FACTORS INFLUENCING REVENUE GENERATION AMONG WATER SERVICE PROVIDERS IN KENYA: A CASE OF NYERI COUNTY, KENYA.

BY

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A RESEARCH PROJECT REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF ARTS DEGREE IN PROJECT PLANNING AND MANAGEMENT OF THE
UNIVERSITY OF NAIROBI

2013

DECLARATION

This research project report is my original work and has not been presented for award of a degree in any other University.

Signed…… Date……

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This research project report has been presented for examination with my approval as a University supervisor.

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DEDICATION

This research project is dedicated to my dad and mum – Zacheaus Kihumba and Marion Kihumba, my siblings Victor and Titus who have stood by me during the pursuit of this Master's degree, to John Mureithi who has been my mentor, and to my grandmother Esther Wairimu for her prayers and encouragement.

ACKNOWLEDGEMENT

I wish to record my sincere indebtedness to individuals and institutions without whose cooperation this research study would not have been successful. I acknowledge the work and academic guidance accorded to me by my able supervisor Mr James Kiige from the Department of Extra-Mural Studies, University of Nairobi; whose input and critique were fundamental to this research.

I am extremely grateful to Eng.Stephen Githinji and Eng.Peter Njagaah of Water Services Regulatory Board for their constructive critique; Eng. Joseph Nguiguti and managers from Nyeri, Mathira, Tetu and Othaya Water and Sewerage Companies for their invaluable time and input towards this study. I also thank Richard Cheruyoit, WASREB's Inspectorate manager for support in preliminary information gathering from the Water Regulation Information System.

My friends and fellow class group members; Pauline Omayo, Maureen Wangui,Kelvin Memia, Simon Kirima,Patrick Kariuki, Njoki Kariuki and Walter Ogallo; your friendship, cooperation and dedication to our group activities all through 2011/2012 was a great source of motivation for me .

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ABBREVIATIONS AND ACRONYMS

GTZ	German Technical Cooperation
GoK	Government of Kenya
MAWASCO	Mathira Water and Sewerage Company
MDGs	Millennium Development Goals
NRW	Non-Revenue Water
NWSS	National Water Services Strategy
NYEWASCO	Nyeri Water and Sewerage Company
OWASCO	Othaya Mukurweini Water and Sewerage Company
TEAWASCO	Tetu Aberdare Water and Sewerage Company
WARIS	Water Resources Information System
WASREB	Water Services Regulatory Board
WHO	World Health Organization
WSB	Water Services Board
WSP	Water Service Provider
WSS	Water Supply and Sanitation
WSTF	Water Services Trust Fund

ABSTRACT

This research study assessed various factors in water provision that influence revenue generation by Water Service Providers (WSPs) in Nyeri County. It explored service coverage, non-revenue water, metering ratio, staffing, and revenue collection efficiency of WSPs; as important efficiency parameters that impact on revenue streams. A WSP can improve on its financial standing and sustainability either by increasing it revenues or by reducing its costs. Improvement in operational efficiency may result in immediate increase in revenues or reduction of future investment needs, hence saving future capital investment costs. This research study was the case of all contracted WSPs in Nyeri County namely; Nyeri Water and Sewerage Company, Mathira Water and Sewerage Company, Othaya Water and Sewerage Company and Tetu Aberdare Water and Sewerage Company. The research methodology used a descriptive survey design and self-administered questionnaires were used as the data collection instrument. They were administered to utility managers identified through stratified random sampling. Interviews were carried out to collect additional qualitative data. Correlational and descriptive statistics through Statistical Package for Social Science (SPSS) were used to analyse data and present the findings of the study. The average water service coverage in the County was found to be below the acceptable sector benchmark. The study showed that the level of service coverage determines the amount of revenue generated by a WSP and by extension the resources available to the WSP to finance its operations. It was also clear that the high level of Non-Revenue Water (NRW) threatens the sustainability of the majority of WSPs in the County since they are losing slightly more than half of their water hence generating revenue from far much less water compared to production yet operation and maintenance expenditure continues to rise. The study also revealed high level of non-functioning meters and little regard to the impact of metering on revenues by WSPs.Effective collection systems and high revenue collection rates among the WSPs in the County were commendable given the direct relationship between collection efficiency and revenues found by the study. The low number in overall Staff Productivity Index (SPI) was indicative of high staff efficiency among the WSPs in the County. It is important for utility managers to understand how different operational parameters influence revenue generation by WSPs in order to realize and enhance commercial viability and financial sustainability of utilities in the water sector. By understanding the factors influencing revenues, policy makers both in government, non-government institutions and other development actors can find solutions to the problem of unviable water utilities and poor service provision. The current size of the consumer base as evidenced by the number of connections and service coverage has a direct bearing on the viability of WSPs.WASREB should therefore ensure that WSBs develop realistic investment plans targeted to achieve progressive increase in coverage; paying tribute to the fact that access to safe water in adequate quantity is a human right entrenched in the Constitution. More effort is required for a commercially sustainable water services sector that makes efficient use of available resources. In this regard,WASREB should reinforce WSPs' efforts towards 100% metering through provision of earmarked funds in tariffs. In order to improve on their collection efficiency, WSPs should enforce stricter collection policies while at the same time improve on their service quality. As measure towards improved staff efficiency, WASREB and WSBs should enforce the implementation of WASREB's criteria for the employment of staff so that a higher level of skills and consequently capacity will be attained. For other researchers, the study has exposed areas for further research which will be useful for expanding knowledge in the Kenya water sector reforms.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Providing access to clean, affordable and accessible water is a top global priority. Over 1.2 billion people worldwide lack access to safe drinking water. World leaders at United Nations Millennium Summit in September 2000 committed to Millennium Development Goals (MDGs) ;among them Goal 7, which aims to halve the proportion of people without access to safe drinking water and sanitation by 2015. According to the World Health Organization and United Nations Children's Fund (2012), this Goal was achieved in 2010, five years ahead of target.

These positive figures hide some striking inequalities. While worldwide access to clean drinking water has progressed enough to reach the MDG target, 780 million people remain without access to clean drinking water. Only 61% of the population in Sub-Saharan Africa has access to improved water supply sources. People lack proper services because systems fail, often because not enough was invested to appropriately build and maintain them, and also because of the stress that urbanization places on the existing infrastructure. In the past decade, Africa's population grew at an annual average of 2.5 percent, and the urban and slum population grew at almost double that rate (World Bank, 2012).

The African continent poses the most difficult challenge for achieving the water and sanitation MDG targets. The MDGs for water supply and sanitation services require a doubling of the pace of expansion of coverage in water supply in urban areas and a tripling for sanitation. Recent projections show that following the 'business as usual' trends, Sub-Saharan Africa would only reach the MDG targets for water services by 2040, and those for sanitation by 2076 (United Nations Development Programme (UNDP), 2006).

For a long time, measures taken by governments to address service coverage gaps have concentrated on building new infrastructure with little attention given to improving efficiency and productivity of water utilities. Estimates of finance requirements for water and sanitation expansion point to large funding gaps and prospects of private sector investments appear bleak.

These realities have compelled major players in the water sector to seek alternative approaches to improving water service coverage.

As noted by World Bank (2010), water utilities in Africa differ greatly in terms of size, organizational culture and operating environments. They share one major challenge of expanding access to appropriate levels of services to their growing urban populations as can be seen clearly in the context of the MDGs where Africa lags far behind other regions. It is now widely acknowledged that the inefficiencies of African water utilities are a major cause of poor access to water services.

In many systems, as much as a third of production is lost through physical and commercial losses and revenues are insufficient to cover operating costs let alone expand service coverage. In addition to the non-revenue water (NRW) challenge, most utilities are currently struggling to cover even their operating costs. In all regions, less than half of the utilities can be considered financially viable and, for many. Thus, it is becoming clear that the real potential in the African water sector lies in increasing efficiency in the existing systems - for example by reducing wastage, improving service quality and securing cash flows.

In the 1990s, many governments sought to implement policy, regulatory and institutional reforms of urban water supply and sanitation (WSS) services, often with support from international financial institutions. Reforms were badly needed: millions of people lacked access to piped water and sanitation services; and for millions of others, service was often poor. Deteriorated infrastructure, fast urban growth, and large investment needs coexisted with poorly run utilities, artificially low tariffs, and scarce fiscal resources. Water sector reforms emphasize the need for consumers' protection and their access to efficient, adequate, affordable and sustainable services, whilst ensuring the financial sustainability of service provider (Hukka & Katko, 2004).

Many African governments have reformed their WSS systems in the past two decades to provide better services for their citizens. Countries that have pursued institutional reforms have built more efficient and effective sector institutions and achieved faster expansion of higher quality services. The potential dividend of such efforts is large, because addressing utility inefficiencies alone could make a substantial contribution to closing the sector funding gap in many countries.

The Government of Kenya recognizes that for the country to meet its poverty-reduction strategies and achieve the MDGs, water has to be made available, accessible and affordable, especially to the poor. This is based on the fact that all the eight MDGs are directly or indirectly related to access to water. The Kenyan water sector has for a long time been characterized by inefficiencies, lack of investments, poor management and confusing array of legal and institutional frameworks. In addition, the exponential growth of Kenya's urban centres has put increasing pressure on utilities to extend services to new areas. To address these challenges and as part of a global trend, the Government of Kenya introduced far reaching reforms in the water sector to restructure and improve sector performance.

The reforms were guided by the Water Act 2002 that was anchored upon recognition of the economic value of water and cost recovery as a means of sustainable service provision among others, as indicated in the National Water Services Strategy (NWSS), (2007-2015).The water Act of 2002 also separated water resources management from water and sewerage services and established autonomous regulatory bodies in the sector. The Water Services Regulatory Board, (WASREB) is mandated to regulate provision of water services and oversee the implementation of policies and strategies relating to provision of water and sewerage services.

The sector reforms established eight Water Services Boards (WSBs) responsible for development and ownership of water infrastructure in their respective areas of jurisdiction. The infrastructure is leased to the Water Service Providers (WSPs) whose mandate is to provide water services. WSPs sign Service Provision Agreements (SPAs) with WSBs which indicate the performance targets to be achieved within a given period.

In the face of implementation of reforms and the existence of the service provision agreements (SPAs) in the sector, the performance of the water companies in terms of coverage , hours of service, quality of water and cost coverage has remained relatively low leading to continued suffering by Kenyans. Services offered by the WSPs are also characterized by high levels of non-revenue water (NRW), poor debt management practices, lack of openness and accountability, inadequate commercial management and tariffs that are insufficient to cover operations and maintenance costs (Citizens report card, 2007).

The Constitution of Kenya 2010 (CoK) contains several key provisions that have major implications on the water sector. With respect to the water sector, it has assigned the responsibility to manage water resources and national public works to the national government while devolving the responsibility to provide water supply and sanitation services to the 47 newly created county governments. To achieve the above, County Governments must ensure that services are provided in a cost-effective and practicable way, by making use of economies of scale, including commercial viability, possibility of cross-subsidization for the benefit of vulnerable and marginalized people and avoidance of unjustified costs for consumers. Each County Government will therefore need to register a maximum of one WSP within its jurisdiction and prove the viability of that WSP.

1.2 Statement of the Problem

As indicated by the Water Act (2002), improvement in performance of water service providers and cost recovery for sustainable provision of water services were some of the key aims of the sector reforms which envisaged increased efficiency and effectiveness in the provision of water services. Further, despite the existence of a regulatory framework that have seen the establishment of clear performance indicators which if achieved would ensure provision of sustainable services, most WSPs have not been able to improve on their operation and maintenance cost coverage.

To date, over 100 WSPs have been contracted by the WSBs in Kenya but access to water and sewerage services is still low. Rapid population growth (estimated 2.44% per annum in 2012) and accelerating urbanization (estimated at 4.2 % per annum between 2010 and 2015) present growing challenges to the water sector in meeting national and international development targets .While urban water and sanitation coverage have steadily increased over the recent years, reaching a level of 52% and 69% respectively, a gap of almost 30 percentage points needs to be closed to reach the sector target of 80% for urban water coverage by 2015(WASREB, 2012).Many of these challenges are as a result of inappropriate utility management practices, including the lack of a commercial-oriented culture. With the growing urban populations, WSPs must adapt quickly to reduce the growing service gap, by reducing unaccounted for water, increasing revenues to cover operation costs, and expanding services to the urban poor.

