

Factors Influencing the Financial Viability of a Water Service Provider in Kenya: The Case of Gusii Water and Sanitation Company Limited

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ABSTRACT

Water is vital for all known forms of life and therefore it is important to ensure adequate supply in the right quantity and quality. Kenya undertook major reforms in the water sector since 2000s to enhance service provision. A major aspect of this was ensuring financial viability of water service providers. However, most WSPs are financially unsustainable. WSPs are faced with weak management structures, processes and systems and poor systems of revenue collection. Therefore, in order to ensure the sustainability of WSPs, it was vital to investigate the interrelationship and importance of factors impacting corporate sustainability, paying greater attention to financial viability of a WSP. This study proposed that revenue adequacy was influenced by nonrevenue water, appropriate tariff design, effective billing and collection and new connections. Cost efficiencies in service delivery is influenced by nonrevenue water, energy efficiencies, staff cost rationalization and chemicals efficiency. Accordingly, this study adopted these factors in measuring the financial viability of water service providers in Kenya. This study was motivated by the studies that have highlighted the financial viability inadequacies of water service providers in sub – Saharan Africa, Kenya inclusive. The inefficiency of the water service providers contribute to limited water access which the quality of human life through increased disease burden, loss of productive time searching for water. The study used the case of Gusii Water and Sanitation Company Limited. The findings of this study can be used to evaluate whether the water reforms in the country are sustainable and effective. Such evidence can inform policies for ensuring attainment of the constitutional obligations towards water rights in Kenya, attainment of Vision 2030 goals as well as the MDGs.

Introduction

Water is vital for all known forms of life and it is certainly central to the human existence through the support of all aspects of consumption, production, human health, recreation and spiritual needs. Given the

role of water in human lives, it is therefore important to ensure adequate supply in the right quantity and quality. In many cases, water is usually not present at the locations and times where and when it is most needed. Interventions are therefore necessary to provide water to support human lives.

In 2002, major reforms were introduced in the water sector in Kenya. The reforms were carried out to address the policy, regulation and service provision weaknesses experienced in the sector (Owour & Foeken, 2009) The reforms were occasioned by the fact that despite many interventions, close to half of the Kenyan population did not have access to clean water (United Nations-Water, 2006). This entailed separating policy functions from regulation and services delivery. Service delivery functions were further separated into asset holding (ownership) and investment; and direct water and sewerage services provision (Owour & Foeken, 2009).

The key weakness identified in the service provision of water was the financing mechanism in the sector (World Bank, 2004). Specifically, there was poor management of water which led to financial difficulties, the inability of water utilities to attract and retain skilled manpower, high levels of unaccounted-for-water and low revenue collection, including corruption, among others (Government of Kenya, 2006). Water utilities did not factor in financial viability in their operation and as such did not adopt cost recovery tariffs, neglected the water infrastructure which became too costly to maintain, therefore draining their capital base (World Bank, 2004).

Before formation of water private companies, service provision under the local authorities was fraught with frequent shortages and wastage, high unaccounted-for-water, illegal connections, mismanagement of funds from water bills, non-reading of meters, and nonpayment of water, among others (World Bank, 2004). All these compromised the financial situation of water utilities. According to the Water Act of 2002, WSPs in Kenya are private entity companies, which are autonomous, managed independently and run professionally. WSPs act as agents of Water Service Boards (WSBs). The Water Act 2002 vests in the WSBs the legal ownership of water and sewerage assets utilized by WSPs. Additionally; WSBs have the authority to regulate water tariffs set by WSPs. Reforms in the water service provision as contained in the Water Act of 2002 were to be guided by the principles of decentralization (provision of services at the local level); financial and operational autonomy of the WSPs; institutionalization of financing of water services (through the establishment of Water Services Trust Fund); as well as financial sustainability. The water reforms in Kenya resonated with similar institutional reforms in the water sector across the developing countries, driven by the Millennium Development Goals targets of ensuring increased access to adequate and quality water (see for example the Government of Republic of South Africa, 2002). At the national level, the challenge of financial sustainability poses a major challenge to the water service providers. A study of water service providers in Tanathi Water Services Board found out that only four of 15 WSPs were able to meet their financial obligations (Tanathi Water Services Board, 2009). In addition, most of the WSPs had weak management structures, processes and systems, had poor systems of revenue collection, and they were unclustered therefore facing diseconomies of scale (Water Services Regulatory Board, 2008).

Water Service Provision in Sub-Saharan Africa

Water and sanitation access in Sub Saharan Africa is still below the internationally accepted access levels despite steady improvement since 1990s. Access to improved water supply has increased from 49 per cent in 1990 to 60 per cent in 2008, while access to improved sanitation has only risen from 28 per cent to 31 per cent (World Health Organization & UNICEF, 2010). It is expected that by 2015, the percentage of the region's population without access to water and sanitation services will still be above the recommendations of Millennium Development Goals (MDGs). Table one and two indicate that water and sanitation access in sub-Saharan Africa is significantly low as compared to the global averages and the progress towards improved access levels has been slower than the world average.

Table 0.1: Use of Drinking Water Sources (Percentage of Population)

Sub Saharan Africa				World			
	1990	2000	2008		1990	2000	2008
Total improved	49	55	60	Total improved	77	83	87
Piped on Premises	15	15	16	Piped on Premises	50	54	57
Other Improved	34	40	44	Other Improved	27	29	30
Unimproved	51	45	40	Unimproved	23	17	13

Source: World Health Organization and UNICEF (2010)

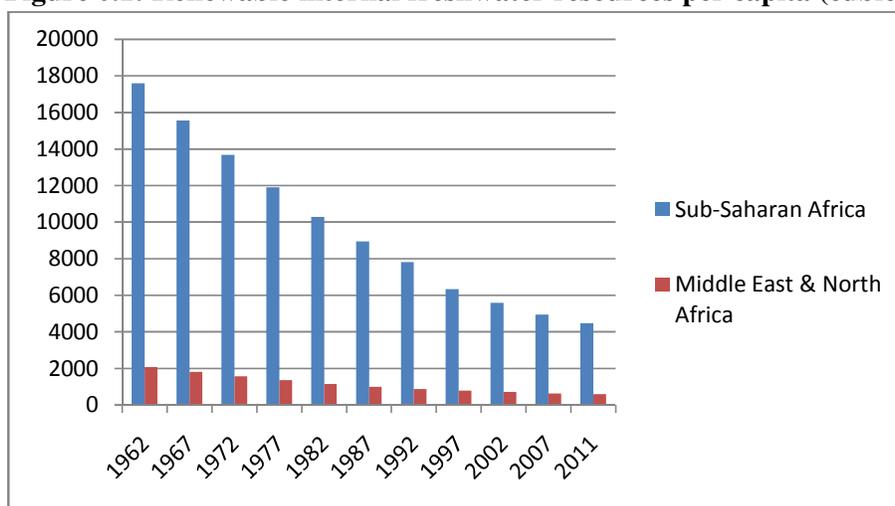
Table 0.2: Use of Sanitation Facilities (Percentage of Population)

