According to the Water Service Regulatory Board (WASREB, 2024), none of the counties in Kenya meets the acceptable NRW

threshold of 25%. In the worst case are counties such as Kisii (66%), Nyamira (66%), Bomet (66%), Tana River (65%), and Baringo (62%). The high losses have significantly impacted their cost recovery rates. Examples of countries that struggle to recover their costs include Wajir (2%), Mandera (11%), Samburu (17%), Lamu (35%), and Bomet (46%).



**Figure 1: Non-revenue Water within Counties**

Source: Water Services Regulatory Board, (2024)

Furthermore, the financial sustainability of WSPS in Kenya is strained by the rising water production costs and billing inefficiency. A case in point is the price of producing one cubic meter of water has increased to KES 61, whereas the cost of billed water increased to KES 108 in the 2022/23 period (WASREB, 2024). These dynamics highlight the urgent need for effective governance and operational reforms to reduce NRW levels and improve financial performance.

Therefore, this study focused on the role of governance in addressing these challenges by exploring how institutional accountability, leadership, and regulatory frameworks influence NRW reduction efforts. By operationalizing governance variables guided by existing literature and justifying the measures developed in the conceptual framework, this study seeks to provide actionable insights for enhancing the performance and sustainability of WSPs in Kenya.

## 1.2 Statement of the problem

According to the Water Services Regulatory Board (WASREB, 2024), Kenyan WSPs lose an average of over 40% of potable water produced, with some utilities recording NRW levels as high as 60%. This situation significantly undermines the operational efficiency and financial sustainability of water utilities, limits service coverage, and weakens public trust in service delivery.

While substantial research has focused on technical approaches to NRW reduction including metering improvements, pipe rehabilitation, and billing systems (Kingdom, Liemberger, & Marin, 2016)) these interventions have yielded limited long-term success. The persistent high NRW levels suggest that technical interventions alone are insufficient. More recently, there has been a growing recognition that governance-related factors may significantly shape NRW outcomes (Chepyegon & Kamiya, 2018) However, existing literature on governance and NRW tends to be generalized, fragmented, or based in non-African contexts, failing to capture the localized dynamics affecting water governance in Kenya.

Specifically, few studies have systematically examined how governance mechanisms—such as policy and regulatory frameworks, institutional accountability, leadership commitment, and transparency in reporting—impact NRW management in Kenyan utilities. While Zawahri et al. (2022) highlight the role of governance in water sector efficiency at a global level, they do not account for the institutional challenges, regulatory capacity gaps, and political influences that uniquely shape governance outcomes in Kenya. Local studies that explore governance often do so tangentially or focus on broader water sector reforms without a direct link to NRW performance.

This lack of localized empirical evidence creates a critical knowledge gap. Without a deeper understanding of how specific governance dimensions influence NRW reduction, policymakers and sector regulators may continue to overlook key levers for sustainable improvement. There is thus an urgent need for research that investigates the relationship between governance practices and NRW management in the Kenyan context.

This study seeks to fill this gap by examining the role of governance in NRW reduction among Kenyan WSPs. By focusing on four governance dimensions—policy frameworks, institutional accountability, leadership commitment, and transparent reporting—this study aims to generate evidence-based insights to inform policy, regulation, and practice in the water sector.

## **1.3 Research Objectives**

### **1.3.1 General objective**

The general objective of this study is to investigate the role of governance in NRW reduction for water service providers in Kenya.

### **1.3.2 Specific objectives**

To meet the study's main objective, the following specific objectives were addressed:

- i. To examine how regulatory frameworks influence NRW reduction for Kenyan WSPs.
- ii. To determine the effect of institutional accountability on NRW reduction for Kenyan WSPs.
- iii. To evaluate the influence of the leadership commitment on NRW reduction for Kenyan WSPs.

## **1.4 Research questions**

At the end of the study, the following research questions were answered:

- i. What is the relationship between existing regulatory frameworks and NRW reduction for WSPs in Kenya?
- ii. What is the effect of institutional accountability on NRW reduction for WSPs in Kenya?
- iii. What is the influence of leadership commitment on NRW reduction for WSPs in Kenya?

## **1.7 Scope of the Study**

This study focused on managing non-revenue water among the water service providers in Kenya by examining how governance influences NRW reduction strategies. The unit of analysis for the study included public and private water utilities regulated by the Water Services Regulatory Board (WASREB) in Kenya, consisting of 102 entities.

The selection of water service providers as the unit of analysis is strategic since these organizations play an essential role in water service delivery and are affected by governance

practices. By analyzing these institutions, the study captured a comprehensive picture of how government factors impact NRW management levels and effectiveness.

Each WSP was examined regarding regulatory compliance, which includes evaluating how the entities adhere to the established regulatory frameworks and how that influences their NRW rates. Institutional accountability was assessed by analyzing the structures and practices to ensure accountability with these entities and their correlation with NRW performance. Leadership dynamics, which was evaluated by exploring the role of leadership in promoting a culture of governance that prioritizes NRW reduction and operational efficiency, and the transparency in reporting was assessed by investigating the current reporting practices related to NRW and their impact on accountability and stakeholder trust within the entities.

### **1.8 Significance of the study**

By focusing on these specific water service providers across the country, the study provides contextual insights responsive to the unique governance challenges faced in Kenya. The findings may then establish actionable recommendations tailored to the governance dynamics prevalent in Kenyan water utilities, enhancing the study's practical implications for policymakers and stakeholders in the water sector.

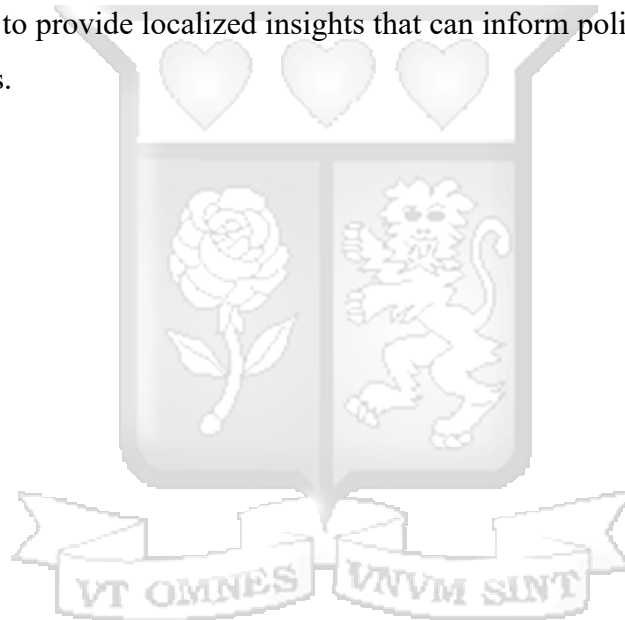
Water service providers, as the key stakeholders to the findings in this study, would benefit by getting insights into effective governance that can enhance their operation efficiency and financial sustainability. The insights can help inform targeted strategies to reduce water losses and improve service delivery and cost recovery. This benefit might be argued from the actionable recommendations regarding regulatory compliance with the study developed.

The second group is the local communities and consumers who benefit from enhanced water availability, quality, and affordability. The benefit is reduced water losses and increased efficiency in water service delivery. All these initiatives stem from the findings of this study.

Thirdly, academics and researchers might benefit from this study's contribution to the knowledge of governance and water management, especially in Africa. The insights this study uncovers may provide a good point for academics and researchers to build upon.

## 1.9 Chapter Summary

This section uncovered the comprehensive introduction to the study of the role of governance in reducing non-revenue water among water service providers in Kenya. The background of the study section reveals that there are challenges faced by WSP especially in Kenya where a significant portion of portable water produced is lost due to various factors including mismanagement, lack of accountability and inadequate governance framework. The problem statement section further underscores the need to address high levels of NRW and point out how existing studies have overlooked governance factors and focusing more on technical solutions. Therefore, the research objectives set forth include to examine how regulatory frameworks, institutional accountability, and leadership commitment influence the management of NRW. These objectives seek to provide localized insights that can inform policymakers and improve practices within WSPs.



## CHAPTER TWO

### LITERATURE REVIEW

#### 2.0 Introduction

The major areas covered in this section include the theoretical frameworks guiding the study. This study is based on governance and institutional theories. The latter part of the section delves into previous empirical studies that can inform the current research. Finally, the section develops a conceptual framework to guide data collection further and answer the research questions.

#### 2.1 Theoretical foundations

This study is anchored in two interrelated theoretical lenses: Governance Theory and Institutional Theory. These frameworks offer complementary insights into how WSPs in Kenya operate within a broader regulatory, political, and institutional environment, and how these dynamics influence the management of NRW.

##### 2.1.1 Governance Theory

The Governance Theory is an extensive theoretical framework used to inform decision-making processes in both formal and informal setups. Governance theory refers to the structures, processes, and methods used to exert power and authority in the management of a country's social and economic resources. (Chhotray & Stoker, 2009). The theory explains how power is distributed, major decisions are made, and accountability is ascertained in various organizational setups.

Governance is more than just the mechanisms of rules; it is also about the dynamic interactions between actors, norms, and institutions that influence outcomes (Bevir, 2013). The governance theory is a relatively recent framework, and its origin can be drawn from different disciplines such as political sciences, sociology, economics, and public administration. Its evolutions come from understanding how various actors, including the public, private, and civil society, coordinate to make authoritative decisions and produce collective outcomes. This makes

governance theory particularly suitable for examining complex service delivery challenges, such as NRW in water utilities, which require multi-stakeholder coordination, policy coherence, and effective oversight.

Fundamentally, the governance theory is based on five premises. The first premise is that the governance process involves leadership and political will. Leaders influence organizational culture, prioritize investments, and enforce performance standards (Bevir, 2013). The second premise highlights that the power is distributed unevenly among the various actors involved in governance. Governance involves establishing rules and regulations that guide organizational behavior. The third premise highlights that effective governance needs mechanisms to hold these actors accountable for their actions. (Bevir, 2013). Fourthly, a rule of law should ensure transparency, fairness, and predictability in the governance process. The last premise highlights that governance itself needs to be inclusive and allow the various stakeholders to participate.

In assessing the role of governance in NRW reduction for water services providers, the governance theory helps inform and assess how the existing policies and regulatory frameworks affect the performance of water utilities in reduction of NRW. Additionally, the theoretical framework is heavily hinged on institutional accountability, which, in this case, can be crucial in assessing the accountability mechanisms within water utilities. Lastly, as with the third objective of the study, the governance theory helped the study understand how leadership commitment can drive non-revenue water reduction efforts. This includes assessing the leadership styles of the key organization leaders and their vision for the utilities.

However, governance theory is sometimes criticized for being too broad and descriptive. It often lacks predictive power and does not fully explain why some governance systems succeed while others fail under similar conditions (Pierre & Peters, 2000). Moreover, the assumption of rational, collaborative actors may not hold in politically charged environments such as Kenya, where vested interests and capacity constraints may hinder reforms.

### **2.1.2 Institutional theory**

The theory originated in the mid-20<sup>th</sup> century and is attributed to sociologists like Peter Blau, Philip Selznick, and Richard Cryert. The institutional theory was more concerned with sociology and organizational studies. It was formulated to react to the dominant views, which were more inclined to economic and rational choice ideologies (Lammers & Garcia, 2017). The institutional theory was the view that these dominating theories neglected the role of social

structures and cultural norms in shaping organizational behavior. While Selznick's contribution was based on how informal organizations influence formal structures, Blau and Scott's contributions examined the role of legitimacy and Isomorphism in organizational behavior.

Hence, the modern Institutional theory argues that organizations are deeply rooted in a social environment characterized by shared values, beliefs, and norms. Therefore, these underlying institutional pressures influence how these organizations behave, including when such organizations are not efficient or rational in purely economic terms (Scott et al., 1999). This theory has three core tenets: Isomorphism, decoupling, and legitimacy.

Institutional theory emphasizes the importance of institutional isomorphism, a process by which organizations in similar environments tend to become more similar over time. That similarity can be achieved through coercive, mimetic, and normative isomorphism (DiMaggio & Powell, 1983).

Institutional theory helps to explain not only how but also why Kenyan WSPs behave the way they do in response to NRW challenges. Coercive isomorphism can be observed on how WASREB, county governments, and development partners influence the extent to which WSPs implement regulatory-driven NRW strategies. On the other hand, the mimetic isomorphs are observed when the institutions copy successful approaches that have been taken by other firms within their sector. It is evident when WSPs adopt strategies used by high-performing peers, often without a tailored assessment of their own local context. Lastly the normative isomorphism can be observed when firms implement practices that are consistent with professional norms and values. It pushes utilities to align with professional practices such as regular meter audits, DMAs, and NRW benchmarking.

Institutional theory also emphasizes the concept of legitimacy—organizations adopt certain structures or practices to appear legitimate to funders, regulators, and the public, even when those practices are not entirely effective (Meyer & Rowan, 1977). This can explain the persistence of ineffective NRW strategies adopted mainly for compliance or appearances.

A limitation of institutional theory is its limited focus on agency. It tends to downplay the role of individual leadership and innovation, which are critical in driving reforms in constrained environments like Kenya. It also may not fully account for the power struggles and resistance that often characterize reform efforts (Greenwood et al., 2011).

## **2.2 Empirical Literature Review**

The general scholarly outlook indicates that non-revenue water has been investigated extensively, with scholars majorly optimizing water resources. However, there is no comprehensive coverage of the impact of governance on these utilities' non-revenue water. Nonetheless, this study finds the past perspectives insightful in setting the direction for this endeavor.

### **2.2.1 Regulatory Frameworks and NRW Levels**

The influence of the regulatory frameworks on non-revenue water levels among water utilities remains a widely understudied area. While most studies identified in this research looked at the role of governance on non-revenue water levels from a broader perspective, very few studies had findings that implied or lightly explicitly touched on the influence of regulatory frameworks. One study that this current research draws from is by Van den Berg (2015). While the study does not explicitly delve into specific regulatory frameworks and how they influence non-revenue water levels, it mentions that policies such as those concerned with labor and energy can significantly influence the effectiveness of utilities in controlling water sources. This study is based on a large sample of utilities in 63 countries and focuses on various aspects of non-revenue water across these utilities. The data was derived from the International Benchmarking Network for Water and Sanitation Utilities (IBNET). The sampling technique utilized was primarily convenient as the data collection process involved the voluntary participation of different water utilities. The sample size amounted to 4,515 observations across the participating entities. Having measured variables such as NRW, Physical factors, management and institutional factors, economic factors, and human resource factors, the study concluded that it hinged on the key drivers of non-revenue water, which were both the physical characteristics of these entities and the management qualities of the utilities.

Another insightful study was carried out by van den Berg and Danilenko (2017) in their assessment of the performance of water utilities in Africa, and they established that, primarily, the regulatory framework has a mixed impact. The scholars established that even though most African countries have regulatory agencies in place, they do not always automatically lead to better operational performance or improvement of water coverage. Their sentiment is that the regulatory framework is insufficient to effectively manage and reduce NRW levels. The study

further explained that most regulatory frameworks focus more on customer protection, primarily promoting minimum service level rather than operational improvements. Such an approach inadvertently neglects the substantial improvement needed to address NRW. Besides, these regulatory frameworks do not prioritize the reduction of water losses. At the same time, the study highlights notable performance discrepancies as water utilities that operate under regulatory regimes show better customer service quality performance than their unregulated counterparts. However, the discrepancy manifests when those heavily regulated utilities have lower water coverage than their unregulated counterparts. The study points towards the shortcomings of these regulations and how they can adversely affect NRW levels. Van den Berg and Danilenko (2017) used 118 utilities. Their measurement variable included performance indicators like service quality and financial performance of water utilities, as well as the non-revenue water measured in terms of percentage of water produced and NRW per connection per day. Lastly, institutional factors encompass types of service delivery (municipal or regional) and the presence of regulatory agencies. The data collection approaches were mixed quantitative and qualitative. Secondary data was gathered from existing performance metrics, utility reports, and data from benchmark organizations like the International Benchmarking Network for Water and Sanitation Utilities. The study also employs surveys and case studies of select utilities to collect more detailed operational context and validate the quantitative findings.

