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Accelerating Safe Water and Sanitation Access in Urban Periphery and Low-Income Areas: The Case of Kenya

Japheth K. Koros[1], Petri S. Juuti[1], Riikka P. Juuti[1], and Jamlick Mutie[2]

Abstract

Achieving universal water and sanitation access by 2030 - Kenya's Vision 2030 and Sustainable Development Goal (SDG) 6, remains challenging for Kenya, especially in urban low-income and periphery areas. Only 23% of low-income are served by licensed utilities. Most are served by small-scale water service producers (SSSPs), who struggle to produce safe water and sanitation despite wide coverage, posing significant public health and other risks. Aiming to increase the understanding of SSSPs as potential water producers, ten SSSP managers from the Nairobi Metropolitan Region were interviewed. The managers find the costs of licensing compliance, taxes, and levies to be inhibitive and anticipate more proactivity and resources from the government. The authors suggest that the institution is flawed in overlooking SSSPs, and their regulation needs reviewing. Yet, as licensing requirements should not be reduced, SSSPs should embrace the clustering policy, and the government should consider subsidies to supplement SSSPs' resources.

Keywords

SDG 6, vision 2030, water and sanitation, small-scale water services production, Kenya

[1]Faculty of Built Environment, Tampere University, Tampere, Finland
[2]Rural Water Management Systems, Nairobi, Kenya

Corresponding Author:
Japheth K. Koros, Tampere University, Rakennustalo, Korkeakoulunkatu 5, Tampere 33720, Finland.
Email: japheth.koros@tuni.fi

Introduction

Kenya has had commendable success in achieving some of the Sustainable Development Goals (SDG). The healthcare sector has seen significant improvements, particularly in reducing maternal and child mortality rates—a critical focus under SGD 3 on "Good Health and Well-being." Maternal mortality has decreased significantly, thanks in part to improved access to antenatal care, skilled birth attendance, and emergency obstetric services. Child mortality rates have also declined, supported by expanded immunization programmes, improved nutrition, and increased access to clean water and sanitation (United Nations Kenya, 2024). However, despite the notable growth in the water and sanitation sector that has contributed to the growth in the health sector, meeting SDG 6 on universal access to water and sanitation is very challenging.

Colonial and some post-colonial institutional choices have made remarkable contributions to these challenges. During the colonial period, supply to the native urban communities was a matter of charity (Bousquet, 2006). Urban squatter areas created during the period lacked water and sanitation services (Dill & Crow, 2014; Nyanchaga, 2016), marking the onset of inequality. Water services development prioritized other uses, e.g., supply for locomotives, irrigation, and industries. Drinking water and sewerage were developed in settler areas, which were occupied post-independence by a few influential individuals (Nyanchaga, 2016).

According to Nyanchaga (2016), Dill and Crow (2014), Bousquet (2006), and the Society for International Development (SID, 2010), the colonial regime's legacy of inequality was not addressed at independence and continues ailing the sector. In rural areas, only part of the initiated schemes for agricultural production had been completed at independence (Dill & Crow, 2014; Nyanchaga, 2016). Tangible progress towards equalization has only come with recent reforms. Additionally, post-independence immigration policy allowing people to migrate freely within the country led to massive migration to urban areas in search of jobs, further expanding the squatter, low-income areas (LIAs), still with limited public utilities (Dill & Crow, 2014).

Water sector reforms from the early 90s aimed to revive the significantly deteriorated water services. Deliberations on this coincided with an ongoing debate on sustainable development, encompassing appropriate technology and Integrated Water Resources Management (IWRM) Principles, dubbed the *Dublin Principles* (UN, 1992; Agarwal et al., 2000). Appropriate technology refers to technology suited to the specific context of developing countries. This concept gained global support following the United Nations International Drinking Water and Sanitation Decade (1981–1990) when it became clear that achieving the goal of universal access to water and sanitation would require a change in how technology was approached (Katko, 2017).

The fourth Dublin Principle is that water has an economic value in all its competing uses and should be recognized as an economic good. Aligned with the economic good dimension of water, the World Bank and International Monetary Fund prescribed a privatization approach to water services to minimize loss-making tendencies in public services (K'Akumu, 2005; Wambua, 2004). Water services were to be merchandized at

cost-reflective tariffs to consumers and alternative solutions for less fortunate estates with no infrastructure (Bousquet, 2006). These prescriptions led to the adoption of a commercialization approach to water services with a promise of less government expenditure, efficiency mimicking that of private companies, and autonomy of utilities, which was desired to spur their growth. New policies and the Water Act 2002 contained these changes on water services, primarily replacing municipal-run utilities with private water services providers (WSPs) owned by the municipalities.

Water Service Gaps and SSSPs in Kenya

The Water Act 2002 was, in that respect, considered one of the most comprehensive and advanced water institutional frameworks (Rampa, 2011). Its execution and that of the present Water Act 2016 were remarkable, executed within the first few years of their enactments. Nonetheless, the most significant setbacks of the WSP model prescribed in the Acts have been their slow advancement in the low-income, peri-urban, and rural areas where the WSPs are unviable (Boakye-Ansah et al., 2019).

Additionally, alternative solutions for underserved and rural areas prescribed in Section 94 of the Water Act 2016 have not helped to ease the WSP gap (The Republic of Kenya, 2016). Infrastructure development has been low due to low sector funding, and only 23% of 16 million with an active WSP connection are low-income (WASREB, 2023a; 2023b). Therefore, many low-income people and those living in newly developing estates in the urban peripheries are underserved, residing *beyond the networks* (Wamuchiru, 2015).

As a result of the gaps in access to WSP services, SSSPs operated by individuals, community-based organizations (CBOs), estate associations, churches, and governmental and non-governmental organizations (NGOs) have been established. There is insufficient data on their coverage; however, these cover the remaining underserved population, about two-thirds of Kenya's 50 million population. Yet, unable to raise adequate resources, e.g., to treat water, employ qualified personnel, manage high electricity tariffs, and adequately cater to infrastructure development costs, they fail to attain normative standards for the right to water and sanitation. They are, therefore, unlicensed and illegal operators.

The regulator, Water Services Regulatory Board (WASREB), which is mandated to license all water service producers, aims to bring all SSSPs to regulation (WASREB, 2023a, p. 7, 2023b). However, there are limited studies on SSSPs to facilitate appropriate action. The World Water Development Report (WWDR) (United Nations, 2023) indicates that a limited understanding of alternative providers has constrained pro-poor regulatory outcomes. The United Cities and Local Governments (UCLG, 2016, p. 396) recommend a further study and careful examination of their potential, as small autonomous systems represent a significant step towards achieving sustainable and universal access to basic services in metropolitan areas worldwide.

Therefore, the objective of this study was to increase the understanding of SSSPs as alternative water service producers. Specifically, it aimed to establish:

(1) External factors influencing their operations, e.g., licensing, regulation, and support
(2) Internal factors influencing their operations, e.g., governance and operational issues
(3) Success and limiting factors to sustainable operations.

Study Relevance

This study provides critical information for shaping Kenya's water services where the Kenyan government is not universally providing the fundamental right to water and sanitation, an obligation tied to the Constitution, marking its national significance. Additionally, Kenya envisions equity, poverty elimination, and accessibility of improved water and sanitation for all in its Vision 2030 (Government of the Republic of Kenya, 2007, pp. 18, 21), a similar goal envisioned in SDGs 1 and 6 (UN, 2024). Therefore, the study contributes to aligning the government with its national and international obligations. Most importantly, it contributes to making drinking water and safe sanitation, which are vital for human survival, common and available to the last person. This study is also applicable in the wider sub-Saharan African region, which has the highest population with limited access to safely managed water and sanitation, according to the United Nations Children's Fund (UNICEF) and World Health Organization (WHO) monitoring reports (2023).

