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Can shared standpipes fulfil the Sustainable Development Goal of universal access to safe water for urban poor in Kenya?

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Abstract

With the analyses of secondary data, the study finds that there has been a consistent increase in safe water coverage in Kenya over the years, mostly through paid common standpipes. However, primary data collected through in-depth field investigations in the Mathare slums of Nairobi reveal that the paid standpipes are overstressed and are prone to unreliable services, neglected operation and maintenance, illegal connections, water theft, unregulated and high tariffs and client favouritism on the basis of tribal affiliations. Thus, the most effective way to serve the urban poor is to increase the number of working standpipes with fixed operating schedules per day, along with strict enforcement of water tariff regulations.

Keywords: Informal settlements; Kenya; Nairobi; Safe water coverage; Standpipe; Urban poor

Introduction

In 1963, when Kenya achieved political independence, the WHO (1963) reported a universal coverage of piped water in urban areas. With a technological paradigm of universal metering since the 1920s, individual connections became the norm in urban Kenya, where costs were not only recovered, but small and medium towns received cross subsidies on water. However, after independence, cost recovery was not prioritized and tariffs did not keep up with the rising inflation. The government's ambitious project to expand network coverage followed high technical standards, which neither kept pace with the deteriorating financial health of the utility nor with the proliferating demand because of mass rural urban migration to Nairobi after the lifting of the ban on African migration[1].

Unfortunately, the colonial creation of inequalities of water service provision among different sections of the population in Nairobi persists even today, since the city continues to use the

[1] The Vagrancy Act was first implemented in 1902 and instituted a pass system granting residential access to only those Africans who were officially employed in Nairobi. It even authorized repatriation of others.

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same colonial water infrastructure which was developed with the aim of racial segregation. Amis (1984) writes:

> '*It (Nairobi) was originally conceived as a European city where Africans were 'tolerated' only for their labour power. To achieve this with minimum of public expenditure and a disease-free urban environment, Nairobi was systematically racially zoned …*'

Since no serious attempt has been made to address the insecurity of tenure, the colonial segregation of land continues to shape water access and service provision even today. The areas vacated by the European settlers are now occupied by the upper and the middle class, and the urban poor, constituting more than 60% of the city's population, live in the pockets of inadequate infrastructure provision (Gerlach, 2008)[2]. According to the National Water Services Strategy for 2007–2015 (Government of Kenya, 2015), access to safe water is around 60% in urban areas in Kenya with only 20% served in low income areas (LIAs) and informal settlements (ISs). Studies suggest that poor service from the over-stressed water infrastructure force both utility connected non-poor as well as the unserved poor residents to consume less water and incur higher costs (Gulyani *et al*., 2005; Dill & Crow, 2014). The poorest in the slums even consume less than 20 litres per capita per day of water (Gerlach, 2008).

With inadequate water infrastructure and rapid urbanization, the cash-strapped public utility in Kenya faces a double challenge to invest in the expansion of water infrastructure as well as cost recovery to maintain the existing network. Providing access to safe water to the unserved poor seems to reflect a compromise between universal provision of safe water and cost recovery. Local utilities generally state factors like unplanned, illegal status of settlements, rapid population growth and the difficulty of obtaining finance to build or extend infrastructure to such 'less profitable areas' (Keener *et al*., 2010). Thus, to fulfil the Sustainable Development Goal (SDG) (Target no. 6.1) of achieving universal and equitable access to safe and affordable drinking water by 2030, communal solutions in the form of paid public standpipes are being reconsidered as the most suitable option[3].

Literature review

Studies on water access in urban households report substantial heterogeneity in water delivery through piped water supplies (McKenzie & Ray, 2004; Satapathy, 2014) even exhibiting a strong relationship between asset, wealth and access to water (Bajpai & Bhandari 2001; McKenzie & Ray, 2004). At places even where piped water supply is available to the urban poor, the service quality has been marked by supply of poor quality water (Thompson *et al*., 2000; Satapathy, 2014), intermittent supply, insufficient pressure and unpredictable service provision leading to both financial and health costs (Zérah, 2000; Satapathy, 2014). Even though standpipes have improved access to drinking water to the poor households in LIAs (Gulyani *et al*., 2005), households that rely on them typically use less than half of the water used by those with individual connections (Thompson *et al*., 2000).