Sub Saharan Africa				World			
	1990	2000	2008		1990	2000	2008
Improved	28	29	31	Improved	54	58	61
Shared	16	18	20	Shared	7	10	11
Unimproved facilities	20	21	22	Unimproved facilities	14	11	11
Open Defecation	36	32	27	Open Defecation	25	21	17

Source: World Health Organization and UNICEF (2010)

Water Management

Figure 0.1: Renewable internal freshwater resources per capita (cubic meters)



Source: World Bank, 2012

Figure one shows that sub-Saharan African countries have higher water volumes at any given period as compared to North African and Middle East countries. Yet, sub Saharan africa have significantly lower levels of improved means of water access compared to Northern African countries.

The management of the water service utilities in north African countries such as Egypt, Tunisia, Libya, Morroco and Algeria have contributed greatly in efficient management of water resources resulting to wider

improved water service coverages. On the contrary, water utilities in sub Saharan African countries are encumbered by management and technical challenges that effectively derails efficient water service provision. World Bank (2006) found most sub Saharan countries' management of water, especially service provision to be affected by financial and technical bottlenecks such as financial viability of water companies, and high levels of unaccounted for water.

This paradox is explained by the case of Egypt which has an average rainfall of 1.8 billion M³ per year and 96 per cent of the country's land mass is made up of desert, yet the country has managed the only source of fresh water, river Nile to transform and develop its economy in all sectors ranging from agriculture, energy, tourism, transportation, trade and industry. Almost the whole Egyptian population has access to improved water sources. In 2010, 98 per cent of the population was connected to water supply, which is very close to the Organization for Economic Co-operation and Development average of 99 percent. Furthermore, 70 percent of the Egyptian population is connected to the sewerage infrastructure. Egypt is much better off than other African countries as it have already reached the Millennium Development Goals of halving the number of people without proper access to safe water and sanitation by 2015. In the last 30 years the Government of Egypt has made huge investment in developing water supply infrastructure sector. Hence Egypt ranks among the best lower middle income countries in the world in terms of the providing rural and urban areas with improved drinking water supply and sanitation.

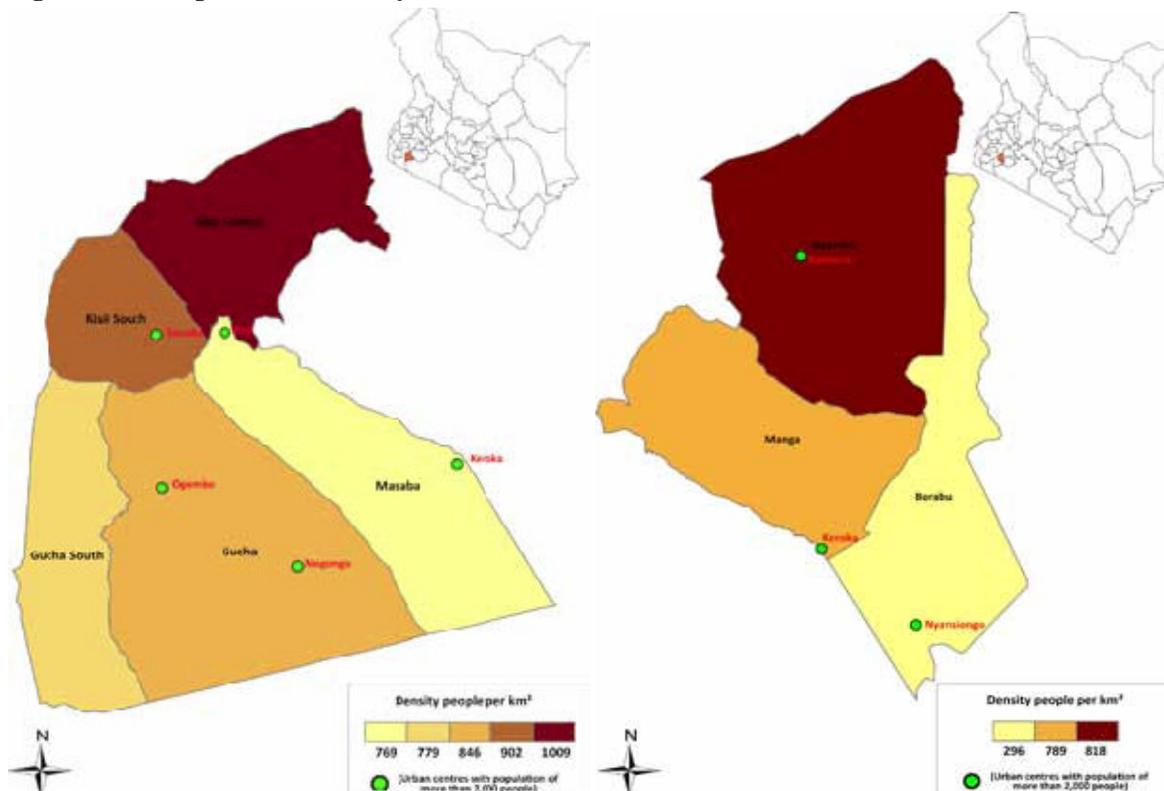
Financial Viability

Broadly, financial viability is the ability of an entity to continue to achieve its operating objectives and fulfill its mission over the long term (U.S. Agency for International Development, 1994). Specifically, financial viability is about being able to generate sufficient income to meet operating payments, debt commitments and, where applicable, to allow growth while maintaining service levels (Government of Australia, 2009). Financial viability considers both quantitative and qualitative aspects of the entity. Unlike quantitative aspects, qualitative aspects of financial viability are not easy to measure and involve mostly intuition such as perceived goodwill of the entity. For water utilities, financial viability measures focus on optimizing water revenues (the demand side) and cost efficiency (supply side) (World Bank, 2009).

Financial viability was therefore an important element of determining the overall sustainability of an entity. An important consideration is that viability is concerned with a long term situation, involving 'trends' as opposed to 'once-off' observations. Additionally, viability considers a number of variables instead of only one or a few and implies lack of capacity on the part of an entity to meet minimum obligations (Marshall & Douglas, 1997).