Kenya's Water Services Institutional Arrangement

The Water Act 2016

To provide a context to how Kenya's water services are organized, Figure 1 shows the water sector's institutional arrangement under the Water Act 2016 (The Republic of Kenya, 2016). County governments are constitutionally mandated to provide water and sanitation services to fulfill the right to water and sanitation.

Respective county governments are to establish WSPs in commercially viable areas and implement alternative measures in uncommercially viable rural areas. The measures in the latter case include point sources, small-scale piped systems, and standpipes managed by community associations, public benefits organizations, or a private person under a contract with the county government. The government is to finance five-year plans developed by the county government to meet these alternative measures. WASREB, on the other hand, provides licensing guidelines for WSPs (WASREB, 2023a, 2023b) and guidelines for the provision of water and sanitation in rural and underserved areas (WASREB, 2019).

The government has also developed a pro-poor strategy targeting urban LIAs (MoWI, 2007). All licensed WSPs with LIAs are to implement this in urban areas. WSPs must show, as a licensing condition, how they cater to low-income people. Furthermore, the Act prescribes clustering the WSPs to achieve economies of scale and

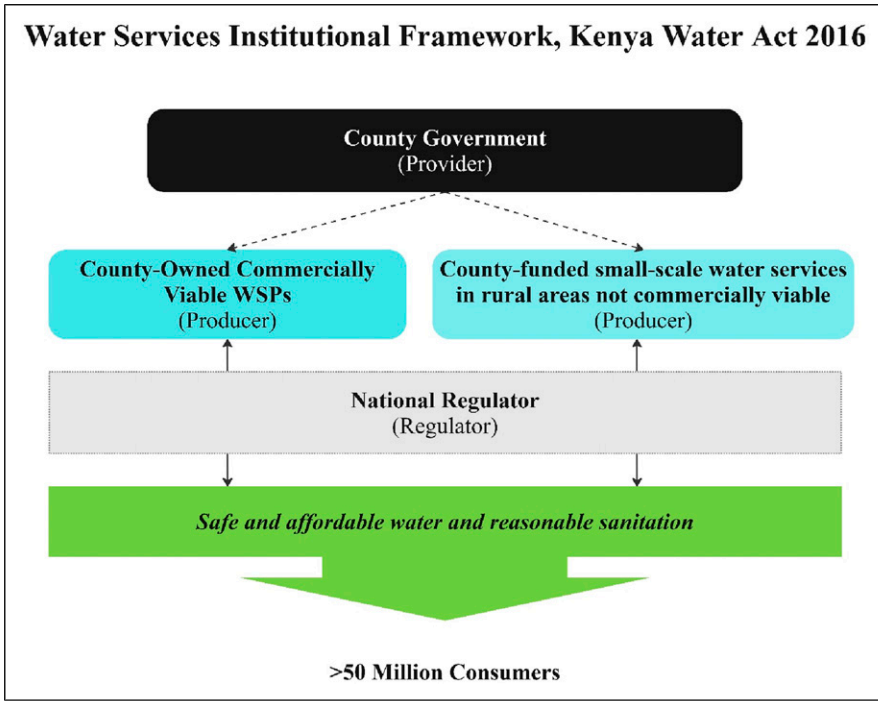


Figure 1. Water services institutional framework, Water Act 2016.

bring SSSPs under regulation. WASREB and county governments implemented this limited to urban water services (WASREB, 2018). Although this approach was accepted in some cases, there are still questions about how to effect it among the WSPs (WASREB, 2021) and many SSSPs objected to the proposal, some managing to block the clustering through litigation. The petitions raised included that the integration policies by one of the counties *purported to usurp and interfere with the governance structure of the Petitioners and their right to manage their affairs, thereby violating their constitutional rights to water and their assets* (George Ngotho & 26 others v Governor of Kiambu County & 6 others, 2019).

Figure 2 shows the water sector outlook with the participation of SSSPs. The addition of SSSPs reveals a divergence from the institutional framework foreseen in the Water Act 2016.

SSSPs

Communally organized services often emerge by default in response to the lack of formal service provision (Allen et al., 2006; Sarkar, 2020; United Nations, 2023, p. 178). SSSP dominance, therefore, depicts gaps in the water sector. Yet, what is

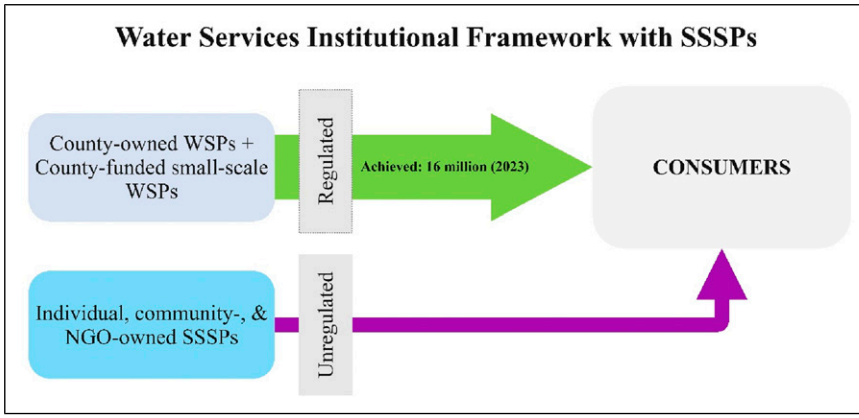


Figure 2. Water services institutional framework with SSSPs.

seemingly a failure can be overturned by formalizing them to supplement the county-owned WSPs, leveraging on the already willing public. The WWDR terms this inclusive approach as a *whole-of-society approach* (United Nations, 2023, p. 178). However, better organization of the SSSPs will be required at the onset. A case study of Kenya's rural water services by Koehler et al. (2018) contributes to this by classifying waterpoint managers as bureaucratic, individualist, community, or fatalist.

The bureaucratic waterpoint managers comprise the publicly owned water utilities and schemes. The government bears all the risks of the scheme. In Kenya, 90 such utilities are licensed, categorized as very large, large, medium, and small, serving 16 million in a license area of 24 million (WASREB, 2023a, p. 17, 2023b). NCWSC, the largest, serves 4 million people in the capital city. Small WSPs supply up to 5000 people (WASREB, 2023a, 2023b). The individualist category comprises privately owned water enterprises. The community category comprises communally managed water projects. Water is managed as a common pool resource, and risks are shared. The fatalist consists of a group of individuals who operate government or donor-funded schemes with which they have little ownership and are unwilling to bear any risk. They are characterized by long-term management failure. On failure, the richer dependents fetch water from nearby projects while others revert to raw water sources (Koehler et al., 2018). The individualist and community categories represent SSSPs with higher prospects for formalization in line with the government's ambition and are the focus of this study. 'Fatalists' have contributed significantly to general SSSPs' criticism and skepticism of their potential positive impact by government and investors.