In Nyeri County, water service delivery is financed through tariffs which determine the level of revenues that WSP receive from users. Ordinarily, the trend is for tariffs to cover the full costs of water supply and sanitation, including capital replacement and the remuneration of equity. Even with cost-reflective tariffs being approved, lack of cost coverage due to insufficient revenues coupled with instances of non-compliance to operational efficiencies as stipulated by WASREB exist. Significant potential for improvement in revenue generation, cost recovery and service delivery by WSPs in Nyeri exist. This potential can be harnessed by improving on efficiencies in operational practices without necessarily increasing the levels of tariffs. It is against this background that the researcher investigated on operational factors influencing revenue generation among water service providers in Nyeri County.

1.3 Purpose of the Study

This study intended to investigate the factors influencing revenue generation among water service providers in Nyeri County by studying five key revenue generation variables.

1.4 Objectives of the Study

The study specifically sought:

(i) To determine how service coverage influences revenue generation by WSPs in Nyeri County.
(ii) To establish how non-revenue water influences revenue generation by WSPs in Nyeri County.
(iii) To explore how metering ratio influences revenue generation by WSPs in Nyeri County.
(iv) To investigate the influence of collection efficiency on revenue generation by WSPs in Nyeri County
(v) To establish how staffing level influences revenue generation by WSPs in Nyeri County

1.5 Research Questions of the Study

The study was guided by the following research questions:

(i) How does service coverage influence revenue generation by WSPs in Nyeri County?
(ii) To what extent does non-revenue water influence revenue generation by WSPs in Nyeri County?
(iii) How does metering ratio influence revenue generation by WSPs in Nyeri County?

(iv) To what extent does revenue collection efficiency influence revenue generation by WSPs in Nyeri County?

(v) How does staffing level influence revenue generation by WSPs in Nyeri County?

1.6 Significance of the Study

This research study sought to demonstrate how improving operational efficiencies on various parameters could lead to improved revenue generation by WSPs. It has provided deeper insight to WSPs on how improving operational efficiencies impacts on commercial viability and financial sustainability of water services; through creation of a virtuous circle of lower operating costs and higher willingness to pay from customers.

To the policy makers, development partners and regulatory authorities such as WASREB, the study will benefit them by underscoring how essential factors influence effectiveness and sustainability in water service delivery. This information will be useful in formulating better strategies, regulatory tools and funding conditions to enhance the sector performance.

For other researchers, it has provided useful reference material on factors influencing revenue generation and exposed areas for further research which can be useful in expanding knowledge in water sector.

1.7 Delimitations of the Study

The research study only focused on the influence of service coverage, metering ratio, non-revenue water, staffing and revenue collection efficiency on revenue generation by water utilities. The study was the case of all contracted WSPs in Nyeri County namely; Nyeri Water and Sewerage Company, Mathira Water and Sewerage Company, Othaya Water and Sewerage Company and Tetu Aberdare Water and Sewerage Company. These WSPs are of close proximity to each other and were easily accessible to the researcher.

1.8 Limitations of the Study

Some of the pertinent issues that this study encountered include:

(i) The study was limited to five operational factors yet there were other factors affecting revenue generation by WSPs.For purposes of this study, such other factors were ignored.

(ii) Different WSPs have different operating environments and hence the need to generalize the findings of this research with caution.

1.9 Assumptions of the Study

It was assumed that data extracted from Water Resources Information System (WARIS) for purposes of this study was accurate and reliable and that all respondents involved in this study gave accurate and honest responses.

1.10 Definition of Significant Terms

This study encompassed the following terms:

Collection Efficiency: This is the total amount collected by a WSP compared to the total amount billed in a given period.

Metering Ratio: This is the number of connections with operational meters compared to the total number of connections.

Non-Revenue Water (NRW): This is the difference between the volume of water put into a water distribution system and the volume that is billed to customers.

Revenue Generation: This is the process by which a water company markets and sells water services to produce income.

Service Coverage: This is the proportion of the population receiving water services compared to the total population in the whole service area in the jurisdiction of a water service provider. This proportion is normally expressed as a percentage of the total population.

Staff/Labour Productivity: This measures the number of staff a WSP utilizes for every 1000 connections. A low ratio indicates high efficiency in the utilization of staff and is therefore desirable.

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1.11 Organization of the Study

Chapter One of this study covers the background to the study, statement of the problem, purpose and objectives of the study, research questions, the significance, assumptions, limitations and delimitations of the study, and definition of significant terms. Chapter Two is the literature review of the study with outlook on theoretical framework, conceptual framework and the scholarly works on revenue generation, operational efficiencies, service coverage, metering ratio, non-revenue water, staffing levels and revenue collection efficiency in relation to water utilities. Chapter Three outlines the research design, target population, sampling technique, data collection method, data analysis, ethical considerations and operational definitions of variables. Chapter Four presents findings of the study discussed under thematic areas and sub-sections in line with the study objectives. Chapter Five covers summary of findings, discussions, conclusion, recommendations and suggestions for further study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter contains relevant literature relating to the research problem outlined in the previous chapter with particular focus on the main variables in the study; which if addressed would lead to better operational efficiencies culminating into better revenue generation by WSPs. These include non-revenue water, metering ratio, revenue collection efficiency, service coverage and staffing of a WSP. The theoretical framework on which the study was based on and the conceptual framework illustrating the relationship between different variables in the study are also outlined.

2.2 Theoretical Framework

This study was based on the Theory of Constraints (TOC) created by Goldratt (1984). The TOC is an organizational change method that is focused on profit improvement. The essential concept of TOC is that every organization must have at least one constraint. The theory says that every system, no matter how well it performs, has at least one constraint that limits its performance – this is the system's weakest link. A constraint is any factor that limits the organization from getting more of whatever it strives for, which is usually profit. The theory also says that a system can have only one constraint at a time, and that other areas of weakness are non-constraints until they become the weakest link.

Goldratt (1984) focuses on constraints as bottleneck processes in a manufacturing organization. However, many non-manufacturing constraints exist, such as market demand, or a sales department's ability to translate market demand into orders. The theory is most useful with important or frequently-used processes within the organization.

The TOC defines a set of tools that change agents can use to manage constraints, thereby increasing profits. Most businesses can be viewed as a linked set of processes that transform inputs into saleable outputs. TOC conceptually models this system as a chain, and advocates the familiar adage that a "chain is only as strong as its weakest link." Since the focus only needs to

be on the constraints, implementing TOC can result in substantial improvement without tying up a great deal of resources, with results after three months of effort. Constraints can involve people, supplies, information, equipment, or even policies, and they can be internal or external to an organization.

Goldratt (1984) defines a five-step process that a change agent can use to strengthen the weakest link, or links as follows:

(i) Identify the constraint.
(ii) Exploit the constraint.
(iii) Subordinate everything else to the constraint.
(iv) Elevate the constraint.
(v) Go back to step 1.

Step 1: Identify the Constraint

The first step is to identify the organization's weakest link – this is the factor that's holding it back the most. Start by looking at the processes that the organization uses regularly. Is it working as efficiently as it could be, or are there bottlenecks – for example, because its people lack skills or training, or because you lack capacity in a key area? Here, it can help to use tools like Flow Charts, Swim Lane Diagrams, Storyboarding, and Failure Modes and Effects Analysis to map out its processes and identify what's causing issues. You can also brainstorm constraints with team members, and use tools like the 5 Whys Technique and Root Cause Analysis to identify possible issues.

Constraints can also include intangible factors such as ineffective communication, restrictive company policies, or even poor team morale. Also bear in mind that, according to the theory, a system can only have one constraint at a time. So, you need to decide which factor is the organization's weakest link, and focus on that. If this isn't obvious, use tools like Pareto Analysis or Queuing Models to identify the constraint.

Step 2: Exploit the Constraint

Once you've identified the constraint, you need to figure out how to manage it. What small changes can you make to increase efficiency in this area and cure the problem, without

committing to potentially expensive changes? Your solutions will vary depending on your team, your goals, and the constraint you're trying to overcome. At this stage, Goldratt (1984) says that you should subordinate everything to the constraint. This means that all other organizational processes should also focus on eliminating the constraint. For example, can you move some types of work out of the constrained area and into other processes, thereby eliminating the constraint?

Step 3: Evaluate Performance

Now review how your system is performing with the simple fixes you've put into place. Is the constraint still causing a bottleneck? If it is, you need to do whatever you can to solve the issue. For instance, do you need to invest in new equipment, outsource certain tasks, or take on more staff? Here, it's useful to review approaches used in Lean Manufacturing, Kanban, Kaizen, and the 5S System to see if these uncover any solutions that can help you eliminate your constraint. Again, you'll also find it useful to brainstorm possible solutions with people in your team, and to use problem-solving tools such as the Five Whys and Cause and Effect Analysis to identify the real issues behind the problems you're having, so that you can come up with good solutions. Once you've identified possible solutions, use decision-making tools such as Grid Analysis and Cost/Benefit Analysis to help you choose the best solution.

Step 4: Start Over

Once you've eliminated the constraint, you can move back to step 1 and identify another constraint. The theory says that every process has at least one constraint. While this may be true, be sensible in how you apply the theory – sometimes removing this constraint will have a minimal impact on performance.

2.3 Water Utility Revenue

For a long time, running a water utility was primarily an engineering and operational challenge but that has blossomed into an industry that must address complicated financial issues, delicate environmental concerns, community interests and varying levels of regulatory oversight. Financial sufficiency is achieved by carefully balancing all aspects of financial management with utility’s anticipated future needs. Financial management consists of effectively generating

sufficient revenue while appropriately managing costs (American Water Works Association (AWWA), 2010).

2.2.1 Revenue Generation by Water Utilities

Water sales to customers are the primary source of income for a water utility. As such, rates and fees associated with water sales typically represent the majority of a utility's revenue. Water utilities need revenues to meet their mission of providing safe, reliable, and high-quality water; the lack of adequate revenue can prevent them from achieving this mission. User rates are normally billed monthly, bimonthly or quarterly and typically include both a fixed (constant among billing periods) component and variable component (fluctuates with the amount of water consumed).

The most common water rate structures are increasing block rate, uniform rate and decreasing block rate**.** The price of water goes up as the amount consumed increases in the increasing block rate whereas customers are charged a constant price per gallon, regardless of the amount of water used in the uniform rate. The price of water declines as the amount used increases in the decreasing block rate.

Some utilities have also developed charges to recover costs that relate to a specific need in the service areas such as connection fees and system development charges. Some enterprising utilities are branching out by selling products and services that are apart from their main mission of providing water services such as bottled water, timber, ice and plumbing services. These innovative methods rarely provide more than 10% of utility's overall revenue and therefore utilities must be cognizant of the amount of resources they devote to such endeavors.

2.4 Operational Efficiency

A key objective for water reforms is to improve operating efficiency. The cost structure of a water utility is made up of many factors, and efficiency gains can be achieved through different dimensions that involve multiple parameters. Although utility operation has multiple facets, in practice, the overall efficiency of an operator can be broadly captured by three main indicators: water losses, bill collection, and labor productivity (Philippe Marin, 2009).

Water losses are a key cost element in most water utilities in developing countries. Controlling water losses is a priority for any well-run utility. Water losses capture the efficiency of both the distribution network and of commercial management. The bill collection ratio directly affects the cash flow of the utility and captures a large portion of the efficiency of commercial management. It is common for poorly performing utilities to have low bill-collection rates because of lax enforcement and the fact that people often resent paying for poor services.

Labor productivity is a major input into an analysis of efficiency, labor being usually the largest fixed cost for a water utility. There is strong evidence that the introduction of new institutions through water reforms resulted in improvements in labor productivity (measured as the number of staff per thousand customers), achieved through both staffing reductions and increases in the customer base. The layoffs are often motivated not just by overstaffing but also by the need to change the overall profile of employees and to hire more skilled staff.

As indicated by Cardone and Fonseca (2003), the biggest contribution that institutional reforms can make is to improve operational efficiency and service quality. These improvements have a major indirect impact on access to financing. Customers become more willing to pay their bills when service improves and more efficient operation creates more cash flow from operations to invest in expansion, which in turn increases the customer base and revenues. As creditworthiness improves, a utility can more easily access funding and invest in service expansion. Benchmarking against other similar utilities can greatly help identify areas for operational improvement.