Similarly, Yehia (2024), while looking at the challenges and strategies related to NRW reduction, touched on the influence of the regulatory framework. While their take does not implicitly talk about the impact of regulatory frameworks on non-revenue water, their study highlights that, in most instances, these regulations impose institutional and political pressures on these water service providers, leading to these utilities underestimating NRW levels. The implication here is that the presence of the regulatory framework itself usually contributes to misreported NRW levels. This link provides an informative perspective on effectively managing NRW. Yehia's study is based in Egypt, and the study population is water service companies in the region. The study variables included the system input volume ( the total volume of water introduced into the distribution network), billed authorized consumption ( the amount of water that consumer pay for), unbilled authorized consumption ( water that is approved but not billed like firefighting and those used for public services), apparent losses (losses due to billing errors, theft or management) and actual losses ( losses due to leakages

that occur within the distribution system) their study mainly used quantitative secondary data obtained from GIS mapping data and field surveys.

### **2.2.2 Institutional accountability and NRW management**

Institutional accountability refers to an organization's responsibilities and duties to be transparent, answerable, and liable for its actions, performance, and decisions. At the same time, the concept generally applies to all institutional setups. In the context of water service providers, the institution's accountability can ensure that these utilities fulfill their duties much more effectively, ethically, and according to the underlying laws, regulations, and generally agreed standards. That included aspects such as transparency, answerability, and liability. Institutional accountability influences other aspects of business operations, such as maintaining public trust, ensuring good governance, and fostering the long-term success of these organizations; it can also impact the management of non-revenue water.

From a scholarly perspective, the study by Van Den Berg (2015) establishes that institutional accountability influences the management of non-revenue water in the sense that it is linked to institutional and governance frameworks. The study highlights that institutional accountability directly impacts management practices that influence NRW management. Here, the management practices within the water utilities are painted as the moderating variable between institutional accountability and NRW management. Precisely, the quality of governance impacts water utility management. Van Den Berg (2015) also mentions that institutional accountability explains the incentives and motivation behind NRW management. The study demonstrates that when these utilities are held accountable for their actions, they tend to be more motivated to adopt effective NRW management strategies. For instance, they can foster a culture of responsibility among the water utility management and staff. Still, the report reiterates the importance of contextual understanding, citing the complexity of the context, which can include factors such as socioeconomic conditions and local governance practices.

Regarding the technicalities of the study, the study population included water utilities from 63 countries. Institutional accountability was measured by assessing the management factors linked with utility performance. These factors included management practices quality, governance structure, financial health, and operation cost coverage.

On the other hand, Chepyegon & Kamiya (2018), when looking at the challenges faced by the Kenyan water sectors, established a positive and significant correlation between higher levels

of institutional accountability and better Management of NRW. The study elaborates that when this water utility has accountability standards that ensure adherence to sound governance principles, it results in better management of resources and reduced inefficiencies, directly impacting NRW levels.

Chepyegon and Kamiya used a descriptive research approach whose study population was the various stakeholders involved in the Kenyan water sector: the water service providers, regulatory bodies, and community members. The institutional accountability was measured using the indicators of adherence to regulatory frameworks, transparency in operations, financial accountability governance practices, and stakeholder involvement. Secondary data was derived from reviewing literature and existing reports (desktop research). Institutional accountability as a variable was measured using indicators such as an independent regulatory agency and oversight within the utility, service delivery model, and policies and procedures to be adhered to within the utility. The data was primarily collected through surveys to collect data on service delivery and financial and operational information. The study also used secondary sources such as regulatory reports and existing databases like the IBNET to supplement the primary data collected.

Lastly, Yehia, while looking into the reduction of non-revenue water, discussed the role of institutional accountability. While not explicitly describing the nature of the relationship between institutional accountability and non-revenue water, the study highlighted some of the aspects that explain this relationship in general. The study mentions report accuracy as a product of institutional accountability, and where this accountability is non-existent, there is a tendency to underreport NRW levels. Institutional accountability also affects factors like the identification of issues. As such, without accountability, these water utilities would fail to determine the true extent of water losses, ultimately affecting the management of the NRW levels. Other factors discussed in the study relevant to the relationship between institutional accountability and NRW levels are improved efficiency of these water utilities and collaborative efforts between different departments to address NRW. While taking a conceptual framework for addressing NRW, the study used NRW reporting and collaboration of varying departments in auditing NRW components to measure institutional accountability.

### 2.2.3 Leadership Commitment and NRW

The leadership commitment aspect of governance encompasses leaders' dedication and active involvement within the water utilities and advocates for, prioritize, and implement initiatives that seek to reduce non-revenue water. The leadership commitment can be informed by vision setting, resource allocation, stakeholder engagement, and institutional culture promotion.

From a scholarly outlook, Van den Berg (2015) establishes a positive relationship between leadership commitment and the reduction of non-revenue water. Specifically, the aspects of leadership commitment that are investigated in the study include the influence on management practices whereby committed leadership exhibits prioritization of NRW management and supporting initiatives that are aimed at enhancing operational efficiency as well as implementing other strategies that are effective in reducing water loss. The second aspect is fostering a culture of motivation and accountability within the utility. This is described as happening when the utility leaders move their staff to take ownership of their roles in addressing NRW reduction. The third aspect comes in the form of resource allocation to NRW management programs. Such could be in the form of allocating financial support to staff training. Technology and infrastructure improvement are intended to enhance NRW reduction. Another aspect discussed is the utility leadership setting strategic direction that emphasizes NRW reduction as a priority objective and ascertaining a coordinated response to NRW challenges.

Similarly, Chepyegon and Kamiya (2018) recognized leadership commitment within the water utilities as an aspect of governance with a positive correlation with non-revenue water reduction. The aspects of leadership commitment mentioned in the study include strategic decision-making to address the causes of NRW. Setting the tone for monitoring and accountability when it comes to managing NRW, sustaining motivation and engagement to inspire staff and other stakeholders to engage in activities that would help reduce NRW, and leadership itself playing a major role in implementing governance principles aimed at NRW reduction.

Van den Berg and Danilenko (2017) also recognize a positive relationship between leadership commitment and the reduction of non-revenue water, pointing out that effective leadership plays a vital role in implementing strategies designed to manage and reduce NRW levels. The specific aspects of leadership commitment that were listed by Van den Berg and Danilenko (2017) include setting a vision and strategic direction for NRW reduction efforts, Policy

formulation and implementation that targets NRW reduction, motivation, and staff engagement to ensure commitment to reducing NRW, and resource allocation to initiatives aimed at reducing NRW.

#### **2.2.4 Summary of Empirical Literature Review and Study Gaps**

The studies above provide various insights into different dimensions that influence water utilities, especially in governance. This study establishes that a substantial body of research focuses more on the technical aspect of non-revenue water, which includes billing efficiency, infrastructure improvement, and water improvement. This is also confirmed in the studies reviewed here, which indicated that insights concerning governance mechanism and their influence on reducing non-revenue water are minimal. This is the most recurrent gap that is presented in the studies reviewed.

Of the studies reviewed, the most prominent trend is the recognition of governance as a major player in the performance of water utilities. Take, for instance, the insights that can be drawn from Van den Berg & Danileko (2017), who elucidated those institutional factors such as regulatory frameworks, leadership commitment, and accountability practices are crucial to improving the operational efficiencies of water service providers. The key findings suggest that while regulatory agencies are part of the governance structure, just existing does not guarantee enhanced outcomes. This observation raises essential questions, especially regarding the Kenyan context, where governance dynamics would likely significantly differ from those in other regions.

Nonetheless, the review reiterated the effects of regulatory frameworks on NRW levels, suggesting that different approaches to policy and regulation can contribute to varying results in water service provision. Still, it is essential to remember that these studies mainly focus on global contexts or specific regions that are not Kenyan WSPs. Studies like that of Liemberger & Wyatt (2018) have quantified water loss due to inefficiencies. Still, they do not inform on localized statistics, which means the Kenyan governance landscapes.

Additionally, the empirical literature review presents gaps in research in areas related to comprehensive investigation into how institutional accountability correlates with NRW outcomes. The evaluated studies fail to adequately explore the nuances of accountability experienced in WSP. This signals an essential need for focused research assessing how leadership commitment can drive NRW reduction efforts in the face of underlying systemic

challenges. Overall, the empirical literature review affirms the importance of governance in influencing NRW management. However, it still reveals notable gaps, especially regarding localized studies in the Kenyan context. These gaps were bridged by investigating the relationships between regulatory frameworks, institutional accountability, and leadership commitment concerning NRW reduction strategies.



**Table 2:** Showing Summary of Empirical Literature Review methodology and focus on governance.

<b>Author(s)</b>	<b>Focus of the Study</b>	<b>Methodology</b>	<b>Key Findings</b>	<b>Research Gap</b>	<b>Relevance to NRW and Financial Efficiency of WSPs</b>
Van den Berg (2015)	Examined performance factors influencing NRW in utilities across 63 countries	Quantitative study using secondary data (IBNET), sample of 4,515 observations from 63 countries	Physical and management characteristics were key drivers of NRW; policies like labor and energy significantly affect utility efficiency	Did not explicitly analyze how regulatory frameworks influence NRW and financial efficiency	Highlights how broader governance and operational practices influence NRW, but lacks direct focus on the financial performance or efficiency outcomes for WSPs
Van den Berg & Danilenko (2017)	Investigated impact of regulatory frameworks on utility performance in Africa	Mixed methods with both quantitative and qualitative data; 118 utilities examined	Regulatory agencies exist in most African countries but do not always improve NRW performance; focus is mostly on customer protection rather than operational efficiency	Fails to explore in-depth how regulatory design affects financial efficiency and NRW levels of WSPs	Provides insight into the limits of existing regulation, indirectly highlighting areas where reform could improve both water loss

					management and cost-efficiency
Yehia (2024)	Reviewed challenges in reducing NRW and the role of institutional and political pressures	Quantitative study using secondary GIS data and field surveys from Egypt	Regulations may cause utilities to underestimate NRW levels; poor accountability leads to misreporting and inefficiency	Lacks an in-depth explanation of how governance structures influence financial sustainability of WSPs	Highlights how misaligned regulations and lack of accountability undermine accurate NRW reporting, indirectly affecting both operational and financial efficiency
Chepyegon & Kamiya (2018)	Assessed governance challenges in the Kenyan water sector	Descriptive research using surveys and secondary data; stakeholders included WSPs, regulators, and community members	Found positive relationship between institutional accountability and improved NRW management	Did not analyze specific governance mechanisms or leadership aspects influencing financial efficiency	Links institutional accountability to reduced NRW levels, suggesting that governance practices can enhance financial and operational performance of WSPs
Van den Berg (2015)	Analyzed role of leadership commitment in utility performance	Quantitative analysis across 63 countries	Leadership commitment positively associated with resource allocation and	Did not consider how leadership directly contributes to financial	Demonstrates that committed leadership can drive operational reforms, which may indirectly

			staff motivation in NRW reduction	sustainability of WSPs	improve both NRW levels and financial outcomes
Van den Berg & Danilenko (2017)	Studied leadership's role in NRW strategy implementation	Mixed methods, secondary data with case analysis	Effective leadership linked to strategic direction, policy development, and NRW-focused investments	Did not directly explore financial efficiency outcomes of improved leadership	Shows leadership's role in shaping effective NRW programs, with implications for financial health through reduced water losses and improved service delivery
Chepyegon & Kamiya (2018)	Evaluated strategic governance practices including leadership	Descriptive research with focus on Kenyan WSPs	Leadership influenced accountability, motivation, and decision-making toward NRW reduction	Lacked quantitative analysis on financial impact of leadership practices	Connects leadership commitment with NRW outcomes, hinting that better leadership can enhance both service quality and cost control in WSPs

Source: Researcher (2025)

## **2.3 Defining and Operationalization of Variables**

### **2.3.1 Legal and Policy Framework**

The legal and policy framework refers to the rules, regulations, and guidelines established by government institutions or regulatory authorities that govern the operations of water utilities. This variable is considered pivotal in shaping the governance structures influencing Non-Revenue Water (NRW) reduction in Kenya. The selection of this variable is grounded in an extensive review of existing regulatory provisions and their influence on operational efficiency within the water sector. Empirical literature indicates that robust legal frameworks can facilitate effective service delivery, while weak or poorly enforced regulations may hinder utility performance. Governance Theory provides theoretical grounding for this variable, emphasizing the role of structured systems and decision-making processes in guiding organizational behavior and accountability within public institutions.

In the context of Kenya's water sector, institutions such as the Water Services Regulatory Board (WASREB) are central in formulating the regulatory frameworks that guide utility operations, particularly concerning NRW management. The strength and clarity of these regulations are essential to ensuring compliance and fostering efficiency in service delivery. Previous studies, notably by Chepyegon and Kamiya (2018), highlight that inadequate enforcement of existing water regulations has contributed to elevated NRW levels in Kenya due to limited compliance and accountability mechanisms. To operationalize this variable, three key measurement items have been identified. First is the presence of formal NRW policies within the utility, which reflects whether a clear policy framework exists. Second is the clarity of these regulations, assessed by determining the degree of understanding and interpretation of NRW-related policies among utility managers. Third is the effectiveness of enforcement policies, gauged by how well utilities adhere to existing rules and whether regulatory oversight translates into tangible NRW reduction outcomes.

### **2.3.2 Institutional Accountability**

Institutional accountability is defined as the degree to which water utilities are answerable for their performance, especially regarding their efforts to manage and reduce NRW levels. This variable captures how internal and external mechanisms hold institutions responsible for

resource utilization and operational outcomes. Research findings suggest that accountability measures, including performance audits and structured reporting mechanisms, significantly enhance the operational efficiency of utilities. The Institutional Theory underpins this variable by asserting that organizations adapt to pressures from their operating environment, including formal rules, professional standards, and public expectations. It posits that organizations tend to conform to these expectations to maintain legitimacy, which in this case would involve the adoption of accountability practices in water service provision.

In the Kenyan setting, accountability in water utilities remains a significant challenge due to weak transparency frameworks and limited enforcement of performance standards. Institutional accountability in this study captures the extent to which utilities implement audit mechanisms, conduct regular performance reviews, and adhere to standardized reporting of NRW figures. The frequency and thoroughness of internal audits help identify inefficiencies and leakage points, offering a basis for corrective action. Similarly, performance review systems provide structured feedback loops for evaluating managerial decisions and their impact on NRW. Standardized reporting practices ensure consistency and comparability in tracking water losses, fostering greater transparency and benchmarking across utilities. Collectively, these components of accountability are critical in addressing the persistent challenges of NRW and promoting responsible resource management.

### **2.3.3 Leadership Commitment.**

Leadership commitment pertains to the degree of engagement and proactive involvement demonstrated by the utility's top management in reducing NRW. This variable is crucial as leadership plays a foundational role in setting organizational priorities, shaping strategic direction, and fostering a culture of efficiency and accountability. The Governance Theory supports this viewpoint by recognizing that leadership is central to institutional functioning, particularly in public utilities where strategic alignment and execution depend heavily on the decisions and influence of senior management. Leadership that is committed to NRW reduction is more likely to allocate necessary resources, mobilize teams, and create a results-oriented environment focused on reducing water losses.

In the context of water utilities in Kenya, leadership commitment is reflected through several practices. One critical indicator is the establishment of clear and measurable NRW reduction targets, signaling the organization's seriousness in tackling inefficiencies. Involvement in

strategic planning is another essential dimension, as it reflects the participation of leadership in formulating and executing NRW management frameworks. Furthermore, leadership’s support for capacity building, especially through training and development initiatives for staff, underscores its commitment to long-term, sustainable improvements in water service delivery. These measurement items collectively capture the influence of leadership in driving organizational change, improving service outcomes, and fostering a culture of continuous improvement in NRW management.

### 2.3.4 NRW Reduction

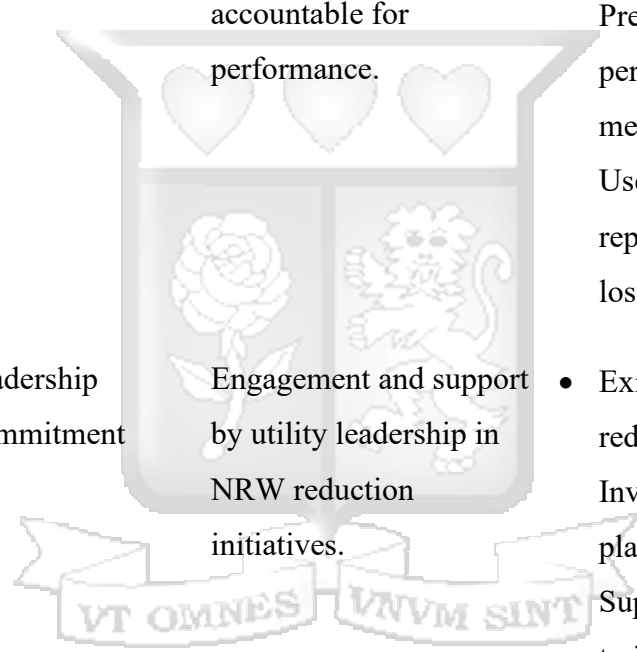
Non-Revenue Water reduction serves as the dependent variable in this study and represents the actual decline in the proportion of water that is produced and supplied but does not generate revenue due to losses, leakages, theft, or metering inaccuracies. NRW reduction is a key indicator of operational efficiency in water utilities and is increasingly used as a benchmark for evaluating utility performance. Effective NRW management not only improves service delivery and customer satisfaction but also enhances financial sustainability for the utilities.