Conceptual Framework

To begin with, Kenya's WSP model design, resembling the conventional municipal water supply systems, does not entirely fit its urban context, which has vast unplanned

sections. Conventional municipal water supply systems are, by design, suited for planned areas where, for example, billing is possible (Blomkvist et al., 2020; Criqui, 2015; Nilsson & Blomkvist, 2021). The model's unviability in rural and underserved areas is acknowledged in Kenya, and the Water Act makes special provisions for the model's unviable areas. Impliedly, unless significant changes are made to the WSP model or similarly effective mechanisms for serving the unplanned areas are created, only a limited population will continue benefiting. The gap is also likely to widen as the unplanned areas continue to grow faster than the government's capability to provide basic services (UN-Habitat, 2008).

Detailed investigations have delved into pro-poor strategies that WSPs implement through dedicated pro-poor units implementing differentiated water service systems, i.e., technologies, tariffs, and payment plans (Kemendi & Tutusaus, 2018; WSUP, 2018). The results of the strategies have varied. A Water and Sanitation for the Urban Poor (WSUP) program report (WSUP, 2018) details increased focus on LIAs following the establishment of pro-poor units in WSPs. In Nakuru and Kisumu WSPs, implementing the pro-poor strategy increased LIA coverage and reduced previous prejudices on LIAs by the WSPs (Kemendi & Tutusaus, 2018).

However, a project piloting prepaid meter use in a Nairobi LIA showed that the measures failed to meet the WSPs targets of bypassing cartels, reducing illegal connections, lowering prices, and making it easier for customers to access and pay for water. Contrariwise, sales slumped (Blomkvist et al., 2020, p. 3; Nilsson & Blomkvist, 2021). Additionally, Werchota and Nordmann (2015) and Kemendi and Tutusaus (2018) indicate that adopting low-cost technologies in a differentiated service model had initially been challenging for WSPs and that development partners played a major role in advancing it.

Therefore, inequality persists. Lack of basic water services by the low-income undermines the national values of equity, social justice, inclusiveness, and equality as stated in Kenya's constitution and Vision 2030, and as a party to the UN, challenges the SDG 2030 primary goal to address inequality. The SDG principle *Leave No One Behind* represents the unequivocal commitment of all UN Member States to eradicate poverty in all its forms, end discrimination and exclusion, and reduce the inequalities and vulnerabilities that leave people behind and undermine the potential of individuals and humanity as a whole (UNSDG, 2022). The UN proposes one way of measuring inequality: calculating the ratio of service coverage between advantaged and disadvantaged groups. In Kenya, the urban inequality ratio in 2020 was 1.5, indicating there were 1.5 more low-income people without water services than higher-income (WHO & UNICEF, 2023, p. 44).

The Kenya government envisioned equity and reduced poverty by 2030 through increased income and employment. The laid-out growth strategy would lead to a consistent ten percent economic growth rate from 2012, leading to the country's middle-income status by 2030 (Government of the Republic of Kenya, 2007). However, this ambitious goal was curtailed by multiple factors, amounting to a slower growth rate. But still, economic growth cannot eliminate inequality; instead, inequality hinders economic growth (SID, 2010, p. 1). According to SID (2010, p. 25), Kenya's development plans must, in parallel, therefore, focus on remedying inequality, part of

which is emphasizing *community-owned and run facilities to further enhance the equalizing effects* – although SID recommends this about tourism.

The UN-HABITAT describes the *urban divide* as a clear injustice and a symptom of systemic dysfunction. The urban divide is evident in the rich living in well-serviced neighborhoods, gated communities, and formal settlements, while the poor are confined to inner-city or peri-urban informal settlements or slums with limited basic services (UN-Habitat, 2008; Boakye-Ansah et al., 2019). With the rich only having access to tax-funded infrastructure and amenities, the poor without access subsidize the rich (Rusca & Schwartz, 2018). Furthermore, low-income earners pay a high cost for this inequality, as revealed in many studies.

Water in LIAs, often of lower quality, costs between five and twenty times more than the regulated water in the other urban zones (Mwihaki, 2018; Sarkar, 2020; Werchota & Nordmann, 2015). Werchota and Nordmann (2015) argue that SSSPs, which predominantly supply LIAs, lack the benefit of economies of scale. The World Water Development Report (United Nations, 2023, p. 178) explains that they, by necessity (no subsidies), charge the full cost of the service. Studies on economies of scale show that it is a general characteristic of small-size water operators to have the highest costs of production per unit (Ferro et al., 2011; Shih et al., 2006), including trends seen in Kenya's licensed WSPs (WASREB, 2024, p. 52).

Disease prevalence is also heightened (Guillaume et al., 2020). Figure 3 summarizes the root causes and effects of low and unequal access to urban water services in Kenya and highlights the focus of this study, which is the water services framework.

The water services framework is largely discussed in the context of water institutions, which various theories describe as vital but complex. Ostrom (1990; 2005) delves into water institutions and institutional diversity in the context of the institutional theory. Many scholars note the complexity of making suitable institutions and emphasize there is no

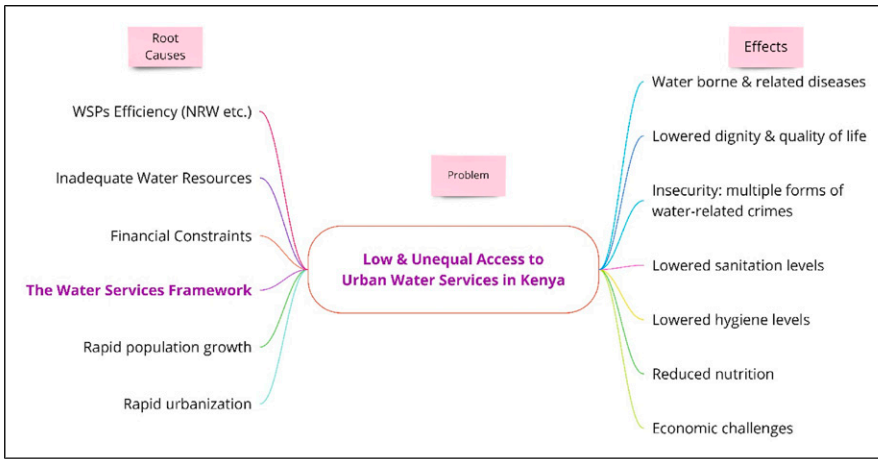


Figure 3. Root causes and effects of low water access in Kenyan urban areas.

one-fits-all institutions (Katko et al., 2012; Kondwani, 2022; Ostrom, 1990). They elaborate on the best approaches through various theories and sampling empirical cases.

For example, the IWRM principles advances stakeholder participation, women inclusion, and the recognition of the economic cost of water as critical for IWRM and sustainable development based on decadal lessons and an intensive discourse (Allouche, 2016). Relevantly, community-managed water services are a part of the broader concept of community participation, which refers to the involvement of local people in the planning, decision-making, implementing, and managing of projects and services that affect their lives (Myers, 2016). Involving the community in managing water services promotes ownership, accountability, and sustainability of the water system, as the community has a direct stake in its success. This approach often leads to more resilient and effective water management solutions tailored to the specific needs and conditions of the community. Scholars on co-production of services such as Myers (2016) and Ostrom (1996) highlight these benefits. Still, the bricolage concept emphasizes customizing imported concepts by matching them or integrating the cultural practices of the beneficiary communities (Cleavers, 2003).

