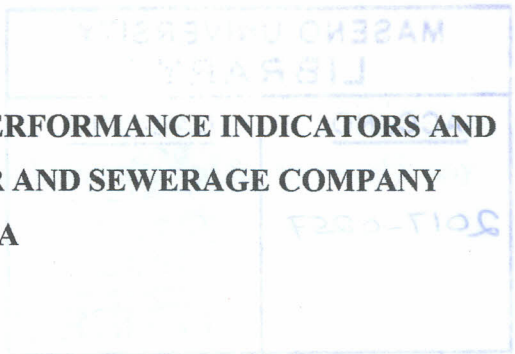


**RELATIONSHIP BETWEEN WATER SERVICE PERFORMANCE INDICATORS AND  
REVENUE GENERATED AT KISUMU WATER AND SEWERAGE COMPANY  
LIMITED, KENYA**



**BY**

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**RESEARCH PROJECT REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE  
REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN FINANCE**

**SCHOOL OF BUSINESS AND ECONOMICS**

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ABSTRACT

The provision of adequate and reliable water supply in Kenya is a challenge for most water utilities especially public service providers which are unable to generate sufficient revenue for sustainability. It is estimated that In Kenya access to water is currently at 59% and sanitation 32%. This situation is associated to inability by water providers to meet the set water service performance indicators Kisumu water Sewerage Company limited (Kiwasco) included. It is clear from available literature that studies on the factors influencing revenue generation of water utilities have generated varied results ranging from those who support a low and significant relationship to those supporting moderate and insignificant relationship. There is no common agreement on how water service performance indicators relate to total revenue generated by water utility. This lack of common agreement may be due to researchers' use of correlation analysis as method of establishing relationships between variables. The aim was to establish the relationship between water service performance indicators and total revenue generated by Kiwasco by use of both correlation and regression statistics. The specific objectives were to establish relationships between collection efficiency, non revenue water, staff productivity index and coverage ratio on total revenue generated by Kisumu Water and Sewerage Company limited for 2008/9-2013/14 financial year on quarterly bases. This study was guided by Theory of Constraints. The research adopted a case study design. The collected data were analyzed through correlational and regression statistics. The study found out that there was significant relationship between Collection efficiency and total revenue generated at kiwasco ltd  $\beta_1 = .006$  ( $p = .034$ ), Non Revenue Water and total revenue generated at kiwasco ltd  $\beta_2 = -.110$  ( $p = .015$ ), staff productivity index  $\beta_3 = -.073$  ( $p = .055$ ). and coverage ratio and total revenue generated at kiwasco ltd  $\beta_4 = .799$  ( $p = .000$ ) and total revenue generated, meaning reduction in staff productivity index and Non Revenue Water increases revenue generated while increase in collection efficiency and coverage ratio increases revenue generated. The study concluded that water service performance indicators had significant relationship to revenue generation of Kiwasco, except staff productivity index which showed a strong negative but insignificant relationship. The study recommends that Kiwasco makes effort to reduce Staff Productivity Index and Non revenue water, while increasing collection efficiency and coverage ratio in order to generate more revenue. For other researchers, the study has exposed areas for further research which will be useful for expanding knowledge in the Kenya water sector.

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background to Study

Improving access to safe and adequate water and sanitation was one of millennium development goals. Though the world has moved from (MDGs) to Sustainable Development Goals (SDGs) SDGs drafters agreed that member state must not divert focus or effort from the achievements of Millennium Development Goals (MDGS) development agenda beyond 2015. In Kenya water is enshrined in the current Constitution of Kenya 2010 as basic human right, it is also a key commitment of the government as contained in the country's Development Blue print, Vision 2030. Yet access to water and sanitation remains low in rural and urban area. The World Health Organization (WHO) and United Nations Children Education Fund, joint monitoring program (2012) report estimates the Country's access to water at 59% and sanitation 32% In Kenya.

The Water Act (2002) herald far reaching institutional reforms in the Kenyan Water Sector, The most important part of these reform was distinction of roles for water resources management and water sanitation services provision .It also provides an institutional framework that Separates policy formulation, regulation and service provision. In terms of services provision the reforms have decentralized functions to semi-autonomous institution. In this agreement the ministry of water retains the role of policy formulation and sector oversight. The Water Service Regulatory Board (WASREB) is responsible for regulation and performance monitoring. Water Services Boards are mandated to provide water and sanitation services through services provision agreement with Water Services Providers (WSPs). Water Service Providers are therefore responsible for daily operation and maintenance of water production and distribution, wastewater, water collection and treatment, billing and Revenue collection and ultimate good service to customers. In Kisumu City water service provision is done by Kisumu Water and Sewerage Company limited contracted by Lake Victoria South Water Services Board.

Despite of conscious effort by the Government to put in place measures to address improvement in water and sanitation service delivery through implementations of sector reforms. Sustainable access of safe water and basic sanitation remains elusive to many Kenyans; the main reasons for

poor performance include old infrastructure, insufficient sustainability measures and inadequate ability by water service providers to adequately generate enough revenue to enhance service provision Kihumba (2013).

Available studies have associated poor revenue generation to inability of water service provider to meet set performance indicators benchmark; however these studies give a varied view of how these water performance indicators relate to revenue generation of water utility. for example Tynan and Kingdom(2002).In their study of effective water service provision in developing countries found that out of 246 water companies they researched on, staff cost was 39% of total operating cost as compared to 29% in developing countries utilities, the coefficient of staff productivity to utility performance was moderately negative but insignificant at the 0.05 level. Another Study by Onsomu (2013) on factors affecting financial viability of water service provider in Kenya, A case of Gusii Water and Sanitation Company found that staff productivity index had a weak negative but significant relationship. These studies though both gave negative relationship result, they had contradicting significance and strength of the relationship, ranging from Onsunu weak and significant relationship to that of Tynan and kingdom moderate but insignificant relationship. Both studies also studied a combination of rural water and small towns Water Utilities; however no known study has looked at relationships between Staff Productivity Index and Revenue Generation of City Water Service Providers.

Another factor which has been put forward as being affecting revenue generation by water service providers has been Non-Revenue Water for example kingdom, Liemberger and Morin(2006) in their study titled challenges in reducing Non-Revenue Water, found that almost about 45 million cubic meter of water is lost daily they translate this to US\$2.9 billion loss, equivalent to more than a quarter amount currently being invested in water infrastructure in the developing world, they concluded that other factors held constant Non Revenue Water had negative significant relationship at the 0.05 level, another study by Kihumba(2013) titled factors influencing revenue generation in Nyeri County found that Non-Revenue Water had a moderate negative relationship. Although this studies give a very good insight of how Non Revenue Water affect revenue generation of water utilities there is no agreement on the strength of relationship, none also has specifically dealt with a purely city set up water utility.

Another Water Service Performance Indicator which has been associated to have been affecting generation is Revenue Collection Efficiency, for example a study by Grawal (2008) found that improving billing and well revenue collection services will have swift impact on revenue streams of water utility. He failed to conclude whether there is a positive or negative relationship between Revenue Collection Efficiency and total revenue water utility. This study aims at confirming or otherwise establishing whether there is a relationship between Revenue Collection Efficiency and total revenue Kiwasco. In Kenya impact assessment report by Water Services Regulatory Board reveal that uncollected revenue by water services providers in Kenya by end of June 2014, was Ksh.0.5billion.all this studies generalize collection efficiency of all places in This generalization of result might give incomplete result hence the need to separate major urban towns to small towns and rural service provision.

Kihumba (2013) in her study found out that increasing Service Coverage and Hours of Supply will greatly enhance revenue generation of water service water providers, In her study she found out there existed positive but insignificant relationship between service coverage ratio meaning results may be due to chance. This study contradicts that of Tynan and Kingdom (2002) who found the coefficient of the log coverage ratio is a negative and significant, which reflects the decrease of revenue with size of the utility. This study tries to reconcile these contradictory results. The available literature does also not put in consideration the fact that urban set ups have high population clustered in small areas as compared to rural. This study sought to determine how Service Coverage affects the revenue generation of city water supply.