Gusii Water and Sanitation Company

Gusii Water and Sanitation Company was formed in 2006 and is currently contracted by Lake Victoria South Water Services Board to provide water in Kisii and Nyamira counties, covering an area of 1974 km² and serving population of 1.6 million people (Lake Victoria South Water Services Board, 2012).

Figure 0.2: Map of Kisii and Nyamira Counties

Source: United States Agency for International Development in Kenya; <http://kenya.usaid.gov>

According to Kenya National Bureau of Statistics (2009), Kisii and Nyamira counties have a total population of 2,109,674 on a combined surface area of 3,441 square kilometers. The percentage of urban population in Kisii and Nyamira counties is 21.5 and 14 per cent respectively. The rate of poverty in Kisii County is 60.7 per cent and 48.1 per cent in Nyamira County. As of 2009, the households accessing water from an improved source was at 68.6 per cent Nyamira and 67.9 per cent in Kisii counties. Access to improved sanitation in both counties at the same period was above 99 per cent.

The company operates in a cluster system covering eight water supplies in the administrative districts of Gusii. It is a limited company owned by 11 local authorities drawn from the area of jurisdiction. Each local authority is a shareholder and the proportion of shares depends on the number of consumers connected to the piped water supply system. Kisii municipality with over half of the total number of consumers (or water connections) is the largest shareholder as well as being the largest local authority

The company has a board comprising 4 directors representing the local authorities, 5 who represent stakeholders, and the managing director. The stakeholders include professional bodies, institutions, the business community, and women representatives.

Financial Operating Framework for Gusii Water and Sanitation Company

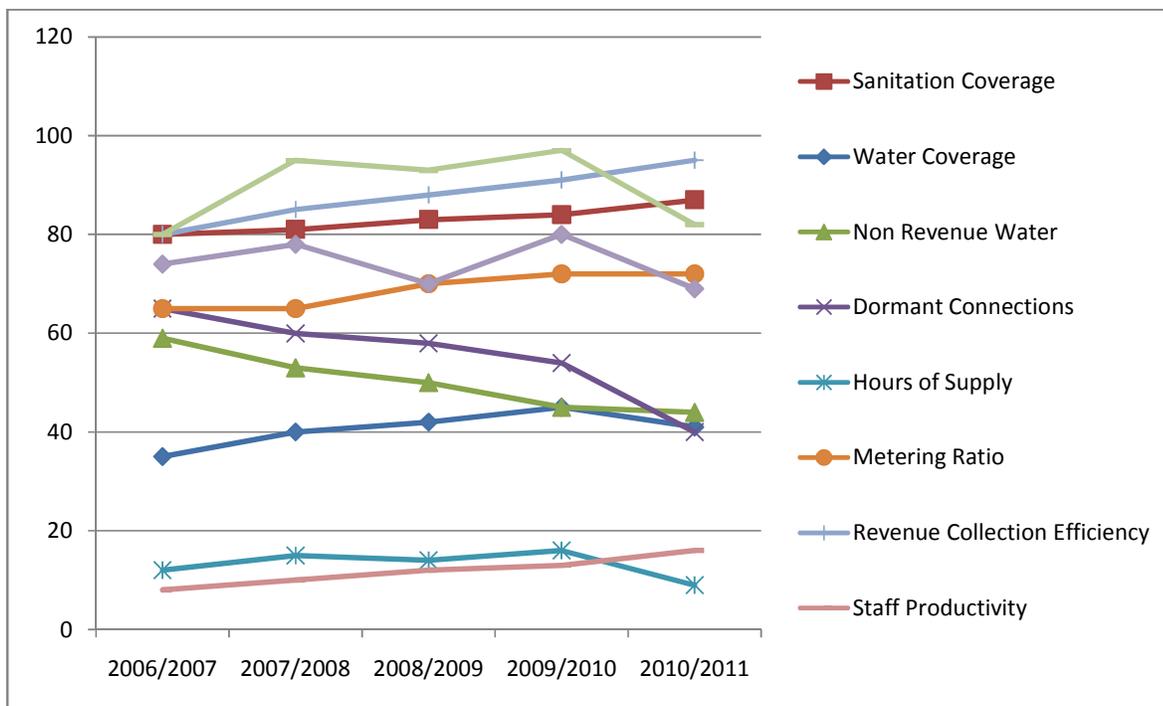
The company was granted use of existing water infrastructure by the licensing entity for the period of contract. The contract exempted the company from any existing debt liability. The company is the only licensed water supplier in its area of jurisdiction, indicating a near-monopoly operating environment. The only competition in water service provision, which is below one percent of the market share comes from water vendors, boreholes, shallow wells and bottled water. Provision of sanitation is however undeveloped. Only 20 per cent of the sewerage services is managed by GWASCO. The rest is managed informally and in

an organized manner. The company does not have the capacity to explore the potential in sanitation provision. This however is a lost opportunity for the company, impacting adversely on its long term revenue stream. The company’s daily supply of water is around 60 per cent of the daily demand. This is due inadequate installed capacity as well as dilapidated water supply systems. Since the company started operations, no major upgrading of the infrastructural framework was undertaken, partly because of the contractual arrangement with the water service board.

Sources of leakages in the company’s financial base include high electricity bills and fluctuations in electricity supply occasioning water rationing. Electricity bills account for 38 per cent of the company’s operating and maintenance costs in 2010/2011 financial year. Others include unaccounted-for-water, which accounts for 54 per cent of the average water supplied (below the recommended 25 per cent to 30 per cent). Metering and billing is also inefficient as only about 50 per cent of active connections are metered and billing is on a flat rate basis, which contributes to revenue loss as customers are not billed according to their use of water.

Figure 1.4 presents the performance of GWASCO on various indicators over the period between 2006/2007 and 2010/2011. These indicators related to the long term sustainability of the company.

Figure 0.3: Performance of Several of Financial Viability Indicators for GWASCO



Source: WASREB, various years

The indicators in the table show declining non water revenue but the rate is still too high, above the recommended rate. Dormant connections are still high but declining. Sanitation coverage ratios grew by around 5 per cent within the study period. There has been intermittent performance of the hours of supply of water over the study period. Metering ratio has been improving but at a decreasing pace. This contributes to the unaccounted for water. The company’s staff productivity, as indicated by the number of staff per 1000 connections averages about 12 staff which is still too high for effective company use of staff. The operation

and maintenance cost coverage averages 89.4 indicating that the company is not able to cover all its operating costs.

Statement of the Problem

One of the key areas identified for reforms in the water sector in Kenya was the service provision which was deemed ineffective and beset by inefficiency bottlenecks. Consequently, the thrust of water reforms was aimed at unbundling water service provision from policy and regulation. Specifically, the Water Act of 2002 provided for the formation of commercially-oriented water service providers in order to ensure efficient and effective water service provision grounded on financial and economic principles.