Therefore, in Kenya's context, integrating community managed water services into its institutional framework would reflect the country's characteristics. Appropriate regulations to ensure safe water and sanitation, addressing a common criticism of SSSPs should follow. In line with the IWRM principles, full-cost recovery should be a key objective. Subsidies should be considered cognizant of costly water services development vis-à-vis individual and community economic capabilities. In addition to the government's priority of increasing private sector participation to address the sector's financial constraints (The Republic of Kenya, 2021), the government should prioritize leveraging the SSSPs investments, a potential that is often overlooked.

Methodology

To enhance the understanding of SSSPs as alternative water service providers, which was the study's aim, semi-structured interviews, which are a form of in-depth interviews, were conducted on managers of ten SSSPs in the Nairobi metropolitan region. Nairobi is Kenya's capital.

Qualitative Study Approach

The interview approach was chosen because interviews provide a space for extended conversations that allow the researcher insights into how people think and what they believe. In-depth interviews go further, employing probes and open-ended questions to elicit more details into the subject (Knott et al., 2022). Managers of SSSPs, which are the subject of this study, were the selected respondents. In-depth interviews create an opportunity for the respondents to articulate the external and internal influences, and success and challenges factors, which broaden understanding of SSSPs and enable follow-up discussions and finding solutions.

Data-collection in semi-structured interviews is typically done using a topic guide comprised of a set of broad questions ordered around key concepts identified by the researcher, and a set of questions along each broad topic. The questions are supposed to be open ended, and probes may be used during the interview to elicit more details into the subject (Knott et al., 2022). The themes used in designing the semi-structured interviews in this study were aligned to the specific objectives as shown in Figure 4. The questionnaire is annexed at the end of this article. Face-to-face interviews were conducted and recorded in March 2024. The respondents filled in a consent form allowing analysis and publication of the interview data in line with ethical requirements.

To ensure a rigorous study, the researchers paid keen attention to the study design-first defining the targeted respondents laying out the inclusion and exclusion criteria, study location, and sample size. According to Knott et al. (2022), a number between 12 and 20 is suitable for this approach even though the primary focus in qualitative studies is depth over breadth in representativeness (Knott et al., 2022). Up to 15 interview requests were sent, and open-ended questions with probes to elicit more information were used. Figure 5 highlights the participant selection criteria and participants' responses.

Study Location and Participant Selection

Figure 6 shows the study location and SSSPs selected. A local engineering consultancy (Rural Water Management Systems, 2024) involved with SSSPs identified the potential participants.

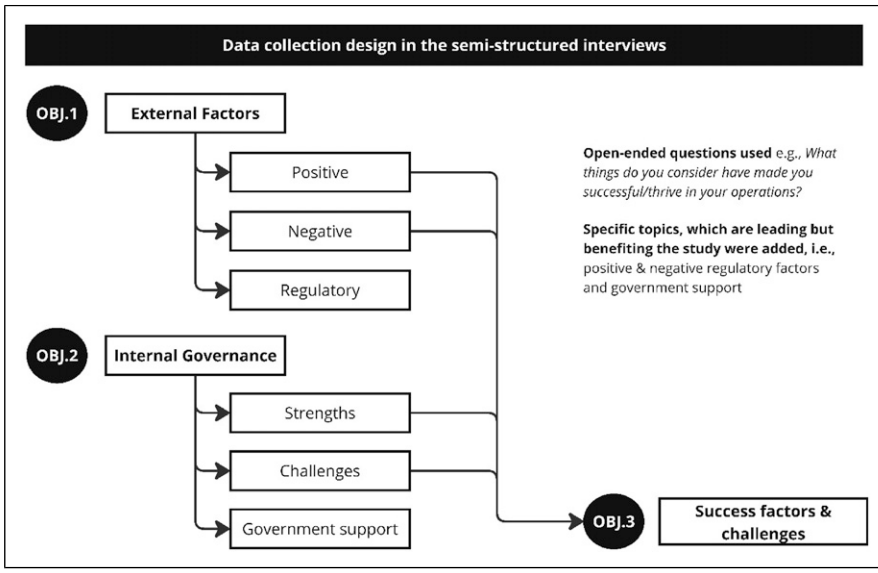


Figure 4. Data collection design in the semi-structured interviews.

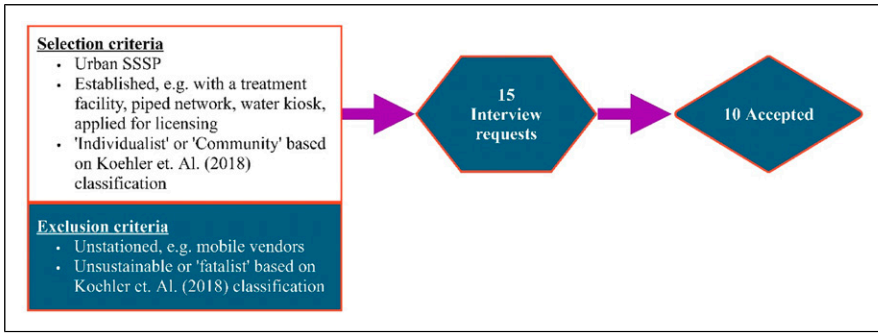


Figure 5. Participants selection criteria and responses.

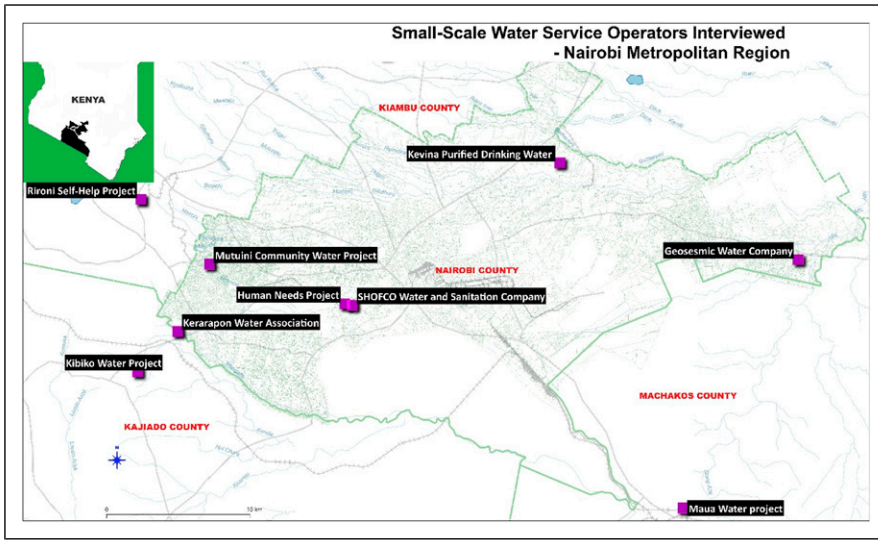


Figure 6. Small-scale operators interviewed.

The Nairobi Metropolitan Region was selected as the most populated area in the country according to Kenya's 2019 population and housing census. Moreover, most SSSPs are established here, as 80% of the low-income population lives in the region (KNBS, 2022). Other major cities such as Nakuru and Kisumu have low-income populations and SSSPs whose activities are well documented, for example, the delegated management model employed by Kisumu Water and Sanitation Company (Nzengya, 2015; Schwartz & Sanga, 2010), but the Nairobi Metropolitan was considered representative of the country as it has the largest LIAs population. Furthermore, there is minimal variation in customer characteristics and SSSPs across the country.

With the constitutional agenda to bring the quality of basic services in marginalized areas to par with the rest of the country through the equalization fund, variations in characteristics will further decrease (The Government of Kenya, 2023).

