Joint Influence of Water Pricing, Infrastructure Financing, Utility Efficiency and Subsidies on Financial Sustainability of Water Service Providers in Kenya

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Abstract

The purpose of this study was to establish the joint influence of water pricing, infrastructure financing, utility efficiency and subsidies on financial sustainability of water service providers in Kenya. The study adopted the pragmatism research philosophy using sequential mixed research design. The target population constituted senior managers in all the eighty-eight registered water service providers (WSPs) in Kenya. From the target population, a sample of 352 units were selected and a structured questionnaire used to collect quantitative data from them. Additional data was collected using interview schedule from key informants namely the Principal Secretary (PS) and Water Secretary from ministry of water, sanitation and irrigation (MWSI), the chief executive officer (CEO) Water Services Regulatory Board (WASREB), and CEOs from each of the eight water works development agencies (WWDAs). Data collected, was coded, cleaned and analysed to obtain both descriptive and inferential statistics. The results revealed that water pricing, infrastructure financing, utility efficiency and subsidies had a positive joint influence on financial sustainability of WSPs in Kenya (F=13.209 (4,247df), P=0.000; R^2 =0.176. Based on the finding, the study recommended the need for the Ministry of Water, Sanitation and Irrigation to spearhead the implementation of an integrated approach to water management whereby, water pricing, infrastructure financing, utility efficiency and subsidy can be handled concomitantly.

Keyword: Financial Sustainability, Water pricing, infrastructure financing, utility efficiency, Subsidies

INTRODUCTION

Universal access to affordable, adequate and quality water need to be linked to financial sustainability of water service providers (Mitlin & Walnycki, 2019). Financial sustainability refers to the ability to recover all the costs with minimal revenue fluctuations (Pinto & Marques, 2016). In the provision of water, financial sustainability is not only important in ensuring universal access to water, but it is also a major consideration by development partners interested in financing the sector (Schwartz, Tutusaus, & Savelli, 2017). In this regard, the level of operation and management (O&M) cost recovery is an input in the assessment for credit worthiness of water service providers, while enabling WSPs have some retained earnings, which can be utilized for extension and continuity in the provision of services (Mitlin & Walnycki, 2019).

The realization of the importance of financial sustainability has partly contributed towards the global move to commercialize water service provision in addition to realizing increasing access and equity in the 1990s (Rusca & Schwartz, 2017). The success of the push for financial sustainability through commercialization of water service provision is however, yet to be ascertained because utilities across the globe continue to report a declining trend in O&M cost coverage (van den Berg & Danilenko, 2011). In a study undertaken by the World Bank to establish the performance levels for water and waste water utilities across the world, it was established that the global O&M cost coverage declined from 1.11 in 2000 to of 1.05 in 2008 (van den Berg & Danilenko, 2011). Similarly, O&M cost coverage in Sub-Saharan Africa declined from 1.26 in 1995 to 1.16 in 2009 (Marson & Savin, 2015).

Tsagkaraki *et al.,* (2014) while studying water utilities in four countries in Europe established that the O&M cost coverage declined from 0.74 in 2007 to 0.66 in 2011. In Asia, Asian Development Bank (ADB) in a study that covered 34 ADB member countries notes that cost recovery declined from 1.03 in 1995 to 0.89 in 2001 (Asian Development Bank, 2004). In addition to the declining financial sustainability trends, none of the countries has consistently attained the acceptable O&M cost coverage benchmarks which varies from 1.30 to 2.00 depending on the reference geographical area (Marson & Savin, 2015).

In Kenya, the need to ensure sustainability of the water sector was initiated in the late 1990s by the government. In the Sessional paper no. 1 of 1999, lack of attainment of full recovery by water utilities across the country was identified as a major setback to attainment of the Millennium Development Goals (MDGs) (GoK, 1999). In the document, various challenges were identified including overreliance on public financing for operation and maintenance, fragmented management of the water schemes across the country, lack of a clear legal framework. Others were inadequate resources for network expansion and rehabilitation, cost insensitive tariffs, and uneven water resource distribution (GoK, 1999).

The government of Kenya proposed four key solutions including water resource conservation, supply of adequate quantities of good quality water and safe disposal of waste water, establishment of effective and efficient institutional framework, development of sound and sustainable financing mechanisms for the sector (GoK, 1999). This was finally actioned through formulation and operationalization of the Kenya's Water Act 2002 (Schwartz *et al*., 2017). In the Act, the government provided the legal framework necessary for the implementation of the strategies laid down under the sessional paper no. 1 of 1999 (Rampa, 2011). Institutional framework was created that separated policy, regulation, resource management and water service provision in order to foster financial sustainability of the sector (Schwartz *et al.,* 2017).

The Act became operational in March 2003 and the regulator started tracking the performance of the Water Service Providers (WSPs) from 2005/2006 financial year. Among the parameters that have been tracked was the level of Operation and Management (O&M) cost recovery as a key parameter for financial sustainability. A WSP is assumed to have attained financial sustainability once 150% O & M cost coverage is attained. Since its implementation, it is estimated that 99% of the WSPs in Kenya are yet to attain the set full cost recovery (FCR) level of 150% of O&M cost coverage (WASREB, 2018). The few WSPs that attained FCR could not sustain it for more than three consecutive years as summarized in Figure 1.