## **1.2 Statement of the Problem**

The Water Sector Reforms act key aim was improvement of access and sustainable access and sustainable growth in provision of water and sanitation services, despite Kenyan government putting a regulation framework which if Water Service Providers achieve would ensure provision of sustainable services, many Kenyans remain without access to clean water which studies have associated to inability by Water Service Providers to increase accessibility because they don't generate sufficient revenue for sustainability. Water Service Performance Indicators such as Staff Level, Non Revenue Water, Revenue Collection Efficiency and Service Coverage and Hours of Supply have been put forward by researchers as the major contributing factors affecting revenue generations, Though studies on revenue generation by water supplies has been

done by several scholars. It is clear from literature that studies on the factors influencing revenue generation have generated varied results ranging from those who support a low and significant relationship to those supporting moderate and insignificant relationship. There is no common agreement on how water service performance indicators relate to total revenue generated by Water Utility. Further analysis review that most of researchers analyzed data through use of correlation analysis to explain the relationship between various performance indicators and total revenue generated by water utilities, correlation does not actually explain relationship but association. The aim was therefore to establish the relationship between water service performance indicators and total revenue generation at Kiwasco by use both correlation and regression methods of data analysis. The sub aim was to test significance of this relationship on a purely city set up water service provider for six years.

### **1.3 General Objective**

The purpose of this study was to establish relationship between water service performance indicators and revenue generated at Kiwasco.

#### **1.3.1 Specific Objectives**

The study specifically sought to:

- i. Establish relationship between collection efficiency and total revenue generated at Kiwasco limited.
- ii. Determine relationship between non revenue water and total revenue generated at Kiwasco limited.
- iii. Establish relationship between water staff productivity index and total revenue generated at Kiwasco limited.
- iv. Establish relationship between service coverage ratio and total revenue generated at Kiwasco limited.

## 1.4 Research hypothesis

The study was guided by the following research hypothesis

1.  $H_{01}$ ; *there is no significant relationship between collection efficiency and total revenue generated at Kiwasco limited.*
2.  $H_{02}$ ; *there is no significant relationship between non revenue water and total revenue generated at Kiwasco limited.*
3.  $H_{03}$ ; *there is no significant relationship between staff productivity index and total revenue generated at Kiwasco limited.*
4.  $H_{04}$ ; *there is no significant relationship between service coverage ratio and total revenue generated at Kiwasco limited.*

## 1.5 Scope of the Study

Although there are many water services Performance Indicators, this study concentrated on the four performance indicators i.e. Staffing Level, Non-Revenue Water, Service Coverage and Hours of Supply and Revenue Collection Efficiency. This study was limited in Kisumu city. It covered six years of operation from 2008/2009 financial year to 2013/2014 financial year, Kisumu Water and Sewerage Company limited (KIWASCO), was chosen because it is the only company contracted by Lake Victoria South Water Services Board to supply water in Kisumu City.

## 1.6 Justification of the Study

This research study sought to demonstrate how water services performance indicators affect revenue generation of Water Service Providers, by giving specific relationship associated with each performance indicator under the study to make the policy makers, development partners and regulatory authorities such as (WASREB), understand how these essential factors influence effectiveness and sustainability in water service delivery. This information is useful in formulating better strategies, regulatory tools and funding conditions to enhance sector performance. For the researchers it provides a useful reference material on revenue generations of Water Service Providers, and exposes areas for further research.

## 1.7 Conceptual Framework

Conceptual frame work is a representation, either graphical or in narrative form, of the main concept of independent variables, and their presumed relationship with the dependent variables. In this section, the topic of performance indicators is elaborated upon by looking at a framework for analyzing performance which was developed by Wasreb (2003). The framework forwarded by Wasreb was originally developed as a framework for benchmarking, meaning that the framework would allow for a comparison between different water utilities in Kenya. The frame work distinguishes the following performance indicators broadly categorized as a) Staff productivity index, b) Non Revenue Water, c) revenue collection efficiency and d) service coverage ratio.

Staffing productivity index refers to the number of staffs in employment for every 1000 connection (total registered water and where applicable sewer connections). It measures efficiency of the WSP in utilizing its staff. A lower figure is thus desirable (WASREB, 2005)

Non-Revenue Water (NRW) is defined as “the difference between the volume of water put into a water distribution system and the volume that is billed to customers (Kingdom, Liemberger and Marin, 2006). Losses are either technical losses mainly by leakages, which are caused by poor operations and maintenance and commercial losses due to customers meter under registration, illegal connection water theft, metering errors and unbilled authorized consumption.

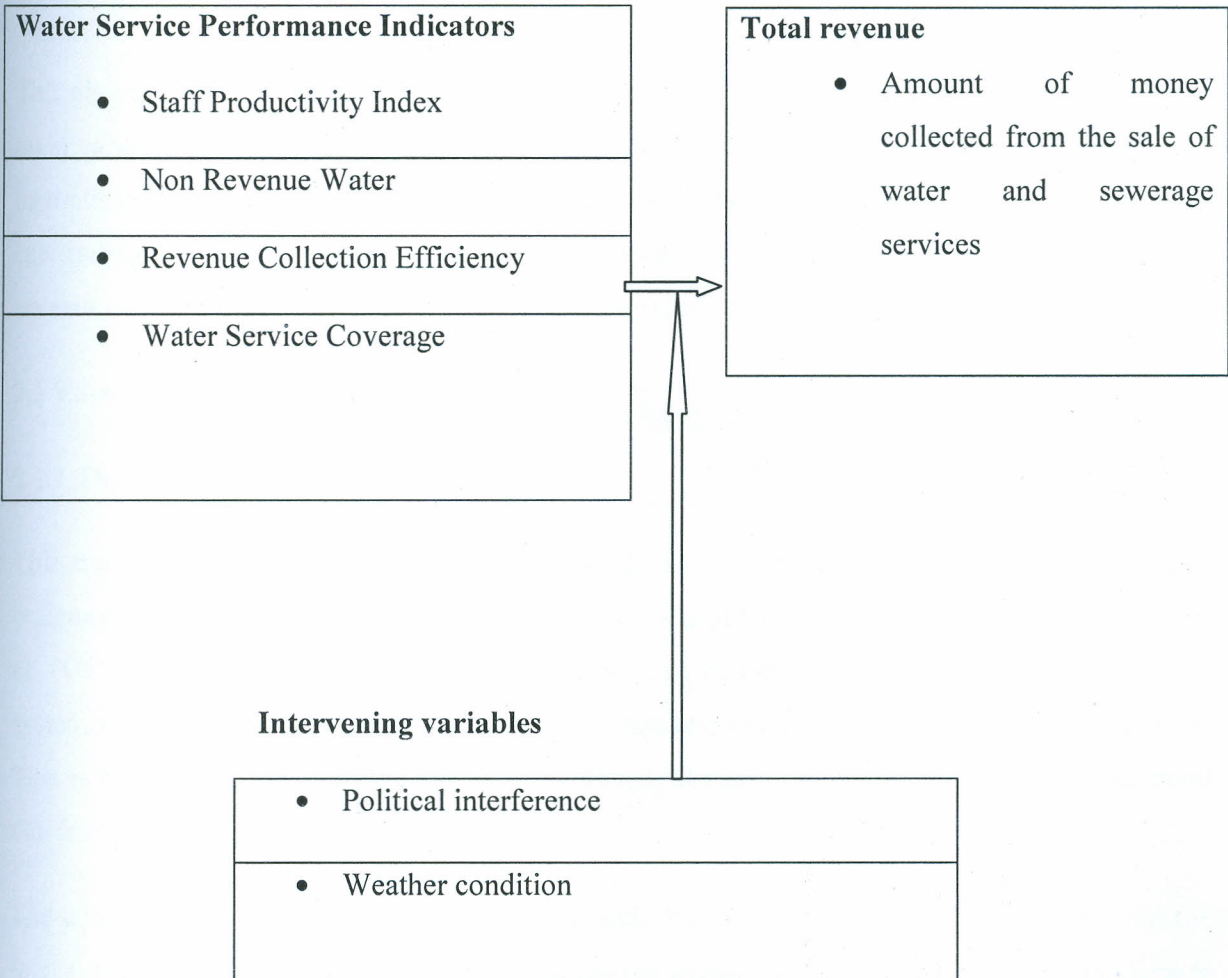
Revenue collection efficiency is defined as the total amount collected by a Water Service Provider compared to the total amount billed in a given period. It is a critical performance indicator of a WSP performance as it given an indication of the effectiveness of the revenue management system in place and consequently the amount of resources available to the Water Service Providers (WASREB Impact report 2012).