Data Preparation

Data preparation entailed transcribing the recordings using software and editing errors in the transcripts. All the responses were then collated into a table corresponding to the relevant questions. Visualizing all results alongside each other enabled easier summarizing of results and analysis. The results were summarized using the Atlas.ti, a qualitative analysis tool (ATLAS.ti Scientific Software Development GmbH, 2024).

Analysis

According to Knott et al. (2022), while conducting a qualitative analysis of semi-structured interviews, the answers are not necessarily in the responses. A generative rather than an extractive approach is necessary in their analysis. Therefore, the analysis involved moving closer to and further away from the data while maintaining the linkage between the participant voices and higher-order conceptual insights.

The main concepts against which the voices in this study were analyzed are those articulated in the conceptual framework. These included the concepts of inequality and community participation in accessing the human right to water. The analytical questions focused on (i) what the voices revealed about inequality and (ii) the implications of these insights on the water services framework, enhancing the understanding of SSSPs in light of water governance.

In summary, the primary steps taken in this qualitative study were (i) identifying a study location, (ii) selecting and contacting suitable participants, (iii) conducting the interviews, (iv) preparing the data, and (v) conducting qualitative analysis.

Results

SSSP Characteristics

SSSPs mainly source water from boreholes, river and spring intakes, and bulk water supply from WSPs. They distribute water through water kiosks, small, piped water systems, and tankers. Their main customers include homes, public facilities, businesses, and water vendors who redistribute to customers further away from the SSSPs. Table 1 highlights the characteristics of the interviewed SSSPs. Each serves significant population segments in different parts of the city and periphery areas.

Table 1. Additional Participants Attributes.

	Name	Registration	Distribution network	Year Est.	Funding sources (last 5 years)	Kiosk	Pop. Served
1	Rironi self-help project	CBO	yes	1970	Water fees	0	5000
2	Kanunga self-help water project	CBO	yes	1974	Water fees	0	10,000
3	Kevina water	Private	yes	-	Water fees, donations	2	-
4	Geosesmic water company	Private	yes	2014	Water fees, commercial loans, donations	1	6000
5	Human needs project	NGO	yes	2014	Water fees, donations, other income	5	40,000
6	SHOFCO water and sanitation company	Private	yes	2016	Water fees, donations	50	40,000
7	Maua water project	Private	yes	2019	Water fees, commercial loans	1	500
8	Mutuini water project	CBO	yes	2010	Water fees, loans, and donations	0	3000
9	Kibiko water project	CBO	yes	1980	Water fees	4	8000
10	Kerarapon water association	CBO	yes	1980s	Water fees	0	5000

External Factors Influencing SSSP Performance

The study aimed to identify external factors influencing SSSP operations. The main factors include technology, loans and grants, fee payments, cartels, government, and regulatory issues.

Technology. Low-cost technological options enable SSSPs to achieve better quality services more affordably. Hyvärinen et al. (2016), for example, write about the relevance of low-cost frugal innovations in sub-Saharan African contexts. One respondent singled out the country's technology level as beneficial to SSSPs, stating, '*We are very much aware of the technological advances and are eager to embrace them*'. Multiple

operators using the nano-filtration technology - an advanced and expensive technology compared to the commonly used sand filters and reverse osmosis- cited significantly improved water quality. One operator described this water quality as '*the best and among the best five water qualities we have in the country.'*

Commercial Loans and Donations. As SSSPs are self-dependent, commercial loans and donations are the second most important alternative income after customer payments. Yet, only a few have had both. Commercial loans were often guaranteed by an individual and therefore common among the individualist type of SSSPs.

'Social enterprises,' which supply water at highly subsidized rates to support low-income communities, rely on grants to cover capital expenses and subsidize tariffs. One respondent explained that *'things are (only) good when we get donations.'* Another, similarly, asserting their attention to donations, stated that *'the charity landscape especially after COVID-19 had increased,'* boosting SSSPs in LIAs.

Still, another explained about a grant: ' *It was such a huge boost for the project… we managed to expand it significantly. We did a 2500 cubic liter tank and a dam, changed the size of the pipes, purchased new pumps, and laid down a good water network.'*

Fees Payment. Fee payment is crucial to SSSP survival. This translated to a high collection efficiency. However, tariff adjustments reduce the willingness of some customers to pay, even when tariffs have remained unchanged for a long time. One, explaining their challenge, states that *'…if you mentioned something about the tariff, then the story changes. Even this (low) one … they complain the fee is a bit high*.' However, the response was different in '*middle-class'* locations. One operator noted *'the people here do not have difficulty paying*'. Similarly, in populated areas, another explained, *'…the fact that we have a significant population here helps. You can charge little and move volumes*.'

With difficulty adjusting tariffs, some SSSPs charged very low unsustainable prices, compensating the deficit with voluntary work. Those running social enterprises charged highly subsidized tariffs. The social orientation is the primary motivation for their persistence. The study, for example, revealed that most operators' major concerns on high taxation and tariffs were about having to pass the costs to their strained customers. A manager explained that *'at the end of the day, we must go back to the community to 'cough' more and, considering the current economic challenges… it's a real issue.'* Another stated that *'this is a self-help project. Not commercial. It must assist the poorest person in accessing water resources.'* This tendency further cements the explanation in with the WWDR (United Nations, 2023), that SSSPs are not exorbitant in their pricing, their tariffs are often reflective of costs, which may be higher because of their scale.

Cartels. Cartels coexist with SSSPs, competing for the same underserved markets. However, they extort through selling unsafe water at high prices and frustrating access to formal services. As highlighted in some statements, '*…they are used to stealing water.*', '*… cutting our pipes…'*, '*…they are unhappy because they want to extort…*'.

The Government and Water Regulation. The government's influence on SSSPs is evident through its enforcement of regulation and taxation. Increased taxation on production materials and inputs, e.g., chemicals and pipes, increases production costs affecting SSSP operations, especially because SSSPs have to pass the extra costs to the customers and donors. One operated explained that they *'increased the cost of production and weighed down donors.'*

Electricity costs, which the government also regulates, were cited as the highest production cost; for one respondent, it accounted for 80% of the cost. They also face direct and indirect political interference. Additionally, the governments and major donors prefer licensed WSPs irrespective of the local SSSPs' competency. This was mentioned severally, with one stating, '*They only know the big WSPs*.' Another explained that *'...so if I go to the county to try to get something, they say no, we can only channel our money through X WSP (one of the licensed WSPs*).'

Nonetheless, another balanced this view, acknowledging that there are things they could not have achieved without the government.

Regulation and Licensing. The study sought SSSP perspectives on water services regulation, which is necessary for customer protection. A few expressly acknowledged its relevance. Zoning was lauded as *'a good policy'* even though it only applies to licensed WSPs. The government needs stricter enforcement mechanisms to counter rogue operators who *'don't care much'* about the quality of water supplied. It also needs to educate the public about the need for regulation. A respondent stated, *'Civic education must be done so that people would realize the need to pay... they don't understand...'*

Overall, regulatory costs are a major concern, which operators described as *'prohibitive,' 'costly,' 'too many permits, 'triple taxation,' and 'exorbitant.'* The issue also concerns their financial capability. One operator notes that *'if you are a small provider without external support, you cannot meet these requirements.'* Additionally, the operators wanted reciprocal services from the regulator. Another operator explained that *'if you are paying so high, they should tell you, here's a conference to train WSPs, but it's not that way. After I pay the licenses, I wait another year to see them again.'*

There is a general perception of an overburdening regulation. Some considered the water sector *'overregulated'* with '*too many permits'* and having *'a lot of bureaucracy; we have to hire a consultant to follow up...'* and *'so many legal and regulatory barriers to entry.' 'Tariff regulation should not lead to tariffs that are too low for sustainability.'* Importantly, there is a call to streamline regulation and regulatory costs.