The operationalization of NRW reduction is based on five critical components. First is the percentage reduction in NRW levels achieved over the previous year, which provides a quantitative measure of performance improvement. Second is the implementation of NRW reduction initiatives, assessing whether utilities have undertaken any structured programs or projects targeting water loss. Third is stakeholder engagement in NRW reduction strategies, evaluating the involvement of external partners, community members, or regulatory stakeholders in planning and execution. Fourth is the cost savings realized as a result of NRW reduction, highlighting the financial benefits accrued through improved efficiency. Lastly, the customer perception of water availability, attributed to NRW reduction, captures the qualitative aspect of service improvement, reflecting how the end users experience and assess changes in service delivery. Together, these indicators offer a comprehensive view of NRW reduction outcomes from both internal and external perspectives.

**Table 3: Operationalization of Variables**

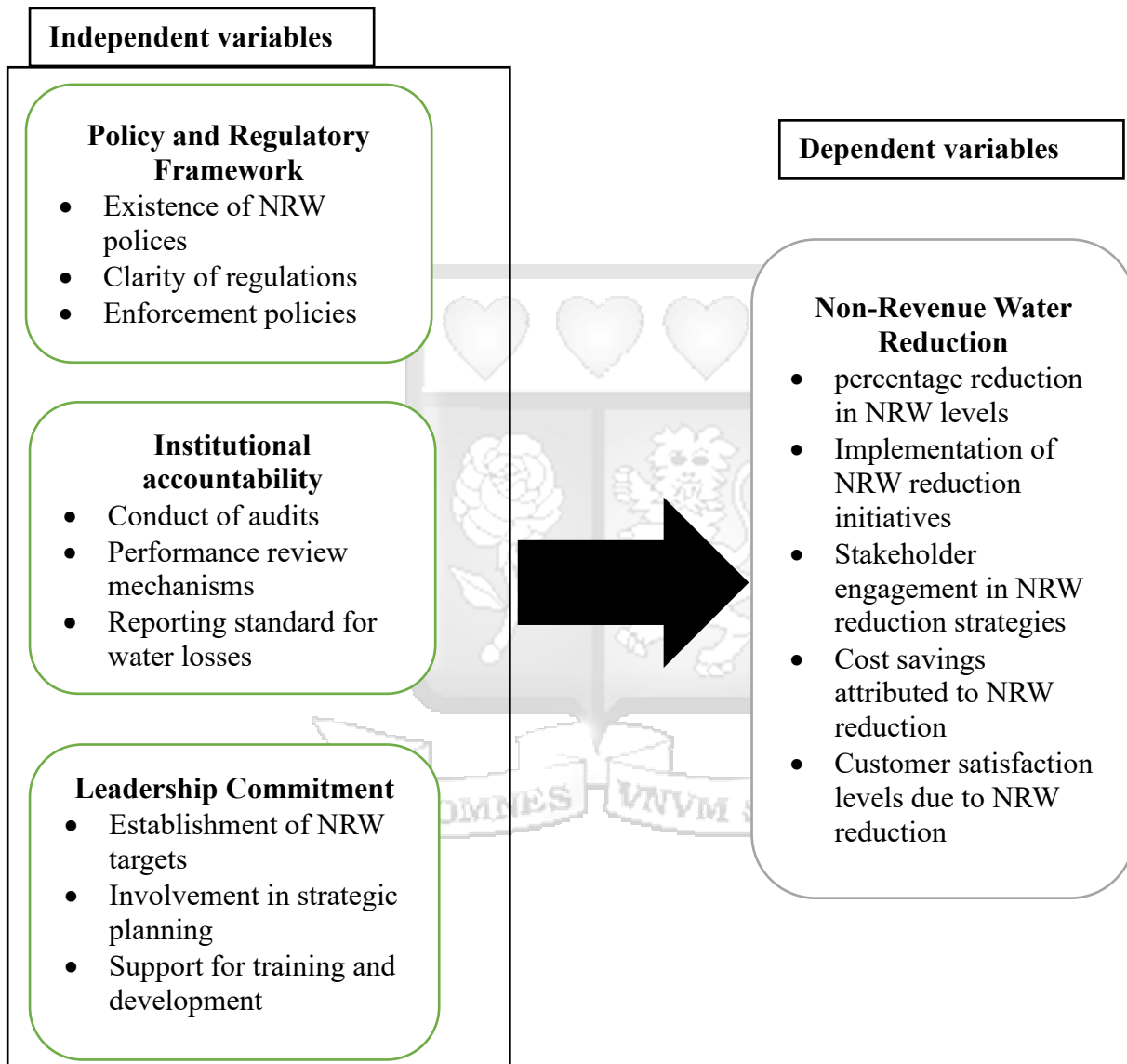
<b>Variable</b>			
<b>Category</b>	<b>Sub-Variable</b>	<b>Description</b>	<b>Measurement Items</b>

<b>Independent Variables</b>	Legal and Policy Framework	Rules and regulations influencing water utility operations and NRW management.	<ul style="list-style-type: none"> <li>• Existence of NRW policies</li> <li>• Clarity of NRW regulations</li> <li>• Effectiveness of enforcement mechanisms</li> </ul>
	Institutional Accountability	Mechanisms ensuring utilities are held accountable for performance.	<ul style="list-style-type: none"> <li>• Frequency of NRW audits</li> <li>• Presence of performance review mechanisms</li> <li>• Use of standardized reporting for water losses</li> </ul>
	Leadership Commitment	Engagement and support by utility leadership in NRW reduction initiatives.	<ul style="list-style-type: none"> <li>• Existence of NRW reduction targets</li> <li>• Involvement in strategic planning</li> <li>• Support for staff training and development in NRW management</li> </ul>
<b>Dependent Variable</b>	Non-Revenue Water Reduction	Decrease in water lost before billing, reflecting operational and service efficiency.	<ul style="list-style-type: none"> <li>• % reduction in NRW levels</li> <li>• Implementation of NRW initiatives</li> <li>• Stakeholder engagement</li> <li>• Cost savings</li> <li>• Customer satisfaction levels</li> </ul>



## 2.4 Conceptual framework

The conceptual framework establishes a structural representation of the significant variables in the study and how they are related. This study's conceptual framework guides how different governance factors impact non-revenue water management.



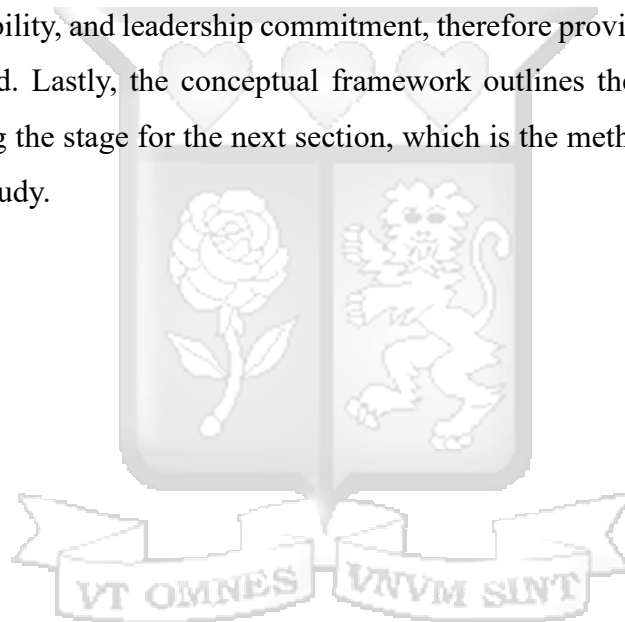
**Figure 2: Conceptual framework**

Source: Researcher (2025)

According to figure 2. 1, the conceptual framework has four variables, with the independent variable including the policy and regulatory frameworks, the institutional accountability, and the leadership commitment. These three variables influence Nonrevenue water reduction.

## 2.5 Chapter Summary

This chapter established a theoretical foundation for the study, which included the Governance Theory and Institutional theory. These theories highlight the importance of governance structures in NRW management. Furthermore, the chapter, after reviewing the empirical studies, establishes the main areas of governance, which include the influence of regulatory frameworks on nonrevenue water reduction, the role of institutional accountability in water service management, and the impact of leadership commitment in reducing NRW. The analysis also reveals gaps in the current literature, particularly regarding localized studies that address the governance dynamics in the Kenyan context. The chapter defined and operationalize the critical variables that was used in the study, including the legal and policy frameworks, institutional accountability, and leadership commitment, therefore providing clarity on how the concept was measured. Lastly, the conceptual framework outlines the relationship between these variables, setting the stage for the next section, which is the methodological approaches that was used in the study.



## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.1 Introduction

The methodology chapter covers all the procedures and approaches that the study used to gather and analyze data with the intention of answering the research objectives. The key areas covered in this chapter included research philosophy, the research designs and data analytical approaches.

#### 3.2 Research Philosophy

The research philosophy refers to the underlying assumptions that is used by the research to underpin the methodological approaches used to go through the research process (Cazeauz, 2017). It also covers the assumptions that the research has on how knowledge exists and how it can be obtained (Khatri, 2020). There are four major research philosophies commonly applied in the research context.

The pragmatic philosophical approach posits that the world can be interpreted differently, and no particular perception of reality has been agreed upon as the absolute truth or fact. The philosophical approach accepts the existence of multiple realities. In a more research context, pragmatism leans more on getting practical solutions to problems and focusing on the results that help address real-world problems. The pragmatic philosophical approach combines quantitative and qualitative research approaches, with the key priority being strategies and methods that would best yield valuable answers to the research questions (James, 2020). It is important to focus on solving the problem that comes from real-world issues and getting the outcomes that can be used to improve the situation of the real world.

The positivist philosophy, on the other hand, posits that the role of the researcher is limited to collecting and interpreting data. At the same time, factual knowledge remains what can be measured objectively. In interpretivism, the researcher has to distance themselves from personal

values when undertaking the study. The studies that take a positivist philosophical approach are usually quantifiable and observable. Besides, positivist researchers usually aim to identify general laws or patterns that can be applied broadly in different contexts to develop universal principles that predict outcomes and explain phenomena (Park et al., 2020).

The realism philosophical approach assumes that reality is independent of the human mind. Still, unlike positivism, realism acknowledges that reality can be understood through human perceptions, which are also affected by social, historical, and cultural contexts. It also believes that an objective reality exists independent of human knowledge or understanding. Still, again, such reality or truth about the world cannot be accessed in its entirety. This philosophical approach leans more toward causality, which influences observable events. Therefore, understanding this causal mechanism can provide a more accurate understanding of the world. Realism research uses qualitative and quantitative methods to help understand social phenomena' context and depth while covering patterns and relationships between variables (Flick, 2017).

In seeking to understand the role of governance in the reduction of non-revenue water (NRW), this study adopts a positivist research philosophy. Positivism is appropriate for this research because it emphasizes objective reality, empirical evidence, and the use of quantifiable data to test hypotheses (Creswell, 2014). This approach aligns with the study's aim of examining the influence of governance factors—such as policy frameworks, institutional accountability, and leadership commitment—on NRW reduction through measurable indicators. By relying on observable and statistically analyzable data, the study maintains objectivity and ensures that conclusions are based on verifiable evidence. This philosophy also enables the development of generalizable findings that can inform policy and managerial decisions within Kenya's water service sector.

### **3.3 Research Design**

This study intends to adopt explanatory research design. The descriptive research design explores why a phenomenon occurs when there is limited information. The exploratory research design helps with understanding a particular topic or concept by ascertaining why something could be happening and create a prediction for future recurrences. Additionally, this research design through looking into cause-and-effect model helps to investigate patterns in the available data that has not been studied before (Rahi, 2017). In examining the role of governance practices in nonrevenue

water reduction, the explanatory research design helps test the cause-and-effect relationship between governance factors like regulations policy, institutional accountability and leadership commitment, and NRW reduction. Besides, the study intends to use quantitative data collected using close-ended questionnaires. Therefore, the research design helped to systematically measure the link that is evident between the variables. This is actualized by conducting statistical tests like regression, correlation, and another form of modeling to explain the established link

### **3.4 Population of the Study**

The study population includes all the 102 water service providers in Kenya. This study population would provide a comprehensive insight into NRW management. Additionally, using staff members from different utilities in Kenya ensured a diverse perspective on governance dynamics and NRW challenges; therefore, the study had a holistic view of the organizational culture and practices surrounding NRW management.

### **3.5 Sampling design**

The study employed a stratified random sampling technique to ensure that water service providers (WSPs) from different regions in Kenya were adequately represented. Given that there are 102 WSPs under the jurisdiction of various Water Works Development Agencies (WWDAs), the study stratified the population based on these agencies. This approach ensured a balanced selection of respondents, providing insights into governance practices and NRW management challenges across different regions.

The target population consisted of 102 staff members involved in NRW management across the nine WWDAs. To reduce the total number from 102 to 81 respondents, the Yamane formula was applied at a 95% confidence level and a 5% margin of error, which yielded a scientifically acceptable sample size. Following this, a random selection process was conducted within each stratum using random number generation, thereby giving each WSP within its stratum an equal chance of selection. This approach maintained the integrity of the sampling process while achieving regional balance and representativeness. Appendix F provides a full list of the selected WSPs.

**Table 2: Study Population and Sample Size**

<b>Water Works Development Agency (WWDA)</b>	<b>Total Population WSPs</b>	<b>Sample Size</b>
1) Athi Water Works Development Agency	21	17
2) Coast Water Works Development Agency	8	6
3) Lake Victoria North Water Works Development Agency	7	6
4) Lake Victoria South Water Works Development Agency	9	7
5) Northern Water Works Development Agency	7	6
6) Central Rift Water Works Development Agency	12	9
7) North Rift Water Works Development Agency	4	3
8) Tanathi Water Works Development Agency	15	12
9) Tana Water Works Development Agency	19	15
<b>Total</b>	<b>102</b>	<b>81</b>

This sampling strategy ensured a representative and diverse selection of respondents, facilitating a comprehensive assessment of governance and NRW reduction initiatives among Kenyan water utilities.

### 3.6 Data Collection Methods

This study collected primary data using close-ended questionnaires as the research instrument. Primarily only quantitative data that has been simplified to accommodate as many participants as possible. The questionnaire is divided into four sections with queries and statements regarding each variable (institutional accountability, regulatory and policy frameworks, Leadership commitment, and non-revenue water). Most of the queries require the participants to rate their sentiment levels or select the option that best applies to their knowledge.

This questionnaire was distributed electronically to enhance accessibility and efficiency. The willing participants received the links to the online survey through their emails, which they

completed at their convenience. This method has been selected to reduce paper use and align with modern research practices.

Since most of the participants were those in managerial positions and senior employees, the initial contact was made with the administration, which communicated the intent of the research through the organizational communication channels. This message included the purpose of the study, the research objectives, and a walk-through of what the questionnaire entailed. The willing participants were sent the questionnaire links. A follow-up message would be sent after initial contact to remind the participant of the survey and give more encouragement. All the participants were issued with informed consent, and their willingness to participate was communicated by completing a survey.

### **3.7 Data Analysis**

The data was analyzed quantitatively using the IBM SPSS. First, the questionnaire was coded to suit the SPSS model. No data cleaning was required since only a fully completed questionnaires were available for analysis. The analyses included descriptive statistics to give an overview of the variables and their interconnected. After this, inferential statistics were conducted to establish the correlation between the variables. This includes correlation and regression analyses to determine the governance aspect and its influence on NRW levels. The data was visualized using graphs and tables.

### **3.8 Research Quality**

To ensure the validity and reliability of the study, a pilot study was conducted for one week using readily available staff members from water utilities within Nairobi. This ensured the survey questions are understandable and that the responses given by participants are consistent.