2.4.1 Technical Efficiency in African Utilities

Labor productivity, water pipe bursts and operating cost are the three indicators used to evaluate the technical operations of the utilities. Labor productivity rates can be hard to compare because of differing reliance on contractors. Nevertheless, a frequently used international benchmark for labor productivity is 2 employees per 1,000 connections, which has been modified to 5 employees per 1,000 connections for developing countries (Tynan & Kingdom 2002).Overall, African utilities covered by Africa Infrastructure Country Diagnostic (AICD), (2010) study, report an average of about 5.6 employees per 1,000 connections, which is right around the developing country benchmark cited above. The rate of bursts per kilometer of water main provides some indication of the condition of the underlying infrastructure, and hence the extent to which it is being adequately operated and maintained (Mehta & M.Cardone, 2009).

2.4.2 Financial Efficiency in African Utilities

According to AICD (2010), five indicators are used to evaluate the financial performance of the utilities: revenue collection efficiency, operating cost ratio, debt-service ratio, value of gross fixed assets per connection, and average operating revenue. The average operating ratio of African utilities shows that operating costs are barely covered and fall short of what is needed to recoup capital expenditures. This ratio is below the benchmark level of 1.3 for developing countries identified by Tynan and Kingdom (2002).Whereas the vast majority of utilities report collection ratios above 90 percent, almost half of the utilities present implicit collection rates below 70 percent, and more than half of the utilities collect tariff revenue from fewer than 50 percent of their customers, according to household surveys.

2.4.3 The High Cost of Inefficiencies in Operations and Pricing of African Utilities

As indicated by Mackenzie and Stella (1996), one way of presenting a global measure of utility inefficiency is to quantify the "hidden" cost of observable operational inefficiencies. This concept is a measure of wastefulness and ineptitude. The hidden cost estimates the financial losses associated with four components—undercollected revenue, distribution losses, underpricing, and overstaffing—and expresses these losses as a percentage of the utilities' overall turnover. These inefficiencies can be quantified by comparing the revenue available to the utility with the revenue available to an ideal utility that is able to charge cost-recovery tariffs, collect all of its revenue, minimize distribution losses, and employ an ideal number of workers per connection. Such inefficiencies account for 0.2 percent of Africa's GDP on average, or $1.3 billion per year (World Bank 2010).

2.5 Non-Revenue Water

Non-revenue water (NRW) is the difference between the volume of water put into a water distribution system and the volume that is billed to customers. NRW comprises three components namely; physical losses, commercial losses, and unbilled authorized consumption. Physical losses comprise leakage from all parts of the system and overflows at the utility's storage tanks. They are caused by poor operations and maintenance, the lack of active leakage control and poor quality of underground assets. Commercial losses are caused by customer meter under-registration, data-handling errors and theft of water in various forms. Unbilled authorized

consumption includes water used by the utility for operational purposes, water used for firefighting, and water provided for free to certain consumer groups.

2.5.1 Non-Revenue Water and Utility Revenues

According to World Bank (2006), one of the major issues affecting water utilities in the developing world is the considerable difference between the amount of water put into the distribution system and the amount of water billed to consumers. High levels of NRW reflect huge volumes of water being lost through leaks, not being invoiced to customers, or both. It seriously affects the financial viability of water utilities through lost revenues and increased operational costs. A high NRW level is normally a surrogate for a poorly run water utility that lacks the governance, the autonomy, the accountability, and the technical and managerial skills necessary to provide reliable service to their population.

The waste of resources resulting from high NRW levels in developing countries is considerable. To illustrate this point, the total cost to water utilities caused by NRW worldwide can be conservatively estimated at $141 billion per year, with a third of it occurring in the developing world. A recent World Bank study estimated the full cost of water losses from urban water utilities in developing countries to be as much as US$5 billion per year (Kingdom, Liemberger & Marin, 2006).As found out by World Bank (2010), the average level of NRW in an entire sample of 134 utilities is 36 percent. This is well above the good practice levels for developing countries considered to be below 23 percent according to (Tynan & Kingdom, 2002).

Although it is not feasible to eliminate all NRW in a water utility, reducing by half the current level of losses in developing countries appears a realistic target. This reduction could generate an estimated additional US$2.5 billion in cash every year for the water sector (from both increased revenues and reduced costs) and potentially service an additional 90 million people without any new investments in neither production facilities nor drawing further on scarce water resources. Figures of such magnitude, even though they are based on a rough estimate, should obviously capture the attention of donors and developing-country governments alike (World Bank, 2010).

2.5.2 NRW in the Kenya Water Sector

According to the annual sector performance report by WASREB (2012),the average NRW has stagnated at 45% since 2009/10, remaining at a level almost double the minimum acceptable level of 25%. Current NRW levels translate to financial losses of KSh 9.5 billion annually, which is about a quarter of the annual sector budget. The continuously high NRW levels threaten the financial sustainability of the water services sector. In order to effectively address NRW, utilities have to put monitoring systems at production, distribution and consumer levels. Far too many WSPs still rely on estimates as they lack master and consumer meters. Moreover, WSPs should focus on reduction of commercial losses. These generally represent about 40% of total NRW yet their mitigation does not require major capital investments.

2.5.3 Challenges in Reducing Levels of NRW

Reducing NRW is not just a technical issue but also one that goes to the heart of the failings of public water utilities in developing countries. These water utilities often operate under a weak governance and financial framework, with utility managers having to face multiple political and economic constraints. They have to provide some form of service to customers on a daily basis with mostly deteriorated infrastructure (Mehta, Cardone & Fugelsnes, 2009).

2.5.4 Benefits of Reducing Non-Revenue Water in Developing Countries

It is not realistic to expect water utilities to eliminate all commercial and physical losses. In developing countries, it is certainly not unrealistic to expect that the high levels of physical losses could be reduced by half.

This reasonable objective would result in the availability of eight billion more cubic meters of treated water to service customers that would consequently translate to ninety million more people with access to water supply, without increasing demand on endangered water resources. Fairness would also be promoted among consumers by acting against illegal connections and those engaging in corrupt meter-reading practices. Consumers would have improved service delivered by more-efficient and more-sustainable utilities.

Water utilities would gain access to an additional US$2.5 billion in self-generated cash flow, equivalent to more than a quarter of the amount currently being invested in water infrastructure

in the developing world, and this without affecting in any manner the debt capacity of those countries. More economic growth with new business opportunities would be created for NRW reduction activities, with thousands of jobs created to support labor-intensive leakage reduction activities.

2.6 Revenue Collection Efficiency

Revenue collection efficiency is defined as the total amount collected by a WSP compared to the total amount billed in a given period. It is a critical performance indicator of a WSP as it gives an indication on the effectiveness of the revenue management system in place and consequently the amount of resources available to the WSP. It also reflects customers' willingness to pay, which is closely related to customer satisfaction (WASREB, 2012)

Effective billing and collection systems and high billing and collection rates are key tools for enhancing the revenue base of the utility, achieving financial viability, and sustainability and hence registering improvements in services delivered. Service providers will need to realize that the benefits of efficient collection practices on their operations is almost instant and can, in fact, improve the revenue accounts of the utility almost immediately. It is in this aspect that the importance of revenue sufficiency cannot be overemphasized. The rate of bill collection can be improved either by enforcing stricter collection policies or by improving service quality, which, in turn, increases customers' willingness to pay their bills.

2.6.1 Collection Practices and Utility Revenues among African Utilities

In Africa, under-collection of water bills is valued at US$0.5 billion annually. Improving the collection rate is an obvious way of increasing water revenues without raising tariffs. Although the better performing water utilities in Africa normally manage collection rates of around 80%, persistent non-payment especially by public agencies, eaves big holes in the accounts of water utilities (Mehta, Cardone & Fugelsnes, 2009) .On average, most utilities are only able to collect about 73% of their billed amounts, and it takes an average of eight months to collect outstanding revenues.

A major issue in all utilities in Sub-Saharan Africa has been the serious difficulty of collecting bills from public buildings and government agencies, which typically represent a sizable portion

of the revenues of water utilities in the region. Erratic payment by public customers has been a recurrent problem, even in successful utilities. Utilities are ill equipped to collect bills from accounts that ultimately belong to their contractual partners, and donors regularly have had to step in and remind governments of their contractual obligations.

Special mechanisms have been developed gradually to mitigate the problem. In Senegal, the operator can now appeal directly to the Ministry of Finance, which directly intervenes in the case of nonpayment by a public agency. In Niger, a system of advance payments has been put in place, with estimated monthly bills for all public agencies paid every month by the Finance Ministry, subject to adjustment at year's end (Marin, 2009).

2.6.2 Factors Influencing Collection Efficiency

Poor revenue collection efficiency is mostly blamed on customers but the utility may also be at fault for delayed and faulty billings, inadequate responses to consumer queries on billings, poor customer service and a lukewarm effort to collect overdue accounts. The effectiveness of the collections process is measured by the amount of outstanding revenues at year end compared to the total billed revenue for the year (World Bank, 2010).

While effective collection practices depend on many internal factors including customer databases, the extent of metered and unmetered service provision, tariff and billing structures, delivery of bills and facilities for customer payments; the institutional arrangements under which service providers operate and provide services determine whether such practices will remain sustainable in the long term.

According to World Bank (2008), more often than not, WSPs consider collection activities a routine exercise that they need to undertake; hence, they do not have a proactive attitude regarding such practices. There is an inclination towards considering that poor and inadequate services need to be tackled through the more popular issues of leakage management and rationalization of input costs, since the delivery of water services is seen more as an engineering task; no one gives finances, billing, and collection practices, among others, a second thought.

How much a utility can increase the rate of bill collection obviously depends on the starting level, but it is also influenced by cultural and country-specific issues. In Senegal, for instance,

the population had a strong tradition of paying their water bills, and the collection ratio was already very good when the institutional reforms took place. Elsewhere, utilities often have to face well-entrenched habits of nonpayment of water bills or a variety of legal impediments that prevent them from enforcing payment. This can make progress difficult. A culture of nonpayment usually develops in reaction to many years of poor service, and achieving a behavioral change in the population takes time (Marin, 2009).

2.6.3 Cost Inefficiencies Related to Ineffective Collection

While the most significant impact of poor collection practices is probably on revenue adequacy and cost recovery, thus resulting in poor standards of services, ineffective collection practices also result in suboptimal results and operational inefficiencies. Given that every service provider must spend time and resources on collection functions, any ineffective initiative will result in cost inefficiencies. For instance, resources may be put into computerizing and updating customer databases and customer records, but if the utility still fails to bill and collect effectively, then all efforts for updating records are wasted.

Ineffective and poorly managed collection practices also impact staffing costs and staff efficiency levels. A utility may be allocating some staff for carrying out collection functions, but if such practices are not effectively targeted and do not result in improved collection efficiencies, then such efforts will have suboptimal results.

2.6.4 Interventions for Improving Collection in Water Utilities

According to World Bank (2008), interventions targeting reduced commercial losses need to be undertaken at the provider level to produce revenue enhancements that will contribute in bringing about sustained improvement of services. Successful billing practice must ensure that bills are raised on a monthly basis and should be volumetric-based, such that customers pay for what they consume. This makes it mandatory for the service provider to adopt 100 percent metering of all its customer connections. Service providers must realize that an effective collection system that rides on these principles can bring about immediate improvements in revenue streams. Nonetheless, to ensure that such practices remain effective, it is absolutely essential that providers have updated, robust, and computerized customer databases such that the billing function can be easily implemented.

A good example is that of National Water and Sewerage Company-Uganda whose capacity for customer management was insufficient to manage an increasing number of customers. In 1998 the collection rate was only 60 %. In order to expand capacity, NWSC computerised invoicing and developed a detailed customer database .The introduction of the new tools and processes were backed up by training courses and advice from long-term and short-term experts. Improved customer management enabled NWSC to increase metering coverage from 39 % to 99 % and to implement effective disconnection for nonpayment. With an average collection rate of around 90 % since 2002, NWSC now appears to be performing rather well in the context of African public (GIZ, 2009).

It is also important to outsource certain essential processes, like billing and collection, in the hands of companies that have proven expertise in such fields, which in turn enabled the provider to focus on the more important functions and core activities for improving quality of services. This can be either through service contracts that are adopted only for this or through other contracting forms where the entire service obligation is outsourced to a third party.