Service coverage is defined as the percentage of population with access to water service (either with direct connection or within reach of a public water point) at area of responsibility (WASREB Impact report 2012).



**Independent variables**

**dependent variable**



**Figure 1.1 relationship between water service performance indicators and total revenue generated**

Source: Adapted from Wasreb impact report (2003).

## CHAPTER TWO

### LITERATURE REVIEW

This chapter presents a review of literature related to the Study; with a particular focus on the main variables of the Study .the literature review is discussed under the following subheadings, theoretical framework, on which study is based on and the imperial study with the following subheading. Revenue generation, water performance indicators, Staff productivity index, Non-revenue water, revenue collection efficiency and service coverage ratio.

#### 2.1 Theoretical literature

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##### 2.1.1 The Theory of Constraints

This study was based on theory of constraints (TOC) created by Goldratt (1984) the theory is an organization and change method that is focused on a profit improvement. The essential concept of TOC is that every organization must have at least constrained. The theory says that every system no matter how well it performs has at least one constraint that limits its performance. This is the weakest point of the system. This theory focuses on improving this weakness point Goldratt call this weakness point the bottle neck.

The core concept of the TOC is that every process has a single constraint at time and that the total process output can only be improved when the constraint is improved. The theory further states that spending time optimizing non-constraints will not provide significant benefits, only improvements to the constraints will further the goal of revenue generation (Goldratt, 1984). The TOC defines a set of tools that change agents can use to manage constraints, thereby increasing profit. Most business can be viewed as a link set of process that transforms input into salable output The theory of constrains provides a specific methodology for identifying and eliminating constrains, referred to as the five focusing steps as follows: Identifying the constraint, Exploit the constraint, Subordinate the constraint, elevate the constraint and Start over the cycle with a new constraint (Goldratt, 1984). This theory is important to this study because it can be used to identify factors in water services, hindering revenue generation and dealing with one at a time until improved revenue generation is achieved within Water Service Providers. TOC is an effective approach but need to be endorsed with performance measurement system.

The underlying reason is that every company wants to measure the effect of improvements on their system. This main idea leads to the development of a process-focused performance measurement system. This system focuses the organization on actions that improve overall financial performance. In literature this framework called "Throughput Accounting". According to TOC there are financial and operational measurements. Financial performance measures are net profit, return on investment and cash flow which are global performance measurements. TOC uses this measurement system but states that they are not enough in the subsystem level. So there must be operational measurements as well which are, throughput, inventory and operating expense.

## **2.2 Revenue Generation**

Etuk-Udo (2003) Defines revenue as an income from both the fixed asset and current assets, he further defines fixed asset as an asset which is expected to last more than one year and it is for future benefit, the current asset as it is defined by Etuk-Udo (2003), means those assets which last less than one year and can be converted in to Cash immediately. The Long man Dictionary of contemporary English (1995) define revenue as money that Business or an Organization receives over a period of time especially from selling goods or services. It also describes revenue as Money that Government receives from tax. Hepworth (1976) described revenue as an income or funds raised to meet the expenditure, he added further that revenue is a raising resources needed to provide Government services. He also says that revenue has two aspect of finance i.e. income and expenditure, in other words sources of funds and utilization.

Fayemi (1991) defined revenue as all tools of income to Government such as Taxes, Rates, fees, duties and other Receipts of Government to which Legislature has the power of appropriation, he further classified revenue in to two kinds – Recurrent and Capital revenue. Fayemi also define revenue generation as a process of sourcing revenue for the firm to carry out their aim and objectives.

Revenue generation has been found to be nose diving from time to time due to weakness in the control framework that exists in the public sector, to address this problem, requires proper implementation of plans directed at enhancing adequate revenue generation. International Financial Reporting Standards 18 recommends that revenue recognition is dependent upon the

terms of contract between the entity and the buyer of the goods, recipient of the services or users of the asset of the entity. Revenue should be measured at the fair value of the consideration receivable or received net of any trade discounts and volume of rebates given by the entity. The International Accounting Standards Board (IASB)'s framework stipulates that revenue to be recognized when it is probable that economic future benefits will flow to the entity and reliable measure of the quantum of revenue is measurable. The following applicable strategies for revenue generation have always been helpful (Alao & Alao, 2012). Planning of available resources such as personnel, mobility etc. Frame work of revenue collection from internal to external coverage in order to maximize collection of revenue with minimum input and Frame work to safe guard revenue collected up to designated account.

According to Norton & Kaplan (2012), the finance focus is not enough to effectively handle diverse types of revenue to be collected, even though the financial health of an organization is essential, there are other interrelated factors which are necessary for success. Strategic plans aimed at achieving organization goals should consider the satisfaction of everyone that is connected in achieving the revenue collection goal, setting of goals which have to do with the quality of service, income generation income generation mix along with other factors directed at attaining organizational goal. In line with this they further argue a tool to cater for better measures of the organizational capabilities that will create long term value by identifying relevant key drivers such as customers, financial and operational plans, innovations should be put as a balanced score card. Equally the appraisal system is necessary to charge revenue staff to harness the organization goals with their personal goals in order to achieve set objectives. The balanced scorecard according to Banker et al (2006) is a goal-directed appraisal system that details how to combine effectively individual and organization goals as measure of their performance. These are crucial to internal revenue department to address in order to achieve expected results in revenue generation. According to Hassan (2001), internal control is defined as the whole system of controls financial or otherwise, established by management in an orderly manner to safeguard its assets, and secure as far as possible the accuracy and reliability of its records.

## 2.2.1 Revenue Generation of Water Utilities

Despite being essential in service provision, Water Utilities experience unavoidable variability in their revenue stream. This revenue variability is driven by many factors, changing population, varying customer demand, unpredictable weather patterns and even rate structures. While it is unrealistic to expect utilities to eradicate revenue variability, utilities can understand its root causes and incorporate it into their overall resource and financing planning, Shadi *et al* (2009). In USA, the City water rates provide an efficient and relatively stable revenue base. The fixed portion of the rate provides about 29% of the city's annual revenue and is extremely stable source of revenue; the single volume charge is also relatively secure revenue source since the city does not rely upon high cost, high volume sales to meet its revenue needs. Shadi *et al* (2009). In Asia urban water utilities face a lot of challenges of extending water service provision to low income communities; this has been associated by inability of water revenue to generate enough revenue needed for service expansion. Water and Sanitation for the Urban Poor, (WSUP 2012). For a long time running water utility was primarily engineering and operational challenge, but that has changed due change into water utility into an industry which must address complicated financial issues, delicate environmental concerns, community interest and varying level of regulatory oversight Kihumba (2013) Financial efficiency is achieved by carefully balancing all aspects of financial management with utilities anticipated future needs, financial management consist of effective generating enough revenue while appropriately managing cost (American water works association(AWWA,2010).