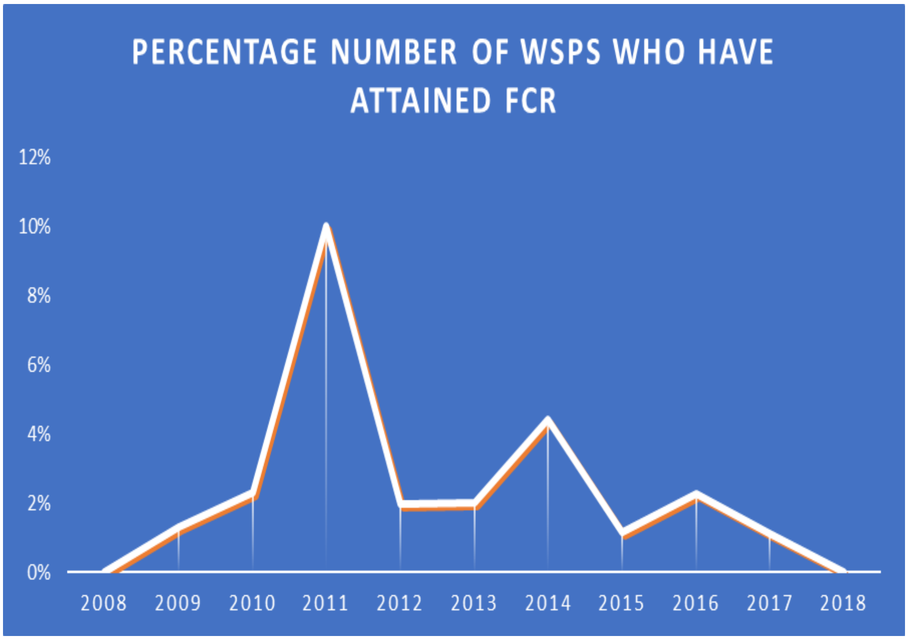

Figure 1: Percentage of WSPs that attained Full cost recovery
Source:(WASREB, 2010; 2011; 2012; 2013; 2014; 2015; 2016; 2018; 2019)

Inability to realize sustainability could be attributed to high levels of inefficiency, sub-optimal water pricing, overreliance on subsidies, failure to implement current technology in the management of water and low water coverage. For instance, according to the European Water Framework Directive (EWFD) 2000, financial sustainability is influenced by pricing, efficiency, investment financing, asset management, subsidies, implementation of the right policies and public participation. This notwithstanding, however, there is limited current, empirical and domesticated research linking these factors either independently or jointly to financial sustainability of water service providers. There is need therefore, to examine the possible influence of these factors on financial sustainability of water service providers in Kenya, severally and jointly.

The implementation of the EWFD (2000) was aimed at ensuring financial sustainability of the water sector. However, since its implementation, global cost recovery level is low and has been on a downward trend over the years (Van Den Berg & Danilenko, 2017). Globally, the cost recovery level declined from 1.11 in the year 2000 to 1.05 in 2008 (van den Berg & Danilenko, 2011). In Africa, the cost coverage between the years 1996 to 2012 ranged between 1.1 to 1.2, against acceptable benchmark range of 1.30 to 2.0 (Marson & Savin, 2015). It follows that there is an urgent need to establish the causes of the low levels of financial sustainability globally, regionally and nationally; and to address the same to ensure attainment of the Sustainable Development Goals (SDGs), the Africa's Agenda 2063 and the country specific national priorities.

That notwithstanding, research has focused more on sustainability in general (Lozano, 2012; Bansal & DesJardine, 2014; Lozano *et al.*, 2015; Lelegwe, Kidombo and Gakuu, 2018), with limited research on financial sustainability. For instance, Lelegwe *et al.* (2018), addressed technical support, community involvement, socio-economic setting and sustainability of selected development partner funded projects. Whereas the study seems rich in methodology, it was addressing broad spectrum of donor funded projects irrespective of the sector, despite the fact that issues of sustainability are likely to vary between sectors. This study is specific in scope and the variables under consideration. Similarly a few studies that have focused on financial sustainability have targeted microfinance institutions (Quayes, 2012; Ayayi & Sene, 2017) local authorities and municipalities (Bisogno *et al*., 2017) and Not-For-Profit organizations (Carroll & Stater, 2009; Chikoto-Schultz & Neely, 2016).

Whereas in some cases efforts have been directed towards financial sustainability, very limited empirical evidence exists to inform debate and policy dialogue on how for instance pricing and investment in infrastructure influence financial sustainability of the provision of water. Additionally, many of the studies have focused majorly on demand side with minimal attention on the supply side. There are also gaps on the determinants of financial sustainability of WSPs, as well as measurement variables, inconsistency of the various findings by different studies, limited geographical scope and the omission of the moderating influence of government regulation. Against this background, it was necessary to examine joint influence of water pricing, infrastructure financing, utility efficiency and subsidies on financial sustainability of water service providers in Kenya.