The main reasons SSSPs need improvement in regulation are:

(1) To enable the entry of more operators and enhance access to safe water
(2) If services are cheaper, consumers can afford more for their health benefits
(3) To energize the operators and
(4) For the operators to have access to commercial loans and donor support

The SSSP operators raised various points regarding what regulatory support would be beneficial. Initially, the regulator should enforce the existing rules, such as maintaining a distance between boreholes and preventing unfair practices, such as selling water cheaply through illegal power connections. Furthermore, they advocated for funding and subsidies. Some recommendations were that *'water is a constitutional right. The government should remove entirely or reduce substantially any taxes on water,' 'substantially minimize charges,' 'subsidize the cost of water distribution and charge less on electricity for public services like water,' 'allow the projects freehand to do their work, and substantially minimize the government charges,*' and '*fund us instead of burdening us with more tax.'*

Capacity Support. Existing funding windows, e.g., through the water sector trust fund or the county government funding for commercially unviable areas, could be applied to upscale SSSPs. Additionally, levies should not fluctuate, as adjusting tariffs is difficult. The regulator should also focus on standardizing equipment and infrastructure and ensuring the quality of products in the market. The regulator must also provide information and education.

As some stated, the operators also want recognition, involvement, and political support without interference. One operator recommended, 'make those operators feel part of a solution…supporting them.' another that 'the area leadership should also have time for this project,' and yet another that 'we would like to be recognized by them, but then they should leave everything *else back to us, not to come and start influencing who comes here as a manager who does this. No.'*

None of the participants were licensed providers yet, but most sought information about licensing and were readjusting to meet the requirements. However, they found the process complex. Two participants had engaged consultants to assist with the transition. Overall, the different roles of the various regulatory bodies were not clear for all, e.g., mixing up the roles of the Water Resources Authority, the county government, and WASREB, as each of these had their various requirements, permits, and licenses.

Merging with County-Owned Public WSPs. All operators negated the possibility of merging with the county-owned public WSPs in their service areas. Table 2 highlights this. The reluctance to merge is primarily based on three reasons:

(1) Asset ownership: There is a concern regarding the lack of mechanisms for providing adequate compensation for the investments made by the communities.
(2) Differing goals and ambitions: Some social enterprise SSSPs charge low tariffs subsidized by donors to benefit low-income communities. This objective might not be achievable post-merger.
(3) Reliability: Some SSSPs believe they are more reliable than the public WSPs and fear merging will reduce their reliability.

The study further inquired about the benefits of remaining private, which they stated were primarily (i) control and (ii) efficiency and reliability.

Table 2. Clustering County-Owned WSPs With Small-Scale Water Service Producers.

Would you like to be merged with public WSPs?	Yes	*No*
	0/10	10/10

Internal Factors

The study aimed to establish the positive and negative internal factors that affect SSSP operations. These primary factors described in this section include financial management, political interference, innovation, good water quality, and various internal challenges.

Financial management. Managing income and expenses was crucial for the survival of SSSPs. Their main challenge is water demand uncertainty, as most customers are not connected to a pipeline. It is harder to project demand and plan in this context. An operator explained this situation as *'a whole set of different changing environments. When it is not as dry, like now, then you can be sure you don't have people coming…'* Such, who had no predictable demand must *'produce as per demand.'* Nonetheless, SSSPs with professionals, e.g., accountants and such professionals on board, managed better with such uncertainties.

Multiple operators stated that it is hard to run SSSPs without professional skills. Some subcontracted accounting services and automated most accounting, billing, payment, and receipting to improve their effectiveness. Yet, it is costly to hire professionals as SSSPs are *'not lucrative.'* One stated that '*we cannot afford an engineer.'* Finding professional volunteers in the community was also challenging, with one noting that *'…mostly, the people you get in a community have never worked in a water project. They have never been anything in the form of a formal environment…'*

Political Interference. Still, internal and external politics greatly hinder SSSPs. As one operator explained, '*…if the community elects good management, the CBO will run effectively, but if politics influences them…the lifespan of the CBO will be short.*'

Innovation. Good customer understanding and relations were key to their growth, aiding innovation. Innovation is key to navigating odd challenges, e.g., security challenges in LIAs. One operator stated the necessity for them to solve problems *'through innovation,'* explaining that *'…we started with underground pipes, but when cartels started cutting our pipes, we came up with an aerial pipeline. Some ideas you cannot see from a supplier perspective, but customers can see, so we listen to them…'*. Another operator similarly stated that *'there is a lot of consumer interface; we speak and continuously engage our clientele and understand their habits, so when we design solutions, we have them in mind…'* Automation in billing and use of '*smart meters'* is significantly progressive as it improves the efficiency of services.

Good Water Quality. The public is keen on the taste and smell of water. Yet, these aspects compete with how much they are willing to spend. Also, this often depends on

SSSP's capacity to adequately and consistently treat water. One respondent stated that operators with a *'profit motive'* are less interested in quality as it is expensive.

To retain customers, some SSSPs had to maintain good water quality through scheduled maintenance by contractors and using superior water treatment facilities. Multiple operators stated this as the main positive feedback they got from their customers. In one operator's observation, *'…our water has a very welcoming taste. It is like the rainwater. But reverse osmosis (used by others) reduces your water quality; it removes all other dissolved minerals.'*

Main Internal Challenges. Water scarcity poses a significant challenge for most operators, especially low groundwater levels during dry seasons or high demand. High demand was, however, also the reason SSSPs had customers, '*…the community needs the services…'*. Electricity tariffs were very high, and one termed it the *'biggest headache.'* Other challenges include *'water theft'* by cartels and *'old pipes breaking.'* Inadequate financial capacity is a major limitation of their operations. One operator termed it a *'lack of muscle to scale,'* which limited their capacity to get adequate infrastructure or engage technical professionals.

Success and Limiting Factors

Table 3 summarizes SSSPs' success and limiting factors, ranking them by recurrence during the interviews.

The participants were also asked about the positive and negative feedback they received from their customers. These are listed in Table 4.

Still, the study sought the participants' recommendations for improving SSSP water services. This aimed to extract the participants' most valuable lessons based on their work experience. Table 5 presents the findings categorized into the sustainability indicators as used by Husain and Khalil (2013); there was a wide range of opinions, with none standing out. No environmental aspects were mentioned.