The only revenue generating activity of Water Service Provider is water sales to customers. According to a study by water research Foundation 2014 a large utilities can take advantage of economies of scale and spread their cost(Which are mostly fixed)over a greater number of customers, thereby reducing cost per account. Smaller utilities have many of the same fixed cost and requirements with fewer customers to cover cost, additionally the authors further says utility staff may lack time and expertise to strategically finance their utility. Lager utilities are also more likely to have diverse customer base i.e. hefty mix of residential, commercial, industrial and wholesale customers)and are less vulnerable to revenue fluctuations as a result of individual customer behavior change

### **2.2.2 Revenue Generation of Water Utilities in Africa**

Water utilities in Africa continue to experience low revenue generation, for example a study done by Water Aid in Ghana (2013) has shown financial viability as real problem affecting water service provision in Ghana, the study further says that water utilities are unable to generate enough revenue to cover for their maintenance and operation cost. In Nigeria only 15% of port Harcourt is served by Port Harcourt Water Corporation (PHWC) which is 100% subsidized by state . Infrastructure and management gaps remain and water losses estimated to be 85% of the total water produced. Water use is not metered or billed, leaving the water utility without a commercial orientation or revenue generation for regular operations and maintenance. (USAID 2013). In Uganda, National Water and Sewerage Corporation was running a monthly deficit of about 300000 US dollar, despite a high tariff of 1 US\$ per cubic meter of water with an overall debt burden US\$ 100 million, all this associated to poor revenue generation. United Nations (2012).

### **2.2.3 Revenue Generation of Water Utilities in Kenya**

Water Utilities in Kenya are faced with many challenges, according to Mwangi (2014), meeting revenue collection targets is one of the challenges that has exposed water utilities to uncertainties in sustainability and in meeting project goals, Mwangi further argues that failure to generate or collect enough revenue is a catastrophe that manifests in stalled operation in an enterprise as a result of unpaid salaries, poor service delivery and stalled projects.

Another study by Grace Kihumba on factors affecting revenue generation of Water Service Provider in Nyeri County 2013, found that the Water Utilities were unable to generate enough revenue for expansion and could only cater for operation and maintenance cost. In Kisii County a study by Onsomu factors affecting financial viability of Water Service Providers in Kenya, a case of Gusii Water and Sanitation Company limited 2013. Found that the Company relied on National Government for subsidies so as to cover its maintenance and operational cost, she further says employees frequently could go for as long as three months without pay due to low revenue generation.

### 2.3 Water Services Performance Indicators of Water Service Provider

The concept of performance indicators of water utilities is a guide to show how well a utility is doing in meeting their goals and objectives. Indicators and pointers, number, facts, opinions or perceptions that measure an organization performance, (Wouter *et al*, 2005) Any water company's performance, hence its ability to coerce customers to pay for services rendered, requires some sort of accountability. Bairetti *et al*. (2006) suggest water utility performance target for developing nations to be; Total revenue, Water production (supply), Drinking water quality, Customer service and Water consumption (Demand). On the other hand Yniquez (2009) suggest the following performance targets for water utilities in Asian developing countries: Availability of service offered in hours per day, Consumption in liters per day, Metering percentage, Operation ratio, Collection period of the revenue and number of Staff to 1000 connections. The public policy for the private sector in setting performance targets for water utility by Tynan and kingdom (2002) suggest the following standard for developing countries Non-revenue water, Working ratio, Collection period, Water supply connection fees, Affordability of water and Continuity. Tynan and kingdom (2002) argue that performance indicators serve two purposes. To highlight the wide variation of performance to be found amongst developed and developing countries utilities. This will provide shareholders with some appreciation of the range of values to be found around the world and the performance being achieved by "best practice" providers and to purpose target indicators values for utilities in developing countries thus giving them grounding reality

In Kenya the regulatory authority (WASREB) sets the following as the performance indicators; Staffing level per 1000 connection, Non-revenue water, Collection efficiency, Coverage and hours of supply and Operation and maintenance costs.

The study will utilize Staffing level per 1000 connections, Non Revenue Water, Revenue Collection Efficiency and Service Coverage as the key performance indicators since water services providers in Kisumu are under jurisdiction of (WASREB) and those four are the one which have effect on Revenue generation.



## **2.4 Staffing Level and Revenue Generation**

Appropriate staffing levels and efficiency task allocation remain major challenges for most service providers. Personnel costs in many utilities in developing countries constitute a larger cost than maintenance and other necessary operating expenses. Kihumba G.W (2013). Staffing levels refers to the number of staffs in employment for every 1000 connection (total registered water and where applicable sewer connections) It measures efficiency of the WSP in utilizing its staff. A lower figure is thus desirable (WASREB Impact report 2014). Staff productivity index (SPI) is an important measure of the efficiency use of human resources in a utility it relates to the number of staff to the number of connections, with good performance manifested by a low staff per 1000 connection. Labor cost represents the biggest cost in most water; it refers to the total annual costs expressed as the total annual operational costs. Staff cost are traditionally major cost of operating costs. In their analysis of 246 water utilities, Tynan and Kingdom (2002) found that the average staff costs were 39 % of the total operating costs in developing countries as compared with 29 % in developed countries utilities. Tynan and Kingdom (2002) propose a SPI of 5 staff per every 1000 connections for developing world, In Kenya the SPI for water utility is marked at 7 staff per every 1000 connections.

## **2.5 Non Revenue Water**

Non-Revenue Water (NRW) is defined as “the difference between the volume of water put into a water distribution system and the volume that is billed to customers ‘ (Kingdom , Liemberger & Marin , 2006 ) losses are either technical losses mainly by leakages, which are caused by poor operations and maintenance and commercial losses due to customers meter under registration, illegal connection water theft ,metering errors and unbilled authorized consumption ( WASREB , Impact performance report 2014 ) high level of NRW indicate poor commercial practices and affects negatively the Revenue generation ability of water utilities through lost revenue , Lost water resources and increased operational costs ( Jansen’s , 2013 ) consequence thy WSPs capacity to expand by increasing connections and services coverage is comprised. Non-Revenue Water is a big challenge in developing world. according to the study done Kingdom B , Liemberger and Marin in 2006 on challenge of reducing Non-Revenue Water in developing countries, they opine that the total cost to water utilities caused by NRW worldwide can be



conservatively be estimated at US\$ 14 billion per year , with a third of it occurring in the developing world . They further say that about 45 million cubic meters of water are lost daily through water leakage in the distribution networks; they claim the water is enough to serve nearly 200 million people. They similarly say close to 30 million cubic meters are delivered every day to customers, but are not billed because of employee's corruption and poor metering. All this directly affects Revenue generation ability by WSPS and hence poor funding of necessary expansion of service. In their study they conclude by finding that water utilities in developing world will gain additional US \$ 2.9 billion in self-generated cash flows, equivalently to more than a quarter of the amount currently being invested in water infrastructure in the developing world.

### **2.5.1 Non Revenue Water in Kenya Water Sector**

In Kenya Olwa (2012) found that NRW had negative effect on financial performance of water utilities and Recommended for intervention in management and operation of system to control and reduce the huge loss of treated water due to NRW. According to annual sector performance report by WASREB (2014) the average NRW is 46% remaining at a level almost twice against the sector bench mark. Financial losses of up to Kshs 9.8 Billion annually which is about 25% of the annual water sector budget. These high levels have threatened the WSP ability to generate enough Revenue to cover their operation cost hence affecting their financial sustainability

Table. 2.1 Non Revenue Water

System input volume	Authorized consumption	Billed authorized consumption	Billed water consumption	Revenue water
			Billed unmetered consumption( flat rate)	
		Unbilled authorized consumption	Unbilled metered consumption  Unbilled unmetered consumption	NRW
	Water losses	Apparent losses	Unauthorized consumption. Customer metering in accuracy. System data handling errors.	
		Real losses	Leakage on transmission or distribution mains. Leakage and overflow at utilities storage tanks. Leakage on service connections up to point of customer metering.	