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[2] There are approximately 2,000 LIAs in urban Kenya with an estimated population of 8 million which receive an influx of more than half a million people every year.

[3] The Utility in its published documents only talks of providing standpipes and kiosks to reach the poor but never mentions piped connection within premises.

The current system of subsidization does not reach the urban poor, who in most cases are not served by the utility network (Boland & Whittington, 2000; Foster *et al*., 2003). Even when the public standpipes are subsidized, evidence shows that the price paid per unit volume of water is much higher than that paid by households with individual water connections (Keener *et al*., 2010) because of the added cost of standpipe attendants (Whittington *et al*., 1998), lax enforcement of special bulk tariffs (Keener *et al*., 2010), rent seeking by private standpipe operators (Gulyani *et al*., 2005) and hidden costs of connecting to distant water trunk lines and making unofficial payments to water officials (Water and Sanitation Program, 1998). Some standpipe operators even supplied water to the informal businesses instead of catering to the poor at whom the subsidies were targeted (Katko, 1991).

While some scholars claim that the poor cannot afford the hidden costs of a network supply (Bakker, 2007), others argue that they are not only willing to pay for a reliable supply (WSP, 1999; Whittington, 2003; Haq *et al.,* 2008), they are able to pay a higher price than previously thought (Whittington *et al*., 1991) since they are already paying high tariffs to the private water vendors (Winpenny, 2005).

Most of the studies that look at the alternative water service provisions in the absence of piped water supply within premises document water access through water vendors who resell water from the standpipes. Moreover, there is no published work, to our knowledge, that analyses the trends of safe water coverage in urban Kenya. A handful of case studies that look at the challenges of accessing water from the paid standpipes mostly talk of its unregulated price. To bridge this gap in the literature, this study combines an analysis of the broader macro trends of safe water coverage in urban Kenya along with an in-depth field-based analysis of actual service provisions from various forms of paid standpipes currently operating in ISs in urban Kenya. Since the Kenyan government is promoting low cost water kiosks to bring more people under the ambit of the utility network to meet the SDGs, it is important for the utility to understand and address the challenges of accessing water from the standpipes to truly serve its citizens with ‘affordable safe water’.

Materials and methods

The analyses of macro trends of safe water coverage are drawn from the data published by the government supported by other published literature. Although the data published by the government utility is comparable with the consistent definition of ‘water coverage’, its major limitation lies in self-reporting, which tends to suffer from misreporting and misrepresentation.

To evaluate the socio-economic implications of accessing water from paid community standpipes, I have used a case study method analysing the in-depth explanations of water access dynamics from the standpoint of residents in the Mathare slums in Nairobi. I have chosen Mathare valley for my primary field work since more than 90% of the residents depended on paid community standpipes. It is the only informal settlement in Nairobi where electronic card-operated standpipes, popularly known as water ATMs, have been working since 2015[4]. Thus, Mathare gives a better picture for comparative analysis with all kinds of paid community kiosks operating together.

[4] Water ATMs were for the first time established in urban Kenya in 2015 in Mathare. There were 40 kiosks and 13 ATM machines, of which four were sponsored by Grundfos costing about USD 4,000 each and more ATM buying was under process most likely from a Netherlands-based private firm (April 2017).

According to the latest census of 2009, Mathare had a total of 27,812 households in 13 villages. Two hundred and fifty-eight households were randomly selected representing all the villages whose main source of drinking water was standpipes. An exhaustive structured household questionnaire and focus group discussions were conducted to understand the uses of water and the residents' perspectives on the functioning of the standpipes, service quality, access, management, water tariffs, affordability, timings of operation, relationship between the standpipe managers and customers and willingness to pay for better water services. Key informant interviews were conducted with the community leaders and utility officials. The selected households were categorized into four different economic classes, based on a composite weighted index of their asset scores borrowing from the methodology used by Shaban & Sharma (2007).