To ensure the reliability of the research instrument, a pilot test was conducted using a sample of respondents drawn from water service providers not included in the final study. The purpose of the pilot was to assess the internal consistency and clarity of the questionnaire items. Feedback from the pilot participants was used to make minor adjustments to the wording and structure of some questions for improved comprehension. The reliability of the instrument was tested using

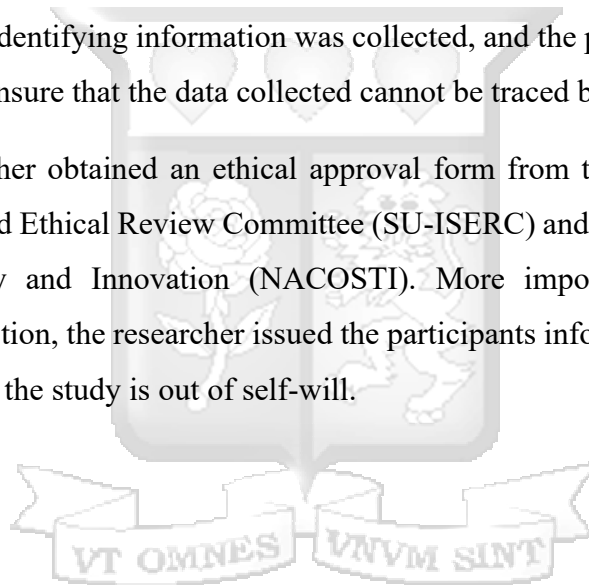
Cronbach's alpha coefficient, which yielded a result of 0.733. This value exceeds the minimum acceptable threshold of 0.60, indicating that the instrument had satisfactory internal consistency and was suitable for the main study.

To further ascertain the measurement item, the research consulted panel reviews on the proposed research items to get suggestions and recommendations that would further help improve the quality of the study.

### **3.9 Ethical Issues in Research**

The critical ethical consideration for this study is ensuring that all the participants are assured anonymity. No personal identifying information was collected, and the participants were assigned anonymous numbers to ensure that the data collected cannot be traced back to the origin.

Additionally, the researcher obtained an ethical approval form from the Strathmore University Institutional Scientific and Ethical Review Committee (SU-ISERC) and the National Commission for Science, Technology and Innovation (NACOSTI). More importantly, before indulging participants in data collection, the researcher issued the participants informed consent, which tells them that participation in the study is out of self-will.



## CHAPTER FOUR

### DATA ANALYSIS, FINDINGS AND INTERPRETATION

#### 4.1 Introduction

This chapter presents the findings of the study on the role of governance in NRW reduction among Kenyan water service providers. The analysis is structured around the study's specific objectives, focusing on the influence of regulatory frameworks, institutional accountability, and leadership commitment on NRW reduction. The findings are based on primary data collected through surveys and interviews with key stakeholders in the water sector. The analysis highlights trends, challenges, and best practices in governance-related NRW management, providing insights into how regulatory and institutional factors shape NRW reduction efforts in Kenyan water utilities.

#### 4.2 Response Rate

Table 4 presents the questionnaire return rate, highlighting the response distribution across various water service providers (WSPs) in Kenya.

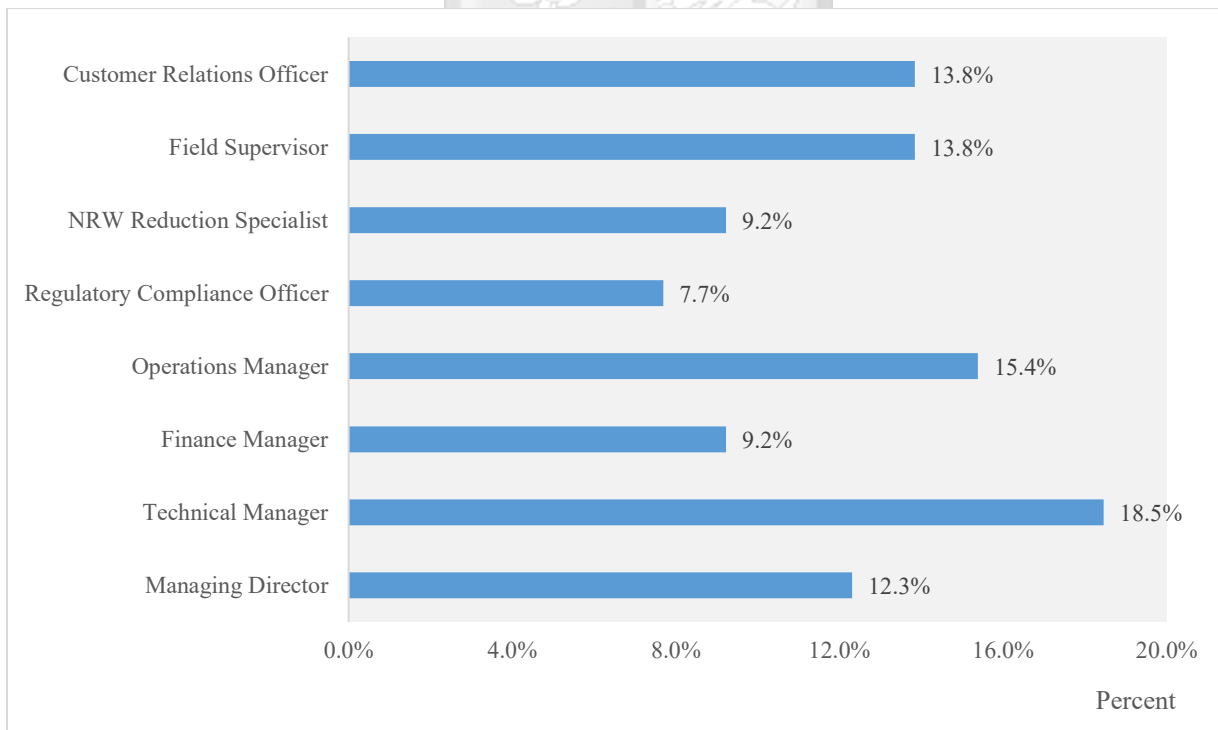
A total of 81 questionnaires were distributed among the selected water service providers (WSPs) in Kenya, with 65 valid responses, resulting in an overall response rate of 80.2%. The response rates varied across different agencies, ranging from 66.7% to 86.7%, with the highest response rate observed in Tana Water Works Development Agency (86.7%) and the lowest in Lake Victoria North and North Rift Water Works Development Agencies (66.7%). Generally, response rates above 70% are considered satisfactory for survey-based research, as they reduce the likelihood of non-response bias (Mugenda & Mugenda, 2003). The high response rate achieved in this study aligns with recommendations by Dillman et al. (2014), who emphasize the importance of effective follow-ups and clear survey instructions in improving participation rates. Moreover, the inclusion of both public and private WSPs under the regulatory framework of WASREB contributed to the diversity of responses. This ensures that the data collected is representative of the sector, allowing

for a more comprehensive analysis of governance factors influencing Non-Revenue Water (NRW) reduction in Kenya.

### 4.3 Demographic Information

Section 4.3 presents the demographic characteristics of the respondents, providing insights into their job titles, departmental affiliations, years of experience, and educational qualifications. Understanding these attributes is essential in assessing the expertise, decision-making capacity, and role distribution within water service providers (WSPs) in Kenya. By analyzing demographics, the study ensures that diverse perspectives from various professional backgrounds contribute to evaluating governance and NRW reduction strategies. According to Creswell (2014), demographic data enhances the reliability of research findings by contextualizing responses and identifying patterns that influence organizational effectiveness.

Figure presents the distribution of respondents based on their job titles, illustrating a diverse representation of professionals involved in water service management.



**Figure 3: Job Title of the Respondents**

Most respondents were Technical Managers (18.5%), followed by Operations Managers (15.4%), and Field Supervisors and Customer Relations Officers (13.8% each).. This diversity ensures a comprehensive perspective on governance and NRW reduction strategies across different functional areas of water utilities. According to Bryman (2016), collecting data from various managerial levels enhances the validity of organizational research by incorporating insights from both strategic and operational decision-makers.

The Technical/Engineering department (27.7%) had the highest representation, reflecting its critical role in NRW reduction efforts. This was followed by Operations & Maintenance (18.5%), which directly handles water infrastructure and loss management. Both Administration and Customer Service (15.4% each) played significant roles, emphasizing governance and stakeholder engagement. Additionally, Finance & Accounts (12.3%) and Regulatory & Compliance (10.8%) departments contributed to the financial and policy aspects of NRW management. A balanced representation across these departments enhances the study's reliability, as diverse expertise and responsibilities influence governance-related NRW interventions (Creswell, 2014).

The majority (55.9%) had 6–8 years of experience, indicating significant familiarity with industry operations and NRW reduction strategies. Those with more than 8 years of experience (19.5%) brought long-term insights into governance challenges and policy implementation. Meanwhile, 18.6% had 2–5 years of experience, reflecting mid-level professionals actively engaged in NRW management. A small proportion (5.9%) had less than 2 years of experience, representing newer entrants into the sector. According to Kothari (2004), a workforce with diverse experience levels strengthens research findings by incorporating both institutional knowledge and fresh perspectives in problem-solving.

The majority (52.5%) held a university degree, demonstrating strong academic preparation for governance and NRW reduction strategies. Additionally, 23.7% had postgraduate qualifications, signifying advanced expertise in leadership and policy implementation. 22.0% of respondents possessed a diploma, highlighting the presence of technical professionals crucial for operational efficiency. Only 1.7% had secondary education, suggesting that most roles in the sector require higher education. According to Bryman (2016), educational attainment enhances problem-solving

abilities and strategic decision-making, which are essential in addressing NRW challenges in the water sector.

#### 4.4 Descriptive Statistics

Descriptive statistics provide a summary of the key variables in this study, offering insights into the perceptions of respondents regarding regulatory frameworks, institutional accountability, leadership commitment, and NRW reduction efforts. By analyzing means and standard deviations, this section highlights the extent to which respondents agree or disagree with various statements related to water utility management and NRW reduction initiatives.

##### 4.4.1 Descriptive Statistics on Regulatory Frameworks

Table 5 presents the descriptive statistics on regulatory frameworks for NRW reduction among Kenyan water utilities.

**Table 4: Descriptive Statistics on Regulatory Frameworks**

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Standard Deviation
a) The existing NRW policies in my utility are clear and well-documented.	5.9	9.3	20.3	31.4	33.1	3.763	1.177
b) The current NRW policies effectively guide water loss management strategies.	8.5	11.9	17.8	33.1	28.8	3.619	1.248
c) Regulatory bodies enforce NRW-related policies consistently.	2.5	4.2	22.9	24.6	45.8	4.068	1.039
d) There are clear penalties and incentives to promote NRW reduction compliance.	8.5	18.6	15.3	25.4	32.2	3.542	1.332
e) The regulatory framework supports innovation in NRW reduction initiatives.	5.1	6.8	13.6	29.7	44.9	4.025	1.146

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Standard Deviation
f) My utility regularly updates policies to align with NRW reduction best practices.	10.2	11.9	11.0	41.5	25.4	3.602	1.263
<b>Average</b>	<b>6.8</b>	<b>10.5</b>	<b>16.8</b>	<b>31.0</b>	<b>35.0</b>	<b>3.770</b>	<b>1.201</b>

The highest-rated statement was "Regulatory bodies enforce NRW-related policies consistently" (Mean = 4.068, SD = 1.039), suggesting that enforcement mechanisms are perceived as relatively strong. Additionally, 35.0% of respondents agreed or strongly agreed that existing regulatory frameworks effectively support NRW reduction. However, penalties and incentives for compliance received a lower mean score (3.542, SD = 1.332), indicating room for improvement in regulatory enforcement and motivation mechanisms. Moreover, 41.5% of respondents agreed that their utilities update NRW policies regularly, yet this aspect had a moderate mean score (3.602, SD = 1.263), suggesting inconsistent policy updates across different utilities.

These findings align with recent studies on regulatory effectiveness in NRW management. Ombongi and Kisaka (2021) found that while regulatory frameworks play a crucial role in water governance, their influence is often dampened by weak enforcement and limited incentives for compliance. Similarly, Ndirangu et al. (2020) highlighted that while policies exist, their implementation is inconsistent, leading to varying NRW reduction success rates across different utilities. However, Opiyo and Otieno (2019) argued that utilities with proactive regulatory compliance structures tend to experience greater reductions in NRW levels. These studies reinforce the current findings, emphasizing that policy enforcement and regular updates are key to strengthening NRW reduction efforts in Kenya.

#### 4.4.2 Descriptive Statistics on Institutional Accountability

Table 6 presents the descriptive statistics on institutional accountability in NRW reduction among Kenyan water utilities.

**Table 5: Descriptive Statistics on Institutional Accountability**

<b>Statement</b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>	<b>Mean</b>	<b>Standard Deviation</b>
a) Internal audits on NRW performance are conducted regularly in my utility.	2.5	8.5	24.6	34.7	29.7	3.805	1.035
b) The audit process for NRW management is transparent and well-documented.	1.7	4.2	14.4	23.7	55.9	4.280	0.973
c) Performance reviews related to NRW reduction are consistently carried out.	3.4	5.9	14.4	22.0	54.2	4.178	1.094
d) NRW performance reports are shared with all relevant stakeholders.	1.7	10.2	14.4	28.8	44.9	4.051	1.1
e) My utility has clear accountability mechanisms for staff responsible for NRW reduction.	1.7	7.6	6.8	33.9	50.0	4.2	1.0
f) There are corrective actions taken when NRW reduction targets are not met.	1.7	10.2	11.9	33.1	43.2	4.059	1.1
<b>Average</b>	<b>2.1</b>	<b>7.8</b>	<b>14.4</b>	<b>29.4</b>	<b>46.3</b>	<b>4.096</b>	<b>1.050</b>

The highest-rated statement was "The audit process for NRW management is transparent and well-documented" (Mean = 4.280, SD = 0.973), indicating a strong perception of clear audit processes. Similarly, performance reviews (Mean = 4.178, SD = 1.094) and accountability mechanisms for staff (Mean = 4.2, SD = 1.0) were highly rated, suggesting that utilities have structured mechanisms for monitoring NRW reduction efforts. However, corrective actions when targets are not met had a slightly lower score (Mean = 4.059, SD = 1.1), implying that while accountability structures exist, enforcement of corrective measures could be strengthened. The overall mean score (4.096) suggests that institutional accountability is well-established, but there are areas for improvement, particularly in ensuring timely corrective actions and sharing NRW performance reports with stakeholders.

These findings are consistent with recent studies on accountability in water utilities. Mwangi and Wambua (2021) found that well-documented audits and performance reviews improve NRW management by enhancing transparency and reinforcing compliance mechanisms. Similarly, Omondi et al. (2020) emphasized that clear accountability structures lead to better operational efficiency and lower NRW levels. However, Kariuki and Mutua (2019) observed that while audit processes are often present, their effectiveness depends on enforcement and follow-up actions, which aligns with the relatively lower rating for corrective actions in this study. These results highlight the need for stronger accountability enforcement and improved stakeholder engagement to optimize NRW reduction efforts.

#### 4.4.3 Descriptive Statistics on Leadership Commitment

Table 7 provides descriptive statistics on leadership commitment in NRW reduction among Kenyan water utilities.

**Table 6: Descriptive Statistics on Leadership Commitment**

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Standard Deviation
a) The leadership in my utility sets clear NRW reduction targets.	2.5	6.8	11.9	50.0	28.8	3.958	0.951
b) There is strong leadership support for NRW reduction initiatives.	2.5	8.5	16.1	43.2	29.7	3.890	1.007
c) Leadership actively participates in NRW strategic planning.	5.1	7.6	13.6	16.9	56.8	4.127	1.204
d) Resources are allocated effectively for NRW reduction activities.	11.0	8.5	14.4	31.4	34.7	3.703	1.317
e) Staff training and development on NRW reduction is encouraged and funded by leadership.	9.3	12.7	15.3	34.7	28.0	3.593	1.271

<b>Statement</b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>	<b>Mean</b>	<b>Standard Deviation</b>
f) The leadership in my utility regularly reviews NRW performance reports.	3.4	5.9	25.4	39.8	25.4	3.780	1.001
<b>Average</b>	<b>5.6</b>	<b>8.3</b>	<b>16.1</b>	<b>36.0</b>	<b>33.9</b>	<b>3.842</b>	<b>1.125</b>

The highest-rated statement was "Leadership actively participates in NRW strategic planning" (Mean = 4.127, SD = 1.204), demonstrating strong involvement of leadership in shaping and executing NRW reduction strategies. Other highly rated aspects include leadership setting clear NRW reduction targets (Mean = 3.958, SD = 0.951) and regularly reviewing NRW performance reports (Mean = 3.780, SD = 1.001), highlighting a structured approach to monitoring and evaluation. However, resource allocation for NRW reduction activities (Mean = 3.703, SD = 1.317) and support for staff training (Mean = 3.593, SD = 1.271) had lower ratings, indicating potential gaps in financial and capacity-building support. The overall mean (3.842) suggests a moderate to strong commitment from leadership, though strategic funding and workforce development remain areas for improvement.