Using performance incentives for improving collection practices, by linking remunerations directly to efficiencies as achieved by water supply and sanitation staff is also important. If the targets are achieved, staff members are rewarded financially or are recognized for being part of the best operating division. Such initiatives for creating peer pressure generate healthy competition for improved revenue performance and overall increases in revenues for the water boards.

Water utilities also need to create incentives and disincentives so that consumers make payments on time. Imposition of fines, partial disconnection, and a complete cutoff of the connection can be used by water service providers to put in place credible threats for defaulters and illegal connections. Customers could be encouraged to pay on time through the use of discounts and rebates for early payments, or easy payments of bills for consumers through options like customer centers, collection centers, online payment facilities, and so on, through facilities like kiosk machines, Electronic Clearance Systems, Internet banking facilities, and integrated service delivery initiatives.

If these initiatives for improving collection practices are to remain sustainable, they will have to be addressed in the overall institutional context that brings in a commercial culture for providing the appropriate incentives to effectively charge, bill, and collect for services provided. When a collection system functions well, it not only generates increased revenues that can help improve services, it also capacitates the generation of reliable data that can inform the strategic planning process of the service provider for ensuring that such improvements in services remain sustainable in the long run.

2.6.5 Revenue Collection Efficiency in Kenya

According to WASREB (2012) the average sector revenue collection efficiency marginally improved from 82% in 2009/10 to 84% in 2010/11 against a sector benchmark of 85%.

2.7 Metering Ratio and Revenue Generation

This is defined as number of connections with operating meter as a percentage of total connections. The metering of customers is considered good practice. It allows customers to influence their water bills by measuring and monitoring their consumption and provides utilities with tools and information to allow them to better manage their systems.

When metering is inefficient and coupled with low tariffs, the financial sustainability of utilities is at stake. Commercial losses occur due to illegal use, inaccuracies in metering, meter reading errors, data handling and billing errors, and have a negative impact on utility revenue and accuracy of water usage data (American Water Works Association (AWWA), 2009).

One of the tools that has received considerable attention in urban water demand management is universal metering .Universal metering refers to systems where meters have been installed on all properties and billing is based on the volume of water used rather than on flat rate billing. Water use reduction in the range of 10 to 30% has been reported as a result of sub-metering. The term ‘sub-metering’ refers to any metering that occurs downstream of a water utility’s master meter to measure individual resident water usage in apartments, condominiums, mobile home parks, and small mixed commercial properties (AWWA,2000).

Universal metering and sub-metering has not brought the much anticipated benefits to water utilities in developing countries, most likely due to metering inefficiencies. Non-revenue water (NRW) resulting from meter inaccuracies and poor water meter management can be reduced by assessing meters' performance and identifying the main causes of malfunction. It is now widely acknowledged that mechanical water meters become more and more inaccurate during their operating life due to 'wear and tear' of the measuring components (Arregui et al., 2006b; Male et al., 1985).

Based on the performance of the top 25 percent of all the 134 utilities involved in the African utility performance assessment, 100 percent metering is a reasonable target for utilities to achieve. Almost half of the Eastern Africa utilities have less than 75 percent meter coverage, implying that utility managers in the region may not be fully in control of their systems. On the other hand, metering is relatively widespread in the Western and Southern regions with almost half of utilities in these regions reporting 100 percent coverage (World Bank, 2010).

2.7.1 Metering Ratio in Kenya

The average metering improved from 82% in 2009/10 to 87% in 2010/11, but it still remains below the sector benchmark of 100%. The reported average performance is likely to be overstated since generally, a certain portion of reported metered connections has non-functional meters. WSPs need to reinforce efforts towards 100% metering by making use of available funding, e.g. earmarked funds in the Regular Tariff Approvals or financing under the WSTF's Urban Projects Concept (WASREB, 2012)

2.8 Staffing Level and Revenue Generation

Appropriate staffing levels and efficient task allocation remain major challenges for most service providers. Personnel costs in many water utilities in developing countries constitute a larger cost factor than usually recognized, draining resources from maintenance and other necessary operating expenses and imposing costs on customers. Efficient utilization of human resources is therefore a critical performance area for utilities. Two key indicators are used to assess the efficiency of human resource utilization in participating utilities. These are staff productivity index; expressed as number of staff per 1000 connections and personnel or labor costs; expressed as a ratio of personnel costs to total operating costs.

Staff productivity index (SPI) is an important measure of the efficient use of human resources in a utility. It relates the number of staff to the number of connections, with good performance manifested by a low staff per 1000 connection ratio while a high ratio may indicate inefficient use of human resources. A frequently used international benchmark for staff productivity is 2 employees per 1000 connections but Tynan and Kingdom (2002) proposes a benchmark of 5 employees per 1000 connections for developing countries. The SPI ratios achieved by the top 25 percent of all utilities in the 134 sample suggest that a target of 7 or fewer staff per 1,000 connections is achievable (World Bank, 2010).

The SPI ratio alone does not provide a satisfactory picture of the situation. To complete the analysis of staff productivity we must examine personnel/labor costs as well. Findings from Andrés, Guasch, and others (2008) and Gassner, Popov, and Pushak (2008a) confirm that reforms usually results in lower staffing levels and higher labor productivity. This raises a dilemma: workers are assets, and governments and donors cannot ignore social issues linked to downsizing. Labor costs on the other hand are also a major component of utility costs, so productivity cannot be ignored either, regardless of whether a utility is privately or publicly managed. For the provision of better and more efficient services, it is often necessary to replace staff members who have limited or no qualifications with others who are more qualified, making some redundancies unavoidable.

2.8.1 Staffing Levels among Kenyan Utilities

A low staff productivity ratio indicates high efficiency in the utilization of staff and is therefore desirable. Staff productivity is affected in part by connection practices (single or shared), skills mix, and outsourcing of staff functions, and the number of water supply schemes. It also depends on whether a utility provides both water and sewerage services. The average performance on this indicator slightly improved from 8 to 7 staff per 1000 connections from the previous period (WASREB, 2012)

2.9 Service Coverage and Revenue Generation

This is defined as the percentage of the population with access to water services (either with direct service connection or within reach of a public water point) as a percentage of the total population under a utility's area of responsibility. This is a key indicator for the MDGs but its assessment is usually affected by whether the data on population is upto date and accurate. An

estimate of the population with direct service connections is fairly easy to make if a utility has good customer records. More customers (higher service coverage) translate to a larger revenue base for the service provider. As noted by World Bank (2010) through its assessment on performance of the top 25 percent of African utilities, a reasonable cut-off point for identifying strong and weak performers is 90 percent for water and 82 percent for sewerage. With these levels, the Southern region has the largest number of best performers for both water and sewerage coverage - the majority being South African utilities. Only a few utilities from the Eastern and Western region make it to the best performer group.

There is a significant potential market for utilities to expand their water services since most poor households currently depend on limited stand post supplies or informal vendors. Where household connections do exist, low pressure and intermittent supply compromises the quality and measurability of services. Low service coverage means less revenue, which in turn results in higher operating ratios/less efficiency. Often, even where network access has been provided, service providers have to make sustained efforts to encourage customers to obtain direct connections and not depend on public standposts or self-provision.

2.9.1 Water Service Coverage in Kenya

Water Coverage assesses the performance of WSPs in supplying potable water to people living within their service areas. While average urban coverage remains below the acceptable benchmark of 80%, a clear positive trend can be observed, with coverage improving by 12 percentage points (from 40% to 52 %) between 2005/06 and 2010/11. Interventions to improve formalized services, especially in underserved urban low-income areas, are clearly bearing fruit, but more needs to be done to sustain the positive trend. This is especially in light of the growing population pressure in Kenya's urban centres. WSBs are still not complying with their obligation to ensure the progressive realization of the human right to water and sanitation by developing realistic investment plans which target the underserved. WSPs need to reinforce their efforts to extend coverage in underserved urban areas through low-cost technologies such as water kiosks and yard taps (WASREB, 2012)

2.10 Conceptual Framework

A conceptual framework is a representation, either graphically or in narrative form, of the main concepts or variables, and their presumed relationship with each other. It is usually shown best as a diagram. This study was based on the conceptual framework shown in Figure 1.

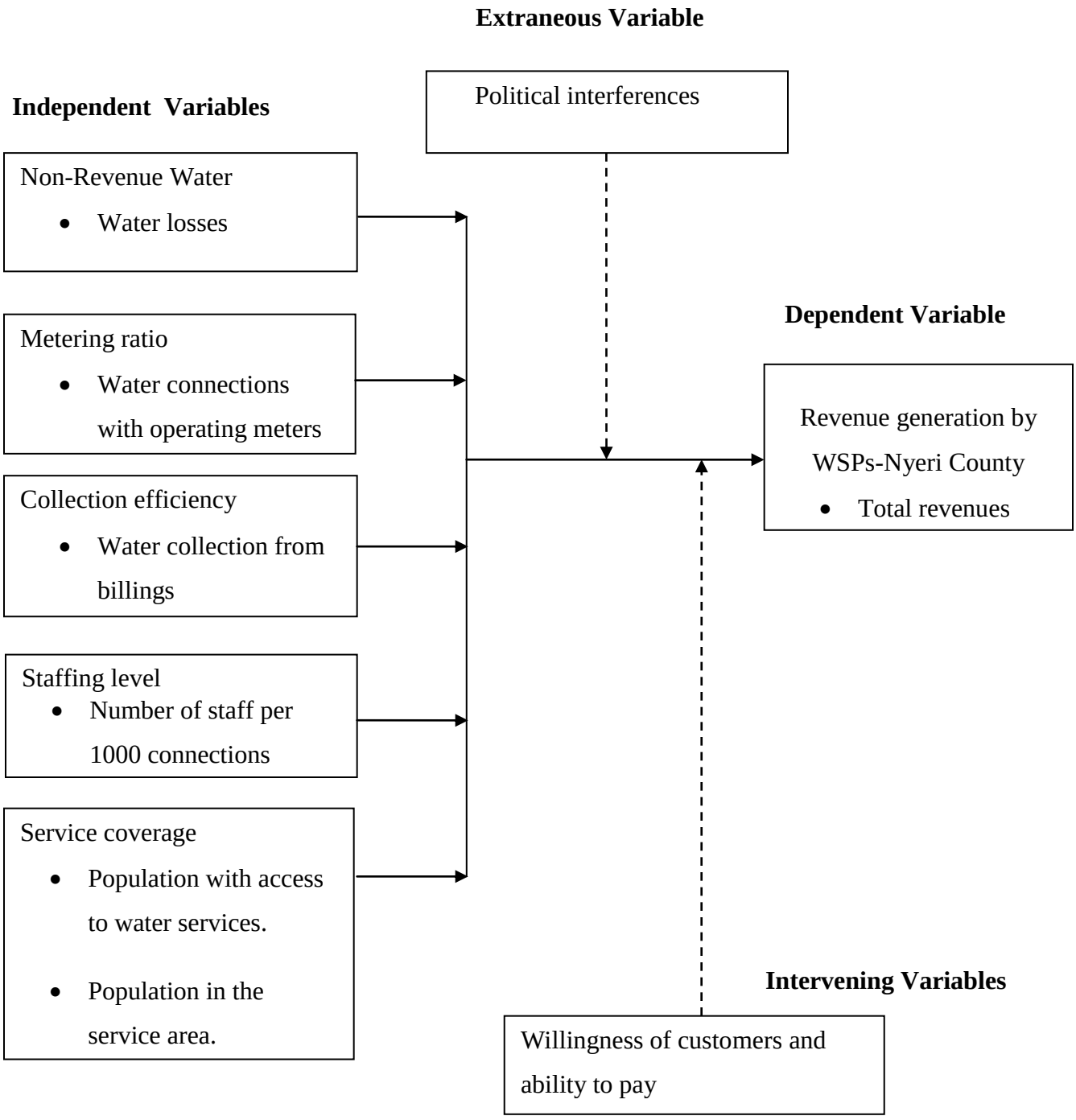

Figure 1: **Conceptual framework.**

The dependent variable in this research study was revenue generation whilst the independent variables were the critical operational factors. These were; metering ratio, service coverage, revenue collection efficiency, staffing ratio and NRW. The extraneous variable was political interferences whilst the intervening variables were willingness and ability of customers to pay.