Source: Adapted from Farley and Trow (2003)

## 2.6 Revenue Collection Efficiency

Revenue collection efficiency is defined as the total amount collected by a Water Service Provider compared to the total amount billed in a given period. It is a critical performance indicator of a WSP performance as it gives an indication of the effectiveness of the revenue management system in place and consequently the amount of resources available to the Water Service Providers (WASREB Impact report 2012). USAID (n.d) argues that in relation to delivery of service, billing is the principal mechanism that drives all cash flows and is the main source of customer information, Billing is thus critically fundamental for water service providers to succeed. Since all revenue of WSP comes from the delivery of services the municipality needs to bill customers regularly and accurately. Payment invoices that reflect the true nature and quantity of service delivered are more likely to be paid. A grawal (2008) argues that improving billing, as well as collection services, will have a swift impact on the revenue streams of service provider. In relation to provision of water and sanitation, the author argues that any successful billing practice must ensure that bills are raised on monthly basis and based on volumes consumed. This way he argues that customers pay for what they have consumed. he further opine that other critical components to collection efficiency should include customer data bases , using improved technology such as spot billing , could further ease the billing function, thus improving collection efficiency and eventually Revenue streams. Blore et al (2004) include billing as a critical part of the tax revenue cycle. The author argues that the difference between payment in advance and ex-post billing is a crucial distinction and the first method is only excludable method to improve collection levels from poorer customers it may be better to include drip – feed payments (e.g. Prepayment meters), Phased payments to counter short-term fluctuations in income, positive bad debt recovery programs and debt collection services. Misra and Kingdom (2012) argue that meter reading and billing errors, whether involuntary as resulting from truculent practices, should be estimated by limiting the human handling of data. The authors argue that well tested commercial software available on the market should be preferred to what they define as home-grown (i.e. locally built) ones. Water service providers should comply with disconnection and reconnection procedures to prevent the accumulation of large unpaid arrears. The authors suggest that to reduce billing fraud, tariffs should be uniform

In Kenya according to WASREB impact report (2014) overall performance on revenue collection indicators is 89% in 2014 financial year against bench mark of 95% by 2015. WASREB estimates non-collected Revenue in Kenya to be Ksh. 0.5 Billion as at the end of June 2014. WASREB Impact Report ( 2014).

## **2.7 Service Coverage**

Service coverage is defined as the percentage of population with access to water service (either with direct connection or within reach of a public water point) at area of responsibility (Kihumba, 2013). Coverage is a key development indicator. In most urban area, access to potable water through a pipe network is the cheapest and most effective method of water supply (World Bank, 1999), Although , coverage provides insights into the extend of the infrastructure provided, it does not reflect the quality of service (Tynan and Kingdom , 2002). In Kenya service coverage in urban areas is about 56% (WASREB Impact Reports defines hours of supply as the average hours per day that water utility provides water to its customer, (WASREB) further puts hours of supply as an important indicator of service performance as it shows the extent to which the WSP is making progress towards the fulfillment of the human right to water and sanitation. in terms of availability and water and sufficient quantities. Service coverage coupled with high hours of supply can increase Revenue generation party due to high customer base and the economies of scale through the available Literature show how improving service and hours of supply can greatly increase Revenue generation ability of water supply.

## **2.8 Empirical Literature**

Ncube, (2011) did assessment of performance of urban water supply in the City of Bulawayo in Zimbabwe, the study covered a period of six years from 2005-2010. The data used in this study was obtained from literature and documentary review and participatory methods such as customer survey questionnaire and key informant interviews. The independent variables of the study were, efficiency of investment, efficiency of operation and maintenance, financial sustainability and responsiveness to customer while the dependent variable was financial performance of water supplies in Bulawayo, the study used both qualitative and quantitative approaches, the results of the study found that improvement of the above independent variables will lead to improvement of financial performance of water supplies though the relationship

between each independent variable and dependent variable showed a positive relationship, the relationship was very low and insignificant, efficiency of investment  $r=.148$  ( $p=.257$ ), efficiency of operation and maintenance  $r=.216$  ( $p=.065$ ), financial sustainability  $r=.129$  ( $p=.078$ ), This study contradicts other study who found that there existed a moderate significant relationship between water service performance indicators and financial performance of water supplies. the use of correlational analysis in this study makes it inferior since correlation only explains association and not relationship, regression analysis is the best methodology to use to explain relationship between variables.

Eskaf, Hughes, Tiger and Bradshaw (2014) in North America, did a study on how to mitigate and manage variability of water revenue in North America. The objective of the study was to measure the revenue variability and to find solutions of mitigating this revenue variability in Water utilities. The study used exploratory Research Design; they found that it was impossible to forecast exact revenue for a given year, but understanding factors that drive revenue variability could allow utility to project Revenue Risk exposure and prepare accordingly. The study also found that there are many factors that affect Revenue variability across Water Utilities; they specifically found that pricing, weather variability, customer characteristics, operation environment and internal controls greatly affected revenue variability of Water Utilities. The study found out though there was revenue variability all water utilities were financially sustainable and were able to generate enough revenue and utilities did not need subsidies from Central Government. This study contradicts the other studies by Kihumba (2013), Onsomu (2013) and Rop (2013) who all found that Water utilities were not financially stable.

Onsomu (2013) investigated the factors affecting the financial viability of Water Service Providers in Kenya, a case of Gusii Water and Sanitation Company. The study objectives were to establish from the available literature the factors that influence the financial viability of water utilities on a developing world context, second to measure how revenue side factors (Hours of Supply and Staff productivity) influence financial viability of water utilities in Kenya, and third to measure the impact Utilities cost structure (Operation and Maintenance cost and Non Revenue Water) on utility's financial viability. Non Revenue Water, Hours of Supply, staff productivity and Operation and Maintenance cost were used as independent variables while the dependent variable was financial viability of water service provider. The study design was a case study and

exploratory, it relied on primary and secondary Data from Water Services Regulatory Board (WASREB). The data was analyzed through exploratory data analysis technique, cross tabulation, and forecasts. The study found that an increase in Non Revenue Water reduced Water Utility's financial viability by 19 percent, all other factors held constant, it also found a percentage increase in Hours of Supply increased the Utility's profitability by 25 percent, all other factors held constant, finally on staff productivity the study found out that an increase in the number of staff per 1000 connections reduced the WSP's profitability by 7.4 percent. This study showed that the relationship were significant at 95% confidence level.

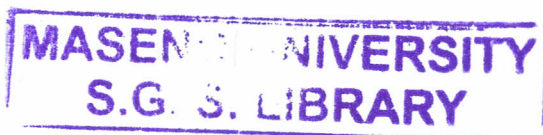
Kihumba (2013) examined factors influencing Revenue generation among water service providers in Nyeri county Kenya. The study assessed various factors in water provision that influence revenue generation of water service providers; it explored Service Coverage, Non Revenue Water, Metering Ratio, Staffing and Revenue Collection Efficiency. The study was a case of all contracted Water Service Providers in Nyeri County, namely Nyeri, Tetu, Mathira and Othaya Water and Sewerage Company, the data was collected through the use of questionnaire administered to Company's Managers it was analyzed through correlational and descriptive statistics through Statistical Package for Social scientists (SPSS). Study found that there existed moderate relationship between performance indicators and total revenue, service coverage  $r = .537$  ( $p = .198$ ), NRW  $r = -.584$  ( $p = .046$ ), metering ratio  $r = .421$  ( $p = .173$ ), collection efficiency  $r = .528$  ( $p = .202$ ) this results shows that the relationship were insignificant at 95% confidence level except relationship between non revenue water and total revenue. This means revenue collection efficiency increased revenue, while increase in non revenue water reduced revenue of water utilities. Unlike Onsomu this study gives us insignificant results. However the researcher would have explained the relationship better had she used regression better instead of correlation which only explains only association between variables.