The actual implementation of these reforms saw formation of water service provision companies across the country, referred to as WSPs, licensed to provide water to specific jurisdiction by WSBs. The contracting arrangement is that the water infrastructure is owned by water service boards, which involves mostly dilapidated systems inherited from the municipal authorities. The tariffs levied by the providers are also subject to control by the water service boards. Additionally, the WSPs are required to ensure that even the poor members within their jurisdiction are supplied with water irrespective of the commercial costs involved.

GWASCO, like other WSPs in Kenya operate in conditions which limit its ability to maximize revenues because of inadequate infrastructure coverage, dilapidated infrastructure that predispose the company to lose over 45 per cent of supplied water, and the inability to set economic water tariffs. The company's operations are affected by an array of operating costs that include high electricity bills, staff costs, inefficient metering and billing and an obligation to subsidize water costs to the poor customers. These operating conditions are likely to affect the financial viability of the company.

It is however not certain that the financial viability of the company is affected by the existing operating environment. So far, there has not been any study done showing how the operating conditions of water service providers in Kenya impact on their financial viability. Yet, according to WASREB (2012), there are clear indications that WSPs are not operating sustainably and a possible contribution is the inability to meet their financial obligations. Additionally, there has been negligible growth of water service access since the reforms were initiated. In Kenya, like in most of sub-Saharan Africa, water utilities continue to operate inefficiently, are characterized by high water losses, insufficient revenues to cover operating costs, dilapidated and poor functioning infrastructure, lack of investments, low billing and collection efficiency, chronic water shortages and failure to meet the existing demand, low coverage, especially for the urban poor, and corruption, among others (see World Bank 2004).

The inefficiency of the water service providers contribute to limited water access which undermine the quality of human life through increased disease burden, loss of productive time searching for water. Attaining sustainable access to safe drinking water is a target within the framework of the international Millennium Development Goals which measures human development; and the Constitution of Kenya (2010) has granted the right to safe drinking water to all Kenyans. Achieving these lofty goals will require efficient and effective operation of the water service providers, especially the financial viability. Studies have highlighted the financial viability inadequacies of water service providers in sub – Saharan Africa that compromises the companies' ability to maintain assets, provide necessary chemical treatments, hire competent managers and eventually compromise service delivery (Wirick, Borrows & Goldberg, 1997; World Bank, 2009).

This study sought to fill the literature gap by providing an assessment of financial viability of a typical WSP in Kenya for a period of four years to shed light on the overall financial sustainability

Objectives of the Study

The general objective of this study was to assess the factors that influence the financial viability of GWASCO, which is a case of a water service provider in Kenya. The specific objectives were to;

1. Establish, from available literature, the factors that influence the financial viability of a water service provider in a developing world context
2. Measure how revenue side factors, hours of supply and staff productivity influence the financial viability of GWASCO
3. Measure the impact of GWASCO's cost structure (operations and maintenance costs, nonrevenue water) on the utility's financial viability
4. Make suggestions and recommendations based on the assessment of the financial viability of GWASCO

Research Questions

The following questions were used to guide the conduct of this study in order to meet the objectives of the study.

1. What are the main factors influencing the financial viability of a water service provider in a developing world context?
2. How do GWASCO's revenue factors of hours of supply and staff productivity influence its financial viability?
3. What is the impact of GWASCO's cost structure, specifically operations and maintenance costs and nonrevenue water on its financial viability?
4. What suggestions and recommendations can be made regarding the assessment of the financial viability of GWASCO?

Literature Review

This chapter highlights the relevant literature on financial viability measures, as applied to a utility entity. The section reviewed both the theoretical and empirical literature on financial utility of water utilities. The review emphasized on critiquing the relevant literature on financial utility of water utilities.

Theoretical Literature

Financial viability is an element within the general subject of sustainability. The concept of sustainability is wide and has environmental, economic, and social dimensions, and encompasses the concept of stewardship and responsible management of resource use (Adams, Thornton & Sepehri, 2012). Faz & Breloff (2012) defined financial viability as the ability to generate sufficient income to meet operating payments, debt commitments and, where applicable, to allow growth while maintaining service levels. Therefore, in order to ensure the sustainability of firms, it is vital to investigate the interrelationship and importance of factors impacting corporate sustainability, paying greater attention to financial viability of a company. According to Koleda, Lace & Ciemleja (2010), this involves evaluating the contribution of financial viability in sustainable development of business entities as well as defining the sufficient level of indicators of financial viability. Such analysis enables commercial organizations to achieve the harmonious sustainable development, and to redefine their development strategy.

World Bank (2009) postulates that financial viability results from achieving revenue adequacy and cost efficiencies in service delivery. Accordingly, the study proposes that revenue adequacy is influenced by nonrevenue water, appropriate tariff design, effective billing and collection and new connections. Cost efficiencies in service delivery is influenced by nonrevenue water, energy efficiencies, staff cost

rationalization and chemicals efficiency. Accordingly, this study adopts these factors in measuring the financial viability of water service providers in Kenya.

Conceptual Framework

To facilitate studying of the factors that influence financial viability of water utilities, a conceptual framework was formulated with the aim of showing the directional relationship of various factors. In line with World Bank (2009), a conceptual framework establishing the factors influencing financial viability of water utilities can be formulated as;