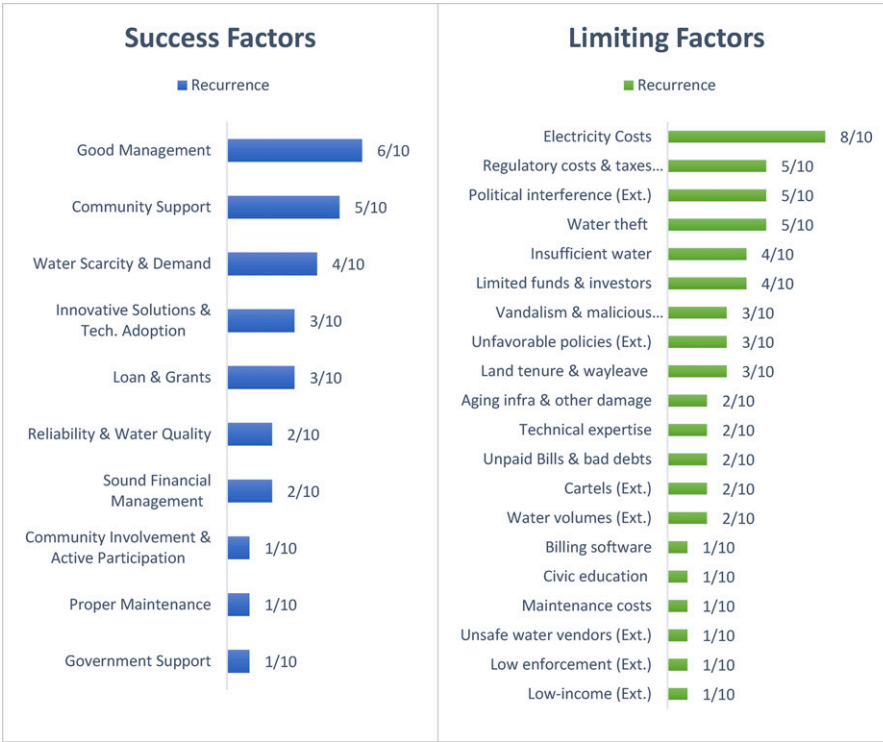
Analysis and Discussion

This study brings important information about Kenya's water institutional arrangement and the gaps that need attention. The custodians of Kenya's water sector must ab initio concede that the sector's failure hinges heavily on the institutional arrangement. The sooner a radical shift is made to address the institutional challenges, the sooner the nation will meet the water and sanitation rights goal and avert an impending crisis that may be faced in the coming few decades.

Measuring Sector Success

The government's proactivity to correct errors in the water sector is evident, considering over six decades of active reforms – except between 1980 and 2000, which

Table 3. Success and Limiting Factors for Small-Scale Water Operators in Kenya.

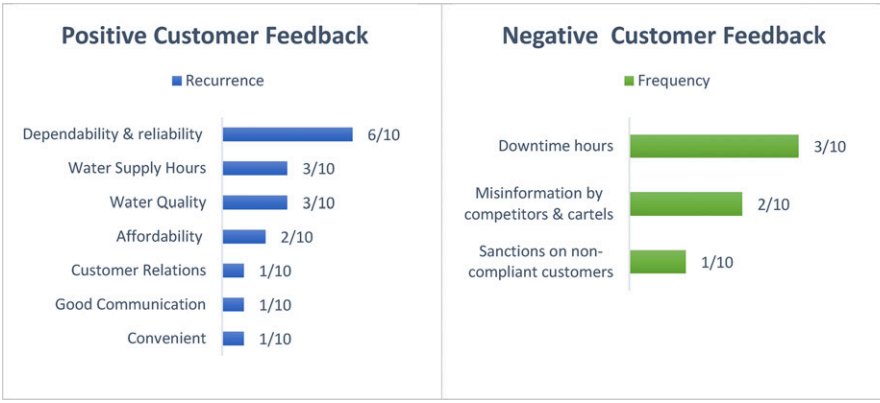


coincided with an economic meltdown in the country, and no tangible progress was possible. The Water Acts 2002 and 2016 have brought with them substantial changes. Nonetheless, despite the successful policy implementation, with significant effort and resources committed, a critical question lingers: have the reforms led to winning the most important battle, access for all, especially the poor and vulnerable? The ideal measure for water institutional successes or failure should be against the human right to water and sanitation goal. The ultimate Kenya goal, stated in its constitution, is for all citizens to have access to clean and adequate water and reasonable sanitation, and the State is mandated to provide them.

'Abandoned Ship'

The policy provision and this study show that the reforms have failed to offer suitable mechanisms to cater to the LIAs and overlooked SSSPs. Commercial-viability criteria distinguish WSPs from SSSPs, and the unlicensed status restraining benefits from them. It is a paradox in Kenya that the standards for the SSSPs serving low-income

Table 4. Customers' Positive & Negative Feedback on Services.



people are expected to match those of WSPs, yet the WSPs receive subsidies and other services and infrastructure support. Rusca and Schwartz (2018) note the same about other sub-Saharan African countries, where full cost recovery objectives in service modalities catering to the urban poor are rigorously implemented whilst prices in higher income areas often incorporate subsidies.

Making the Most of what Works

The achievement of the universal water access goal varies globally. The sub-Saharan African and Oceania regions are lagging with below 70% coverage, as most other regions have over 90% coverage on basic drinking water services (WHO & UNICEF, 2023). Yet, it is critical that developing nations do not resign to the water sector failures that are mostly attributed to economic constraints. Rather, a more rigorous investigation of its institutions is called for, more relevantly leveraging on strengths such as community participation. Still, path dependence, which in this case refers to relying on only conventional water supply systems, may not necessarily be ideal if unfiltered to fit context – Ostrom (1990) refers to this as a 'metaphorical adoption of policy prescriptions' which she argues have in the past had negative consequences, especially in Africa.

Based on the interviews and observations at the visited schemes, all operators supplied water sourced from improved sources, mainly boreholes and river intakes from forests. The water quality of one of the participants was among the five best in the country, according to the Kenya Bureau of Standards. Multiple others had similarly positive customer feedback on their water quality. This was due to the use of high-quality water treatment equipment.

Besides, using smart meters, water ATMs, and automated billing systems improved the quality of their services. Some also operated aerial piped systems to

Table 5. Suggestions for Improved Performance of Small-Scale Water Operators.

Financial aspects	Social -economic aspects
• **Growth strategy**: Grow in line with demand, long-term planning, seek collaboration over competition, and learn from others (Recurrence: 3/10) • **Organization & management**: Ensure competitive salaries, prioritize integrity, and establish subcommittees for effective management. (Recurrence: 2/10) • **Formalized payment arrangements**: Establish formal payment arrangements to avoid bad debts. (Recurrence: 1/10)	• **Relationship with the community**: Involving the community and effective communication will ensure their full support. (Recurrence: 3/10) • **Ethical service & community engagement**: Offer value-driven services and prioritize passion over profit. (Recurrence: 3/10) • **Understanding terrain and customers**: Address each terrain's unique challenges. (Recurrence: 1/10) • **Detachment from politics and dependence mentality**: Establish boundaries to prevent external interference and promote performance. (Recurrence: 2/10) • **Reduced regulatory requirements & government support**: - (Recurrence: 2/10)
System Reliability	**Environmental aspects**
• **Solar production**: - Reduce or eliminate electricity bills. (Recurrence: 1/10) • **Consistent high-quality water production**: - (Recurrence: 1/10) • **Scheduled maintenance**: - (Recurrence: 1/10) • **Technology**: - Embrace technology, including ATMs, prepaid smart meters, and efficient accounting and billing software. (Recurrence: 1/10)	• **None mentioned**

counter vandalism in LIAs. Other outstanding positive attributes included dependability, reliability, and water supply hours. Figure 7 highlights some of the technologies adopted by the small-scale operators visited. Based on such examples, it is plausible to assume that a section of small-scale operators provides safe water and sanitation.

This calls for a rethinking of the regulator's licensing criteria. A category and license conditions that consider the small-scale operators' limitations, e.g., low resource levels, would be an apt consideration. Picking out the high-potential operators will require the regulator to have detailed information about SSSPs.