Rop (2013) examined the factors influencing water service provision in Garisa Kenya. The study used water demand, water source, service level, water tariff as independent variables while water provision was the dependent variable. Questionnaire was used as a method of primary data collection while secondary data was obtained from literature articles, books and internet. Descriptive analysis was used to analysis the data. The study found out that water demand exceeded the water supply and the residents had to rely on other sources, he further found that

water utilities were unable to generate enough water due to wanting infrastructure. The study does not do relationship between his study variables with total generation and therefore one cannot connect how the factors were influencing service provision

Kibuka and Wanyoike (2013) assessed the factors affecting financial sustainability of rural water supplies in Nyandarua County Kenya. The study was carried in water scheme that is Kangui water scheme. The objective of the study was the effect that non revenue water has on financial viability of Rural Water Supply. The data was collected through questionnaire, with a study population of 62 staff working at Kangui water scheme, a pilot testing involving seven respondents was carried out, and the data was analyzed through descriptive methods. The study established that there existed negative but moderate negative correlation  $r=0.556$  ( $p=.04$ ) between Non Revenue Water and financial sustainability of Rural water supplies. The study only analyzed data of a single year which can provide only a snapshot of performance. The study also uses only non revenue water as the only factor affecting financial sustainability of Water Utility completely ignoring other factors.

Based on this literature, it is clear that studies on the factors influencing revenue generation have generated varied results ranging from those who support a low and significant relationship to those supporting moderate and insignificant relationship, this contradiction may be due to researchers' use of inferior method of analysis that is correlation analysis instead of regression. . There is no common agreement on how water service performance indicators relate to total revenue generated by Water Utility. Hence, the results are inconclusive and require more studies to reconcile the contradictory results.



## CHAPTER THREE

### RESEARCH METHODOLOGY

This chapter outlines the research design, the study area, target population, sampling procedures and sample size, data collection methods and data analysis and presentations used in this study.

#### 3.1 Research Design

The study adopted case study design as well as exploratory research design ,case study design is an in-depth study of a particular research problem, it is often to narrow down a very researchable examples. The researcher adopted case study because he needed to do detailed and in-depth investigation on how Water Service Performance indicators relate with revenue generation of Kiwasco. Additionally the study was exploratory because it sought insights and discovery of the trends in explaining the relationship of water service performance indicators and total revenue generated by Kiwasco.

#### 3.2 Study Area

The study was carried out in the city of Kisumu which is third largest city in Kenya with estimated population of over 400,000 inhabitants based on the census projections of 2009. It was case of KIWASCO which supplies water to the city residents, Kisumu city is located at the shores of Lake Victoria, located at 0<sup>0</sup>6' South of equator and 34<sup>0</sup>45' East of Prime Meridian. Its altitude is around 1,131m (3,711ft) above sea level

#### 3.3 Target Population

Mugenda and Mugenda (1999) define target population as that population to which researcher wants to generalize the results of the Study. The ideal setting for a research study is one that satisfies researchers (singleton, 1993).Therefore the target population was water service performance indicators, variables for Kiwasco. According to WASREB (various years) these performance indicators include service coverage ratio, non revenue water, revenue collection efficiency and staff productivity index. In order to meet the study objectives this study, observation for these variables were used.



### **3.4 Sampling Procedures and Sample Size**

Sampling refers to the selection of some part of an aggregate or totaling on the basis of which a judgment of inference about aggregate or totaling is made, it is a process of obtaining a sample from a given population (Orotho, 2005).this study used purposive sampling and choose kiwasco. In purposive sampling the decisions concerning the individuals to be included in the sample are taken by the researcher. The choice of Kiwasco ltd was informed by the fact that, the researcher has specialist knowledge of the company, as well as the researcher's capacity to conduct research at the company in terms of financial and time constraints. The study thus comprised of one company, the focus was on particular characteristics of a population that were of the interest. The sample enabled the researcher to test the research hypothesis.

### **3.5 Data Collection Methods**

#### **3.5.1 Data source**

This study relied primarily on secondary data (audited financial reports) from the Water Service Providers (KIWASCO) and monitoring and evaluation reports from Lake Victoria South Water Service Board which keeps a data base of key performance indicators which affect total revenue generated by Water Service Providers.

#### **3.5.2 Data Collection Procedures**

After approval of the research by the School of Graduate Studies, a research permission to authorize the researcher to carry out the study was obtained from management of Kiwasco. Secondary data on water performance indicators and revenue generation of Kiwasco was obtained from documents availed by relevant managers of kiwasco and from audited financial reports and monitoring and evaluation from manager urban water at Lake Victoria South Water Services Board.

#### **3.5.3 Data Collection Instruments**

Secondary data was collected through analysis of documents to get quantitative data on water service performance indicators; the documents included audited financial reports and monitoring and evaluation reports for the six years under study.

### **3.5.4 Validity and Reliability of the Research Instruments**

Validity indicates the degree to which an instrument measures an intended content area (Gall.*et al.*, 2003). Reliability is the level of internal consistency or stability over time (Gall *et al* 2003). 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 secondary data from analysis of annual reports were reliable since the Researcher used audited financial reports and monitoring and evaluation reports kept by the regulator.

### **3.6 Data Analysis and Presentation**

While data collection is the systematic recording of information, data analysis according to Best and Khan (2006); Involves working to uncover patterns and trends in data set by publishing data and techniques used to analyze and interpret the data scientists give the community the opportunity to both review the data used in the future research. Descriptive statistics enables the researcher to reduce a large mass of Data to simple and more understandable terms, the Descriptive Statistics used were measure of Central tendency (Mean) and measures of Dispersion (standard deviation). To uncover relationship between different types of variables, Pearson's correlation coefficient and multiple regression was used the relationship between independent variables and dependent variable, to indicate the magnitude and direction of the linear relationships. This Data analyses was done with the aid of the IBM predictive software (PASW) (formerly statistical package for social scientists (SPSS)).

## CHAPTER FOUR

### RESULTS AND DISCUSSION

This chapter presents findings of the study where by effects of water service performance indicators were studied, the findings of the study has been discussed under thematic areas and sub- sections in line with the study objectives- the thematic areas include: study demographic, water service performance indicators with sub sections staffing level, non revenue water, revenue collection efficiency and service coverage.

#### 4.1 Descriptive analysis

The Kisumu Water and Sewerage Company reported on quarterly basis, so for the six years under study for a period 2008/9-2013/14 financial years resulted in a sample of 24 quarterly observations. A step by step analysis was done by first showing the descriptive statistics of the data used in the estimation.

**Table 4.1 Results of Descriptive Analysis**

	N	Minimum	Maximum	Mean	Std. Deviation
<b>TOTAL REVENUE</b>	24	47528490	112744029	72247888.54	17944328.20
<b>COLLECTION EFFICIENCY</b>	24	76.1	98.14	86.8217	6.56894
<b>NRW</b>	24	33.46	59.89	47.3025	7.31126
<b>SPI</b>	24	6.84	7.59	7.0754	.23672
<b>COVERAGE RATIO</b>	24	42.10	66.30	53.8226	8.57321
Valid N (list wise)	24				

*Research data (2015)*

The table shows the descriptive statistics for variables used in the study. The variable are defined thus: Total revenue is the total amount of money in Kenya shillings obtained by kiwasco from sale of water and sewerage services; Collection efficiency = the amount collected divided by the total amount billed; Non Revenue Water refers to the difference between the amount of water produced for distribution and the amount of water billed to customers usually expressed in percentage; Staff Productivity Index in water utility refers to the number of staff in employment

for every, 1000 connections; service coverage ratio the number of the population with access to water services as compared to total population always expressed in percentages.

Table 4.1 above showed that during the period under study, total revenue collected by Kiwasco had a quarterly mean of Ksh 72,247,888.54 with standard deviation of Ksh 17944328.20, With minimum total revenue being attained at first quarter of first year of study and maximum total revenue obtained during the last quarters of the years under study, indicating kiwasco improved total revenue generation over the years under study. The findings compare favorably to those obtained by previous studies (Onsomu, 2013) who found out that there has been a gradual increase in total revenue generated by water providers in recent years, this finding can also be explained by the fact that there has been massive investment in new water supplies at Kiwasco by the Government through Lake Victoria south water services board since year 2011.