LITERATURE REVIEW

Although studies have been done linking either one or two of the factors under consideration in this study to financial sustainability, empirical research on the joint influence of water pricing, infrastructure financing, utility efficiency, and subsidies on financial sustainability is limited. Vučijak *et al.* (2018) undertook a study on financial sustainability of public utilities in West Balkans. The study was done through a survey comparing WSP actual performance against acceptable sector benchmarks. The indicators under consideration were access levels, water produced, water sold, network failures, non-revenue water (NRW), staff productivity, revenue earned, revenue collected, cost recovery, costs, affordability, management of non-payments and quality of service. The results of the study indicated that, the unit price was lower than the unit cost and an average cost recovery rate of 98.61%. The efficiency levels were also below the set benchmarks. The results showed that though water pricing was important for financial sustainability, it has to be accompanied by efficiency improvements and infrastructure investment.

In a study undertaken to establish financial sustainability of urban service provision in developing countries, it was established that a whole inclusive strategy had to employed (Monteiro *et al.,* 2016). The study which was a case study done in Mozambique, found out that for O & M cost recovery the per unit price had to be reviewed upward. In addition, the country needed additional investment of USD 8,605 million inclusive of USD 439 million for rehabilitation of existing infrastructure (Monteiro *et al.,* 2016). The investment in rehabilitation was considered important in order to address inefficiencies linked to NRW. These costs were simulated to be financed by internal resources earned through appropriate water pricing (Monteiro *et al.,* 2016). The research which simulated financial sustainability by 2045 noted that in some areas like Niassa province, a tariff deficit of USD 0.1 per unit would be required in order to keep the percentage household income expenditure on water at 4%. This deficit was to be financed by government subsidies. The results of this study attest to the fact that addressing one aspect cannot guarantee financial sustainability in the water sector. This study was prone to the limitations associated with case studies including inability to generalize the findings and limited rigour with which the analysis can be undertaken.

A study was undertaken to address water demand and establish optimal pricing levels for full cost recovery (Del Villar & Melgarejo, 2020). The study involved simulation using factors such as water price, water demand, price elasticity, household income, investment financing requirements, technological developments, efficiency and water consumption; the study undertook simulations for a 30-year period considering different scenarios (Del Villar & Melgarejo, 2020). The study established that it was possible to get an optimal demand management solution through additional sources and infrastructure investment; the demand and price model was found capable of promoting water use and investment efficiency (Del Villar & Melgarejo, 2020). The study considered scenarios which indicated that with varying tariffs, price elasticity, efficiency and investment financing requirements, full cost recovery could be attained. It therefore implies that pricing coupled with efficient infrastructure financing promotes to full cost recovery. Financial sustainability therefore has to be a factor of several variables and not just one. Simulation analysis used in this study is prone to biasness depending on the level of the researcher's positivity.

In India, lack of full cost water recovery was attributed to lack of adequate water, sub-optimal water rates, lack of accountability by government utilities and government subsidies (Birkenholtz, 2010). The study established that the implementation of public private partnership (PPP) financing was not adequate to address the lack of cost recovery and low access levels in Jaipur (Birkenholtz, 2010). The study was undertaken through interviews administered on the residents; including household survey as well as interviews with managers from the public water utility and also from private water vendors. The household surveys were done in 2007 and followed up in 2009 while the public and private water suppliers were interviewed both in 2007 and 2009. The results of this study indicate that innovative infrastructure financing cannot lead to financial sustainability and should therefore be implemented together with high efficiency levels, appropriate water pricing and must be backed by the relevant policies. This study included interviews to water users while the current study focused purely on the supply side.

In a study that sought to develop a full cost water rate calculation, it was established that several aspects are interrelated including water pricing, NRW, water use, population density, geographical location and water demand; they should therefore be considered in setting up an optimal water rates (Kanakoudis, Gonelas, & Tolikas, 2011). The study which sought to find the acceptable components of an optimal price, was undertaken using scenario analysis. The study found that the interconnectedness of the factors introduced dynamism in water tariff setting. The study concluded that in order to attain FCR there was need to implement effective NRW reduction measures, be able to accurately determine direct, environmental and resource costs for optimal pricing (Kanakoudis et al., 2011). The current study uses actual data collected from the executive leadership of WSPs across the country on the factors that influence financial analysis.

In a recent study undertaken to establish the outcome of the implementation of the EWFD in Europe, after twenty years, it was established that the development and actualization of a FCR tariff was untenable and that financial sustainability could only be actualized through the tariff, taxes and transfers (3T) financing methodology (Barraqué, 2020). The study which was undertaken through a performance review of the implementation of the EWFD in the different EU member states. The study established that the EU member states had not attained FCR despite having implemented the WFD for twenty years. This failure was attributed to the difficulty of accurately establishing the costs for purposes of FCR water pricing and inability to attain the delicate balance between the economic, environmental and equity aspects of the economy, environment and equity (3E) sustainability framework (Barraqué, 2020). This study confirms that water price cannot lead to FCR without consideration for subsidies and proper governance. The study was based on a performance review comparing actual performance against expected benchmarks; the current one relied on primary data and sought to establish relationships using correlation, ANOVA and regression analysis.

In a study undertaken through case studies covering Africa, Europe, Canada, and the United States it was established that suboptimal pricing, intermitted subsidies and low efficiency levels including high NRW, low metering efficiency led to the ever-growing infrastructure financing gap and lack of FCR (Hukka & Katko, 2015). The study was done through a review of literature related to the different countries. Low cost recovery and efficiency levels were highlighted as a key issue affecting African countries; the European countries were faced with inadequate asset renewal and high cost recovery levels; in Canada and the US, water prices were found to be low, the cost recovery was high but the service provision was highly dependent on subsidies. The study recommended that water prices should be high enough to cover O&M costs as well as infrastructure development costs. Although the study shows the linkage between pricing, efficiency, infrastructure financing and subsidies, it only does so as informed by a review of literature as opposed to the current study which shows the linkage as informed by primary data collected from senior managers from all WSPs across Kenya.