Figure 7. Water systems, smart meters, and water ATMs used by small-scale water operators.

SSSPs unlicensing, unreadiness to merge with WSPs, and the present institutional arrangement creates an unfavourable environment for them. They cannot access support or regulation. This is summarised in Figure 8.

A clear SSSP pathway to safe water and sanitation would be to get licensed and comply with all management levels of the water sector. By being licensed, they fulfil the legal requirement of licensing, are regulated, and gain access to government resources through the national and county governments.

SSSPs' Responsibility

Despite the strong emphasis on rethinking the institutional arrangement to incorporate SSSPs, SSSPs must recognize the critical need to align with the normative water and sanitation rights standards. These standards must not be lowered. A strong inclination to self-governance threatens this, especially because most SSSPs have inadequate resources to ensure safe water production independent of external support. This makes the clustering possibility a second-best alternative for the SSSPs consideration. The government should, in turn, consider suitable compensation for the communities' investments for a complete takeover or shareholding arrangements to ensure the individuals and communities keep part ownership. Yet, as water services development is costly and the government is heavily constrained, mergers or subsidies do not guarantee instant success.

The Governance Question

Real and perceived governance failures are a major bottleneck to collaborative efforts that will enable desired economies of scale and enable coping with expenses for SSSPs. Despite their robustness and government support, which may benefit SSSPs, licensed

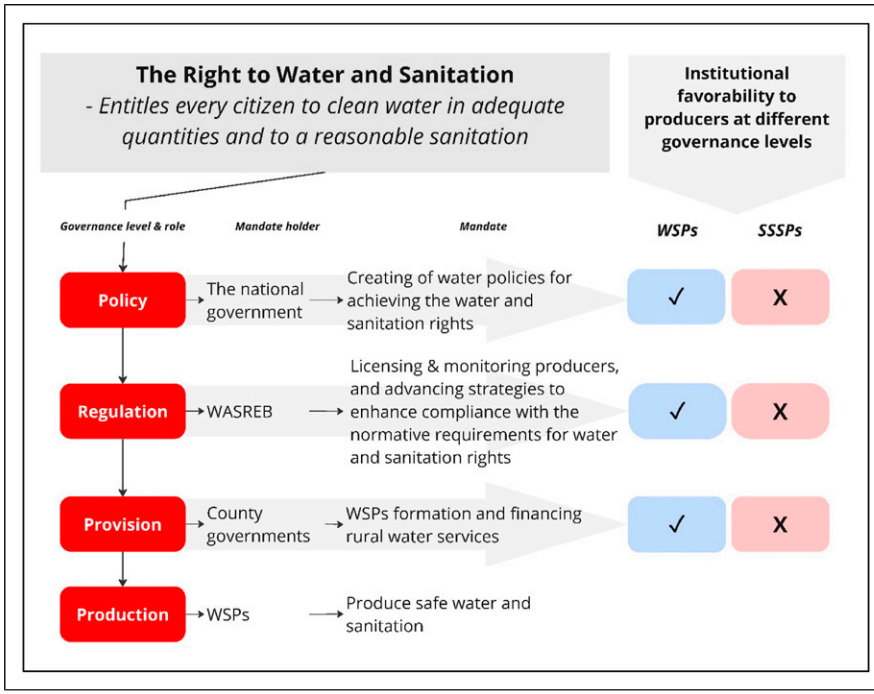


Figure 8. Favorability for water service producers in a multi-level governance model perspective.

WSPs lack adequate financial planning and management, corruption, high NRW, etc., which are attributed to governance challenges that reduce their attractiveness. Similarly, SSSPs must upscale their standard of services and professionalism, closing loopholes for capture by a few officials, which is a major governance threat. Additionally, they should adopt more external collaborations.

Time for Change? Or Not

Consecutive water sector reports in Kenya have shown the government's intention to formalize SSSPs. This is a grand conceptualization that requires urgent action. In the current unsanctioned state of SSSPs, the government tolerates illegality. Yet, it is not practical to sanction SSSPs, seeing the inherent services gap. This quagmire reveals an institutional arrangement dysfunction. Unaddressed, this dysfunctional state propagates inequality and urban divide, besides health, dignity, and consequent socio-economic impacts, as the formal water services respond to few people's needs. The state must make an urgent call to correct the inherent flaws.

Conclusion

At only 16 of 50 million people served by licensed WSPs, there is no guarantee of safe water and sanitation for most Kenyans. The diverse mix of SSSPs, while a vital addition to the water services production mix, serves most of the remaining population and is largely unregulated and reliant on external resources but lacks government support. This study observes SSSPs' conditional success if, ab initio, the custodians of the water sector acknowledge institutional gaps to the extent that they inhibit SSSPs' success. Still, small-scale operators must embrace the clustering strategy, their second-best option, to supplement their resources, as the government must not lower the normative standards for water and sanitation rights. The government must reciprocate by adequately compensating them and consider shareholding options for co-management with SSSPs. Additionally, offering subsidies to supplement their capabilities and ensuring consistent good quality services would be a reasonable response to their incapacity. However, operators should note that due to the overall financial constraints of the government, neither clustering nor subsidies will guarantee instant success.

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ORCID iD

Japheth K. Koros https://orcid.org/0000-0003-2704-7856

Supplemental Material

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Author Biography

Japheth K. Koros is a doctoral researcher at Tampere University, pursuing a Doctor of Science (Technology) degree in Civil and Infrastructure Engineering. His research focuses on enhancing local-level participation in water and sanitation access. He holds a BSc in Environmental and Biosystems Engineering and an MSc in Civil and Construction Engineering (Water Resources). With over eight years of professional experience, Japheth has specialized in monitoring, evaluation, and knowledge management of water and natural resource projects, as well as water stewardship initiatives across Africa. He is also an active member of the Capacity Development in Water and Environmental Services (CADWES) research group, a global consortium dedicated to advancing water and environmental services.

Petri S. Juuti is the head of the CADWES research team at the University of Tampere is a historian and UNESCO Professor. Previously he has acted as Head of Publications, Visiting Professor at North-West University, the University of Johannesburg, and the University of South Africa. He is also Guest Professor at Hubei University, China. His major area of interest is environmental history, especially the interaction between society and nature has been the focus of his research projects. He is also interested in water history, urban environment, city-service development, urban technology, pollution, public policy, political history, development studies, and economic history.

Riikka P. Juuti, co-leads the CADWES research team, is a Doctor of Science (Technology), co-UNESCO professor, and an Associate Professor (Water Services). In her research, she has already become thoroughly acquainted with the long-term development of more than ten Finnish water utilities. Over the years, she has been able to work on many very interesting projects, most of which have been directly related to water supply services. Her areas of expertise and research interest are water and environmental services, sustainable water and sanitation services, and water services management.

Jamlick Mutie is the Founder and CEO at Rural Water Management Solutions Kenya, an organisation dedicated to accelerating water access in rural areas by championing professional management of the water supply systems; by leveraging innovative service delivery models, cutting-edge IT solutions, and strategic Public-Private Partnerships (PPPs) that ensure sustainable, efficient, and reliable water services for underserved communities. The MSc student in Civil and Construction Engineering (Water Resources) has a first degree in Environmental & Biosystems Engineering (Irrigation & Water Resources) and 15+ years' experience in engineering design, construction and management of water supply systems.