There are a few limitations regarding the research methodology and approach that are worth mentioning. Rigorous quantitative data are not available detailing the percentage of the population relying on different sources of water in Mathare. The intent of the qualitative data presented here is not to provide a complete picture of water access, but to outline information, thoughts and perspectives of water access that were articulated by interviewees.

The study is divided into nine sections. The first three sections deal with the Introduction, Literature review and Materials and methods. The fourth section traces the macro trends of access to safe water coverage in urban Kenya and Nairobi after independence, both with the help of secondary data provided by the public water utility and through various other published studies and reports. The fifth section describes the broader framework of water supply services in Kenya and contextualizes the functioning of Kenyan standpipes. The next four sections are on the socio-economic implications of accessing water from the standpipes, functioning of standpipes, willingness to pay for better water services and conclusions and policy implications.

Access to safe water in urban Kenya: the macro trends

The World Health Organization (WHO) defines access to water supply services as the availability of at least 20 litres per person per day from an 'improved source' within 1 kilometre of the user's dwelling. 'Improved sources' which are likely to provide 'safe water' are mentioned as household connections, public standpipes, protected dug wells, rainwater collection, boreholes and protected springs[5].

Since 1963, the definition of 'access' as well as the monitoring system and data collection methods have changed several times. Water coverage at present is defined by the Kenyan utility as the percentage of people served with water from the piped utility sources (including individual piped connections within premises, paid kiosks and community standpipes) to the total population within the service area of the water service provider (WSP). Government has claimed that WHO estimates of universal coverage of the urban population in 1963 was an overestimation due to a 'loose definition' of 'access to safe water'. Nevertheless, since urban growth in Kenya is majorly concentrated in its ISs where water service provision continues to be largely non-existent, average estimates of safe water coverage continue to be low. Even the government's commitment to increasing service coverage during the 'Water Decade' of the 1980s was futile, as urban coverage went down from 85% to 78% and hit its lowest coverage at 32% in 1989 (Hukka *et al.*, 1992).

[5] 'Not improved' sources include unprotected wells, springs, vended water and tanker truck water.

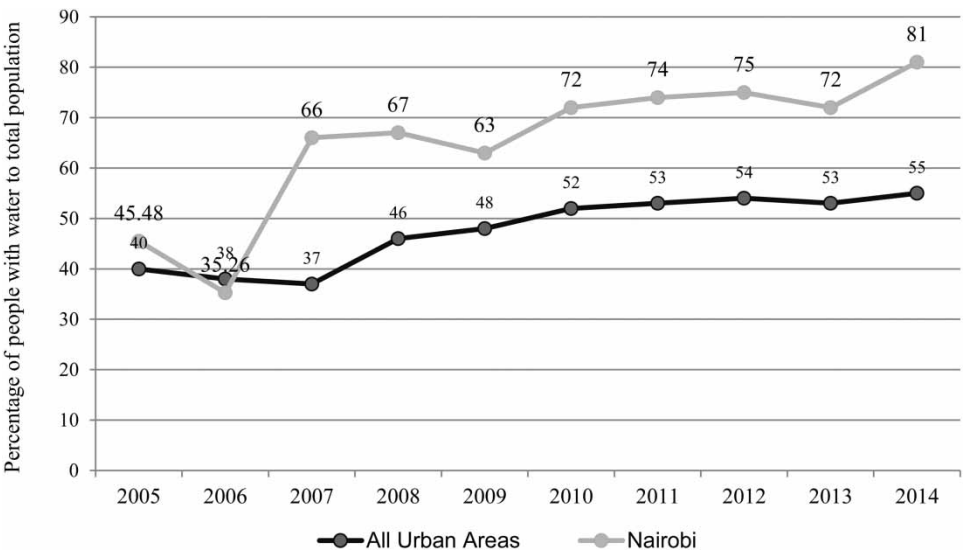

Fig. 1. Trend of piped water coverage in urban Kenya and Nairobi (2005–2014). *Source*: WSRB Impact Reports (Various Issues).