A review of Chile's water sector performance since the implementation of an elaborate water reforms (1999) found that the country had achieved high access levels 99.9% by 2013 while 91% of the WSPs had achieved full cost recovery with an average return on assets of 8.4% on average (Donoso, 2017). The study was undertaken through a case study which traced the Chilean water industry from the year 1998 to 2014. The water quality across the country attained an average of 97.8% by 2014 while the average WSP efficiency was reported to be 0.839 while direct subsidies benefited 13.4% of all the households in the country and 5% of revenue earned by the WSPs (Donoso, 2017). The study however established that only 26% of the WSPs had NRW falling within the set benchmark of 20% while 61% had NRW>30% with the country average being 29.7% (Barraqué, 2020). This was attributed to failure to comply with investment plan which declined from 90% in 2012 to 73% by 2014. The Chilean situation confirms that comprehensive implementation of pricing, investment plan, high efficiency and an effective subsidy system lead to financial sustainability by WSPs. The study used country averages compared to this study which is at the water utility level; it also has limited rigour of analysis having employed descriptive analysis only.

A recent study undertaken in the United States of America (US) confirms the need to consider more than just water pricing in ensuring attainment of financial sustainability of water service provision (Beecher, 2020). The study which was undertaken through a performance and situation review of the US water services sector notes that it is irrational to expect market based pricing solutions while water is non-excludable with inelastic demand (Beecher, 2020). The study stressed the need to enforce high levels of efficiency and public accountability (Beecher, 2020). It also advocates for full cost recovery pricing and entrenchment of equitable subsidy systems and government grants. The subsidies must be funded and must not adversely affect the tax payers. The study was undertaken through a theoretical and situational review of the water services sector in the US. While the study alluded to the need for all rounded approach for financial sustainability of water utilities, it was grounded on theoretical review. Thus, compared to the current study, the study lacked the rigor of analyses connected with the use of actual data.

From the literature reviewed some studies were undertaken by way literature review, performance review, simulation and scenario analysis (Beecher, 2020; Hukka & Katko, 2015; Birkenholtz, 2010; Kanakoudis *et al.*, 2011; Del Villar & Melgarejo, 2020; Barraqué, 2020; Monteiro *et al.*, 2016). None of the studies reviewed considered the influence of all the variables under the current study on financial sustainability; instead, they considered the joint influence of two of the four variables on one aspect of financial sustainability.

METHODOLOGY

This study used the explanatory sequential mixed design whereby quantitative data was collected and analyzed, followed by qualitative data collection and analysis. The qualitative results were used to validate and explain the findings of the quantitative phase. The quantitative data was collected using a self-administered structured questionnaire administered to four senior managers across all the registered eighty-eight WSPs within the categories small to very large. For quantitative data Multi-stage sampling was used whereby, census sampling was used to identify the participating WSPs, while purposive sampling was used to select four senior management representatives including managing directors, Managers in charge of finance and accounts, Manager in charge of commercial department and Manager in charge of technical, thus the sample size was $88 \times 4 = 352$. The selected sample comprises of senior managers whose roles relate to the variables under study and also being members of senior management, they are conversant with the financial sustainability status of the respective WSPs. The questionnaires were emailed to the identified managers in advance while trained research assistants distributed hard copy questionnaires and collected already filled questionnaires.

Regression analysis and analysis of variance (ANOVA) was undertaken to establish the nature and the magnitude of hypothesized relationships whereby the relationship was considered statistically significant if the P-value was ≤ 0.05. Prior to undertaking regression analysis, diagnostic tests were done to confirm normality, linearity and to rule out heteroscedasticity and multicolliearity. The qualitative data was collected using interviews with industry experts drawn from the MWSI, the WWDAs and WASREB. Purposive sampling was used to identify the participants in the collection of the qualitative data; three participants were selected while ensuring representation from each of the participating organization. Content analysis was used to analyse data collected in this phase and the results were used to validate the quantitative findings.

RESULTS

The joint influence of water pricing, infrastructure financing, utility efficiency and subsidies on financial sustainability was established by running a multiple regression and ANOVA analysis using the data obtained from each of the variables.

Response Rate

The study achieved a response rate of 71.59% as 252 respondents filled and returned the questionnaire out of 352 questionnaires issued out to the respondents.

Regression Analysis

Various assumptions of the parametric data analysis were considered and tested before subjecting data to analyses. These included multicollinearity, normality, heteroscedasticity and linearity. Whereas, multicollinearity test was done using variance inflation factor (VIF), normality tests were done using Shapiro-Wilt test, test Glesjer was used for heteroscedasticity, while deviations from linearity were used for linearity.

Multicollinearity Tests

Multicollinearity occurs when inter-correlations are found among the explanatory variables. The variables were subjected to multicollinearity test using VIF and tolerance tests. Table 1 show that the VIF ranged from 1.104 to 1.965 which is within the range as set by Meyers (1990) who suggested that VIF should be less than 10 suggesting that there was no multicollinearity amongst the variables.