2.11 Summary

This chapter has given in depth insights into the independent and dependent variables of the study by basing the literature on published works by other researchers. It has also outlined the conceptual and theoretical framework upon which the study was based.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter gives an explanation and justification on the choices of methodology approaches that were used and adapted in order to answer the research questions posed. It also outlines the systematic research procedures used in the collection and analysis of data. This includes project's research design, target population, sample and sampling procedure, data collection instruments and finally how the data collected was analyzed.

3.2 Research Design

According to Cooper and Schindler (2008) a research design is a statement of the essential elements of a study and constitutes the blue-print for the collection, measurement and analysis of data. It refers to the structure of an enquiry; it is a logical matter rather than a logistical one. The function of a research design is to ensure that the evidence obtained enables us to answer the research question as unambiguously as possible. It is therefore a logical and systematic plan prepared for directing a research study (Shajahan, 2005). The aim of this study was to investigate on factors influencing revenue generation among WSPs in Nyeri County.

This study utilized a descriptive survey design where interviews and self-administered questionnaires were used for data collection. Kothari (2004) describes descriptive surveys as fact-finding enquiries, involving asking questions (often in the form of a questionnaire) of a large group of individuals, adding that the major purpose is description of the state of affairs as it exists at present and represent the findings/ information statistically. Mugenda and Mugenda (1999) states that a descriptive survey design determines and reports the way things are or answers questions concerning the current status of the subjects in the study.

3.3 Target Population

The population of interest in this study consisted of all managers in the contracted WSPs in Nyeri County namely; Nyeri Water and Sewerage Company, Mathira Water and Sewerage

Company, Othaya Water and Sewerage Company and Tetu Aberdare Water and Sewerage Company. The population also included the managing directors of the water companies.

Table 3.1: ***Composition of Target Population***

Level	No in Position	Percentage of Total Population
Technical	10	20.8
Finance	10	20.8
Commercial Services	8	16.6
Human Resource (HR)	8	16.6
Marketing	8	16.6
Managing Directors	4	8.4
Total	48	100

As shown in Table 3.1, there were 48 managers in the four water companies.

3.4 Sample Size Selection and Sampling Technique

Sampling procedure may be defined as a systematic process of identifying individuals for a study to represent the larger group from which they are selected (Mugenda and Mugenda, 2003)

Table 3.2: ***Sample Population***

Level	No in Position	Proportion	Sample
Technical	10	0.5	5
Finance	10	0.5	5
Commercial Services	8	0.5	4
Human Resource (HR)	8	0.5	4
Marketing	8	0.5	4
Managing Directors	4	0.5	2
Total	48	0.5	24

Stratified random sampling was applied in carrying out the study as per the departments (Technical, Finance, HR, Commercial Services and Marketing); a sample of 50% of the total population was used resulting in 24 respondents who constituted the sample population for the study. This is as shown in Table 3.2.According to Gay (1983) as cited by Mugenda and Mugenda, (2003) suggests that for descriptive studies at least 10% - 20% of the total population

is enough. Stratified random sampling involves dividing the population into homogeneous subgroups (stratum) and then taking a simple random sample from each stratum independently of each other. It is generally used when the population is heterogeneous, or dissimilar or where certain homogeneous, or similar, sub-populations can be isolated (Patton, 1990). According to Mugenda and Mugenda (2003), the goal of stratified random sampling is to achieve desired representation from various subgroups in the population.

3.5 Data Collection

Primary data was collected through the use of interviews and self-administered questionnaires. Triangulation of the quantitative data collected was done by counterchecking with available secondary data from WARIS at WASREB.Self-administered questionnaires were used to collect essential data from water utility managers. They were delivered by mail to the respondents. Specifically designed close-ended questions were used to collect the quantitative data, while the open-ended questions were used to seek in-depth information.

3.6 Validity and Reliability of Research Instruments

Conclusions made by researchers are based on the information they obtain from research instruments. Therefore, the quality of instruments used in research is very important. To achieve this, researchers ensure that the instruments are reliable and valid. Any data collection tool worth its purpose has to be fit to measure what it intends to measure and should also be capable of generating the same results on repeat measurements.

3.6.1 Validity of Research Instruments

Validity of research instrument refers to the degree to which a test or measuring instrument measures an intended content area. Internal validity refers to the questionnaire's ability to measure what is intended to be measured while content validity refers to the extent to which the questions provide adequate coverage of the subject matter.Mugenda and Mugenda (1999) defines validity as the degree to which results obtained from analysis of the data actually represent the phenomenon under study. Its determination is primarily judgmental and intuitive. It can also be determined by using a panel of persons who shall judge how well the measuring instrument meets the standards, but there is no numerical way to express it.

Validity of this study was ensured by use of experienced professionals in research who assessed and reviewed the suitability of the instrument in measuring the intended variables and its comprehensiveness in content. They helped in judging the study's adequacy using Best and Kahn's two-step method of demonstrating evidence of validity, i.e. first, defining the universe of content that could be included in the test, and secondly, ensuring that the test's items were representative of the universe.

A pilot study was done in Thika Water and Sewerage Company in order to bring to light the weaknesses and strengths of the questionnaires. Views from water sector experts on the questionnaires were also sought. Improvement was then effected by reviewing the content and reformulating the questions where necessary. To achieve a high questionnaire return rate, respondents' approval to participate in the study was sought before administering the questionnaire. Preliminary notification by telephone and frequent follow-up was also done. The researcher used oral administration of an interview guide to collect data from the managing director. This entailed a one to one talk between the researcher and the respondents and aimed at obtaining more generic views on the factors affecting revenue generation.

3.6.2 Reliability of Research Instruments

Mugenda and Mugenda (1999) defines reliability as a measure of the degree to which a research instrument yields stable and consistent results or data on repeated trials. Although unreliability is always present to a certain extent, there will generally be a good deal of consistency in the results of a quality instrument gathered at different times. Therefore, a measuring instrument is reliable if it provides consistent results (Best and Kahn, 2006).The aim of reliability is to minimize the errors and biases in a study.The stability aspect of reliability in this study was ensured by standardizing the conditions under which the measurement took place. External sources of variation such as boredom and fatigue were minimized to the extent possible. Equivalence aspect was improved by using carefully designed directions for measurement with no variation from group to group, using trained and motivated persons to conduct the research and by broadening the sample of items used.

To check on these risks, the data collection instruments was pretested and improved after pretesting. Split-half technique was used and aimed at determining the coefficient of internal consistency or reliability coefficient. The research instrument was split into two subsets, one

consisting of odd numbered questions and the other of even numbered questions. The score of responses of all odd and even numbered questions in the pilot study was then computed. If the correlation became greater than 0.8, it was described as strong, whereas a correlation less than 0.5 was described as weak.

3.7 Data Analysis

While data collection is the systematic recording of information, data analysis according to Best and Kahn (2006) involves working to uncover patterns and trends in data sets. By publishing data and techniques used to analyze and interpret the data, scientists give the community the opportunity to both review the data and use it in future research.

The data collected was entered and analyzed as per the research objectives using Microsoft Excel and Statistical Package for Social Scientists (SPSS) version 17.0.The process consisted of data cleaning and initial data analysis. Data cleaning ensured that erroneous entries were inspected and corrected where possible. The initial data analysis used descriptive statistics to answer questions on the quality of the data, the quality of the measurements, the characteristics of the data sample and whether the implementation of the study fulfilled the intentions of the research design.

3.7.1 Qualitative Data Analysis

Qualitative data analysis essentially involves synthesizing the information the researcher obtains from various sources into a coherent description of what he has observed or otherwise discovered. Qualitative analysis was used to summarize the mass of words generated by the open ended questions in the questionnaires. The process began right from the first day of data collection where data was arranged into relevant themes according to the research questions. Any other new idea that emerged in the subsequent day's field work was added into the summary of themes.

3.7.2 Quantitative Data Analysis

Quantitative data analysis was done by use of descriptive statistics which consisted of graphical and numerical techniques for summarizing data. Descriptive statistics enabled the researcher to reduce a large mass of data to simpler, more understandable terms. The descriptive statistics used were measures of central tendency (mean) and the measures of dispersion (standard deviation).

To uncover relationships between different types of variables, Pearson's correlation coefficient (Pearson's **r**) was used. It is a statistical measure of the co- variation or association between two variables. The correlation coefficient r, ranges from +1.0 to -1.0. If the value of r was 1.0, there was a perfect positive linear relationship. If the value of r was -1.0, there was a perfect negative linear relationship or a perfect inverse relationship. No correlation is indicated if r = 0. The correlation coefficient indicated both the magnitude and direction of the linear relationship (Nunnally, 1978).

3.8 Ethical Considerations

Ethical issues related to the study were addressed by maintaining high level confidentiality of the information volunteered by the respondents and not using the information for other purposes other than drawing the conclusion of the study. The names of the respondents were optional and not disclosed to protect their identities. All personal details were limited to general information.

3.9 Operational Definition of Variables

Operational definition is a description of a variable, term or object in terms of the specific process or set of validation tests used to determine its presence and quantity. Variables described in this manner must be publicly accessible so that persons other than the definer can independently measure or test for them at will (Kish, 2011).Operationalization refers to the translation of concepts into tangible indicators of their existence (Saunders et al, 2009).Table 3.1 below summarizes the operational definitions of variables that were used in this study.

Table 3.3: ***Operational Definition of Variables in the Study***

Objective	**Variable**	**Indicator(s)**	**Measurement**	**Scale**	**Data Collection Method**	**Type of analysis**	**Level of Analysis**
To investigate how service coverage influences revenue generation	Independent Variable Service coverage	a) Population in service area b) Population with access to water services	a) Number of people in service area b) Number of people served with water (either with direct service connection or within reach of a public water point) c) Percentage population served with water in service area	Nominal Nominal Ratio	Questionnaire and WARIS	Quantitative	Correlational and descriptive statistics
To investigate how non-revenue water influences revenue generation	Independent Variable Non-revenue water	a) Water Produced in m3 b) Water Billed c) Water losses in service area	a) Volume of water produced (m^3) b) Volume of water billed(m^3) c) Percentage water losses (%)	Nominal Nominal Ratio	Questionnaire and WARIS	Quantitative	Correlational and descriptive statistics

To investigate how metering ratio influences revenue generation	Independent Variable Metering ratio	a) Active connections b) Connections with operating meters	a) Total number of active connections b) Total number of metered connections c) Percentage metered connections	Nominal Nominal Ratio	Questionnaire and WARIS	Quantitative	Correlational and descriptive statistics
To investigate how revenue collection efficiency influences revenue generation	Independent Variable Collection efficiency	a) Water & Sewerage Billing b) Water & Sewerage collection	a) Total Amount of money billed b) Total amount of money collected c) Percentage collected revenues	Nominal Nominal Ratio	Questionnaire and WARIS	Quantitative	Correlational and descriptive statistics
To investigate how staffing influences revenue generation	Independent Variable Staffing levels	a) Staffing levels b) Active connections	a) Total number of staff in the water company b) Total number of active connections c) Number of staff per thousand connections	Nominal Nominal Ratio	Questionnaire and WARIS	Quantitative	Correlational and descriptive statistics

3.10 Summary

This chapter describes the methodology that was used in carrying out the study. The reasons for conducting the study as outlined are also given and explained. In this chapter the sample size, sampling techniques, method and tools for collecting data have also been outlined and defended .The questionnaire developed was pilot tested prior to the actual one being administered. The chapter has also indicated that, data was analyzed using SPSS version 17.0 and presented in form of frequencies and tables. The next chapter will present the findings of the research.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents findings of the study whereby factors influencing revenue generation among WSPs were examined. The findings of the study have been discussed under thematic areas and sub-sections in line with the study objectives. The thematic areas include: study demographics, service coverage, non-revenue water, metering ratio, collection efficiency and staffing levels of WSPs.

4.2 Response Rate

A questionnaire with open and close-ended questions was administered to 24 management staff from 4 WSPs in Nyeri County heading technical, finance, commercial, human resource and marketing departments. Out of the 22 questionnaires administered, 20 were completed and returned. This represents a response rate of 90.9% .The second group of respondents from the interviews, however, recorded a response rate of 50% since only 1 out of the 2 randomly selected managing directors was available to participate.

4.3 Demographic Characteristics of Respondents

The demographics of respondents were as categorized in the following sections:

4.3.1 Distribution of Respondents by Gender

During data collection, respondents were requested to indicate their gender.