The latest government data show improving trends[6] of safe water coverage in urban Kenya in the last decade (Figure 1). The steepest rise in water coverage in Nairobi to 66% in 2007 is due to the addition of all people served by the utility connected standpipes and yard connections. Further, in 2007–2008, Nairobi embarked on metering of all water connections in ISs and launched a massive customer data clean-up campaign which led to the increase in the reporting of population served leading to an increase of about 15 percentage points between 2007–2008 and 2014–2015. The increasing trend of safe water coverage in urban Kenya can be attributed to the significant increase in water coverage in the larger urban WSPs like Nairobi and Kirinyaga and smaller WSPs like Kwale and Nithi.

Though average safe water coverage in urban Kenya remained at only 55%, seven WSPs reported water coverage above 80%. Although Nairobi has reached 80% service coverage, doubts can be raised on data reporting, which is alleged to have also included the dormant connections[7]. Since water coverage is an indicator for ranking WSPs and a requirement for licence renewal, in the self-reporting systems utilities may report acceptable coverage percentages to gain better ranks.

The Millennium Development Goal target to 'halve the proportion of people without sustainable access to safe drinking water by 2015', was only reached by half of the WSPs in Kenya. To reach the 2030 SDG target, the utility needs to almost double its coverage, which will require an estimated annual average growth of 200,000 new water connections per year that, according to the recent estimate, is only around 14,000 per year (WSRB, 2016). Although at present more people in absolute numbers are enjoying access to safe water, the percentage of urban population with access to a public water supply still remains the lowest since independence.

[6] The reduction of coverage in Nairobi in 2006 is claimed to be due to data correction by the utility (WSRB, 2008).
[7] Nairobi and several other WSPs do not provide credible data on their dormant connections (WSRB, 2010).

While the public utility reports an increasing percentage of safe water coverage, individual studies conclude just the opposite (Gulyani *et al*., 2005). Using census data, Gerlach (2008) estimated that in Kenya, only 20% of Nairobi households were covered under piped connections while an estimated 75% purchased water from water kiosks and private water vendors. The deteriorating service quality of the piped network is indicated by the massive drop in average per capita water consumption since the 1960s (Thompson *et al*., 2000) which was even worse for families accessing water from the public standpipes (Thompson *et al*., 2001; UNDP, 2006).

Although there is a web-based performance monitoring system in the Water Regulation Information System equipped to incorporate data for measuring water coverage and hours of supply within urban underserved areas, the Water Service Boards (WSBs) generally do not meet their responsibility of ensuring that their agents (WSPs) fulfil regulatory reporting requirements. Interestingly, the performance of all WSBs in pro-poor strategies since 2014–2015 has been assessed as fair by the public utility even though only 31 of the reporting WSPs had dedicated pro-poor units (WSRB, 2016). Evidently, without disaggregate data such assessments are inappropriate and inadequate. However, the target of universal coverage by 2030 seems arduous as by then half of all Kenyans will be living in urban areas, mostly concentrated in the urban underserved LIAs.

A few field work-based studies report on the water coverage situation in the ISs in Kenya. Collignon & Vezina (2000) reported that almost 30% of over two million inhabitants in Nairobi did not have access to utility provisions and depended on unsafe supplies from private water vendors. According to the African Population and Health Research Centre (APHRC, 2002), 80% of slum dwellers in Nairobi had no direct access to piped water. A World Bank funded report estimated about 50%, 77%, 52% and 5% of the households using yard taps, kiosks, other alternative sources and individual connections within premises, respectively, were poor in Kenya (Gulyani *et al*., 2005). Even though metal pipes are legally required for all water connections, plastic pipes are often used in the ISs since metal pipes are frequently stolen in the slums. The plastic pipes are easily cracked, leading to contamination of water from the pit latrines (Mudege & Zulu, 2011).