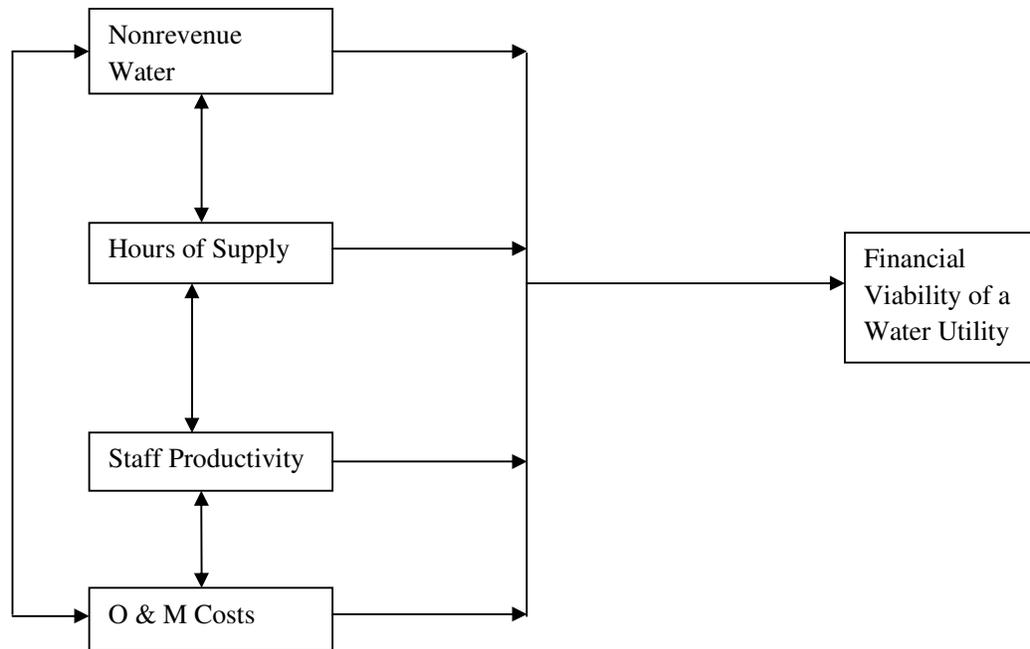


Figure 0.4: Financial Viability of a Water Utility

Source: Author (2013), constructed from literature

Nonrevenue Water

Nonrevenue 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 pp 11). Losses are either physical – leakages mainly due to poor operations and maintenance; commercial – due to customer meter under registration, data-handling errors, and water theft; and unbilled authorized consumption. Non-revenue water negatively affects the financial viability of water utilities through lost revenue, lost water resources, and increased operational costs (Janssens, 2013). Consequently, water utilities’ capacity to expand by increasing connections and service coverage is compromised. Nonrevenue water is a serious problem in developing countries with estimations indicating that water lost through illegal connections for example could account for about 40 per cent of NRW (Kingdom, Liemberger & Marin, 2006). In a study investigating the non-revenue water levels in the water system in Accra, Yeboah (2008) found out that the NRW within the system was at 57per cent. this leakage led to the 40 per cent reduction in the water utility’s profitability. Consequently the water utility’s financial viability was negatively affected. In Kenya, Olwa (2012) found that NRW had detrimental effect on the financial viability of water utilities

through lost revenue, lost water resources, and increased operational costs, reducing their capacity to fund necessary expansions of service.

Hours of Supply

According to WASREB (2012, pp 53), hours of supply measure the ‘average number of hours per day that a utility is able to provide water to consumers’. McBain (1985) offered that reliability of service of water utility – continuous supply of water in the adequate quantity and quality- was a major determinant of the utility’s financial viability.

The hours of supply in service utilities indicates the social viability, as utilities are seen to meet social goals of providing uninterrupted service. This is reflected as ability of an enterprise to provide enough value to justify any social costs (Tisdell & Ward, 2003). Shamir & Howard (1981) expresses water supply system reliability in terms of the shortages that result from the failures of a system’s physical components. Intuitively, the system failure affects the capacity which determines the revenue and subsequently financial viability. Increasing capacity involves improving physical facilities storage, pumping capacity and the system pipelines.

Staff Productivity

Organization for Economic Co-operation and Development (2008) defines staff productivity as the output per worker in a given time. The concept is used in utility management to reflect the relative efficiency gains resulting from different systems of management, organization or co-ordination. The consensus in its measurement is that a ratio is used. However, the comparability of output measures can be negatively affected by the use of different valuations, which define the inclusion of taxes, margins, and costs, or different deflation indexes, which turn current output into constant output (Hausser, 1949).

Operation and Maintenance Cost

According to WASREB (2010), operations and maintenance (O&M) costs are the costs incurred to operate a system and maintain its infrastructure. They include personnel costs, energy costs, chemical costs and maintenance of plant and equipment. O&M cost coverage indicates that a water utility has reached short term sustainability. It is the first step towards total cost recovery which requires investment costs to be covered as well. Financial viability is achieved when revenue obtained by a water utility not only cover the O&M costs but also the investment costs.

Knowledge Gap

In its many uses, water for domestic purposes such as drinking, personal hygiene and other domestic purposes is most essential. However, in most developing countries, this need is barely fulfilled. The situation led to the declaration of the Millennium Development Goal of halving the number of people without proper access to safe water and sanitation by 2015. This is further driven by the fact that improved water supply as being the most important individual factor in controlling disease and improving living conditions, especially in the developing countries (United Nations Educational, Scientific and Cultural Organization, 1987).

While many studies acknowledge that water supply in most of developing countries is inadequate, there has not been studies linking this apparent shortcoming to the financial viability of water service providers. For instance, authors such as Kingdom, Liemberger & Marin, (2006) show how nonrevenue water affect utility’s operating framework, but such studies do not explicitly link NRW to financial viability. Similarly, WASREB (various years) consistently document the shortcomings limiting the operations of WSPs but does not link these with the financial viability of the water companies. While in Kenya, water reforms were

informed by poor management of WSPs, the issue of financial viability of the country's WSPs has never been investigated, despite the fact that poorly managed utilities contributed to sub-optimal service.

Methodology

This chapter provided the systematic procedures adopted in conducting the study towards achieving of the research objectives.

Research Design

The general objective of this study was to assess the factors that influence the financial viability of GWASCO, which is a case of a water service provider in Kenya. Therefore, in order to meet the objectives of this study, strategies used to plan research were of crucial importance to its outcome.

Completing successful research depended on having a clearly defined purpose and access to useful data pertinent to that purpose (Hakim, 1987). In order to assess the financial viability of a typical water company, the study combined a case study strategy as well as exploratory research strategy. The study adopted concentrated on GWASCO for a detailed and in-depth investigation. Additionally, the study was exploratory because it sought insights and discovery of the trends in explaining the financial viability of the water company.

Target Population

The target population for this study was the revenue and cost variables for Gusii Water and Sanitation Company. According to Wasreb (various years), these variables included service coverage, nonrevenue water, hours of supply, revenue collection efficiency, staff productivity, dormant connections and operations and maintenance costs. These were the major variables influencing the financial viability of a water service provider in Kenya, GWASCO included. In order to meet the objectives of this study, all available observations for these variables were used. Observations for similar WSPs in the country were also used for comparisons.

Sampling Frame

Among the different sampling frameworks, this study used purposive sampling and choose GWASCO. In purposive sampling, the decisions concerning the individuals to be included in the sample are taken by the researcher. In this case, the choice of GWASCO was informed by the fact that the researcher has specialist knowledge of the company, as well as the capacity of the researcher to conduct research at GWASCO in terms of financial and time constraints.

The study thus comprised of one water and sanitation company. In this case, the focus was on particular characteristics of a population that were of interest, which enabled the researcher to answer the research questions. The sample being studied was not representative of the population, but the analysis sought to capture a wide range of perspectives relating to the phenomenon being studied.