Table 1: Multicollinearity Tests

Variable	**Tolerance**	**VIF**
Water Pricing	0.509	1.965
Infrastructure Financing	0.855	1.169
Price Subsidies and Revenue Grants	0.629	1.589
Utility Efficiency	0.906	1.104
Government Regulation	0.746	1.341

Source: Own Computation

Normality Tests

This test is done to determine whether a set of sample data is well modeled by a normal distributed population. This was done using Kolmogorov-Smirmov tests statistics (KS-tests) and Shapiro-Wilk test (SW-test). The KS-test tests if the data followed a specific distribution while, Shapiro-Wilk test is used to detect departures from normality because of kurtisis, skewness or both (Razali & Wah (2011). Table 2 shows that for all the variables under investigation, the KS statistic ranged from 0.349 to 0.404 at $p<0.05$, while the SW-test results ranged between 0.750 and 0.873 at $p<0.05$. This leads to the rejection of the null hypothesis that the sample was not picked from a normal population.

Table 2: Normality Tests

	Kolmogorov-Smirmov			**Shapiro-Wilk**		
Variable	**Statistic**	**Df**	**Sig.**	**Statistic**	**df**	**Sig.**
Water Pricing	0.378	252	0.003	0.787	252	0.031
Infrastructure Financing	0.349	252	0.046	0.771	252	0.046
Subsidies	0.404	252	0.008	0.768	252	0.044
Utility Efficiency	0.385	252	0.000	0.750	252	0.000
Government Regulation	0.332	252	0.000	0.873	252	0.000

Source: own Computation

Tests of Heteroscedasticity

Heteroscedasticity test is used to determine whether there is a difference in the residual variance of the observation period to another period of observation. In this study, the test Glesjer was used to rule out heteroscedasticity problem. The rule is such that if the value $p>0.05$, there is no problem of heteroscedasticity and the converse is true (Hair et al., 2010). As shown in Table 3, all the variables (water pricing, infrastructure financing, subsidies, utilities efficiency, and government regulation) had a p-value greater than 0.05; an indication that there was no heteroscedasticity problem.

Table 3: Tests of Heteroscedasticity

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.265	3.792		.597	.553
	Water pricing	-.105	.088	-.248	-1.192	.240
	Infrastructure financing	-.008	.065	-.019	-.116	.908
	Subsidies	.087	.081	.202	1.079	.287
	Utilities efficiency	-.004	.053	-.012	-.075	.940
	Government regulation	.058	.065	.153	.889	.379

Source: own Computation

Tests of Linearity

The linearity test was conducted to determine whether there was a relationship between the dependent and independent variables was linear or not. Linearity is assumed when the P-value for the deviation from linearity is greater than 0.05, and vice versa. Based on the results presented by tables 4 to 8, all the variables (water pricing, infrastructure financing, subsidies, utility efficiency and government regulation) had a P-value for deviation from linearity greater than 0.05 ($p>0.05$) an indication that the relationship between the dependent and independent variables are linear.

Table 4: Tests for Linearity for Water Pricing

			Sum of Squares	df	Mean Square	F	Sig.
Financial Sustainability * Water Pricing	Between Groups	(Combined)	847.242	18	47.069	.747	.722
		Linearity	56.178	1	56.178	2.780	.104
		Deviation from Linearity	793.441	17	46.673	.602	.845
	Within Groups		2059.487	233	8.839		
	Total		3136.196	251			

Source: own Computation

Table 5: Tests for Linearity for Infrastructure financing

			Sum of Squares	df	Mean Square	F	Sig.
Financial Sustainability * Infrastructure Financing	Between Groups	(Combined)	1195.396	18	66.411	1.764	.071
		Linearity	164.364	1	164.364	7.699	.008
		Deviation from Linearity	1031.032	17	60.649	1.368	.208
	Within Groups		1940.800	233	8.330		
	Total		3136.196	251			

Source: own Computation

Table 6: Tests for Linearity for Subsidies

			Sum of Squares	df	Mean Square	F	Sig.
Financial Sustainability * Price Subsidies and Revenue Grants	Between Groups	(Combined)	1368.610	18	76.034	1.217	.297
		Linearity	.011	1	.011	1.031	.316
		Deviation from Linearity	1368.599	17	80.506	1.230	.290
	Within Groups		1767.587	233	7.586		
	Total		3136.196	251			

Source: own Computation

Table 7: Tests for Linearity for Utilities Efficiency

			Sum of Squares	df	Mean Square	F	Sig.
Financial Sustainability * Utility Efficiency	Between Groups	(Combined)	1208.862	18	67.159	2.013	.033
		Linearity	424.787	1	424.787	11.890	.001
		Deviation from Linearity	761.719	17	44.807	1.396	.190
	Within Groups		1985.859	233	8.523		
	Total		3136.196	251			

Source: own Computation

Table 8: Tests for Linearity for Government Regulation

			Sum of Squares	df	Mean Square	F	Sig.
Financial Sustainability * Government Regulation	Between Groups	(Combined)	1619.075	18	89.949	2.353	.014
		Linearity	275.917	1	275.917	13.952	.001
		Deviation from Linearity	1343.158	17	79.009	1.579	.122
	Within Groups		1517.122	233	6.511		
	Total		3136.196	251			

Source: own Computation

Regression Analysis for the Joint Influence of Water Pricing, Infrastructure Financing, Utility Efficiency and Subsidies on Financial Sustainability

The results in Table 9 indicate that there is a positive joint relationship between water pricing, infrastructure financing, efficiency, subsidies and financial sustainability with R=0.420, R square=0.176 meaning that water pricing, infrastructure financing, efficiency and subsidies jointly explains 17.6% of financial sustainability of the WSPs, while the remaining percentage is explained by other factors not considered in the model.