The mean collection efficiency is 86.82% with a standard deviation of 6.57, with minimum and maximum values being obtained at the first quarter of first year of study and last quarter of last year under study respectively, meaning that out of the every Ksh 100 billed kiwasco could only collect Ksh 86.62 and a whole ksh 13.38 of the billed money could not be collected over the years. The value compare favorably to those obtained by previous studies (Kihumba, 2013) who found out that at of the total amount billed by water services providers in Nyeri County only 88% was actually collected.

Non Revenue Water had a mean of 47.30% with a standard deviation of 7.31, meaning that out of every 100 liters of water produced, treated and put for distribution for sale only 52.7 liters is sold. These values are in line with WASREB various reports that in Kenya NRW is at an average of 52%. These findings also agreed with those of Onsomu (2013), that 60% of total water produced by Gusii water and Sanitation Company was unaccounted for. The findings were also consistent with those of Rop (2013), who found out in Garisa 51% of water produced did not generate any money. High level of NRW indicate poor commercial practices and affects negatively the revenue generation ability of water utilities through lost revenue, lost water resources and increased operational costs (Tynan and Kingdom, 2002).

The mean Staff Productivity Index for Kiwasco was 7.08 (SD=.236) staffs per every 1000 connections respectively. This is within the acceptable sector benchmark of 7 staff per 1000 connections. This finding was in agreement with that of Kihumba, (2013) who found that staff

productivity index within the WSPs in Nyeri County was at the average of 7 staffs per every 1000 connections, Rop (2013) also found in Garisa Water and Sanitation company was at an average of 6 staff per every 1000 connections. This staff efficiency may be attributed to the Kiwasco having the right skills mix and qualified personnel.

The mean Coverage Ratio is 53.82% (SD =8.57), meaning that only 53.82 of the population is served by water services. Kiwasco was below the sector benchmark of 80% coverage, and therefore more resources allocation is required to improve water coverage. This finding concurred with WASREB impact report (several years) which states that the average service coverage in Kenya is at 55%, it also agrees with that of Kihumba (2013) who found out that service coverage stood at 65.5% in Nyeri county.

#### **4.2 Bivariate Association between Water Services Performance indicators and Total Revenue Generated at Kiwasco.**

In order assess the association of water performance indicators on total revenue generated by Kiwasco; Pearson's correlation analysis is performed. It is a measure of strength of association between two variables. Correlation coefficients are used to determine the magnitude and direction of associations. Their values range from -1 (perfect negative correlation) to +1 (perfect positive correlation). The nearer the values are these two values, the stronger the association. The more the coefficients are close to 0, the less the relationship; at 0, there is no relationship (Danthine *et al.*, 2005 and Maddala, 2008). The results presents how total revenue generated at Kiwasco associate with dependent variables constructs namely Collection efficiency, Non Revenue Water, Staff Productivity Index and Coverage Ratio.



**Table 4.2 Results of Bi-Variate Correlation Analysis**

total revenue	Pearson					
	Correlation	1				
	Sig. (2-tailed)					
	N	24				
collection efficiency	Pearson					
	Correlation	.717**	1			
	Sig. (2-tailed)	.000				
	N	24	24			
nonrevenue water	Pearson					
	Correlation	-.723**	-.801**	1		
	Sig. (2-tailed)	.000	.000			
	N	24	24	24		
spi	Pearson					
	Correlation	-.777**	-.727**	.837**	1	
	Sig. (2-tailed)	.000	.000	.000		
	N	24	24	24	24	
coverage ratio	Pearson					
	Correlation	.934**	.713**	-.686**	-.761**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	24	24	24	24	24

#### 4.3.1 Bivariate Association between Collection Efficiency and Total Revenue of Kiwasco

A bi-variate analysis was done and Pearson correlation coefficient ( $r$ ) computed and tested at 0.05 significant levels. The result showed a strong positive relationship  $r = 0.717$  ( $p=.000$ ) between collection efficiency and WSPs' total revenues. This relationship was statically significant at 5% level. This means an increase in collection efficiency all other factors held constant will bring about an increase to the Total Revenue generated. The findings concur with those of Kihumba (2013), and Onsomu (2013), who all found that increased collection efficiency will increase revenue generated, specifically Onsomu found out that 1 Percentage increase in collection efficiency increased total revenue of Gusii Water and Sanitation Company by 17%.

#### **4.3.2 Bivariate Association between Non-revenue water and total revenues**

A bivariate analysis was done and Pearson correlation coefficient (r) computed and tested at 0.05 significant level. The result showed a strong negative relationship  $r = -0.723$  ( $p = 0.00$ ) between Non revenue water and total revenue. This relationship was statically significant at 5% level. Meaning that there existed a significant relationship between NRW and total revenue generated, that is the higher NRW the lower total revenue generated. Rop (2013), Kihumba (2013), found that NRW had a great effect on water utilities ability to financially sustain itself. This negative relationship might explain why the revenue of Kiwasco increased as NRW decreased. The strong relationship  $-0.723$  indicated that almost half of water produced by Kiwasco does not generate any revenue.

#### **4.3.3 Bivariate Association between Staff Productivity Index and Kiwasco Total Revenue.**

A bi-variate analysis was done and Pearson correlation coefficient (r) computed and tested at 0.05 (5%) significant level. The result showed a strong negative relationship of  $r = -0.777$  ( $p = 0.000$ ) between staff productivity and Kiwasco Total Revenue. This relationship was significant at 95% confidence level, meaning the higher staff productivity index the lower total revenue generated by Kiwasco. (Tynan and Kingdom, 2002, Kihumba, 2013 and Onsomu, 2013) have strongly argued that reducing SPI to standard benchmark of 7 staff per every 1000 connection will lead to improved revenue for WSP, her work however does not show which kind of staff should form the bulk of the company for it to achieve improved revenue. Kiwasco mostly employed support staff during the years under study whose personnel cost has a very low effect to the total revenue generated.

#### **4.3.4 Bivariate Association between Service Coverage Ratio and Total Revenue of Kiwasco**

A bi-variate analysis was done and Pearson correlation coefficient (r) computed and tested at 95% significant level. The result showed a strong positive relationship of  $r = 0.934$  ( $p = 0.000$ ) between service coverage and total revenue of Kiwasco this relationship was statically significant at 5% level. This means an increase in Service Coverage Ratio all other factors held constant will bring about an increase to the revenue generated. This finding is consistent with Onsomu (2013) who found out that in Kisii County coverage was at 57%

#### 4.4 Regression Analysis Results

In statistical modeling, regression analysis is a statistical process for estimating the relationships among variables. It includes many techniques for modeling and analyzing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables (or 'predictors'). More specifically, regression analysis helps one understand how the typical value of the dependent variable (or 'criterion variable') changes when any one of the independent variables is varied, while the other independent variables are held fixed.

**Table 4.3 Regression**

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.941 <sup>a</sup>	.886	.862	6657356.88627

a. Predictors: (Constant), coverage ratio, nonrevenue water, collection efficiency, spi

As shown on the table above on model summary the four independent variables under study explains 88.6% of the total revenue generated by kiwasco as represented by  $R^2$  .886. This therefore means that other factors not studied in this research explain 11.4 % of the total revenue generated, thus another study to look at those variables should be conducted.