Data collection instruments

The choice of the instruments used was guided by the need of the tool to measure the variables in the research questions. This study relied primarily on secondary data from the water service provider as well as from the Water Services Regulatory Board of Kenya, which keeps a database of key measures of financial viability for all water service providers in Kenya.

Data Processing and Analysis

Once the data was collected, the other logical step was to process and analyze it before interpreting it and making inferences. In this stage, the following was done; data entry, validation, exploratory data analysis, cross tabulation, transformation, calculation of trends and forecasts, hypothesis testing among others before the results were interpreted.

The conceptual framework of this study provided the broad relationship of various factors that influenced the financial viability of a WSP in the Sub-Sahara African context. Based on the World Bank (2009) conceptualization, an empirical framework for assessing key factors that influenced the financial viability of a water utility can therefore be model as;

$$FV = \alpha_0 + \alpha_1NRW + \alpha_2HSP + \alpha_3SPR + \alpha_4OMC + \varepsilon \dots \dots \dots (1)$$

FV = Financial Viability of a water service provider

NRW = Non Revenue Water

HSP = Hours of Supply

SPR = Staff Productivity

OMC = Operations and Maintenance Cost

$\alpha_{0, \dots, 4}$ = Coefficients of the model variables

ε . = the Error Term, which measures the variation in the model not explained by the listed variables

This regression analysis model helped in establishing how the value of the dependent variable, financial viability, changes when any one of the independent variables was varied, while the other independent variables were held fixed.

α_0 , referred to the intercept or the constant being expected mean value of dependent value when all the independent value is zero.

α_1 is the coefficient for the nonrevenue water variable in the model. It represents the difference in the predicted value of financial viability for each one-unit difference in nonrevenue water, if all other variables remain constant. This means that if nonrevenue water differed by one unit, and other variables did not differ; financial viability of the water utility will differ by α_1 units, on average. The value of the coefficient is $\alpha_1 < 0$ and the relationship is expected to be inverse.

α_2 is the coefficient for the hours of supply variable in the model. It represents the difference in the predicted value of financial viability for each one-unit difference in hours of supply, if all other variables remain constant. This means that if hours of supply differed by one unit, and other variables did not differ; financial viability of the water utility will differ by α_2 units, on average. The value of the coefficient is $\alpha_2 > 0$ and the relationship is expected to be direct.

α_3 is the coefficient for the staff productivity variable in the model. It represents the difference in the predicted value of financial viability for each one-unit difference in staff productivity, if all other variables remain constant. This means that if staff productivity differed by one unit, and other variables did not differ; financial viability of the water utility will differ by α_3 units, on average. The value of the coefficient is $\alpha_3 < 0$ and the relationship is expected to be inverse.

α_4 is the coefficient for the operations and maintenance cost variable in the model. It represents the difference in the predicted value of financial viability for each one-unit difference in operations and maintenance cost, if all other variables remain constant. This means that if operations and maintenance cost differed by one unit, and other variables did not differ; financial viability of the water utility will differ by α_4 units, on average. The value of the coefficient is $\alpha_4 < 0$ and the relationship is expected to be inverse.

Research Findings and Discussion

This chapter presents the results of the estimation of the study model developed and used in chapter three. We begin by providing a brief explanation of the variables, then present the results and finally discuss the findings. A brief explanation of the variables used in the analysis is presented in table 1. The expected relationship of the independent variables with the dependent variable is offered. The financial viability is the dependent variable for this model and is measured by the difference of the WSP's total revenue and total cost, on an annual basis.

Table 0.1: Variables definitions and Measurements

Variable	Description	Measurement	Relationship
NRW	Water produced but not billed for income to the WSP	Percentage	Inverse
HSP	Average number of service hours that a utility is able to provide services	Hours	Direct
SPR	Staff productivity, indicated as number of staff per 1000 connections	Number	Inverse
OMC ¹	Cost recovery of operations and maintenance	%	Inverse

Descriptive Statistics

This section provides the basic features of the data in this study. It provides simple summaries about the sample and the measures.

Table 0.2: Summary Statistics of the Study Variables

Variable	Observations	Mean	Std Dev	Min	Max
Financial Viability	6	7,461,609	9,248,575.67	-3,149,845	24,069,176
Non Revenue Water	6	48.8	6.43	42	59
Hours of Supply	6	13	2.53	9	16
Staff Productivity	6	11.8	2.7	8	16
Operations & Maintenance Cost	6	89.4	7.0	80	97

In the period of six years in which the financial viability of the water service provider was studied, the average annual profit was Kes. 7,461,609. The level of dispersion in the amounts of annual profit declared was substantial at Kes. 9,248,576. This is expected given the loss reported in the 2006/2007 financial year and the substantial shift in the WSP's profits of 24,069,176 reported in 2009/2010 financial year.

Nonrevenue water was highest in 2006/2007 financial year and lowest in 2011/2012, indicating an effort towards reducing the percentage of nonrevenue water in the WSP. The average was 49 per cent and a small deviation of 6 percentage points. The mean hours of supply of water were 13 and a relatively small deviation of 2 hours in the 6 year period of the study. The lowest annual average hours of supply were 9 and were recorded in 2010/2011 financial year while the most hours of supply were reported in 2009/2010 at 16 hours. Staff productivity, as measured in this study averaged at 12 staff per 1000 connections and a

variability of 3. This measure was highest at 8 staff per 1000 connections in 2006/2007 and has been declining since then to the level of 16 staff per 1000 connections in 2010/2011. The recovery of operations and maintenance costs was lowest at 80 per cent in 2007/2008 and highest at 97 per cent in 2009/2010. In the period of study, the mean percentage of cost recovery was at 89 per cent and a deviation of 7 percentage points.

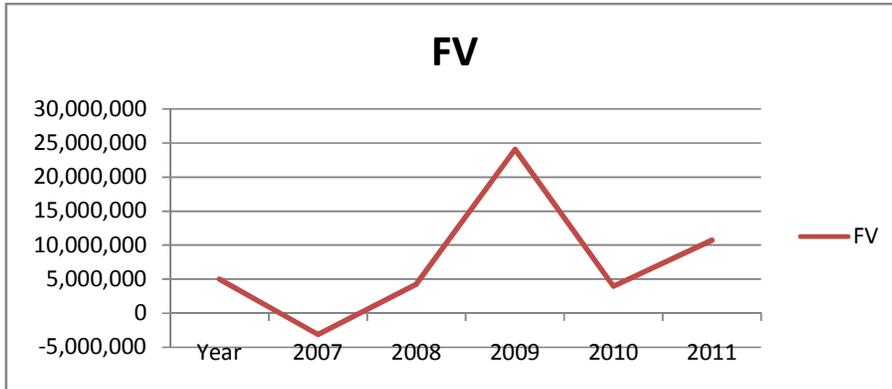


Figure 0.1: Financial viability: measured by the WSP's profit

Figure 4.1 presents the financial viability trends of GWASCO in the period from 2007 to 2011. In 2007, the water utility made a net loss but the profits increased steadily in the subsequent years to peak in 2009 before plummeting in 2010 followed by a marginal increase in 2011. This figure indicates an unsteady performance of financial indicator of the water utility.