Table 9: Model Summary for the Joint Influence of Water Pricing, Infrastructure Financing, Utility Efficiency and Subsidies on Financial Sustainability

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.420[a]	.176	.163	3.23414

a. Predictors: (Constant), Utilities efficiency, Water pricing, Infrastructure financing, Subsidies

Table 10 provides an F statistic of 13.209 (4,247df) and a p-value of 0.000<0.05 while the critical value at (4,247df) is 2.372. Since 13.209>2.372 at a p value of 0.000, the null hypothesis is rejected in favour of the alternative hypothesis that, water pricing, infrastructure financing, utility efficiency and subsidies are jointly good predictors of financial sustainability of WSPs in Kenya.

Table 10: ANOVA Results for the Joint Influence of Water Pricing, Infrastructure Financing, Utility Efficiency and Subsidies on Financial Sustainability

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	552.661	4	138.165	13.209	.000[b]
	Residual	2583.536	247	10.460		
	Total	3136.196	251			

a. Dependent Variable: Financial Sustainability
b. Predictors: (Constant), water pricing, utility efficiency, infrastructure financing, subsidies

Regression analysis was done to determine the coefficients of the independent variables on dependent variable. Table 11 shows that the regression coefficients were 0.136, 0.115, 0.246 and -0.070, for water pricing, infrastructure financing, utilities efficiency and subsidies, respectively.

Table 11: Regression Coefficients for the Joint Influence of Water Pricing, Infrastructure Financing, Utility Efficiency and Subsidies on Financial Sustainability

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	27.088	5.791		4.678	.000
	Water pricing	.136	.141	.149	.964	.339
	Infrastructure Financing	.115	.102	.142	1.122	.266
	Subsidies	-.070	.129	-.082	-.540	.591
	Utilities efficiency	.246	.090	.336	2.739	.008

Source: Own Computation

Based on these findings, the study rejects the null hypothesis that there is no joint influence of water pricing, infrastructure financing, utilities efficiency and Subsidies on financial sustainability of WSPs in Kenya. The study therefore concludes that water pricing, infrastructure financing, utilities efficiency and Subsidies have a joint influence on financial sustainability of WSPs in Kenya. These results suggest the need for an integrated approach to financial sustainability among the WSPs in Kenya. Addressing one aspect without due consideration to the others may not result to an optimal and long-term financial sustainability.

DISCUSSION

The ANOVA analysis results indicated that, water pricing, infrastructure financing, utility efficiency and subsidies are jointly good predictors of financial sustainability. The regression analysis results found that water pricing, infrastructure financing, utility efficiency and subsidies had a positive influence on financial sustainability of WSPs in Kenya, with the factors jointly explains 17.6% of the financial sustainability variations. These findings are similar to those of other studies including a study by Vučijak *et al.* (2018) who undertook a study on financial sustainability of public utilities in West Balkans. The study found that water pricing alone without due consideration to efficiency levels and infrastructure development did not lead to financial sustainability.

Similarly, a number of studies undertaken across the globe have established that financial sustainability cannot be attained by addressing just one aspect. In

Mozambique for example, it was established that in addition to an upward water price review, the country needed additional investment of USD 8,605 million inclusive of USD 439 million for rehabilitation of existing infrastructure which was considered important to reduce NRW (Monteiro *et al.*, 2016). The study further recommended full cost recovery (FCR) pricing coupled with direct subsidies to cover an estimated per unit tariff deficit of USD 0.1 required to ensure that the individual household expenditure is maintained at 4%. Del Villar and Melgarejo (2020) undertook a study through a 30-year simulation while considering various factors; the results of this study show that water pricing, improved efficiency levels and increased investment are key to the achievement of effective demand management and FCR by WSPs. In a study done to find out the impact of EWFD implementation in Europe it was established that optimal water pricing was not capable of ensuring FCR (Barraqué, 2020). The study found that it was not possible to finance O&M costs and infrastructure financing from water tariffs alone but the sector had to continue relying on subsidies especially for infrastructure development (Barraqué, 2020).

The water service delivery in Chile show that a comprehensive and concurrent implementation of strategies anchored on the four factors leads to financial sustainability (Donoso, 2017). Following the implementation of an elaborate water reforms (1999) which incorporated water pricing, utility efficiency, an elaborate direct subsidy policy backed by research and an investment plan, the country attained 99.9% access to water by 2013, 0.839 efficiency index, and 5% subsidy revenue was earned by WSPs across the country (Donoso, 2017). With the improved performance, 91% of the WSPs achieved FCR. The high levels of WSPs attaining FCR in Chile is an attestation that concurrent implementation of water pricing, infrastructure financing, utility efficiency and proper application of subsidies lead to financial sustainability among WSPs.