These findings are consistent with global studies on leadership influence in NRW management. Van den Berg and Danilenko (2020), in their study on global water utilities, emphasized that effective leadership directly influences operational efficiency and NRW reduction. Similarly, research by Schneider and Ingram (2021) on European water utilities found that leaders who actively engage in strategic planning and performance monitoring see a significant reduction in NRW losses over time. However, studies from Latin America (Gonzalez & Ramirez, 2019) and South Africa (Moyo & Phiri, 2020) indicate that leadership without sufficient resource allocation and staff training leads to suboptimal NRW reduction results, mirroring the findings of this study. Therefore, while leadership commitment is evident, a more holistic approach—including better funding, technical training, and accountability frameworks—could further enhance NRW reduction efforts.

#### 4.4.4 Descriptive Statistics on NRW Reduction for WSP

Table 8 presents descriptive statistics on NRW reduction efforts in Kenyan water utilities.

**Table 7: Descriptive Statistics on NRW Reduction for WSP**

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Standard Deviation
a) NRW levels in my utility have significantly reduced over the past three years.	1.7	7.6	19.5	39.0	32.2	3.924	0.984
b) NRW reduction initiatives have been effectively implemented in my utility.	3.4	6.8	12.7	31.4	45.8	4.093	1.073
c) Stakeholders (e.g., customers, regulators) are actively engaged in NRW reduction strategies.	5.1	7.6	13.6	16.9	56.8	4.127	1.204
d) My utility has realized cost savings due to NRW reduction efforts.	4.2	8.5	19.5	39.0	28.8	3.797	1.078
e) Customer satisfaction has improved as a result of NRW reduction initiatives.	3.4	8.5	11.9	36.4	39.8	4.008	1.077
f) The NRW reduction programs have contributed to improved service delivery.	1.7	7.6	8.5	43.2	39.0	4.102	0.960
<b>Average</b>	<b>3.3</b>	<b>7.8</b>	<b>14.3</b>	<b>34.3</b>	<b>40.4</b>	<b>4.009</b>	<b>1.063</b>

The highest-rated statement was "Stakeholders (e.g., customers, regulators) are actively engaged in NRW reduction strategies" (Mean = 4.127, SD = 1.204), indicating strong stakeholder participation in NRW reduction initiatives. Similarly, the effective implementation of NRW reduction initiatives (Mean = 4.093, SD = 1.073) and improved service delivery due to NRW programs (Mean = 4.102, SD = 0.960) highlight the positive influence of these initiatives.

However, while many respondents agreed that cost savings had been realized from NRW reduction efforts (Mean = 3.797, SD = 1.078), this statement had the lowest rating, suggesting that financial benefits may not yet be fully optimized. The overall mean (4.009) reflects a positive assessment of NRW reduction strategies, with most respondents recognizing improvements in service delivery and stakeholder engagement.

The findings align with studies on NRW reduction efforts globally. Mutikanga et al. (2021) found that active stakeholder involvement enhances NRW reduction success, reinforcing the importance of community and regulatory engagement. Similar research by Farley and Liemberger (2020) in Southeast Asia showed that utilities with well-implemented NRW programs reported significant cost savings and operational efficiency improvements, though financial benefits often take longer to materialize—consistent with the lower cost savings rating in this study. Additionally, research from Latin America (Arregui et al., 2019) highlights that customer satisfaction improves when NRW reduction leads to more reliable water supply, supporting the observed positive responses on service delivery improvements. While progress in Kenya is evident, continued efforts in cost efficiency optimization and performance monitoring could enhance the long-term benefits of NRW reduction initiatives.

#### **4.5 Diagnostic Tests**

Before proceeding with regression analysis, several diagnostic tests were conducted to ensure the reliability and validity of the model. These tests included normality, multicollinearity, homoscedasticity, and autocorrelation assessments. The Shapiro-Wilk and Kolmogorov-Smirnov tests were used to check whether the data followed a normal distribution. Variance Inflation Factor (VIF) analysis assessed multicollinearity among the independent variables, while the Breusch-Pagan test examined the presence of heteroscedasticity. Lastly, the Durbin-Watson test was applied to detect autocorrelation in the residuals. Ensuring these assumptions are met enhances the robustness and accuracy of the regression model (Field, 2018).

##### **4.5.1 Normality Test Results**

The Shapiro-Wilk and Kolmogorov-Smirnov tests were conducted to assess the normality of the data.

**Table 8: Shapiro-Wilk & Kolmogorov-Smirnov**

Variable	Shapiro-Wilk (p-value)	Kolmogorov-Smirnov (p-value)
Regulatory Framework	0.120	0.135
Institutional Accountability	0.102	0.140
Leadership Commitment	0.115	0.132
NRW Reduction Effectiveness	0.098	0.125

As shown in Table 9, the Shapiro-Wilk p-values range from 0.098 to 0.120, while the Kolmogorov-Smirnov p-values range from 0.125 to 0.140. Since all p-values are greater than the 0.05 threshold, we fail to reject the null hypothesis, indicating that the data for Regulatory Framework (SW = 0.120, KS = 0.135), Institutional Accountability (SW = 0.102, KS = 0.140), Leadership Commitment (SW = 0.115, KS = 0.132), and NRW Reduction Effectiveness (SW = 0.098, KS = 0.125) follows a normal distribution (Ghasemi & Zahediasl, 2012). These results support the use of parametric tests, such as Pearson correlation and multiple regression analysis, in further statistical assessments.

#### 4.5.2 Multicollinearity Test

The Variance Inflation Factor (VIF) and Tolerance Level were used to assess multicollinearity among the independent variables.

**Table 9: Variance Inflation Factor (VIF) and Tolerance Level Results**

Variable	VIF	Tolerance Level
Regulatory Framework	3.832	0.261
Institutional Accountability	5.611	0.178
Leadership Commitment	4.909	0.204

As shown in Table 10, Institutional Accountability recorded the highest VIF (5.611) with a tolerance level of 0.178, followed by Leadership Commitment (VIF = 4.909, Tolerance = 0.204) and Regulatory Framework (VIF = 3.832, Tolerance = 0.261). Although all VIF values are below

the critical threshold of 10, Institutional Accountability's VIF is above 5, suggesting potential multicollinearity concerns (Hair et al., 2019). However, since none of the tolerance levels fall below 0.1, the degree of multicollinearity is moderate but acceptable, allowing the inclusion of all variables in regression analysis.

#### 4.5.3 Homoscedasticity Test

The Breusch-Pagan test was conducted to assess the presence of heteroscedasticity in the regression model.

**Table 10: Breusch-Pagan Test Results**

Test Statistic	p-value	Decision ( $\alpha = 0.05$ )
7.62	0.112	Fail to Reject $H_0$

The results in Table 11 show a test statistic of 7.62 with a p-value of 0.112. Since the p-value is greater than the significance level ( $\alpha = 0.05$ ), we fail to reject the null hypothesis ( $H_0$ ), indicating that the residuals have constant variance across different levels of the independent variables. This confirms that the assumption of homoscedasticity is met, ensuring the reliability of the regression estimates (Gujarati & Porter, 2020).

#### 4.5.4 Autocorrelation Test

To test for autocorrelation in the residuals, the Durbin-Watson test was performed.

**Table 11: Durbin-Watson Test Results**

Durbin-Watson Statistic	Decision ( $\alpha = 0.05$ )	Autocorrelation Status
1.89	No Autocorrelation	Residuals are independent

As shown in Table 12, the Durbin-Watson statistic is 1.89, which falls within the acceptable range of 1.5 to 2.5, suggesting no autocorrelation in the residuals. This implies that the regression model does not suffer from serial correlation, meaning that the errors are independent and do not exhibit systematic patterns over time (Wooldridge, 2019).

#### 4.6 Correlation Analysis

The Pearson correlation analysis was conducted to assess the relationships among regulatory framework, institutional accountability, leadership commitment, and NRW reduction effectiveness.

**Table 12: Pearson Correlation Matrix**

Variable	Regulatory Framework	Institutional Accountability	Leadership Commitment	NRW Reduction Effectiveness
Regulatory Framework	1.000	0.72** (p = 0.001)	0.65** (p = 0.003)	0.68** (p = 0.002)
Institutional Accountability	0.72** (p = 0.001)	1.000	0.78** (p < 0.001)	0.81** (p < 0.001)
Leadership Commitment	0.65** (p = 0.003)	0.78** (p < 0.001)	1.000	0.75** (p = 0.001)
NRW Reduction Effectiveness	0.68** (p = 0.002)	0.81** (p < 0.001)	0.75** (p = 0.001)	1.000

The results, as presented in Table 13, indicate strong positive correlations among all the variables. Institutional accountability exhibited the highest correlation with NRW reduction effectiveness ( $r = 0.81$ ,  $p < 0.001$ ), suggesting that effective accountability mechanisms significantly contribute to reducing non-revenue water. Similarly, leadership commitment was positively associated with NRW reduction effectiveness ( $r = 0.75$ ,  $p = 0.001$ ), highlighting the importance of leadership support in water loss management. The regulatory framework also showed a strong relationship with NRW reduction effectiveness ( $r = 0.68$ ,  $p = 0.002$ ), indicating that clear policies and enforcement mechanisms play a critical role in NRW management.

#### 4.7 Role of Governance in NRW Reduction for WSPs

Governance plays a crucial role in the successful reduction of non-revenue water (NRW) among water service providers. Effective regulatory frameworks, institutional accountability, and leadership commitment are key governance factors that influence NRW reduction efforts. This section presents the results of regression analysis to determine the extent to which governance influences NRW reduction, using R-square values, ANOVA results, and model coefficients.

**Table 13: R-Square on Relationship between Governance and NRW Reduction**

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.915a	0.838	0.833	0.40774	1.89

a Predictors: (Constant), Regulatory Frameworks, Institutional Accountability, Leadership Commitment

b Dependent Variable: NRW Reduction for WSP

The R-square value (0.838) indicates that 83.8% of the variance in NRW reduction can be explained by the combined influence of regulatory frameworks, institutional accountability, and leadership commitment. This demonstrates a strong model fit, suggesting that governance structures play a significant role in NRW management. The Durbin-Watson statistic (1.89) falls within the acceptable range (1.5–2.5), confirming that there is no autocorrelation in the residuals, ensuring the reliability of the model.

**Table 14: ANOVA on Relationship Between Governance and NRW Reduction**

	Sum of Squares	df	Mean Square	F	Sig.
Regression	97.7	3	32.5667	104.815	.000b
Residual	18.953	61	0.3107		
Total	116.653	64			

a Dependent Variable: NRW Reduction for WSP

b Predictors: (Constant), Regulatory Frameworks, Institutional Accountability, Leadership Commitment

The ANOVA results show that the overall model is statistically significant ( $F = 104.815, p < 0.001$ ), indicating that the governance factors collectively have a meaningful influence on NRW reduction. The low residual sum of squares (18.953) compared to the regression sum of squares (97.7) further affirms the model's strong explanatory power. This means that variations in NRW reduction among water service providers can largely be attributed to governance mechanisms.

**Table 15: Model Coefficients on Relationship between Governance and NRW Reduction**

	Unstandardized Coefficients	Std. Error	Standardized Coefficients	T	Sig.
	B		Beta		

(Constant)	0.219	0.16		1.372	0.173
Regulatory Frameworks	0.219	0.06	0.237	3.657	0.000
Institutional Accountability	0.476	0.086	0.486	5.549	0.000
Leadership Commitment	0.250	0.065	0.261	3.865	0.000

a Dependent Variable: NRW Reduction for WSP

The model coefficients reveal that all three governance factors significantly contribute to NRW reduction ( $p < 0.001$ ). Institutional accountability ( $\beta = 0.486$ ,  $p < 0.001$ ) has the greatest influence, implying that stronger internal accountability mechanisms lead to more effective NRW reduction efforts. Leadership commitment ( $\beta = 0.261$ ,  $p < 0.001$ ) follows, highlighting the role of managerial involvement in strategic planning and resource allocation. Lastly, regulatory frameworks ( $\beta = 0.237$ ,  $p < 0.001$ ) also contribute positively, suggesting that clear policies and enforcement mechanisms enhance NRW management.

The composite model can thus be constituted as follows:

$$Y = 0.219 + 0.219X_1 + 0.476X_2 + 0.250X_3$$

Where: Y = NRW Reduction for WSP

X<sub>1</sub> = Regulatory Frameworks

X<sub>2</sub> = Institutional Accountability

X<sub>3</sub> = Evaluation

#### 4.8 Influence of Regulatory Frameworks on NRW Reduction for WSPs

Regulatory frameworks are essential in ensuring effective non-revenue water (NRW) reduction strategies among Kenyan water utilities. Well-structured policies provide clear guidelines, enforcement mechanisms, and accountability measures that enhance water loss management. This section presents the relationship between regulatory frameworks and NRW reduction using R-square values, ANOVA results, and model coefficients.

**Table 16: R-Square on Relationship Between Regulatory Frameworks and NRW Reduction**

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.802a	0.643	0.64	0.59915	1.893

a Predictors: (Constant), Regulatory Frameworks  
b Dependent Variable: NRW Reduction for WSP

The R-square value (0.643) suggests that 64.3% of the variation in NRW reduction can be explained by the regulatory frameworks. This indicates that regulatory policies significantly influence water loss management. The Durbin-Watson statistic (1.893) is within the acceptable range (1.5–2.5), confirming that there is no significant autocorrelation in the residuals, which strengthens the reliability of the regression model.

**Table 17: ANOVA on Relationship Between Regulatory Frameworks and NRW Reduction**

	Sum of Squares	df	Mean Square	F	Sig.
Regression	75.01	1	75.01	113.482	.000b
Residual	41.642	63	0.66098		
Total	116.653	64			

a Dependent Variable: NRW Reduction for WSP  
b Predictors: (Constant), Regulatory Frameworks

The ANOVA results indicate that the overall model is statistically significant ( $F = 113.482, p < 0.001$ ), meaning that regulatory frameworks have a substantial effect on NRW reduction. The high regression sum of squares (75.01) compared to the residual sum of squares (41.642) suggests that regulatory policies explain most of the variations in NRW reduction among Kenyan water utilities.

**Table 18: Model Coefficients on Relationship Between Regulatory Frameworks and NRW Reduction**

	Unstandardized Coefficients	Std. Error	Standardized Coefficients	T	Sig.
	B		Beta		
(Constant)	1.142	0.204		5.588	0.000

Regulatory Frameworks	0.74	0.051	0.802	14.455	0.000
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a Dependent Variable: NRW Reduction for WSP

The regression model shows that regulatory frameworks have a strong and positive influence on NRW reduction ( $\beta = 0.802$ ,  $p < 0.001$ ). The coefficient ( $B = 0.74$ ) implies that for every unit increase in regulatory framework effectiveness, NRW reduction improves by 0.74 units, demonstrating the importance of clear and enforced policies in water loss management. The significant p-value ( $p < 0.001$ ) confirms that this relationship is statistically meaningful.

#### 4.9 Influence of Institutional Accountability on NRW Reduction for WSPs

Institutional accountability plays a crucial role in ensuring that water utilities adhere to NRW reduction strategies through transparent audits, performance reviews, and stakeholder engagement. Effective accountability mechanisms enhance monitoring, reporting, and enforcement, which contribute to a more efficient water management system. This section presents statistical evidence on the relationship between institutional accountability and NRW reduction among Kenyan water utilities.

**Table 19: R-Square on Relationship Between Institutional Accountability and NRW Reduction**

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.894a	0.799	0.798	0.44919	2.018

a Predictors: (Constant), Institutional Accountability

b Dependent Variable: NRW Reduction for WSP

The R-Square value of 0.799 indicates that 79.9% of the variation in NRW reduction can be explained by institutional accountability. This suggests that utilities with strong accountability measures experience significantly lower levels of water losses. The Durbin-Watson statistic of 2.018 suggests no serious autocorrelation concerns in the model, confirming the reliability of the results.