Table 4.1: ***Gender Distribution of the Respondents***

Gender	Frequency	Percent Frequency	Cumulative percent
Male	14	66.7	66.7
Female	7	33.3	100.0
Total	21	100.0	

As shown in Table 4.1, the resulting gender distribution among 21 respondents was 14 (66.7%) males and 7 (33.3%) females. This pointed to the fact that distribution of gender among management staff of WSPs is skewed towards male.

4.3.2 Distribution of Respondents by Level of Education

Respondents were also requested to indicate their highest level of education.

Table 4.2: ***Level of Education of the Respondents***

Level of education	Frequency	Percent frequency	Cumulative percent
Graduate	9	42.8	42.8
Postgraduate	12	57.2	100.0
Total	21	100.0	

The findings presented in Table 4.2 show that out of 21 respondents, 9 (42.8%) had graduate degree as their highest level of education whereas 12 (57.2%) had post graduate as their highest level of education.

4.3.3 Distribution of Respondents by Level of Management.

Respondents were also requested to indicate their level of management in their respective WSPs.

Table 4.3: ***Level of Management of the Respondents***

Level of management	Frequency	Percent frequency	Cumulative percent
Middle level management	9	42.8	42.8
Top level management	12	57.2	100.0
Total	21	100.0	

The findings presented in Table 4.3 show that among the 21 respondents, 9 (42.8%) were from middle level management and 12 (57.2%) were from top level management in the 4 WSPs. All respondents from the top level management had postgraduate degrees in various fields.

4.4 Service Coverage and Revenue Generation

The first objective of this study was to determine how service coverage influences revenue generation by WSPs. Service coverage is defined as a percentage of the population with access to water services to the total population under utility's area of responsibility. It assesses the performance of WSPs in supplying potable water to people living within their service areas. Consequently, more customers (higher service coverage) translate to a larger revenue base for the WSP.

4.4.1 Number of People in the Service Area against Number of People Served With Water.

The total number of people under the jurisdiction of Mathira, Nyeri, Othaya and Tetu WSPs were 148847,134392, 175450 and 92074 respectively. Among them, those served with water were 43695,105426, 152440 and 82856 respectively. This data was used in calculating water coverage levels for the WSPs.

4.4.2 Service Coverage by WSPs

The service coverage levels in Mathira, Nyeri, Othaya and Tetu were 29%, 78%, 87% and 90% respectively. The mean service coverage for the 4 WSPs over the last 3 years was found to be at 65.50% with a standard deviation of 25.7.Notably, Mathira WSP was found to be far below the acceptable sector benchmark of at least 80% coverage but the other 3 WSPs had acceptable levels of water coverage. More targeted resource allocation is therefore required to improve water coverage in Mathira.

4.4.3 Influence of Service Coverage on Revenue Generation

Respondents' opinion on whether service coverage influenced revenue generation in their respective WSPs was sought and was as outlined in Table 4.4. All the respondents affirmed to the fact that service coverage influences revenue generation.

Table 4.4: ***Influence of Service Coverage on Revenue***

Response	Frequency	Percent	Cumulative percent
Yes	21	100	100
No	0	0	100.0
Total	21	100.0	

4.4.4 Measures Needed to Increase Service Coverage

Respondents were asked to indicate the most appropriate and feasible measure for increasing service coverage .

Table 4.5: ***Most Appropriate Measure for Increasing Service Coverage***

Measure	Frequency	Percent	Cumulative Percent
Implementation of new investments and/or upgrading of existing infrastructure for water provision by WSBs	8	38.1	38.1
Reduction of the existing water losses (both technical and commercial) by WSPs	12	57.1	95.2
Use of low-cost technologies such as water kiosks and yard taps; in bringing formal service provision into low-income settings.	1	4.8	100.0
Total	21	100	100

As shown in Table 4.5, the results showed that even though a significant percentage (38.1%) of management indicated that increase in coverage could only be achieved through more investments, majority of the respondents (57.1%) believed that more water coverage can be achieved by using the available resources more efficiently. Reduction of water losses could result to more people served and /or improved water services such as less rationing and more hours of supply.

4.4.5 Relationship between Service Coverage and Total Revenues

A bi-variate analysis was done using historic data from the last 3 years on service coverage and total revenues for the WSPs. Pearson correlation coefficient (r) was then computed and tested at 0.05 (5%) significant level. The result showed a moderate positive relationship (r=0.537) between service coverage and WSPs' total revenues. This relationship was statically significant at 5% level as shown in Table 4.6.

Table 4.6: ***Relationship Between Service Coverage and WSPs' Total Revenues***

		Service coverage (%)	Total revenues
Service coverage (%)	Pearson correlation	1	.537
	Sig. (2-tailed)		.198
	N	12	12
Total revenues	Pearson correlation	.537	1
	Sig. (2-tailed)	.198	
	N	12	12

4.5 Non-Revenue Water (NRW) and Revenue Generation

The second objective of this study was to establish the influence of non-revenue water on revenue generation by WSPs in Nyeri County. High levels of NRW reflect huge volumes of water being lost through leaks, not being invoiced to customers, or both. It seriously affects the financial viability of water utilities through lost revenues and increased operational costs.

4.5.1 Volumes of Water Produced Against Volumes of Water Billed By WSPs

The volumes of water (m^3) produced by Tetu, Nyeri, Othaya and Mathira WSPs were 2479394, 5029527, 5981760 and 4033906 respectively. Of the volumes produced, those billed to customers were 1169303, 3773025, 2306225 and 1247249 respectively. This data was used in calculating non-revenue water levels for the WSPs.

4.5.2 Non-Revenue Water Levels for WSPs

Respondents were asked to indicate the percentage amounts of NRW in their respective WSPs. The NRW levels in Nyeri, Tetu, Othaya and Mathira were 25%, 53%, 61% and 69% respectively. The mean NRW for the 4 WSPs over the last 3 years was found to be at 51.75% with a standard deviation of 15.57.Among the 4 WSPs, only Nyeri WSP is at the edge of the acceptable sector benchmark of below 25%.The mean value of 51.75% for the 4 WSPs over the last 3 years is indicative of poor service and large revenue losses .WSPs should therefore improve on the management of their systems to stem the massive financial losses from the county by prioritizing customer management and maintenance of the infrastructure.

4.5.3 The Main Cause of NRW in Service Areas

Respondents were asked to indicate the main cause of NRW in their service areas. Their responses were categorized into various thematic areas as shown in the Table 4.7.

Table 4.7: ***Main Cause of Water Losses in Service Areas***

Main cause of water losses	Frequency	Percent frequency	Cumulative percent
Water leakages due to dilapidated infrastructure.	6	28.6	28.6
Illegal connections by some members of public	8	38.1	66.7
Unmetered connections	5	23.8	90.5
Defective meters, meter reading errors and corruption among some meter readers	2	9.5	100
Total	21	100	100

From the findings, it is evident that a large percentage of respondents (71.4%) attributed NRW to commercial causes such as illegal connections/water theft, unmetered public consumption, metering errors, unbilled metered consumption and water use for which payment is not collected.

4.5.4 Measures Taken by WSPs to Reduce NRW

Respondents were asked to indicate the mitigation measures they have taken to reduce the water losses in their WSPs .

Table 4.8: ***Steps Taken to Reduce Water Losses***

Measures implemented to reduce NRW by WSPs	Frequency	Percent frequency	Cumulative percent
Rehabilitation and replacement of overdue infrastructure	5	23.8	23.8
Field inspections for illegal connections	7	33.3	57.1
Ensuring 100% metering by putting up monitoring systems at production, distribution and consumer levels, replacement of non-functional meters and rotation of meter readers.	8	38.1	95.2
Public sensitization campaigns on the rights and responsibilities of consumers in regard to water services and their payment.	1	4.8	100
Total	21	100	100

From the findings in Table 4.8, most managers (71.4%) and by proxy their WSPs, have realized the negative impact of commercial losses on their revenue and have embarked on processes of effectively mitigating them. From the interview carried out with the managing director of one of the WSPs, one of the emerging issues was that WSPs should focus more on reduction of commercial losses. This is because commercial losses generally represent about 40% of total NRW yet their mitigation does not require major capital investments. He also stated that high NRW levels indicate poor management, either in form of poor commercial practices or poor infrastructure maintenance, and are detrimental to the commercial viability of water utilities as well as the quality of the water itself.

4.5.5 Impacts of NRW on Revenue Generation by WSPs

Views concerning the impact of water losses on revenue generation were sought from the respondents and outlined in Table 4.9. The management staff was well informed on the negative impacts of NRW on revenues.

Table 4.9: ***Impacts of NRW on Revenue***

Response	Frequency	percent	Cumulative percent
Reduces revenues	21	100	100
Increases revenues	0	0	100.0
Total	21	100.0	

4.5.6 Relationship between NRW and Total Revenues

A bi-variate analysis was done and Pearson correlation coefficient (r) computed and tested at 0.05 (5%) significant level. The result showed a moderate negative relationship (r=-0.584) between NRW and WSPs' total revenues. This relationship was statically significant at 5% level as shown in Table 4.10.

Table 4.10:*Relationship between NRW and WSPs' Total Revenues*

	Percentage NRW (%)		Total revenues
Percentage Non-revenue water (%)	Pearson Correlation	1	-.584
	Sig. (2-tailed)		.046
Total revenues	Pearson Correlation	1	-.584
	Sig. (2-tailed)		.046

4.6 Metering Ratio and Revenue Generation

The third objective of this study was to explore how metering ratio influences revenue generation by WSPs in Nyeri County. The biggest component of commercial losses is associated with metering. Commercial losses occur due to illegal use of water (non-metered connections), inaccuracies in metering, meter reading errors, data handling and billing errors. These have a negative impact on utility revenue and accuracy of water usage data.

4.6.1 Metering Ratios for WSPs

Respondents were asked to indicate the percentage of metered connections in relation to total active connections in their respective WSPs.The metering ratios in Othaya, Mathira, Tetu and Nyeri were 52%, 70%, 88% and 100% respectively. The average performance on this factor for the 4 WSPs over the last 3 years was found to be at 74.50% with a standard deviation of 18.62.It

is therefore still far below the sector benchmark of 100%. More effort is required for commercially sustainable WSPs that make efficient use of available resources. Policies and donors funds should therefore work towards reinforcing WSPs' efforts towards 100% metering.

4.6.2 Assessment of Metering Ratios against the Sector Benchmarks

Respondents were asked to indicate whether the metering ratios obtained were satisfactory or not. Their responses were as documented in Table 4.11. Their assessments were made against the sector benchmarks for metering ratio highlighted below:

>100	Good	95 - 99	Acceptable	<95	Not Acceptable

Source:WASREB

Table 4.11: ***Assessment of WSPs' Metering Ratio***

Response	Frequency	Percent	Cumulative percent
Satisfactory	6	28.6	28.6
Unsatisfactory	15	71.4	100.0
Total	21	100.0	

4.6.3 Measures to Improve Metering Ratio

Respondents were asked to indicate the steps they have taken towards improving metering ratios in their respective WSPs .

Table 4.12: ***Measures Taken to Improve Metering Ratio***

Measures Taken	Frequency	Percent	Cumulative percent
Replacement of non-functional meters	9	42.9	42.9
Field inspections to ensure all active connections as per the database	12	57.1	100.0
Total	21	100.0	

The findings from the interview and Table 4.12 pointed to the fact that most WSPs (57.1%) have been and are working towards reconciling their customer database with the active connections on the ground through field inspections .This is an essential activity in revenue and customer management of WSPs. Replacement of non-functional meters with functional meters is also an ongoing activity conducted to ensure that customers pay for the actual volumes of water consumed thereby minimizing NRW.

4.6.4 Influence of Metering On Revenue Generation

Respondents were asked to indicate how they thought metering ratio influences revenue generation. Table 4.13 shows the thematic categories identified from their responses.

Table 4.13: ***Impacts of Metering Ratio on Revenue***

Response	Frequency	Percent	Cumulative Percent
Reduces revenues	21	100	100
Increases revenues	0	0	100.0
Total	21	100.0	

4.6.5 Relationship between Metering Ratio and WSPs' Total Revenues

A bi-variate analysis was done and Pearson correlation coefficient (r) computed and tested at 0.05 (5%) significant level. The result showed a moderate positive relationship (r=0.421) between metering ratio and WSPs' total revenues. This relationship was statically significant at 5% level as shown in Table 4.14.