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6563887418845330.000	4	1640971854711332.000	37.025	.000 <sup>b</sup>
	Residual	842087613512740.100	19	44320400711196.850		
	Total	7405975032358070.000	23			

a. Dependent Variable: Total Revenue

b. Predictors: (Constant), Coverage Ratio, Nonrevenue Water, Collection Efficiency, Staff productivity index

The p- value of .000 (less than .005) implies that the model of relationships between water performance indicators and total revenue generated by Kiwasco, is significant at the 5% significance as illustrated by the table above, the value is 0.00 which is less than 0.05



**Coefficients**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	32471926.591	92165874.098		.352	.028
	collection efficiency	17590.371	380924.862	.006	.046	.034
	nonrevenue water	-268959.640	405272.931	-.110	-6.664	.015
	spi	-5513607.958	12158239.320	-.073	-4.453	.055
	coverage ratio	1671829.897	267965.403	.799	6.239	.000

The regression coefficient in the table above answer the regression equation model  $\hat{Y} = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + \epsilon$

Where

Y= Total Revenue

X1= Collection Efficiency

X2= Non Revenue Water

X3= Staff productivity index

X4= Coverage Ratio

$a$  constant,  $b_1$  coefficient of collection efficiency,  $b_2$  coefficient of Non Revenue Water,  $b_3$  coefficient of Staff productivity index and  $b_4$  coefficient of Coverage Ratio.

$\epsilon$  = standard error.

Based on model it there becomes

$$\hat{Y} = 32,471,926.59 + 17,590.37X_1 - 268,959.6X_2 - 5,513,607.958 X_3 + 1,671,829.897X_4 + \epsilon.$$

From the model it is clear that holding the predictor variables at constant at zero, total revenue generated by kiwasco will be ksh, 32,471,926.59. This is the level of total revenue without the influence of predictor variables.

#### **4.4.1 Relationship Between Collection Efficiency and Total Revenue Generated by kiwasco**

The results from regression analysis indicate that collection efficiency is a significant positive predictor of total revenue generated by kiwasco  $\beta = .006$  ( $p = .034$ ). These values are statically significance since the p- values are less than 0.05. It can be inferred from these values that unit change in collection efficiency leads to increase in total revenue generated all things being fixed. Therefore, *the null hypothesis that there is no significant relationship between Collection Efficiency and total Revenue Generated at Kiwasco ltd was rejected*. This means an increase in collection efficiency all other factors held constant will bring about an increase to the Total Revenue generated. The findings concur with those of Kihumba (2013), and Onsomu (2013), who all found that increased collection efficiency will increase revenue generated, specifically Onsomu found out that 1 Percentage increase in collection efficiency increased total revenue of Gusii Water and Sanitation Company by 17%.

#### **4.4.2 Relationship between Non Revenue Water and Total Revenue Generated by kiwasco.**

The results from regression analysis indicate that non revenue water is a significant negative predictor of total revenue generated by kiwasco  $\beta = -.110$  ( $p = .015$ ). These values are statically significance since the p- values are less than 0.05. It can be inferred from these values that unit change in non revenue water leads to decrease in total revenue generated all things being fixed. Therefore, *the null hypothesis that there is no significant relationship between non revenue water and total Revenue Generated at Kiwasco ltd was rejected*. The directions of relationship are consistent with the literature (Onsunu, 2013, Kihumba, 2013, and Rop, 2013). These studies propose that negative relationship between Non Revenue Water and total revenue generated by water utilities is feasible and therefore acceptable. However, the results are at variance with the findings of Mwangi (2004) who found a negative but insignificant relationship between non revenue water and financial viability of kandui water service provider.

#### **4.4.3 Relationship between staff productivity index and Total Revenue Generated by kiwasco.**

The results from regression analysis indicate that staff productivity index is insignificant negative predictor of total revenue generated by kiwasco  $\beta = -.073$  ( $p = .055$ ). These values are statically insignificance since the p- values are greater than 0.05. It can be inferred from these

values that unit change in staff productivity index leads to decrease in total revenue generated all things being fixed. Therefore, *the null hypothesis that there is no significant relationship between non revenue water and total revenue generated at Kiwasco ltd was accepted.* These results vary with previous studies (Onsunu, 2013, Kihumba, 2013 and Rop, 2013) who find a significant negative relationship between staff productivity index and total revenue generated by water utilities.

#### **4.4.4 Relationship between Service Coverage Ratio and Total Revenue Generated by kiwasco**

The results from regression analysis indicate that Service Coverage Ratio is a significant positive predictor of total revenue generated by kiwasco  $\beta = .799$  ( $p = .000$ ). These values are statically significance since the p- values are less than 0.05. it can be concluded from these values that unit change in Service Coverage Ratio leads to increase in total revenue generated all things being fixed. Therefore, *the null hypothesis that there is no significant relationship between Service coverage ratio and total revenue generated at Kiwasco ltd was rejected.* This means an increase in Service Coverage Ratio all other factors held constant will bring about an increase to the Total Revenue generated by kiwasco. Those results concur with that of Tynan and kingdom (2009) and Kihumba (2013) who found a positive relationship between service coverage ratio and total revenue generated by water utilities.

Thus the use of multiple regression methodology on relationships reconciles conflicting results and therefore water service performance indicators have a significant effect on total revenue generated by Kiwasco.

## CHAPTER FIVE

### SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes the findings of the study and presents conclusions, recommendations. The purpose of this study was to establish the relationship between water service performance indicators and revenue generated of Kiwasco ltd.

#### 5.1. Summary of Findings

The research findings were as follows:

From the study findings Kiwasco had acceptable levels of collection efficiency compared to the sector benchmark of 85%. The correlation and regression analysis showed strong positive significant relationship between collection efficiency and total revenue generated meaning that a unit increase in revenue collection efficiency brings about an increase in total revenue generated by Kiwasco ltd.

The results indicate, Kiwasco was still far below the sector benchmark of 25% NRW. The correlation and regression analysis showed significant negative relationship between Non revenue and total revenues meaning the higher the NRW, the lower the total revenues generated by Kiwasco ltd.

In addition, the correlation and regression results show that staff productivity index is insignificant negative predictor of total revenue generated. Kiwasco had acceptable levels of staff productivity index as per results of descriptive analysis compared to sector benchmark of 7 staff per 1000 connections.

Finally the descriptive results indicate, Kiwasco had a mean of service coverage which is far below the sector benchmark of 80%. The correlation and regression analysis showed a strong positive significant relationship between service coverage and total revenue generated by Kiwasco ltd, meaning that a unit increase in service coverage ratio the lead to increase of total revenue other factors held constant.

#### 5.2. Conclusion

Four conclusions can be drawn based on the preceding evidence. The first conclusion is that staff productivity index (SPI) does negatively predict the total revenue generated by Kiwasco ltd

though not significantly. Secondly, it is concluded that Non Revenue Water is a significant negative variable informing the total revenue generated at Kiwasco ltd. The third conclusion is that collection efficiency is a pertinent positive predictor of total revenue generated at Kiwasco ltd. Forth conclusion is that, service coverage significantly positively predicts total revenue generated in Kiwasco ltd.

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### **5.3. Recommendations of the study**

In the light of the key findings of this study the following recommendations are proposed to address total revenue generated by Kiwasco ltd. Based on first conclusion, since collection efficiency is a significant predictor of total revenue generated, it is recommended that Kiwasco should improvise criteria for improving its collection efficiency. Secondly non revenue water being a significant negative predictor of total revenue generated, Kiwasco should strive to reduce Non Revenue Water. Thirdly Kiwasco should improvise a way of reducing Staff Productivity Index, either by reducing the number of staff or increase number of connections. Finally the study recommends that Kiwasco and Lake Victoria South Water Services Board should make effort to increase service coverage ratio which is a significant positive predictor of total revenue generated by the company.

### **5.4. Limitations of the Study**

The study restricted itself on service performance indicators alone and as the regression analysis indicate that the studied variables explain only 88.6 % of variables explaining total revenue other factors which have effect on total revenue generated by Kiwasco were not included in the study. The research was conducted using a single company of Kiwasco and therefore the results of the study cannot be generalized to show relationship between water service performance indicators and revenue generation of all water service providers in Kenya.

### **5.5. Suggestions for further studies**

This study focused on relationship between service performance indicators and revenue generation thus another study should be carried out on other factors such as internal control and corporate governance on total revenue generated by Kiwasco.

The study focused on Kiwasco alone and therefore another study should be done on relationship of water service performance indicators and revenue generation on other City water service providers in Kenya.

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