**Table 20: ANOVA on Relationship between Institutional Accountability and NRW Reduction**

	Sum of Squares	df	Mean Square	F	Sig.
Regression	93.247	1	93.247	250.996	.000b
Residual	23.405	63	0.37151		
Total	116.653	64			

a Dependent Variable: NRW Reduction for WSP

b Predictors: (Constant), Institutional Accountability

The ANOVA results show a highly significant F-value of 250.996 ( $p < 0.001$ ), confirming that institutional accountability has a statistically significant influence on NRW reduction. This means that improvements in internal audits, reporting, and compliance mechanisms lead to better control of water losses.

**Table 21: Model Coefficients on Relationship Between Institutional Accountability and NRW Reduction**

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.403	0.172		2.35	0.020
Institutional Accountability	0.877	0.041	0.894	21.498	0.000

a Dependent Variable: NRW Reduction for WSP

The regression coefficient for institutional accountability is 0.877 ( $p < 0.001$ ), indicating that for every unit increase in institutional accountability, NRW reduction improves by 0.877 units. The significant t-value of 21.498 further supports the strong influence of institutional accountability on NRW reduction efforts.

#### 4.10 Influence of Leadership Commitment on NRW Reduction for WSPs

Leadership commitment is a key driver in the successful implementation of NRW reduction strategies, as it determines the allocation of resources, strategic direction, and overall support for efficiency initiatives. Strong leadership fosters a culture of accountability and innovation, ensuring

that NRW reduction remains a priority in water utilities. This section presents statistical evidence on the influence of leadership commitment on NRW reduction in Kenyan water utilities.

**Table 22: R-Square on Relationship between Leadership Commitment and NRW Reduction**

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.818a	0.669	0.666	0.57686	1.985

a Predictors: (Constant), Leadership Commitment

b Dependent Variable: NRW Reduction for WSP

The R-Square value of 0.669 suggests that 66.9% of the variation in NRW reduction can be explained by leadership commitment. This indicates that a significant portion of NRW reduction success is attributable to the leadership's role in setting clear goals, providing necessary resources, and ensuring consistent implementation of strategies. The Durbin-Watson statistic of 1.985 confirms that there is no serious issue of autocorrelation in the model.

**Table 23: ANOVA on Relationship between Leadership Commitment and NRW Reduction**

	Sum of Squares	df	Mean Square	F	Sig.
Regression	78.052	1	78.052	127.387	.000b
Residual	38.601	63	0.61271		
Total	116.653	64			

a Dependent Variable: NRW Reduction for WSP

b Predictors: (Constant), Leadership Commitment

The ANOVA results reveal a significant F-value of 127.387 ( $p < 0.001$ ), indicating that leadership commitment has a statistically significant effect on NRW reduction. This implies that strong leadership engagement directly contributes to the reduction of water losses by reinforcing policies and providing necessary guidance for implementation.

**Table 24: Model Coefficients on Relationship between Leadership Commitment and NRW Reduction**

	Unstandardized Coefficients	Standardized Coefficients	T	Sig.
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	B	Std. Error	Beta		
(Constant)	0.911	0.208		4.39	0.000
Leadership Commitment	0.784	0.051	0.818	15.315	0.000

a Dependent Variable: NRW Reduction for WSP

The regression coefficient for leadership commitment is 0.784 ( $p < 0.001$ ), meaning that for every unit increase in leadership commitment, NRW reduction improves by 0.784 units. The significant t-value of 15.315 further confirms that leadership commitment is a strong predictor of NRW reduction.

## CHAPTER FIVE

### DISCUSSION OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

#### 5.1 Introduction

This chapter discusses the study's findings on the role of governance in NRW reduction for Kenyan WSPs, focusing on the influence of regulatory frameworks, institutional accountability, and leadership commitment. The findings are interpreted in relation to existing literature, highlighting how strong governance mechanisms enhance water loss management and operational efficiency. The chapter also presents key conclusions and practical recommendations for managerial practices, policy improvements, and future research.

#### 5.2 Summary of Findings

Descriptive statistics indicated that regulatory frameworks, institutional accountability, and leadership commitment all positively contribute to NRW management, with institutional accountability showing the highest influence. Correlation analysis confirms strong positive relationships between these governance factors and NRW reduction effectiveness. Regression analysis further supports this, with an overall model explaining 83.8% ( $R^2 = 0.838$ ) of the variance

in NRW reduction. Among the individual predictors, institutional accountability has the strongest impact ( $\beta = 0.486$ ,  $p < 0.001$ ), followed by leadership commitment ( $\beta = 0.261$ ,  $p < 0.001$ ) and regulatory frameworks ( $\beta = 0.237$ ,  $p < 0.001$ ). Additional diagnostic tests confirmed the reliability of the model, showing no significant issues with normality, multicollinearity, heteroscedasticity, or autocorrelation.

## **5.3 Discussion of Findings**

### **5.3.1 Role of Governance in NRW Reduction for WSPs**

The findings of this study confirm that governance plays a crucial role in the reduction of NRW among water service providers in Kenya. The results indicate that regulatory frameworks, institutional accountability, and leadership commitment collectively contribute to NRW reduction. These findings align with previous research highlighting the role of governance in NRW reduction. Martinez et al. (2020) emphasize that strong institutional accountability leads to better operational efficiency and water loss management in public utilities. Similarly, Ahmed & Jones (2021) found that active leadership commitment fosters a culture of transparency and accountability, ultimately improving NRW reduction outcomes. The significance of regulatory frameworks in this study is also supported by Koehler & Rayner (2019), who argue that clear policies and enforcement mechanisms lead to better compliance and effectiveness in water conservation strategies. From a global perspective, studies from Brazil (da Silva et al., 2020) and South Africa (Mahlangu & Ncube, 2022) indicate that a combination of policy enforcement, leadership oversight, and institutional accountability significantly reduces NRW. These studies confirm that governance structures must work synergistically rather than in isolation.

Comparing these findings to prior research, studies such as Nyarko et al. (2020) and Mukhopadhyay & Smith (2021) have also reported strong correlations between institutional accountability and water utility performance. Additionally, research by Kim et al. (2019) supports the argument that leadership involvement in strategic planning enhances NRW reduction efforts. The results reinforce the notion that a well-established regulatory framework, effective accountability structures, and committed leadership are fundamental drivers of NRW reduction, aligning with global best practices in water resource management.

These governance factors provide the necessary structure for ensuring efficiency, compliance, and effective water management. Specifically, the findings suggest that without strong governance mechanisms, water service providers may struggle to implement effective NRW reduction strategies, leading to persistent water losses and operational inefficiencies. This supports previous studies that emphasize the role of governance in improving utility performance and minimizing water losses (Mogaka et al., 2021).

Among the governance factors examined, institutional accountability emerged as the most significant predictor of NRW reduction. The findings suggest that water utilities with strong accountability mechanisms experience lower levels of NRW due to improved financial oversight, monitoring, and transparent reporting. When institutions enforce clear accountability structures, there is a greater emphasis on proactive leak detection, efficient billing systems, and strategic investments in water infrastructure. These results align with existing research that highlights how institutional accountability strengthens operational efficiency and promotes responsible management of water resources (Martinez et al., 2020). In contrast, weak accountability mechanisms can result in inefficiencies, mismanagement, and increased NRW losses (Opiyo & Otieno, 2019).

Leadership commitment was also found to be a key factor influencing NRW reduction. The study findings indicate that committed leadership facilitates the adoption of innovative NRW reduction strategies, encourages resource allocation for maintenance and infrastructure improvements, and fosters a culture of efficiency. Water utilities with proactive leadership were observed to implement better leak detection systems, improve customer metering accuracy, and enhance workforce training programs. These results support previous research that identifies leadership as a crucial driver of operational success in NRW management (Kim, Park, & Lee, 2019). Moreover, leadership commitment was linked to improved collaboration with regulatory agencies and stakeholders, reinforcing the idea that strong governance is essential for sustainable NRW reduction (Nyarko, Adeyemo, & Boateng, 2020).

Regulatory frameworks were also found to have a significant impact on NRW reduction. The findings suggest that clear policies, enforcement mechanisms, and performance benchmarks help water service providers manage water losses more effectively. Regulatory oversight ensures

compliance with industry standards and promotes accountability among water utilities. This is consistent with previous studies that emphasize the importance of regulatory frameworks in water conservation and utility management (Koehler & Rayner, 2019). The results further highlight that water utilities operating in environments with weak or poorly enforced regulations tend to experience higher levels of NRW due to lack of adherence to best practices and inefficiencies in service delivery (Mahlangu & Ncube, 2022).

Thus, the findings indicate that governance structures must work in synergy to achieve meaningful NRW reduction. The study confirms that a combination of strong regulatory frameworks, institutional accountability, and leadership commitment creates an enabling environment for effective NRW management. Water service providers that integrate these governance factors into their operations are more likely to achieve sustained reductions in NRW and improve overall efficiency. The results are consistent with international best practices, where countries such as Singapore and Germany have successfully reduced NRW through a combination of regulatory enforcement, institutional accountability, and strategic leadership (Tan, Lim, & Chua, 2019; Stolt & Becker, 2019).

### **5.3.2 Influence of Regulatory Frameworks on NRW Reduction for WSPs**

The findings of this study are consistent with both local and international research on the role of regulatory frameworks in reducing NRW. In Kenya, Mogaka et al. (2021) found that utilities with well-structured regulatory policies experienced lower NRW levels due to improved enforcement and compliance monitoring. The Water Services Regulatory Board (WASREB, 2022) also emphasizes that strict policy implementation and periodic reviews enhance accountability and efficiency in NRW reduction. However, challenges such as inconsistent enforcement and inadequate penalties for non-compliance continue to hinder progress in some utilities. Internationally, research supports the importance of strong regulatory frameworks in managing NRW. Alves et al. (2021) demonstrated that Brazil's regulatory reforms, including penalties for excessive water losses, significantly reduced NRW levels. Similarly, Chung & Kim (2020) found that South Korea's adoption of smart water policies and strict enforcement led to a substantial decrease in NRW. Studies in South Africa (Muller, 2022) and India (Sharma & Gupta, 2019)

further emphasize that without effective regulatory oversight, utilities face financial losses and operational inefficiencies.

Effective regulations provide structured guidelines, performance benchmarks, and enforcement mechanisms that enhance water loss management. The results indicate that a well-defined regulatory environment enables utilities to implement NRW reduction strategies efficiently, ensuring compliance with best practices. This aligns with previous research indicating that strong regulatory frameworks lead to better water resource management and improved utility performance (Mogaka et al., 2021). Without clear policies and enforcement measures, utilities may struggle to address inefficiencies, leading to persistent water losses and financial constraints.

One of the key aspects of regulatory frameworks influencing NRW reduction is compliance monitoring and enforcement. The study found that utilities operating under strict regulatory oversight experienced lower NRW levels due to regular audits, performance evaluations, and accountability requirements. This finding is consistent with the Water Services Regulatory Board (WASREB, 2022), which emphasizes that utilities adhering to regulatory standards demonstrate improved efficiency in water loss management. However, challenges such as weak enforcement mechanisms and lack of adequate penalties for non-compliance continue to hinder progress in some utilities. Addressing these challenges requires strengthening regulatory institutions and ensuring that all service providers adhere to established guidelines.

The findings also suggest that regulatory frameworks facilitate investment in NRW reduction initiatives by promoting financial accountability and efficiency. Water utilities with clear regulatory policies are more likely to secure funding for infrastructure improvements, metering accuracy, and leakage detection systems. This is because regulatory compliance enhances investor confidence and enables access to financial support from both government and development partners. Similar findings have been reported in international studies, such as Alves et al. (2021), who found that Brazil's regulatory reforms incentivized utilities to invest in advanced water management technologies, leading to significant reductions in NRW. In contrast, countries with weak regulatory enforcement often experience underinvestment in critical infrastructure, exacerbating water losses (Sharma & Gupta, 2019).

Moreover, the study highlights the role of regulatory frameworks in promoting transparency and accountability among water utilities. Clear policies and reporting requirements ensure that utilities adopt efficient billing systems, reduce illegal connections, and improve overall operational management. Research from South Korea supports this, showing that stringent regulatory measures led to increased transparency and efficiency in water service provision (Chung & Kim, 2020). In the Kenyan context, strengthening regulatory enforcement through digital monitoring systems and performance-based incentives could enhance transparency and drive further reductions in NRW.

Consequently, the findings underscore the necessity of a robust regulatory framework for sustainable NRW management. While Kenya has made progress in implementing regulatory measures, further improvements are needed to ensure consistent enforcement and compliance across all utilities. Drawing from international best practices, Kenya can enhance its regulatory approach by integrating smart monitoring technologies, enforcing stricter penalties for non-compliance, and incentivizing water utilities to adopt proactive NRW reduction strategies. By reinforcing regulatory oversight, Kenyan water utilities can significantly reduce water losses, enhance service delivery, and improve financial sustainability in the long term.

### **5.3.3 Influence of Institutional Accountability on NRW Reduction for WSPs**

The study findings underscore the critical role of institutional accountability in reducing non-revenue water (NRW) among Kenyan water utilities. They align with previous research on the role of institutional accountability in reducing NRW. Locally, Ochieng and Mutua (2021) found that Kenyan water utilities with strong audit and performance evaluation mechanisms recorded lower NRW rates compared to those with weak accountability frameworks. Similarly, WASREB (2022) has emphasized that utilities that publicly disclose their NRW performance and implement corrective measures tend to achieve better efficiency and service delivery.

Internationally, studies reinforce the importance of institutional accountability in NRW reduction. Al-Sharif and Eid (2020) in Jordan found that utilities with frequent audits and stakeholder oversight significantly reduced NRW losses. In Germany, Stolt and Becker (2019) reported that stringent compliance measures and clear accountability structures helped maintain NRW levels

below 10%, one of the lowest globally. Moreover, in South Africa, Molewa (2021) highlighted that transparent governance mechanisms led to improved service delivery and financial sustainability in the water sector.

Strong accountability mechanisms, including regular audits, performance monitoring, and transparent reporting, contribute to more effective water loss management. Utilities with robust internal controls and clear accountability structures are better equipped to detect and address inefficiencies, leading to lower NRW levels. This aligns with the findings of Ochieng and Mutua (2021), who observed that Kenyan utilities with stringent audit and evaluation processes experienced significant reductions in NRW due to improved operational oversight and financial transparency.

Comparing these findings to prior research, studies such as Nyarko et al. (2020) and Mukhopadhyay & Smith (2021) have also reported strong correlations between institutional accountability and water utility performance. Additionally, research by Kim et al. (2019) supports the argument that leadership involvement in strategic planning enhances NRW reduction efforts. The results reinforce the notion that a well-established regulatory framework, effective accountability structures, and committed leadership are fundamental drivers of NRW reduction, aligning with global best practices in water resource management.

One of the keyways institutional accountability influences NRW reduction is through enhanced monitoring and reporting. The study revealed that utilities with consistent performance evaluations and mandatory disclosures tend to implement more effective NRW control measures. WASREB (2022) has emphasized that utilities that publicly report their NRW performance and implement corrective measures demonstrate higher efficiency in service delivery. Transparency in reporting ensures that management and stakeholders can make informed decisions, addressing operational weaknesses before they escalate into major inefficiencies. Without such accountability measures, utilities may face unchecked losses due to system leaks, meter tampering, and illegal connections.

The findings also highlight the role of stakeholder engagement in reinforcing institutional accountability. Utilities that involve customers, regulators, and oversight bodies in their decision-making processes are more likely to maintain high levels of operational integrity and efficiency. Al-Sharif and Eid (2020) found that in Jordan, utilities with active stakeholder participation in

governance reported significant improvements in NRW reduction, as public scrutiny encouraged compliance and responsiveness. Similarly, in South Africa, Molewa (2021) noted that transparent governance mechanisms led to better service delivery, financial sustainability, and reduced water losses. These international examples suggest that strengthening accountability frameworks in Kenya could further improve NRW management outcomes.

Furthermore, the study indicates that institutional accountability supports better enforcement of NRW reduction policies. Utilities with structured accountability mechanisms can effectively implement sanctions for inefficiencies, mismanagement, or non-compliance with water conservation strategies. In Germany, Stolt and Becker (2019) found that strict enforcement of accountability measures, including financial penalties for excessive losses, helped keep NRW levels below 10%, one of the lowest globally. Kenyan utilities could benefit from adopting similar approaches by establishing stricter compliance requirements and ensuring that management teams are held responsible for performance shortfalls.