Table 4.14:*Relationship between Metering Ratio and WSPs' Total Revenues*

		Total revenues	Metering ratio (%)
Total revenues	Pearson Correlation	1	.421
	Sig. (2-tailed)		.173
	N	12	12
Metering ratio (%)	Pearson Correlation	.421	1
	Sig. (2-tailed)	.173	
	N	12	12

4.7 Collection Efficiency and Revenue Generation

The fourth objective of this study was to investigate the influence of collection efficiency on revenue generation by WSPs in Nyeri County. Revenue collection efficiency gives an indication on the effectiveness of the revenue management system in place and consequently the amount of resources available to the WSP. It also reflects customers' willingness to pay, which is closely related to customer satisfaction.

4.7.1 Total Water and Sewerage Billing Against Total Collections

The total amount billed by Tetu, Othaya, Mathira, Nyeri WSPs was KShs. 39304041,104122308, 312991393and 61,930,069 respectively. Of the amounts billed, the amount collected from customers was KShs. 38551759, 63168289, 295567534 and 52487788 respectively. This data was used in calculating the collection efficiencies for the various WSPs.

4.7.2 Collection Efficiency for WSPs

The collection efficiencies in Othaya, Mathira, Tetu and Nyeri were 61%, 85% ,98% and 94% respectively. The mean collection efficiency for the 4 WSPs over the last 3 years was found to be at 88.75% with a standard deviation of 15.56. In spite of the low collection efficiency by Othaya WSP (61%), the mean collection efficiency in the county (88.75%) achieved the sector benchmark of 85%.

4.7.3 Causes of Collection Inefficiencies by WSPs

Respondents were asked to indicate whether the collection efficiencies obtained in their respective WSPs were satisfactory or not. Their responses were as documented in Table 4.15.Their assessments were made against the sector benchmarks for collection efficiency highlighted below:

>90	Good	85 - 90	Acceptable	<85	Not acceptable

Source: WASREB

Table 4.15: ***Assessment of WSPs' Collection Efficiencies***

Response	Frequency	Percent	Cumulative percent
Satisfactory	16	76.2	76.2
Unsatisfactory	5	23.8	100.0
Total	21	100.0	

Further, respondents were asked to list the main cause of collection inefficiencies by WSPs. Their responses were grouped into various thematic areas as shown in the Table 4.16.

Table 4.16: ***Main Cause of Collection Inefficiencies by WSP***

Main cause of collection inefficiencies	Frequency	Percent frequency	Cumulative percent
Unwillingness of customers to pay	12	57.1	57.1
Laxity on the side of WSP in enforcing strict non-compliance penalties	7	33.3	90.4
Weak revenue management systems	2	9.5	100
Total	16	100	100

The findings above indicate that collection inefficiencies are mainly attributed to unwillingness of customers in paying their water bills (57.1%).This may be suggestive of unsatisfactory services by WSPs (directly connected to the high water losses), customers' culture or inability to pay due to low income levels.

4.7.4 Measures Taken to Improve Collection Efficiency

Respondents were asked to indicate the steps they have taken towards improving collection efficiencies in their WSPs'.Their responses were as shown in Table 4.17.

Table 4.17: ***Steps Taken to Improve Collection Efficiency***

Steps taken by WSPs to improve collection of water bills	Frequency	Percent	Cumulative percent
Field inspections to ensure all active connections as per the database are metered (100% metering)	10	47.6	47.6
Strict issuance of penalties, partial disconnections and complete cut off of connections for defaulters and illegal connections.	11	52.4	100
Total	21	100.0	

4.7.5 Influence of Collection Efficiency on Revenue Generation

Respondents were asked to indicate how they thought low collection efficiency impacts on revenue generation. Table 4.18 shows the key themes identified from their responses.

Table 4.18: ***Impacts of Low Collection Efficiency on Revenue Streams***

Impact	Frequency	Percent	Cumulative percent
Negative impact	21	100	100
Positive impact	0	0	100.0
Total	21	100.0	

4.7.6 Relationship between Collection Efficiency and WSPs' Total Revenues

A bi-variate analysis was done and Pearson correlation coefficient (r) computed and tested at 0.05 (5%) significant level. The result showed a positive relationship (r=0.202) between collection efficiency and WSPs'total revenues. This relationship was statically significant at 5% level as shown in Table 4.19.

Table 4.19: ***Relationship Between Collection Efficiency and WSPs' Total Revenues***

		Total revenues	Collection efficiency (%)
Total revenues	Pearson correlation	1	.202
	Sig. (2-tailed)		.528
	N	12	12
Collection efficiency (%)	Pearson correlation	.202	1
	Sig. (2-tailed)	.528	
	N	12	12

4.8 Staffing Level and Revenue Generation

The fifth objective of this study was to establish the influence of staffing level on revenue generation by WSPs in Nyeri County. Staff productivity index; expressed as number of staff per 1000 connections and personnel costs; expressed as a ratio of personnel costs to total operating costs are used to assess the efficiency of human resource utilization in water utilities. Personnel costs are incurred by a WSP in hiring and maintaining staff. WSPs are required to focus on reduction of the proportion of personnel costs to total operating costs by having the right staff in place and ensuring that they have the right skills mix in order to increase their efficiency and therefore achieve an acceptable staff productivity index.

4.8.1 Staff Productivity Index for WSPs

Respondents were asked to indicate the total number of staff in their respective WSPs. The findings presented in Table 4.20 show that the total number of staff in Tetu, Mathira, Nyeri and Othaya was 62, 65, 107 and 108 respectively. This data was then used in calculating the Staff Productivity Index. In relation to the number of active connections, respondents were asked to indicate their SPIs.The findings presented in Table 4.20 show that SPI in Tetu, Nyeri, Mathira and Othaya was 6, 6, 7 and 11 respectively. The mean SPI for the 4 WSPs over the last 3 years was found to be at 7 with a standard deviation of 2. This is within the acceptable sector benchmark of 8 staff per 1000 connections. This staff efficiency may be attributed to the WSPs having the right skills mix and/or qualified personnel.

Table 4.20: ***Total Number of Staff and Staff Productivity Index for WSPs***

WSP	Number of staff in WSP	Staff Productivity Index
Tetu	62	6.00
Mathira	65	7.00
Nyeri	10 7	6.00
Othaya	10 8	11.00

4.8.2 Relationship between Staffing Productivity Index and WSPs' Total Revenues

A bi-variate analysis was done and Pearson correlation coefficient (r) computed and tested at 0.05 (5%) significant level. The result (see Table 4.21) showed a weak negative relationship (r=-0.161) between SPI and WSPs' total revenues.

Table 4.21: ***Relationship between Staffing Productivity Index and WSPs' Total Revenues***

		Total revenues	Staff productivity index
Total revenues	Pearson correlation	1	-.161
	Sig. (2-tailed)		.617
Staff productivity index	Pearson correlation	-.161	1
	Sig. (2-tailed)	.617	

4.8.3 Relationship between Personnel Costs and WSPs' Total Revenues

A bi-variate analysis was done and Pearson correlation coefficient (r) computed and tested at 0.05 (5%) significant level. The result (see Table 4.22) showed a moderate negative relationship (r=-0.402) between personnel costs and WSPs' total revenues.

Table 4.22: ***Relationship between Personnel Costs and WSPs' Total Revenues***

		Total revenues	Personnel expenditure as a percentage of O&M (%)
Total revenues	Pearson Correlation	1	-.402
	Sig. (2-tailed)		.195
Personnel expenditure as a percentage of O&M (%)	Pearson Correlation	-.402	1
	Sig. (2-tailed)	.195	

4.9 Factors Influencing Revenue Generation

The respondents were requested to identify the operational factor they thought was most influential in revenue generation by WSPs.

Table 4.23: ***Most Influential Factor in Revenue Generation by WSPs***

Operational parameter	Frequency	Percent	Cumulative percent
Service coverage	10	47.6	47.6
Non-revenue water	8	38.1	85.7
Metering ratio	1	4.8	90.5
Collection efficiency	1	4.8	95.2
Staffing levels	1	4.8	100
Total	21	100	

From Table 4.23,it was evident that most respondents (47.6 %) were of the view that among the five factors, service coverage was most influential in revenue generation followed closely by NRW (38.1%).WSPs should therefore aim at maximizing on the number of people they serve for more revenue; either through more water connections or low cost technologies such as water kiosks or yard taps.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes and discusses the findings of the study and presents conclusions, recommendations and suggestions for further research. The purpose of this study was to investigate factors influencing revenue generation by WSPs in Nyeri County. The variables examined were service coverage, non-revenue water, metering ratio, collection efficiency and staffing level in 4 WSPs in Nyeri County.

5.2 Summary of Findings

The research findings were as follows:

5.2.1 Influence of Service Coverage on Revenue Generation

According to the findings, 3 out of 4 WSPs had acceptable levels of water coverage as compared to the sector benchmark of 80%.The mean water service coverage in the County was at 65.5%.Notably, the 3 WSPs were also able to cover their costs while the remaining 1 WSP was unable to cover its costs, maintain and expand the water service infrastructure networks to ensure improved service delivery. This was also supported by the bi-variate analysis which showed a moderate positive relationship (r=0.537) between service coverage and total revenues.

5.2.2 Influence of Non-Revenue Water on Revenue Generation

From the study findings, all WSPs in Nyeri County were still far below the sector benchmark of 25% in NRW and the average value for the 4 WSPs over the last 3 years was 51.75%. The bi-variate analysis showed a moderate negative relationship (r=-0.584) between NRW and total revenues meaning that the higher the NRW, the lower the total revenues generated by the WSP.

5.2.3 Influence of Metering Ratio on Revenue Generation

According to the findings, only 1 out of 4 WSPs in Nyeri County had an acceptable level of metering ratio at 100%.The bi-variate analysis showed a moderate positive relationship

(r=0.421) between metering ratio and total revenues. This means that the higher the metering ratio, the higher the total revenues. The average performance on this indicator for the 4 WSPs was found to be at 74.5% which was below the sector benchmark of 100%.

5.2.4 Influence of Collection Efficiency on Revenue Generation

From the study findings, 3 out of 4 WSPs had acceptable levels of collection efficiency and the mean collection efficiency for the 4 WSPs over the last 3 years was 88.75% compared to the sector benchmark of 85%. The bi-variate analysis showed a moderate positive relationship (r=0.202) between NRW and total revenues.

5.2.5 Influence of Collection Efficiency on Revenue Generation

According to the findings, all 4 WSPs had acceptable levels of SPI as compared to the sector benchmark of 8 staff per 1000 connections. The mean SPI for the 4 WSPs over the last 3 years was found to be at 7 staff per 1000 connections. The bi-variate analysis revealed weak negative relationship (r=-0.161) between SPI and total revenues.

5.3 Discussion of Findings

The following section presents discussion of findings under the various thematic areas.

5.3.1 Influence of Service Coverage on Revenue Generation

The first objective of the study was to determine the influence of service coverage on revenue generation by WSPs. The findings showed a positive relationship between service coverage and revenue generation by WSPs. This observation confirms Marin (2009) findings in the study of Public Private Partnership for Urban Water Utilities that poorly performing public utilities in developing countries had service coverage below 50%. In this regard, WSPs that have low service coverage are also likely to perform poorly in their delivery of services due to low revenues. The findings also showed that even though a significant percentage (38.1%) of management indicated that increase in coverage could only be achieved through more investments, majority of the respondents (57.1%) were of the view that more water coverage could be achieved by using available resources more efficiently. This finding is in agreement with World Bank (2004) views that utility managers need incentives, autonomy and resources to improve on efficiency of investments, management and operations of WSPs. These efficiency

gains should then be allocated to improve service coverage and quality of water and maintain affordable tariffs.

5.3.2 Influence of Non-Revenue Water on Revenue Generation

The second objective of the study was to establish the influence of non-revenue water on revenue generation by WSPs in Nyeri County.The finding on average level of NRW implies that WSPs in Nyeri County lose slightly over half the amount of water they produce. These losses translate to huge financial losses that impact negatively on total revenues and financial sustainability of most WSPs. The findings concur with those made by Prideaux (2009) that high level of water losses in water supply system affects financial viability of water utilities through lost revenues and increased operational costs. Most respondents (71.4%) attributed the huge water losses to commercial causes such as illegal connections and metering errors. This finding confirms World Bank's (2006) findings that one of the major issues affecting water utilities in the developing world is the considerable volumes of water lost through commercial losses. Managers should therefore prioritize on minimizing such water losses through frequent system maintenance and dislodging illegal connections and other commercial malpractices.