Figure 0.2: Nonrevenue Water

In 2007, nonrevenue water represented 60 per cent of the total water produced by GWASCO. However, the levels of nonrevenue water have been declining since then, but the rates are still above 40 per cent, a high rate according to international standards.

Figure 0.3: Hours of Supply

Ideally, water utilities should ensure maximum hours of supply, a key benchmark for customer satisfaction. In the case of GWASCO, hours of supply are quite low as per accepted standards. Specifically, the average hours of supply were 12, then rose steadily to 16 hours before plummeting to less than 10 hours in 2011 before rising in 2012.

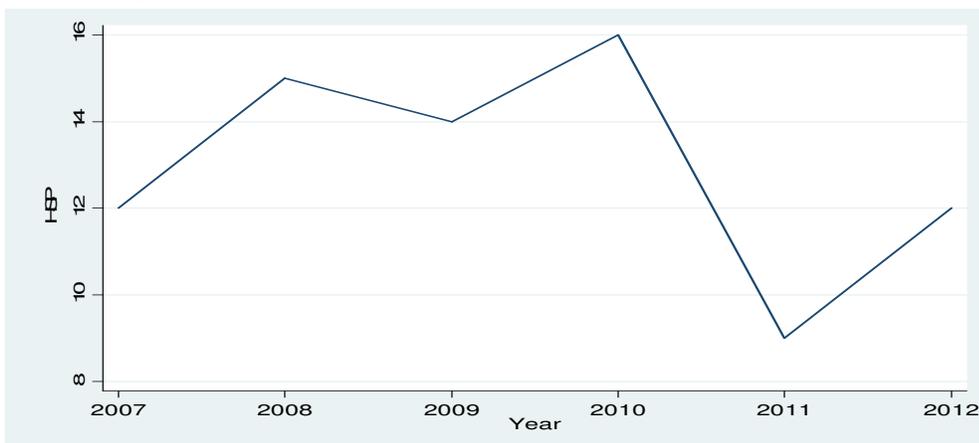
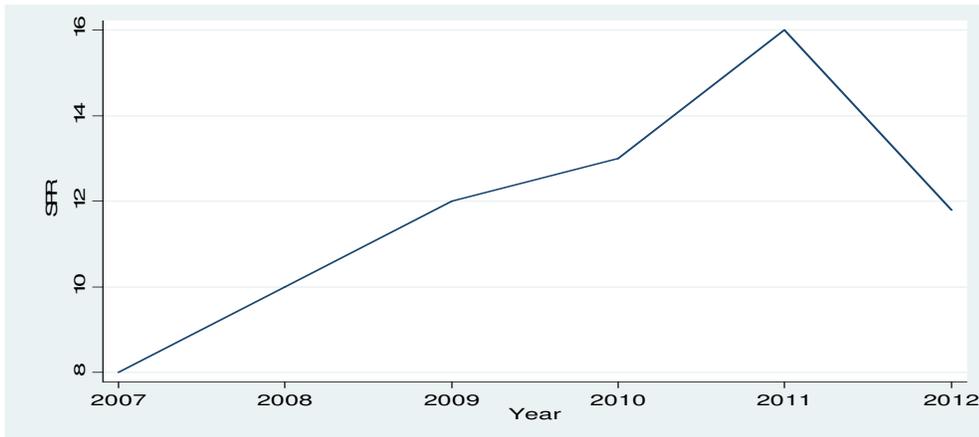


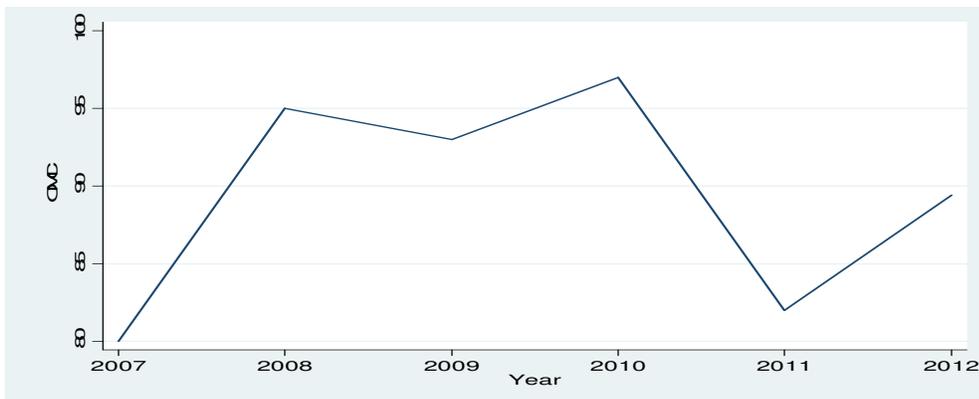
Figure 0.4: Staff Productivity



Staff productivity, as measured by the number of staff per 1000 connections has been increasing beginning 2007 and peaking in 2011. However, the number declined in 2012. High number of staff per 1000 connections indicates inefficiency, and impacts negatively on the water utility’s financial viability.

Figure 0.5: Operations and Maintenance Cost

Operations and maintenance cost represents the financial outflows of the company. In the case of GWASCO, the percentage of cost recovery of operations and maintenance have been above 80 per cent and increasing to the highs of 95 per cent over the study period. These figures indicate unsustainable cost management in the water utility, which affects the financial viability of the water utility.



All the variables exhibit nonstationarity, consistent with time series observations. Therefore, in order to make the data series stationary, they are differenced. This process involves subtracting the value of an earlier observation from the value of a later observation (Gujarati & Porter, 2009).

To ensure the correct specification, the estimation model was converted into log-log form. In the log-log model, the slope coefficients measure the elasticity of WSP financial viability with respect to various determinants (the independent variables) (Gujarati & Porter, 2009). In effect, the alphas indicate the percentage change in the WSP financial viability for a given (small) percentage change in the nonrevenue water, hours of supply, staff productivity, and operations and maintenance cost. Converting equation 1 into a log-log format gives equation 2, representing the study variables converted into their natural logs.