Management of standpipes under the broader framework of water supply services in Kenya

A major overhaul of the water sector in Kenya took place after the enactment of the Water Act 2002, whereby the public utility changed its role from a service provider to a service regulator. Water service provision is under the Ministry of Water & Irrigation (MW&I), which mainly deals with policy and legislation (Figure 2). Eight new regional semi-independent government entities called the WSBs hold the statutory responsibility for water services which contract operators and lease utility infrastructure to Water Service Providers (WSPs). The WSPs can be private companies, civil society organizations or individuals, but they must be issued with a licence and operate under a time-bound contract. These WSBs are self-financed through the tariffs and are supervised by Water Services Regulatory Board (WSRB) at national level which approves tariffs, develops standards and guidelines and oversees compliance on licences and contracts. There is also a Water Appeals Board where consumers can make complaints.

Since all water services are now contract-based operating under commercial terms, their revenues cannot be easily diverted for other purposes by the local governments. All the WSBs and WSPs are ranked on the basis of specific performance indicators of their service (for contract renewals) based

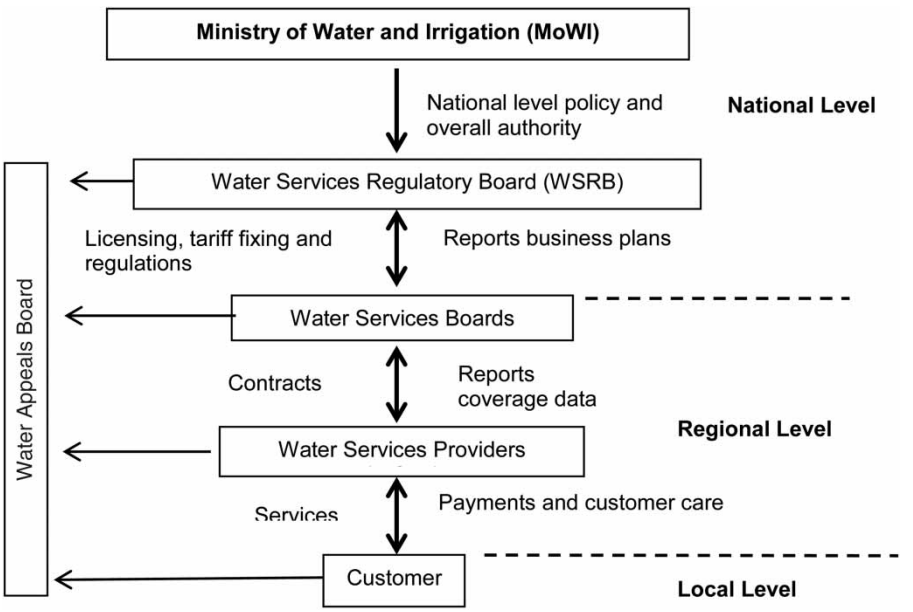

Fig. 2. Institutional framework for water supply in urban Kenya.

on coverage, economic efficiency and equality. The WSBs' efforts to provide service to LIAs can give them a maximum score of 3 out of a total of 120 points, there is no indicator that monitors the WSPs' effort to provide services to LIAs (WSRB, 2009).

Under this broader institutional framework, all the standpipes are now leased to the WSBs with licensed permission from WSRB to sell water. WSBs further outsource the management of the standpipes to the WSPs, which can constitute groups like community-based organizations (CBOs), Water Committees or self-help groups (SHGs) or individuals who are community leaders or local authority administrators. The contracts specify resale prices, hours of operation, terms of payment and conditions of rescinding the contract along with a 'bulk sale agreement' which allows them to buy water at special subsidized rates (bulk rates) from the utility. The 'tertiary' networks that were built by small-scale water service providers by mobilizing funds from personal investments, raised from within the communities, or funded by a donor or NGO in the unserved ISs, are gradually getting authorized by WSBs to demonstrate more people under the safe water network.

WSPs run by individual private operators continue to invest in water infrastructure for profit and are mostly politically connected, equipped with both technical and managerial skills. In cases of WSPs run by CBOs, technical management is entrusted to salaried trained professionals and accounting and financial management remains with voluntary workers chosen from the community. Although CBO-run WSPs are most popular among customers for being more accountable than those run by local leaders and private investors, their main challenges are issues of ownership, depreciation, responsibility for maintenance and renewal and rehabilitation of infrastructure and licences. Moreover, a good service delivery depends on the degree of organizational ability and management capacity in the community.