5.3.3 Influence of Metering Ratio on Revenue Generation

The third objective of the study was to determine how metering ratio influences revenue generation by WSPs. The findings show that most WSPs in the County pay little regard to the impact of metering on revenue streams yet high metering ratio impacts positively on revenues. This is supported by the findings of the study conducted by Mutikanga (2007) investigating on the impact of utility metering on revenue water. Among its findings was that although metering is widely used as a tool to promote water conservation and utility revenues in developed countries, its impact from the utility perspective of increasing revenue water is not very well understood particularly in poorly managed water distribution networks of developing countries that supply water irregularly. Meters that are installed generally do not work for very long due to high particulate matter in the mains, damages caused by surges or due to vandalism. Nevertheless, most WSPs (57.1%) were in the process of reconciling their customer database through field inspections with the view of improving metering ratios. This is in line with WASREB's (2012) recommendation that WSPs need to reinforce efforts towards 100% metering by making use of available funding to replace all non-functional meters with functional ones.

5.3.4 Influence of Collection Efficiency on Revenue Generation

The fourth objective of the study was to investigate the influence of collection efficiency on revenue generation by WSPs. The high level of collection efficiency in the County was commendable and in agreement with Mehta, Cardone and Fugelsnes (2009) findings that the better performing water utilities in Africa normally manage collection rates of around 80%. There is therefore a direct relationship between collection efficiency and revenues generated by a WSP.That is, the higher the collection efficiency, the higher the revenues. Most WSPs (57.1%) attributed the existing collection inefficiencies to unwillingness of customers in paying their water bills whereas 33.3% ascribed them to laxity on the side of WSP in enforcing strict noncompliance penalties. This concurs with World Bank's (2010) findings that poor revenue collection efficiency is mostly blamed on customers but the utility may also be at fault for delayed and faulty billings, inadequate responses to consumer queries on billings, poor customer service and a lukewarm effort to collect overdue accounts. In an effort to improve their collection efficiencies most WSPs have resorted to strict issuance of penalties, partial disconnections and complete cut off of connections for defaulters while others have opted for field inspections to ensure that all active connections are metered.

5.3.5 Influence of Staffing Level on Revenue Generation

The fifth objective of this study was to establish the influence of staffing level on revenue generation by WSPs .The value obtained was in line with World Bank's (2010) study that suggested a target of 7 or fewer staff per 1,000 connections was achievable in developing countries. Such low values of SPI are indicative of staff efficiency and consequently low personnel costs. According to Tynan and Kingdom (2002), efficient utilization of human resources is a critical performance area for WSPs since personnel costs constitute a larger cost factor than usually recognized, draining resources from maintenance and other necessary operating expenses and imposing costs on customers. It can therefore be deduced from the study that high personnel costs caused by high SPIs impact negatively on revenue generation by WSPs whereas efficient WSPs characterized by low SPIs are able to attract and retain qualified staff.

5.4 Conclusion

From the above findings the researcher can conclude that the level of service coverage determines the amount of revenue generated by a WSP and by extension the resources available to the WSP to finance its operations. High service coverage impacts positively on total revenues generated by a WSP, hence a significant predictor of total revenues. More targeted resource allocation is therefore required to improve water coverage in order to improve on the revenues generated by the WSPs and by extension improve on the water service delivery in the County. WSPs are encouraged to improve formalized coverage in low income areas through increased use of low cost technologies such as water kiosks and yard taps to cover more people in these areas. This will ensure the poor access quality water at regulated prices. It is also clear that high level of Non-Revenue Water (NRW) threatens the sustainability of the majority of WSPs in the County since they are generating revenue from far much less water compared to production while operation and maintenance expenditure continues to rise. This has translated to declining revenues and gradually to poor service levels in both urban and rural areas. There is therefore direct negative relationship between NRW levels and WSP's revenues. It is imperative that WSPs and WSBs focus on the reduction of NRW in order to realize higher levels of returns and, in the long-run, surpluses that can be ploughed back to improve efficiency in the WSPs.

The high level of non-functioning meters and little regard to the impact of metering on revenues by WSPs should be of concern to the sector in the pursuit of commercial and financial sustainability since the study pointed to a positive relationship between metering ratio and revenue generation. Without being able to measure actual consumption, effective management becomes impossible. Effective collection systems and high revenue collection rates among the WSPs in the County were commendable .These are key tools for enhancing the revenue base of the utility, achieving financial viability, sustainability and registering improvements in services delivered. Hence the study findings that the higher the collection efficiency, the higher the revenues available to the WSP.The low number in overall SPI was indicative of high staff efficiency among the WSPs in the County.WSPs should strive and maintain this trend of a low SPI since as the study revealed a high SPI resulting from high staffing levels impact negatively on total revenues.

5.5 Recommendations of the Study

In light of the key findings of this study, the following recommendations are proposed to address revenue generation by WSPs:

(i) Utility managers and all the other players in the sector should understand how different operational parameters influence revenue generation by WSPs.This is in order to realize and enhance commercial viability and financial sustainability of utilities in the water sector. By understanding the factors influencing revenues, policy makers both in government, non-government institutions and other development actors can find solutions to the problem of unviable water utilities and poor service provision.

(ii) Water service coverage has been revealed as an important factor in determining WSP's revenues and by extension its financial sustainability. The current size of the consumer base as evidenced by the number of connections and service coverage has a direct bearing on the viability of WSPs.WASREB should therefore ensure that WSBs develop realistic investment plans targeted to achieve progressive increase in coverage; paying tribute to the fact that access to safe water in adequate quantity is a human right entrenched in the Constitution.

(iii) Even though reducing NRW especially in the older systems is an expensive affair, it is critical in boosting revenues of WSPs. There are critical steps that WSPs in conjunction with WSBs should take in order to minimize the losses. Key among these are: targeting universal consumer metering, aggressive meter replacement programmes, adoption of accurate bulk measuring devices at production and major distribution points, punitive penalties for illegal connections, rapid response to reported bursts and leakages, gradual replacement of ageing infrastructure and aggressive awareness campaign.

(iv) More effort is required for a commercially sustainable water services sector that makes efficient use of available resources. WASREB should reinforce WSPs' efforts towards 100% metering through provision of earmarked funds in tariffs. In order to improve on their collection efficiency, WSPs should enforce stricter collection policies while at the same time improve on their service quality. As measure towards improved staff efficiency, WASREB and WSBs should enforce the implementation of WASREB's criteria for the employment of staff so that a higher level of skills and consequently

capacity will be attained. An effective monitoring system should be put in place by WASREB to ensure enforcement of this criterion by the WSPs.

5.6 Suggestions for Further Research

(i) The scope of this study should be widened to examine factors affecting revenue generation by WSPs run by communities who are currently not regulated by WASREB and where no study has been carried out to find what hinders their performance in delivering service.

(ii) The study focused on influence of operational factors on revenue generation by WSPs. Apart from operational factors, revenue generation by WSPs may also be influenced by social economic factors like income and willingness to pay among others. Further research encompassing those other factors can therefore be done.

(iii) A study should be carried out on factors influencing financial sustainability of WSPs in Kenya.

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APPENDICES

APPENDIX I

LETTER OF INTRODUCTION

University of Nairobi
P.O Box 30197-00100
NAIROBI.

Dear respondent,

I am a post-graduate student at University of Nairobi conducting research study on **"Factors influencing revenue generation among Water Service Providers in Nyeri County".** This is in partial fulfillment of the requirement for the award of a Masters of Art in Project Planning and Management degree whereby I am required to carry out a research project.

Your response to this questionnaire is crucial to the successful completion of this research project. I kindly request you to answer all the questions by filling in the space provided and/or by ticking the appropriate answer that best suits your opinion for each question. Individual responses will be anonymous. Your time and participation in this study will be greatly appreciated.

Thank you for your cooperation.

Yours Sincerely,

Grace Wambui.

APPENDIX II

QUESTIONNAIRE

SECTION A: GENERAL INFORMATION

1. What is your gender?

   Male ( ) Female ( )

2. What is your highest level of education?

   Primary ( ) Secondary ( ) Graduate ( ) Postgraduate ( )

3. Which department are you in?

   Technical/engineering ( ) Finance ( ) Human Resource ( )

   Marketing/PR ( ) Commercial services ( )

4. What level of management are you in?

   Top management ( ) Middle level management ( ) Supervisory level ( )

   Others (specify) _____

SECTION B: SERVICE COVERAGE

5. What is the total population in the WSP service area? _____

6. How many registered water connections does your WSP have at the moment? _____connections

7. What is the average number of people served per active connection?

_____ People

8. What is the total number of people served with water in the service area?

   _____ People

9. What is the percentage water coverage in your service area? _____ (%)

10. Does service coverage influence revenue generation in your water company?

    Yes ( ) No ( )

Explain your answer.

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11. In your opinion, what measures need to be taken to increase service coverage and by whom?

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SECTION C: NON-REVENUE WATER

12. What is the total volume of water produced and channeled to the distribution system?

_____ m^3

13. What is the total volume of water billed to all consumers (These include domestic, institutional, commercial, and industrial consumers)? _____ m^3
14. What is the percentage amount of non-revenue water? _____ (%)
15. What are the causes of water losses in your service area?

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16. What steps has your WSP taken to reduce these losses?

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17. What do you think is/are the impact/s of these water losses to revenue generation in your water company?

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SECTION D: METERING RATIO

18. What is the total number of active connections? _____Connections

19. Among the connections above, how many are metered? _____ Connections

20. From 18 and 19 above, what is your metering ratio? _____ (%)

21. Is the metering ratio obtained in 20 above satisfactory?

Yes ( ) No ( )

If no, what factors can you attribute the unsatisfactory level to?

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22. What measures have you put in place to improve the metering ratio?

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23. Does metering ratio influence revenue generation among water companies?

Yes ( ) No ( )

Explain your answer.

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SECTION E: COLLECTION EFFICIENCY

24. What was the total billing for the last reporting period? Kshs._____

25. What was the total collection for the last reporting period? Kshs._____

26. From 24 and 25 above, what is your collection efficiency? _____ (%)

27. Is the collection efficiency obtained in 26 above satisfactory?

Yes ( ) No ( )

If no, what factors can you attribute the unsatisfactory level to?

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What measures have you put in place to improve the collection efficiency?

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28. Does collection efficiency influence revenue generation among water companies?

Yes ( ) No ( )

Explain your answer

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SECTION F: STAFFING LEVELS

29. At the moment, what is the total number of staff in the company? _____

30. In relation to the total number of active connections, what is the staff productivity index in the company (staff per thousand active connections)? _____

31. In your opinion and basing on the staff productivity index obtained in 30 above, is the number of employees in your company appropriate to handle the volume of work?

Yes ( ) No ( )

Kindly justify your response. _____

32. What is the current level of personnel expenditure as a percentage of total operations and maintenance expenditure? _____ (%)

33. Does staffing level influence revenue generation among water companies?

Yes ( ) No ( )

Explain your answer.

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SECTION G: REVENUE

34. What was the total operating revenue for the last financial year? Kshs._____

35. What was the total operating and maintenance expenditure for the last financial year? Kshs._____

36. From 34 and 35 above, what was your cost coverage for the last financial year? _____(%)

37. In your own opinion, which factor is most influential in revenue generation?

Please put a circle to indicate the extent to which you agree with the statements. A scale of 1 to 4 has been used where 1= strongly disagree and 4 = strongly agree.

	Strongly Agree	**Agree**	**isagree**	**Strongly Disagree**
a) Increasing service coverage to acceptable sector benchmark levels of >90% would greatly improve revenue generation	1	2	3	4
b) Reducing non-revenue water to acceptable sector benchmark levels of <25% would greatly increase revenue generation	1	2	3	4
c) Increasing metering ratio to acceptable sector benchmark level of >95% would greatly increase revenue generation	1	2	3	4
d) Increasing collection efficiency to acceptable sector benchmark level of >90% would greatly increase revenue generation	1	2	3	4
e) Reducing staff productivity index to acceptable sector benchmark level of 7 would greatly increase revenue generation	1	2	3	4