The results demonstrate that addressing one aspect cannot guarantee financial sustainability in the water sector which concurs with the findings of the current study. The positive joint influence of water pricing, infrastructure financing, utility efficiency and subsidies on WSP financial sustainability can be explained by the fact that water pricing is critical to ensure that full cost coverage, at the same time, high efficiency levels are required to minimize lost revenue and subsidies ensure that there is a balance between FCR and affordability while at the same time ensuring continued infrastructure investment.

Content Analysis Results

Through interviews, industry experts opined that financial sustainability is wider than financial viability; the latter only seeks to attain cost recovery. They observed that the water sector reforms of 2002 were aimed at attaining financial sustainability for the sector by striking a balance between cost recovery, equity and access. This was envisaged to be attained through appropriate water pricing, increasing innovative financing mechanisms, clear institutional framework and high efficiency levels. Water pricing was expected to assure full cost coverage but over a period of time and during that time infrastructure development was expected to be financed through public funds.

On infrastructure financing, the interviewees noted that in the period between 1990 and 2000, the infrastructure development was financed through communities and the non-government organizations (NGOs) and with minimal government or loan financing. However, the water sector reforms (2002) introduced overreliance on government and loan financing, which have grown over time. Although the Government of Kenya (GoK) together with development partners have invested heavily in the sector, the increasing financing deficit raises questions on the effective application of the financing. They emphasized the need for involvement of WSPs by the National Treasury as they negotiate for infrastructure financing to improve on the packaging of the proposals so that such financing incorporate a full project from sourcing water to storage all the way to distribution.

On efficiency, the interviewees agreed that the country was losing over to Kshs 7 billion annually on account of NRW comprising of physical and commercial losses. Experts opined that in order to address the inefficiencies, WSPs need to disaggregate the causes of NRW per WSP and also to inculcate a culture of integrity among WSP staff. While referring to subsidies the industry experts observed that the subsidies given to various WSPs are not meant to facilitate financial sustainability but some WSPs have to rely on subsidies since their revenue earnings are lower than the staff and other critical O&M costs. The national government has been forced to occasionally finance major breakdowns in the trunk mains and mega water storage facilities like dams. They explained that such installations require heavy capital input while the WSPs are hardly meeting the O & M costs. They indicated the need for an elaborate subsidy policy that focuses on service availability and not performance at the current service levels.

The experts agreed on the need for an integrated water management system encompassing all the stakeholders who require water extraction for their core business. In their opinion, integrated water management will ensure protection of water sources and sustainable water extraction; WSPs require the resource itself for financial sustainability hence the need for consulted effort in the protection of water towers.

CONCLUSION AND RECOMMENDATION

The results show that water pricing, infrastructure financing, utility efficiency, and subsidies jointly have a statistically significant influence on financial sustainability of WSPs in Kenya. The sector requires an improvement in efficiency levels, infrastructure financing, optimal pricing, and proper application of subsidies to those who are not able to pay in order to attain financial sustainability. For a balanced approach to financial sustainability by WSPs in Kenya, issues on water pricing, infrastructure financing, utility efficiency and subsidies should be addressed concurrently. Therefore, an integrated approach to water management is required for financial sustainability among the WSPs to be attained.

REFERENCES

Asian Development Bank. (2004). Water in Asian Cities. In *Utilities' Performance and Civil Society Views* (121303rd ed.). Manila, Philippines: National Library of the Philippines.

Ayayi, A. G., & Sene, M. (2017). What drives microfinance institution's financial sustainability. *The Journal of Development Areas*, *44*(1), 303–324.

Bansal, P., & DesJardine, M. (2014). Business sustainability: It is about time. *Strategic Organization*, *12*(1), 70–78. https://doi.org/10.1177/1476127013520265

Barraqué, B. (2020). Full cost recovery of water services and the 3 T's of OECD. *Utilities Policy*, *62*(October 2019), 1–8. https://doi.org/10.1016/j.jup.2019.100981

Beecher, J. A. (2020). Policy Note: A Universal Equity-Efficiency Model for Pricing Water. *Water Economics and Policy*, *6*(3), 1–29. https://doi.org/10.1142/S2382624X20710010

Birkenholtz, T. (2010). Full-cost recovery: Producing differentiated water collection practices and responses to centralized water networks in Jaipur, India. *Environment and Planning A*, *42*(9), 2238–2253. https://doi.org/10.1068/a4366

Bisogno, M., Cuadrado-Ballesteros, B., & García-Sánchez, I. M. (2017). Financial Sustainability in Local Governments: Definition, Measurement and Determinants. In R. B. M. (eds) (Ed.), *Financial Sustainability in Public Administration* (pp. 57–83). https://doi.org/10.1007/978-3-319-57962-7

Carroll, D. A., & Stater, K. J. (2009). Revenue diversification in nonprofit organizations: Does it lead to financial stability? *Journal of Public Administration Research and Theory*, *19*(4), 947–966.