Domestic reselling[8] is most prevalent in LIAs where standpipes are overstressed or sparingly located or are shut down. Domestic resellers can also become WSPs by obtaining licences from WSBs to sell water. In other words, individual domestic connections within premises are now working as paid standpipes wherever individuals are willing to resell water from their own connections for profit. This solves a dual purpose. The utilities are now able to show much greater safe water coverage without any additional investment and customers (who are neighbours) are getting safe water from a connection located closer to their houses. Moreover, it is believed that since the licensed resellers are getting subsidised bulk tariffs from the utility, the consumers will have to pay less for water.

Water ATMs have been launched in Mathare under a private public partnership programme. Since these ATM machines are very expensive, they are housed in small rooms located on the main roads of the slum. The ATM management is run by SHG groups (WSPs) who were chosen by the utility on the basis of their popularity with a belief that there would be no (less) disputes about its smooth operation. The SHGs are given a master ATM card by the utility with 40% free water for profit. For example, by paying a water credit of Ksh. 100 (USD 1), one can get water worth Ksh. 140 (USD 1.4). When smart cards are swiped on the water ATM screen, water is dispensed at the charge of half a Kenyan shilling (half a US cent) per 20 litres, which the customers can access at any time even in the absence of the ATM managers. Water tariffs are fixed by the utility, as payments per unit water dispensed are fixed and processed in the cards and there is no cash handling between the WSPs and the utility since all water selling is done by pre-paid cards.

In spite of several provisions of paid water services, stealing of water by cutting into municipal pipes is also very common in Nairobi slums. Individuals also buy 'stolen' water from local water entrepreneurs who specialize in cutting pipes and diverting water for sale at a flat rate of Ksh. 20 (USD 0.20) per day. Others deliberately vandalize water pipes to create water shortages in order to maintain the business of selling water. It is estimated that unaccounted water is over 50% of the total volume of treated water produced in Nairobi, where water is lost through both 'technical losses', i.e., leakages and 'commercial losses', i.e., unbilled, uncollected revenues and theft (Foster & Tuinhof, 2005).

Socio-economic implications of accessing water from standpipes

Around 88% of dwellers reported to be using standpipes for drinking and other domestic uses in Mathare slums. Although the geographic spread of water points is fairly good[9] in Mathare, all the standpipes are overstressed, catering to more than the 250 people which is the prescribed threshold to be served per standpipe. Thus, overcrowded standpipes are prone to unreliable water provisions often forcing slum dwellers to depend on other sources of water, which are frequently not safe and reliable. Clearly, access to safe water in reality is not guaranteed by the mere presence of standpipes or by the statistical enumeration of people accessing them. Rather, it depends on service quality and economic accessibility of water.

[8] People with private connections within premises registered in their names resell water to their neighbours.

[9] 76.3% of the population in Mathare live within 50 metres of the nearest standpipe and 100% live within 500 metres (Corburn *et al.*, 2012).

Table 1. Tariffs of standpipe water and profits from water sales.

Tariff of water (per litre) bought by the respondents		Estimated revenue for water sold per standpipe per month		Estimated profit per month per standpipe*		Number of respondents	
Ksh	USD	Ksh	USD	Profit	Percentage of profit	Total	Percentages
It varies	It varies	It varies	It varies	It varies	It varies	16	6.20%
0.1	0.001	47,250	472.50	33,075	70%	20	7.80%
0.1 to 0.12	0.001 to 0.0015	47,250 to 70,875	472.50 to 708.75	33,075 to 56,700	70 to 80%	2	0.80%
0.1 to 0.25	0.001 to 0.0025	47,250 to 118,125	472.50 to 1,181.25	33,075 to 103,950	70 to 88%	2	0.80%
0.15	0.0015	70,875	708.75	56,700	80%	134	51.90%
0.15 to 0.25	0.0015 to 0.0025	70,875 to 118,125	708.75 to 1,181.25	56,700 to 103,950	80 to 88%	62	24%
0.25	0.0025	118,125	1,181.25	103,950	88%	10	3.90%
0.15 to 0.5	0.0015 to 0.005	70,875 to 157,500	708.75 to 1,575	56,700 to 143,325	80 to 94%	12	4.70%
Total						258	100%