Model Estimation Results and Discussion

Table 3 provides the results of the study model estimated taking into account the time series nature of the data and correcting for the estimation challenges observed.

Table 0.3: Water Service Provider Financial Viability Estimation Function

Variable	Coefficient
Constant	19.4522*** (1.978364)
Nonrevenue Water	-19.2292*** (0.2513138)
Hours of Supply	24.93651*** (0.156226)
No of Staff per 1000 Connections	-7.39170*** (0.1224501)
Operations & Maintenance Cost	-34.53735*** (0.4020284)
Dependent Variable	Natural log of annual profit of a WSP
R squared	0.6307
Sample size	Observations: 5, Number of Series: 6
The standard errors are in brackets. *, ** & *** indicates level of statistical significance at 10%, 5% and 1% respectively	

The results of the estimation model indicate that all the coefficients are statistically significant at 10 per cent level of confidence. An R squared of 0.6 indicates that most of the variations in the change of financial viability of a water service provider in Kenya can be explained by the factors in the study model.

Effect of Nonrevenue Water on Financial Viability

The estimation model indicates that nonrevenue water negatively impacts on the financial viability of Gusii Water and Sanitation Company. Specifically, the results indicate that a percentage increase in nonrevenue water reduces the WSP's financial viability by 19 per cent, all other factors held constant. These findings are consistent with those of McKenzie, Siquilaba & Wegelin (2012) who found that a 36.8 per cent level of nonrevenue water in South African water utilities resulted to a 12 per cent reduction in annual profitability.

Effect of Hours of Supply on Financial Viability

The study shows that a percentage increase in the number of hours of water supply increases the WSPs profitability by 25 per cent, all other factors held constant. In the developing countries with constrained water supply, additional hours of uninterrupted supply translates into more consumption of water subsequently increasing the water utility's profitability (Khatri & Vairavamoorthy, 2007).

Effect of Staff Productivity on Financial Viability

The staff productivity is measured by the number of staff per 1000 water connections. Ideally, more staff deployed reduces staff productivity of the WSP, therefore, the negative relationship. In this study, it was found out that an increase in the number of staff per 1000 water connections reduced the WSP's profitability by 7.4 per cent. Mugabi, Kayaga and Njiru (2007) in a study of Kenyan water utilities found that bloated

staffs were a major cause of operational inefficiencies which impacted negatively on the utilities' bottom line.

Effect of Operational and Maintenance Cost on Financial Viability

As expected, operational and maintenance cost had a strong and negative effect on the WSP's financial viability. A percentage increase in the cost reduced the WSP's profitability by 35 per cent, other factors held constant. These findings are consistent with Banerjee et al. (2010) who found that operational and maintenance cost reduced Africa's water utilities' profitability by between 30 – 40 per cent. According to the study, the operational costs posed the greatest threat to the utilities financial viability.

Conclusion and Recommendations

This section provides the concluding remarks of this study and offers recommendations for ensuring effective management of water service providers in Kenya to ensure and sustain financial viability. Also, the limitations of the study are given and areas for further research suggested.

Conclusion

Despite the vital role of water in human life, in most of African countries the commodity is not available in the right quantity and quality. This undermines the quality of human life through increased disease burden and loss of productive time searching for water. This study analyzed the financial viability of water service providers in Kenya, using a case of Gusii Water and Sanitation Company. The study was motivated by a prevalent problem among WSPs in Kenya, specifically operational challenges such as unaccounted for water, inability to set economic water tariffs, high operating and maintenance costs, inefficient metering and billing and an obligation to subsidize water costs to the poor customers. Cumulatively, these operating conditions affected the financial viability of WSPs.

In order to understand these operational challenges, the study separately analyzed how the revenue side factors as well as the WSP's cost structure influenced the financial viability of the water utility. This was done through review of relevant literature which informed the conceptual framework for designing the study. Accordingly, revenue and cost data from GWASCO for the period between 2006/2007 to 2011/2012 financial year. Estimation results were consistent with the *a priori* expectations. The coefficients of all the model variables were statistically significant. Nonrevenue water, number of staff per 1000 connections and operational and maintenance cost had negative effect on the financial viability of GWASCO. On the other hand, increasing the hours of supply had a positive effect on the financial viability of the WSP.

Recommendations

Financial viability of water service providers in Kenya continues to be a challenge despite numerous reforms in the water sector. The inability of the privatized WSPs to attain financial viability in their operations compromises the health and the overall quality of life of millions of inhabitants. This undermines the realization of Kenya Vision 2030 goals as well as the Millennium Development Goals.

The general recommendation of this study is that WSPs in Kenya should look for innovate ways to address the factors affecting their financial viability without which they will be unable to implement sustainable improvements in service delivery. Specifically, the WSPs need to be able to meet operational costs and, subsequently, to self-finance an ever greater share of capital investment. The water utilities should also repay debt in a timely manner from sustainable cash flows through its operational surplus combined with transfers from national or county governments if these are predictable.

Nonrevenue water should be addressed decisively since it is strongly and negatively affecting the WSP's financial viability. 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. Thus it will be prudent for the WSPs and other stakeholders such as government departments to work on the managerial and technical skills of their staff avoid the high levels of NRW. Although it is not feasible to eliminate all NRW in a water utility, reducing by half the current level of losses in the Kenyan WSPs appears a realistic target that can have profound effect on utilities financial feasibility and the number of people accessing clean water.

Ideally, water should be supplied 24 hours a day. Findings of this study support the fact that increasing the number of hours of continuous water supply is a strong factor for addressing financial viability. The hours need to be increased to serve many people, reduce risks of contaminating the water pipes. Therefore, WSPs should look beyond privatization and overhaul management and increase service quality. Increasing staff productivity has been shown to have strong positive effect on the WSPs financial viability. Towards this, water utilities are advised to undertake productivity and efficiency analysis to address inefficiencies in the human resource mobilization. On the other hand, operational and maintenance costs need to be checked because they affect the WSP's profitability. The water utilities need to focus the management objectives on efficient operation as the key to profitability.

Limitations of the Study and Areas for Further Research

The study attempted to achieve its objectives and provide solutions to the research questions. However, the scope was not exhaustive and therefore could have missed some salient factors affecting the financial viability of water service providers in Kenya. Future studies including all the factors that influence the financial viability would thus provide useful insights into the management of water utilities in Kenya. Additionally, given the role of staff productivity in influencing the financial viability of water utilities, it would be interesting to go further than this study and gauge the level of efficiency and productivity of the water supply industry, including partial productivity indicators, total factor productivity.

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