https://doi.org/10.1093/jopart/mun025
Chikoto-Schultz, G. L., & Neely, D. G. (2016). Exploring the Nexus of Nonprofit Financial Stability and Financial Growth. *Voluntas*, *27*(6), 2561–2575. https://doi.org/10.1007/s11266-016-9786-0
Del Villar, A., & Melgarejo, J. (2020). Prospective models for water service demand and price analyses. *Water (Switzerland)*, *12*(6), 1–13. https://doi.org/10.3390/w12061613
Donoso, G. (2017). Urban water pricing in Chile: cost recovery, affordability, and water conservation. *Wiley Interdisciplinary Reviews: Water*, *4*(2), e1194. https://doi.org/10.1002/wat2.1194
GoK. (1999). *Sessional Paper No. 1 of 1999 on National Policy on Water Resources Management and Development* (No. 824 KE99). Nairobi.
Hukka, J. J., & Katko, T. S. (2015). Appropriate pricing policy needed worldwide for improving water services infrastructure. *Journal - American Water Works Association*, *107*(1), E37–E46. https://doi.org/10.5942/jawwa.2015.107.0007
Kanakoudis, V., Gonelas, K., & Tolikas, D. (2011). Basic principles for urban water value assessment and price setting towards its full cost recovery - Pinpointing the role of the water losses. *Journal of Water Supply Research and Technology - AQUA*, *60*(1), 27–39. https://doi.org/10.2166/aqua.2011.093
Lelegwe, L. S., Kidombo, H., & Gakuu, C. (2018). Empirical Analysis of the Moderating Influence of Community Participation on the Relationship Between Technical Assistance and Sustainability of Donor Funded Projects in Samburu County , Kenya. *Internatiinal Journal of Economics, Commerce and Management*, *VI*(3), 76–87.
Lozano, R. (2012). Towards better embedding sustainability into companies' systems: An analysis of voluntary corporate initiatives. *Journal of Cleaner Production*, *25*, 14–26. https://doi.org/10.1016/j.jclepro.2011.11.060
Lozano, R., Carpenter, A., & Huisingh, D. (2015). A review of "theories of the firm" and their contributions to Corporate Sustainability. *Journal of Cleaner Production*, *106*, 430–442. https://doi.org/10.1016/j.jclepro.2014.05.007
Marson, M., & Savin, I. (2015). Ensuring sustainable access to drinking water in Sub Saharan Africa: Conflict between financial and social objectives. *World Development*, *76*(October 2014), 26–39. https://doi.org/10.1016/j.worlddev.2015.06.002
Mitlin, D., & Walnycki, A. (2019). Informality as Experimentation: Water Utilities' Strategies for Cost Recovery and their Consequences for Universal Access. *Journal of Development Studies*, *0*(0), 1–19. https://doi.org/10.1080/00220388.2019.1577383
Monteiro, A., Matos, J., Megre, F., Silva, A., Nunes, A., Germano, R., … Matavela, V. (2016). Financial sustainability of urban water cycle services in developing countries: A case study in Mozambique. *Water Science and Technology: Water Supply*, *16*(4), 1068–1076. https://doi.org/10.2166/ws.2016.008
Montgomery, M. A., Bartram, J., & Elimelech, M. (2009). Increasing functional sustainability of water and sanitation supplies in rural sub-saharan Africa. *Environmental Engineering Science*, *26*(5), 1017–1023. https://doi.org/10.1089/ees.2008.0388
Pinto, F. S., & Marques, R. C. (2016). Tariff Suitability Framework for Water Supply Services: Establishing a Regulatory Tool Linking Multiple Stakeholders' Objectives. *Water Resources Management*, *30*(6), 2037–2053. https://doi.org/10.1007/s11269-016-1268-z
Quayes, S. (2012). Depth of outreach and financial sustainability of microfinance institutions. *Applied Economics*, *44*(26), 3421–3433. https://doi.org/10.1080/00036846.2011.577016
Rampa, F. (2011). *Analysing governance in the water sector in Kenya* (No. 124). Brussels.
Rusca, M., & Schwartz, K. (2017). The paradox of cost recovery in heterogeneous municipal water supply systems: Ensuring inclusiveness or exacerbating inequalities? *Habitat International*, *30*, 101–108. https://doi.org/10.1016/j.habitatint.2017.03.002
Schwartz, K., Tutusaus, M., & Savelli, E. (2017). Water for the urban poor: Balancing financial and social objectives through service differentiation in the Kenyan water sector. *Utilities Policy*, *30*(2017), 1–10. https://doi.org/10.1016/j.jup.2017.08.001
Tsagkaraki, M. I., Komorowski, M., Boda, B., Popa, T., Gega, D., Nikolaou, I. E., & Tsagarakis, K. P. (2014). An exploratory approach for evaluating the energy and personnel share of operation and maintenance costs for water utilities in selected emerging economies of Europe. *Journal of Water Supply: Research and Technology - AQUA*, *63*(5), 368–378. https://doi.org/10.2166/aqua.2013.228
van den Berg, C., & Danilenko, A. (2011). The IBNET Water Supply and Sanitation Performance Blue Book. In *The IBNET Water Supply and Sanitation Performance Blue Book*. https://doi.org/10.1596/978-0-8213-8582-1
Van Den Berg, C., & Danilenko, A. (2017). *Performance of Water Utilities in Africa*. https://doi.org/10.1596/26186
Vučijak, B., Pašić, M., & Bijelonja, I. (2018). Financial sustainability of public utilities in western balkans 1-3. *International Journal of Engineering*, *16*, 53–59.
WASREB. (2018). *A Performance Report of Kenya's Water Services Sector 2015 / 16 and 2016 / 17*. Nairobi.
WASREB. (2019). *Impact: A performance Report of Kenya's Water Services Sub-Sector*. Retrieved from https://wasreb.go.ke/downloads/WASREB_IMPACT_Issue10_FINAL.pdf