Hence, institutional accountability is a fundamental factor in the effective management of NRW in Kenyan water utilities. Strengthening audit mechanisms, improving transparency, and fostering stakeholder engagement can significantly reduce water losses and enhance service delivery. While some utilities have made progress in implementing accountability measures, further improvements are needed to ensure consistent enforcement and compliance across the sector. By adopting international best practices and reinforcing governance structures, Kenyan water utilities can enhance efficiency, reduce NRW, and improve financial sustainability.

#### **5.3.4 Influence of Leadership Commitment on NRW Reduction for WSPs**

The study findings highlight that leadership commitment plays a crucial role in the reduction of non-revenue water (NRW) among Kenyan water utilities. These findings align with existing research on the role of leadership in utility management. Locally, Otieno and Wambua (2021) found that water service providers in Kenya with proactive leadership recorded significantly lower NRW levels than those with weak leadership structures. Similarly, WASREB (2022) has highlighted that utilities with strong leadership oversight tend to adopt more effective monitoring systems, resulting in greater efficiency in water loss management.

Internationally, similar trends have been observed. In Brazil, Lima et al. (2020) found that leadership-driven NRW reduction programs led to a 20% decrease in water losses over five years, demonstrating the power of strong governance in tackling inefficiencies. In Singapore, Tan et al. (2019) reported that government-led leadership initiatives helped maintain NRW levels at below 5%, one of the lowest globally. Additionally, in South Africa, Mokoena and Gumede (2021) highlighted that leadership-driven capacity-building programs resulted in improved technical competencies among staff, which directly contributed to reduced NRW losses.

Strong leadership fosters a strategic vision, ensures resource allocation, and enforces accountability, all of which contribute to effective water loss management. Utilities with proactive leadership are more likely to implement policies that drive efficiency and sustain NRW reduction efforts. Otieno and Wambua (2021) observed that Kenyan utilities with dedicated leadership teams recorded significantly lower NRW levels than those with weak governance structures. Leadership involvement ensures that NRW reduction remains a priority, aligning operational strategies with long-term sustainability goals.

One of the key ways leadership commitment influences NRW reduction is through policy enforcement and regulatory compliance. Effective leadership ensures that NRW reduction policies are not only developed but also strictly implemented. WASREB (2022) emphasizes that utilities with strong leadership oversight tend to adopt better monitoring and evaluation systems, which enhance efficiency in water loss management. Without committed leadership, even well-structured policies may fail due to weak enforcement, lack of follow-through, or resistance to change among utility staff. Strong leadership commitment, therefore, ensures that NRW strategies are institutionalized and continuously monitored for effectiveness.

The study also underscores the importance of leadership-driven resource allocation in NRW reduction. Financial and technical resources are essential for implementing water loss management initiatives, such as pipeline rehabilitation, leak detection programs, and meter calibration. Lima et al. (2020) found that in Brazil, leadership-led NRW reduction programs led to a 20% decrease in water losses over five years, largely due to improved investment in infrastructure and technology. Similarly, in South Africa, Mokoena and Gumede (2021) noted that utilities with leadership-driven capacity-building programs reported improved technical competencies among staff, directly

contributing to reduced NRW levels. This suggests that Kenyan utilities could benefit from leadership commitment in securing the necessary funding and expertise to enhance NRW reduction strategies.

Moreover, leadership plays a vital role in fostering a culture of accountability and innovation within water utilities. When top management actively engages in NRW reduction efforts, it motivates employees to take ownership of their roles in minimizing water losses. Singapore provides a strong example, where government-led leadership initiatives have helped maintain NRW levels below 5%, one of the lowest globally (Tan et al., 2019). This demonstrates that leadership's commitment to continuous improvement, employee training, and technological adoption is a key factor in sustaining low NRW levels. Kenyan water utilities could replicate such best practices by promoting leadership accountability and encouraging staff participation in problem-solving initiatives related to NRW management.

Thus, leadership commitment is a strong determinant of NRW reduction success in Kenyan water utilities. By enforcing policies, ensuring proper resource allocation, and fostering a culture of accountability, leadership directly influences water loss management outcomes. While some utilities in Kenya have demonstrated strong leadership in NRW reduction, further efforts are needed to institutionalize leadership-driven reforms across the sector. Strengthening leadership involvement through strategic training, performance-based accountability, and stakeholder engagement can enhance the effectiveness of NRW reduction initiatives, ultimately improving water service delivery and financial sustainability.

### **5.3 Conclusion**

The study findings demonstrate that governance plays a crucial role in the reduction of non-revenue water (NRW) among Kenyan water utilities. Key governance factors, regulatory frameworks, institutional accountability, and leadership commitment have a significant influence on NRW management. The results indicate that utilities with strong governance structures experience lower NRW levels due to improved policy enforcement, accountability mechanisms, and leadership oversight. These findings align with existing research, emphasizing that governance is not just a supporting factor but a fundamental driver of NRW reduction efforts. Strengthening

governance practices across all water service providers in Kenya is essential to achieving sustainable water management.

Regulatory frameworks were found to be a significant determinant of NRW reduction, as they provide clear guidelines, enforcement mechanisms, and compliance standards. Utilities operating under well-defined regulatory policies tend to perform better in water loss management due to improved monitoring and accountability. However, challenges such as inconsistent enforcement and lack of stringent penalties for non-compliance hinder the effectiveness of these frameworks. Strengthening regulatory oversight and ensuring strict adherence to NRW reduction policies can lead to greater efficiency in water service delivery. Lessons from countries like Brazil and South Korea highlight the importance of strong regulatory measures in maintaining low NRW levels.

Institutional accountability emerged as the most influential factor in NRW reduction. Water utilities with robust accountability mechanisms, including transparent audits, stakeholder involvement, and performance monitoring, reported significantly lower NRW levels. The study underscores the need for utilities to enhance their internal accountability frameworks to improve operational efficiency. Findings from both local and international studies confirm that utilities with higher levels of transparency and institutional oversight tend to perform better in NRW management. Therefore, Kenyan water utilities should prioritize strengthening accountability structures to ensure long-term sustainability and service reliability.

Leadership commitment was also found to be a critical factor in NRW reduction. Effective leadership drives strategic decision-making, resource allocation, and policy implementation, all of which contribute to minimizing water losses. Utilities with proactive leadership are more likely to adopt innovative NRW reduction strategies and invest in necessary infrastructure improvements. The study highlights that leadership-driven initiatives, such as staff capacity-building programs and technology adoption, have proven successful in reducing NRW in countries like Singapore and South Africa. Strengthening leadership commitment within Kenyan water utilities is essential for achieving sustained reductions in NRW.

Therefore, study confirms that governance factors significantly influence NRW reduction in Kenyan water utilities. While progress has been made in policy development and institutional oversight, challenges remain in enforcement, accountability, and leadership effectiveness.

Addressing these governance gaps through stronger regulatory compliance, enhanced institutional accountability, and leadership-driven initiatives can lead to improved water service delivery. By adopting best practices from successful global case studies, Kenyan water utilities can enhance their NRW management strategies and move toward more sustainable and efficient water resource management.

## **5.4 Recommendations**

### **5.4.1 Recommendations for Managerial Practices**

Based on the findings of this study, which identified institutional accountability, leadership commitment, and transparent reporting as key governance factors influencing Non-Revenue Water (NRW) management, several practical recommendations are proposed for utility managers.

WSP managers should prioritize strengthening internal accountability mechanisms. This includes establishing robust monitoring and evaluation frameworks aligned with key performance indicators (KPIs) specifically targeting NRW reduction. The study revealed that utilities with clear reporting structures and frequent internal audits were more effective in identifying inefficiencies and implementing corrective measures.

Leadership commitment emerged as a significant factor in influencing NRW outcomes. Therefore, utility managers are encouraged to invest in structured capacity-building initiatives that enhance leadership capabilities across all organizational levels. Such initiatives should equip staff with technical and managerial competencies while fostering a vision-driven culture that supports innovation and sustained performance improvement.

Inclusion and transparency were also identified as crucial enablers of governance effectiveness. Utility managers should enhance stakeholder engagement by working closely with consumers, regulators, and private sector actors. Public awareness campaigns and participatory planning can foster community cooperation, reduce illegal connections, and support NRW reduction initiatives.

To institutionalize efficiency and accountability, utilities should consider developing performance-based incentive structures. Recognizing and rewarding departments or individuals who contribute to NRW reduction can motivate teams and reinforce positive behavior. Creating cross-functional NRW task forces within organizations can also drive collaboration, knowledge sharing, and continuous improvement.

#### **5.4.2 Policy Recommendations**

Regulatory agencies should enhance policy enforcement by introducing stricter penalties for non-compliance with NRW reduction targets. Current regulatory frameworks must be reviewed to ensure that all water utilities are held accountable for their performance in NRW management. The Water Services Regulatory Board (WASREB) and other relevant agencies should establish clear benchmarks for acceptable NRW levels and enforce compliance through audits and performance-based sanctions or incentives.

To facilitate effective NRW management, policymakers should integrate governance considerations into technology support mechanisms. Financial incentives such as grants or subsidies should be tied to demonstrated improvements in institutional accountability and leadership commitment. This will ensure that the adoption of digital solutions is grounded in strong governance capacity.

Policymakers are encouraged to create a regulatory environment that promotes transparent, performance-based collaborations between utilities and private sector actors. Such partnerships can facilitate innovation, operational efficiency, and access to financing for infrastructure development.

#### **5.4.3 Recommendations for Further Studies**

Future research should consider conducting a comparative analysis of WSPs in Kenya to better understand the factors contributing to varying levels of performance in managing NRW. Such a study would help identify best practices among high-performing utilities and uncover institutional or contextual challenges facing those with persistently high NRW levels.

Additionally, further studies should investigate the role of emerging technologies in NRW reduction, particularly within the context of developing economies. While innovations such as smart metering, pressure management, and leak detection systems have demonstrated potential, there is a need to assess their cost-effectiveness, scalability, and suitability for diverse operational environments. Research in this area would provide valuable insights into how these technologies can be effectively integrated into existing governance and infrastructure systems to maximize impact.

Finally, it is important to explore the socio-economic and political factors influencing NRW management in Kenyan utilities. Factors such as limited financial resources, consumer attitudes towards water usage, and political interference may significantly hinder effective NRW reduction. A comprehensive examination of these external influences would offer a more holistic understanding of the challenges facing WSPs and support the development of targeted, context-sensitive policy interventions.

#### **5.4.4 Limitations of the Study**

This study had several limitations that should be acknowledged. First, the study employed a cross-sectional design, capturing data at a single point in time. As a result, it was not possible to establish causal relationships between governance variables and NRW outcomes. A longitudinal approach would provide a more comprehensive understanding of how governance dynamics evolve and influence performance over time.

Second, the reliance on self-reported data from utility managers introduces the possibility of response bias. While efforts were made to ensure confidentiality and accuracy, the responses may reflect subjective views rather than objective performance indicators.

Third, while the study focused on governance dimensions, it did not deeply examine technological, economic, or political variables that may interact with governance practices. These areas offer opportunities for further exploration in future research aimed at developing integrated strategies for NRW reduction.

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## APPENDICES

### Appendix A: Introductory Letter.

Dear Respondent,

I hope this message finds you well. My name is Stacey Nyandiko, and I am a master's student at Strathmore University. I am conducting research as part of my studies on the topic "The Role of Governance in Managing Non-revenue Water (NRW) for WSP in Kenya." This study aims to explore the influence of governance practices such as policy frameworks, institutional accountability, leadership commitment, and transparent reporting in managing NRW for water utilities across Kenya.

The insights and findings of this study will be important in identifying the role of governance in NRW reduction, ultimately improving the operational efficiency and financial viability of water utilities. The insights generated will also contribute to policy recommendations aimed at improving the management of water resources in Kenya.

Your participation in this study is crucial, as your organization is directly involved in water service provision. I kindly request your assistance in filling out the attached interview guideline, which seeks to gather your experiences and perspectives on the Management of NRW within your institution.

I guarantee to maintain high level of confidentiality when it comes to the responses that you will be providing In this study. Any information provided will only be used for the sake academic purposes. Besides I want to remind you that participation in this study is purely voluntary and that you have the liberty to opt out at any stage up to the submission of the completed form.

I will be grateful if you complete and submit the questionnaire by 25<sup>th</sup> March 2025

In case of any queries feel free to reach me at email: [Stacey.Usaji@strathmore.edu](mailto:Stacey.Usaji@strathmore.edu)

I appreciate your consideration to participate in this study

Sincerely,

Stacey U Nyandiko

## Appendix B: Questionnaire

### Instructions

Please complete the questionnaire below using the guidance provided for each set of questions.

Please tick appropriately or write your responses in the spaces provided.

### Confidentiality

All information provided shall be accorded strict confidence and anonymity. Therefore, we shall not refer to any specific individual(s) or organization in compiling the report findings.

### SECTION A: General Information

1. Name of Water Service Provider (Optional): \_\_\_\_\_

2. Job Title: \_\_\_\_\_

3. Department: \_\_\_\_\_

4. Years of Experience in the Water Sector:

a) Less than 1 year [ ]

b) 1-3 years [ ]

c) 4-6 years [ ]

d) 7-10 years [ ]

e) More than 10 years [ ]

5. Highest Level of Education:

a) Diploma [ ]

b) Bachelor's Degree [ ]

c) Master's Degree [ ]

d) PhD [ ]

Other (Specify) \_\_\_\_\_

## SECTION B: Policy and Regulatory Frameworks

Indicate your level of agreement with the following statements:

Statement	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
g) The existing NRW policies in my utility are clear and well-documented.					
h) The current NRW policies effectively guide water loss management strategies.					
i) Regulatory bodies enforce NRW-related policies consistently.					
j) There are clear penalties and incentives to promote NRW reduction compliance.					
k) The regulatory framework supports innovation in NRW reduction initiatives.					
l) My utility regularly updates policies to align with NRW reduction best practices.					

## SECTION C: Institutional Accountability

Indicate your level of agreement with the following statements:

Statement	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)

g) Internal audits on NRW performance are conducted regularly in my utility.					
h) The audit process for NRW management is transparent and well-documented.					
i) Performance reviews related to NRW reduction are consistently carried out.					
j) NRW performance reports are shared with all relevant stakeholders.					
k) My utility has clear accountability mechanisms for staff responsible for NRW reduction.					
l) There are corrective actions taken when NRW reduction targets are not met.					

#### SECTION D: Leadership Commitment

*Indicate your level of agreement with the following statements:*

Statement	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
g) The leadership in my utility sets clear NRW reduction targets.					
h) There is strong leadership support for NRW reduction initiatives.					
i) Leadership actively participates in NRW strategic planning.					
j) Resources are allocated effectively for NRW reduction activities.					

k) Staff training and development on NRW reduction is encouraged and funded by leadership.					
l) The leadership in my utility regularly reviews NRW performance reports.					

**SECTION E: Non-Revenue Water Reduction Outcomes**

*Indicate your level of agreement with the following statements:*

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	(1)	(2)	(3)	(4)	(5)
g) NRW levels in my utility have significantly reduced over the past three years.					
h) NRW reduction initiatives have been effectively implemented in my utility.					
i) Stakeholders (e.g., customers, regulators) are actively engaged in NRW reduction strategies.					
j) My utility has realized cost savings due to NRW reduction efforts.					
k) Customer satisfaction has improved as a result of NRW reduction initiatives.					
l) The NRW reduction programs have contributed to improved service delivery.					

Thank you for your participation.

## Appendix C: Letter of Transmittal

Ole Sangale Rd, Madaraka Estate  
P. O Box 59857 - 00200, Nairobi, Kenya  
Cell: +254 703 034 414/6/7  
X/Twitter/Tiktok: @SBSKenya  
Facebook/LinkedIn: Strathmore University Business School  
Email: [sbsinfo@strathmore.edu](mailto:sbsinfo@strathmore.edu) or visit [www.sbs.strathmore.edu](http://www.sbs.strathmore.edu)



Monday, 24th March 2025

To Whom It May Concern,

**RE: FACILITATION OF RESEARCH – STACEY NYANDIKO USAJI**

This is to introduce Stacey Nyandiko Usaji, a Master of Science in Development Finance (MDF) student at Strathmore University Business School, admission number MDF/152966/22. As part of our MDF Program, Stacey is expected to do applied research and undertake a project. This is in partial fulfillment of the requirements of the MDF course. To this effect, she would like to request appropriate data from your organization.

Stacey is undertaking a research paper on *“The Role Of Governance in Non-Revenue Water Reduction for Water Service Providers In Kenya.”* The information obtained shall be treated confidentially and shall be used for academic purposes only.

Our MDF Programme seeks to establish links with industry, and one of the ways of doing so is directing our research to areas that would be of direct use to industry. We would be glad to share our findings with you after the research, and we trust that you will find them of great interest and of practical value to your organization.

We appreciate your support and shall be willing to provide any further information if required.

Yours sincerely,

Alois Njenga,  
Manager, Graduate Programmes,  
Strathmore University Business School.

Strathmore University Business School is a Proud member of:



## Appendix D: Ethical Approval



21<sup>st</sup> March 2025

Ms Nyandiko Stacey,  
stacey.usaji@strathmore.edu

Dear Ms Nyandiko,

**RE: The Role of Governance in Nonrevenue Water Reduction for Water Service Providers in Kenya**

This is to inform you that SU-ISERC has reviewed and **approved** your above **SU-masters** proposal. Your application reference number is **SU-ISERC2767/25**. The approval period is from **21<sup>st</sup> March 2025 to 20<sup>th</sup> March 2026**.

This approval is subject to compliance with the following requirements:

- i. Only approved documents including (informed consents, study instruments, MTA) will be used.
- ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by SU-ISERC.
- iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to SU-ISERC within 72 hours of notification.
- iv. Any changes anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to SU-ISERC within 72 hours.
- v. Clearance for the export of biological specimens must be obtained from relevant institutions.
- vi. Submission of a request for renewal of approval at least 60 days prior to the expiry of the approval period. Attach a comprehensive progress report to support the renewal.
- vii. Submission of an executive summary report within 90 days of completion of the study to SU-ISERC.

Before commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology, and Innovation (NACOSTI) <https://research-portal.nacosti.go.ke/> and obtain other clearances needed.

Yours sincerely,

A handwritten signature in black ink, appearing to read "Ambrose Rachier".

**Mr Ambrose Rachier,**  
Chairperson; SU-ISERC

# Appendix E: NACOSTI Approval

 REPUBLIC OF KENYA	 NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
Ref No: 586371	Date of Issue: 24/March/2025
<b>RESEARCH LICENSE</b>	
	
<p>This is to Certify that Ms.. Stacey Usagi Nyandiko of Strathmore University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Baringo, Bomet, Bungoma, Busia, Elgeyo-Marakwet, Embu, Garissa, Homabay, Isiolo, Kajiado, Kakamega, Kericho, Kiambu, Kilifi, Kirinyaga, Kisii, Kisumu, Kitui, Kwale, Laikipia, Lamu, Machakos, Makeni, Mandera, Marsabit, Meru, Migori, Mombasa, Muranga, Nairobi, Nakuru, Nandi, Narok, Nyamira, Nyandarua, Nyeri, Samburu, Siaya, Taita-Taveta, Tanariver, Tharaka-Nithi, Transzoia, Turkana, Uasin-Gishu, Vihiga, Wajir, Westpokit on the topic: <b>THE ROLE OF GOVERNANCE IN NON REVENUE WATER REDUCTION FOR WATER SERVICE PROVIDERS IN KENYA.</b> for the period ending : 24/March/2026.</p>	
License No: NACOSTI/P/25/417606	
586371	
Applicant Identification Number	Director General NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
	Verification QR Code
	
NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.	
See overleaf for conditions	

## Appendix F: Water Service Providers

	SN.	UTILITY NAME	COUNTY	SUBCOUNTY	WEBSITE
ATHI WATER WORKS DEVELOPMENT AGENCY	1	Nairobi City Water and Sewerage Company (NCWSC)	Nairobi	Makadara	<a href="http://www.nairobicw.co.ke">www.nairobicw.co.ke</a>
	2	Thika Water and Sewerage Company (THIWASCO)	Kiambu	Thika	<a href="http://www.thikawater.co.ke">www.thikawater.co.ke</a>
	3	Murang'a Water and Sanitation Company (MUWASCO)	Murang'a	kihuru	<a href="https://muwasco.co.ke">https://muwasco.co.ke</a>
	4	Murang'a South Water and Sanitation Company (MUSWASCO)	Murang'a	Murang'a south	<a href="http://www.muswasco.co.ke">www.muswasco.co.ke</a>
	5	Gatundu Water and Sanitation Company (GATWASCO)	Kiambu	Gatundu South	<a href="http://www.gatunduwater.co.ke">www.gatunduwater.co.ke</a>
	6	Kikuyu Water Company Limited	Kiambu	kikuyu	<a href="https://kikuyuwater.co.ke">https://kikuyuwater.co.ke</a>
	7	Ruiru Juja Water and Sanitation Company (RUJWASCO)	Kiambu	Ruiru-juja	<a href="https://ruiruwater.co.ke">https://ruiruwater.co.ke</a>
	8	Kiambu Water and Sewerage Company	Kiambu	Kiambu	<a href="https://kiambuwater.com">https://kiambuwater.com</a>
	9	Murang'a West Water and Sanitation Company / Kahuti	Murang'a	kangema	<a href="https://www.mwewasco.co.ke">https://www.mwewasco.co.ke</a>
	10	Limuru Water and Sewerage Company	Kiambu	limuru	<a href="https://www.limuruwater.go.ke">https://www.limuruwater.go.ke</a>
	11	Karuri Water and Sanitation Company	Kiambu	kiambaa	<a href="https://karuriwater.co.ke">https://karuriwater.co.ke</a>
	12	Tatu City Water and Sanitation Company	Kiambu	Ruiru	<a href="https://tatuwasco.com">https://tatuwasco.com</a>
	13	Two Rivers Water and Sanitation Company	Nairobi		
	14	Iiisi Water and Sewerage Company	Kiambu		
	15	Runda Water Ltd	Nairobi	westlands	<a href="https://www.rundawater.co.ke">https://www.rundawater.co.ke</a>
	16	Athi Water - Karimenu Bulk Water Supply			
	17	Athi Water - Northern Collector Tunnel			
COAST WATER WORKS DEVELOPMENT AGENCY	18	Mombasa Water and Sewerage Company	Mombasa	Changamwe	<a href="http://www.mombasawater.co.ke">http://www.mombasawater.co.ke</a>
	19	Kilifi Mariakani Water and Sanitation Company	Kilifi	Rabai	<a href="https://www.kilifiwater.co.ke">https://www.kilifiwater.co.ke</a>
	20	Kwale Water and Sewerage Company	Kwale	Matuga	<a href="https://kwalewater.co.ke">https://kwalewater.co.ke</a>
	21	Malindi Water and Sewerage Company	Malindi	Malindi	<a href="http://malindiwater.co.ke">http://malindiwater.co.ke</a>
	22	Tavevo Water and Sewerage Company	Taita Taveta	Voi	<a href="https://tavevowater.co.ke">https://tavevowater.co.ke</a>
LAKE VICTORIA NORTH WATER WORKS DEVELOPMENT AGENCY	23	Lamu Water and Sewerage Company Limited	Lamu	Lamu West	<a href="https://lamuwater.co.ke">https://lamuwater.co.ke</a>
	24	Busia Water and Sewerage Services Company	Busia	Budalangi	<a href="https://buwasco.co.ke">https://buwasco.co.ke</a>
	25	Nzoia Water Services Company	Trans Nzoia/Bungom	Kimilili	<a href="https://www.nzoiawater.or.ke">https://www.nzoiawater.or.ke</a>
	26	Kakamega County Water and Sanitation Company	Kakamega	Malava	<a href="https://kakamegawater.co.ke">https://kakamegawater.co.ke</a>
	27	Kakamega County Rural Water and Sanitation Company	Kakamega		
LAKE VICTORIA SOUTH WATER WORKS DEVELOPMENT AGENCY	28	Amatsi Water Services Company	Vihiga	Vihiga	<a href="https://amatsiwater.co.ke">https://amatsiwater.co.ke</a>
	29	Kapsabet Nandi Water and Sanitation Company	Nandi	Aldai	<a href="https://kanawasco.co.ke">https://kanawasco.co.ke</a>
	30	Kisumu Water and Sanitation Company	Kisumu	Kisumu West	<a href="https://kiwasco.co.ke">https://kiwasco.co.ke</a>
	31	Gusii Water and Sanitation Company	Kisii	Manga	<a href="https://ewasco.co.ke">https://ewasco.co.ke</a>
	32	Nyamira Water and Sanitation Company	Nyamira		
	33	Kericho Water and Sanitation Company	Kericho	Ainamoi	<a href="https://www.kewasco.co.ke">https://www.kewasco.co.ke</a>
NORTHERN WATER WORKS DEVELOPMENT AGENCY	34	Homa Bay County Water and Sanitation Company	Homa Bay	Homa Bay town	<a href="https://homawasco.co.ke">https://homawasco.co.ke</a>
	35	Bomet Water and Sewerage Company	Bomet	Bomet central	<a href="https://www.bometwater.co.ke">https://www.bometwater.co.ke</a>
	36	Migori County Water and Sanitation Company	Migori	Suna West	N/A
	37	Garissa Water and Sewerage Company	Garissa	Garissa Township	<a href="https://gawasco.org">https://gawasco.org</a>
	38	Isiolo Water and Sanitation Company	Isiolo	Isiolo	<a href="https://wasco.or.ke">https://wasco.or.ke</a>
	39	Samburu Water and Sanitation Company	Samburu	Maralal	<a href="https://samburuwaterco.co.ke">https://samburuwaterco.co.ke</a>
	40	Mandera Water and Sanitation Company	Mandera	Mandera West	<a href="https://manderawater.co.ke">https://manderawater.co.ke</a>
	41	Wajir Water and Sewerage Company	Wajir	Wajir East	<a href="https://www.wajirwater.co.ke">https://www.wajirwater.co.ke</a>
	42	Marsabit Water and Sanitation Company	Marsabit	Saku	<a href="https://marwasco.co.ke">https://marwasco.co.ke</a>
	CENTRAL RIFT WATER WORKS DEVELOPMENT AGENCY	43	Nakuru Water and Sanitation Services Company	Nakuru	Nakuru town East/West
44		Nakuru Rural Water and Sanitation Company	Nakuru		<a href="https://www.naruwasco.co.ke">https://www.naruwasco.co.ke</a>
45		Naivasha Water and Sanitation Company	Nakuru	Naivasha	<a href="https://www.naivasha.co.ke">https://www.naivasha.co.ke</a>
46		Narok Water and Sewerage Services Company	Narok		<a href="https://www.narwasco.co.ke">https://www.narwasco.co.ke</a>
47		Nyandarua Water and Sanitation Company	Nyandarua	Oi'Kalou	<a href="https://nyandawas.co.ke">https://nyandawas.co.ke</a>
48		Ndaragwa Water Project	N/A	N/A	N/A
49		Oi'Kalou Water and Sanitation Company	Nyandarua	Oi'Kalou	<a href="https://oikalouwater.co.ke">https://oikalouwater.co.ke</a>
50		Nanyuki Water and Sewerage Company	Laikipia	Laikipia East	<a href="https://www.nanyukiwater.co.ke">https://www.nanyukiwater.co.ke</a>
NORTH RIFT WATER WORKS DEVELOPMENT AGENCY	51	Nyahururu Water and Sanitation Company	Laikipia	Laikipia West	<a href="http://www.nyahururuwater.co.ke">http://www.nyahururuwater.co.ke</a>
	52	Eldoret Water and Sanitation Company Limited	Uasin Gishu	Eldoret	<a href="https://eldowas.or.ke">https://eldowas.or.ke</a>
	53	Kapenguria Water and Sanitation Company	West Pokot	Pokot South	N/A
	54	Lodwar/ Turkana Urban water and Sanitation Company			
	55	Iten Tambach Water and Sewerage Services Company Limited	Elgeyo Marakwet	Marakwet East	<a href="https://elgeyomarakwet.go.ke">https://elgeyomarakwet.go.ke</a>
	56	Kitui Water and Sanitation Company	Kitui		<a href="https://www.kituiwasco.co.ke">https://www.kituiwasco.co.ke</a>
	57	Oloolaiser Water and Sewerage Company	Kajiado	Ongata Rongai	<a href="https://www.oloolaiserwatercompany.co.ke">https://www.oloolaiserwatercompany.co.ke</a>
TANA WATER WORKS DEVELOPMENT AGENCY	58	Mavoko Water and Sewerage Company Limited	Machakos	Mavoko	<a href="https://www.mav-water.org">https://www.mav-water.org</a>
	59	Machakos Water and Sanitation Company	Machakos	Machakos Town	<a href="https://machwasco.co.ke">https://machwasco.co.ke</a>
	60	Kibwezi Makindu Water and Sanitation Company	Makueni	Kibwezi West	<a href="https://kimawas.com">https://kimawas.com</a>
	61	NolTuresh Loitokitok Water and Sanitation Company	Kajiado	Oloitokitok	<a href="https://www.nolturesh.co.ke">https://www.nolturesh.co.ke</a>
	62	Kiambere Mwingi Water and Sanitation Company	Kitui	Mwingi North	<a href="https://www.kimwasco.co.ke">https://www.kimwasco.co.ke</a>
	63	Namanga/ Oi Donyo Water Users Trust	Kajiado	N/A	N/A
	64	Wote Water and Sewerage Company	Makueni	N/A	<a href="https://wotewater.co.ke">https://wotewater.co.ke</a>
	65	Mwala Water and Sanitation Company	Machakos	Mwala	<a href="http://www.mwalawater.co.ke">www.mwalawater.co.ke</a>
	66	Mbooni Water and Sanitation Company	Makueni	Mbooni	N/A
	67	Kathiani Water and Sanitation Company	Machakos	Kathiani	N/A
	68	Nyeri Water and Sanitation Company	Nyeri	Nyeri Town	<a href="https://www.nyewasco.co.ke">https://www.nyewasco.co.ke</a>
TANA WATER WORKS DEVELOPMENT AGENCY	68	Meru County Rural Water and Sanitation Company (Imetha)-MeRuWASCO	Meru		<a href="https://www.meruwasco.co.ke">https://www.meruwasco.co.ke</a>
	69	Ngandori Nginda Water Consumers Association	Embu		<a href="https://ngandoriwater.com">https://ngandoriwater.com</a>
	70	Mathira Water and Sanitation Company Limited	Nyeri	Mathira	<a href="https://mawasco.co.ke">https://mawasco.co.ke</a>
	71	Ngagaka Water and Sanitation Company	Embu	Runyenyjes	<a href="https://www.ngawasco.co.ke">https://www.ngawasco.co.ke</a>
	72	Embu Water and Sanitation Company	Embu	Mbeere South	<a href="https://ewasco.embuwater.co.ke">https://ewasco.embuwater.co.ke</a>
	73	Nithi Water and Sanitation Company	Tharaka Nithi	Nithi North	<a href="https://nithiwater.co.ke">https://nithiwater.co.ke</a>
	74	Meru Water and Sewerage Services Company	Meru	imienti North	<a href="https://www.mewasco.co.ke">https://www.mewasco.co.ke</a>
	75	Kirinyaga Water and Sanitation Company	Kirinyaga	kirinyaga central	<a href="https://www.kirwasco.co.ke">https://www.kirwasco.co.ke</a>
	76	Othaya Mukurweni Water Services Company	Nyeri	Othaya	<a href="https://www.omwasco.co.ke">https://www.omwasco.co.ke</a>
	77	Tetu Aberdare Water and Sanitation Company	Nyeri	Tetu	<a href="https://teawasco.co.ke">https://teawasco.co.ke</a>
	78	Naromoru Water and Sanitation Company	Nyeri	Naromoru	<a href="https://naromoruwater.co.ke">https://naromoruwater.co.ke</a>
	79	Embe Water and Sanitation Company	Embu	Mbeere North	<a href="https://embewater.co.ke">https://embewater.co.ke</a>
	80	Muthambi 4K Water Association	Tharaka Nithi	Muthambi	<a href="https://www.muthamb4k.org">https://www.muthamb4k.org</a>
81	Murugi Mugumango Water Society	Tharaka Nithi	Maara	<a href="https://murugimugumangowaterserviceprovider.org">https://murugimugumangowaterserviceprovider.org</a>	