*To calculate monthly revenue and profits for each standpipe, 315 slum residents have been taken to be served by each standpipe (average people served in Mathare per standpipe) and each person is considered to consume 50 litres of water daily, which is the basic minimum as prescribed by WHO.
Source: Questionnaire surveys in Mathare slums, 2016–2017.

Economic accessibility of the standpipes

Although the utility offers a bulk tariff of Ksh. 30 (USD 0.30) per M^3 to the (registered) WSPs operating standpipes and the resale prices are mentioned in their sale contracts, it seems there is leeway in implementation of this price regulation. Moreover, the unlicensed standpipe managers charged the regular domestic tariff which is double the bulk rates, passing on the higher water bills to customers[10]. It is clear that standpipe managers are earning a good profit in their water businesses, taking advantage of the monopoly generated by less standpipes and insufficient supply from the mains (Table 1). Standpipe water was sold at Ksh. 2 to 3 (USD 0. 02 to 0.03) per jerry can (20 litres), but when water supply was both insufficient and unpredictable the price shot up to as high as Ksh. 10 (USD 0.10) per jerry can. Hence, by taking advantage of the bulk rate, the standpipe managers were earning profits as high as 70% to 94%[11].

Although several respondents in the interview resented that standpipe managers often increased the price of water arbitrarily without any notice, the standpipe managers outrightly denied such allegations claiming that water prices were competitive and prices were kept low for fear of losing valuable customers. In my observation, it was common for standpipe managers to increase water tariffs to Ksh. 10 to 15 (USD 0.10 to 0.15) per jerry can when water was supplied only once or twice a week from the mains. Besides coping with water scarcity, any unpredictable arbitrary increase in water prices led to further hardships for slum dwellers as it increased their household expenditure, especially for larger households with a greater number of dependants. Some even complained they had spent their savings and borrowed

[10] With bulk water usage they fall under the highest paying block in the progressive block tariff system, which is Ksh. 64 (USD 0.64) per cubic metre.
[11] The profit margin can be less if the standpipe managers have leased the standpipe or have a salaried manager. Per head profit may be less if it is managed by SHGs.

money to buy water. Protests about arbitrary increases in price were also very common which resulted in habitual disputes and fights.

It seems that with less water to sell, and to maintain a steady profit, the standpipe managers increased water tariffs. Some standpipe managers argued that with unreliable and inadequate water supply from the mains, they had to keep awake at night to check whether water was being supplied and often had to sell water at night. Quoting the reason of inappropriate and inconvenient timing of water supply they justified selling water at a higher price. Some even claimed that they were being charitable by selling water at odd hours. When standpipes remained dry for days, residents had to pay much more to the water vendors and this varied from Ksh. 150 to 200 per m^3 (USD 1.5 to 2 per m^3) depending on demand.

The volumetric prices quoted by the utility are lowest for users of water ATMs followed by paid public standpipes and the highest is paid to the distributing vendors (Table 2). The vended water is more expensive because water is often sold second- or third-hand and high prices can be related to severe shortages or some form of collusion among the vendors or standpipe managers. Due to the lower number of standpipes, the standpipe managers enjoy a monopoly, and even prevent new standpipes being built. They siphon off water from water ATMs' overhead tanks and stop them functioning. It is certain that if the water ATMs are successful, they can provide large coverage of safe water in the ISs at a more stable and cheaper rate and eventually eradicate illegal tap connections and water vendors along with revenue generation. However, unfortunately, the ATMs have a very low coverage due to their scanty presence, too clustered along the main road far away from dwellings.

Water access from standpipes: economics and beyond

Although the official operating time of the standpipes was from 8 a.m. to 8 p.m. every day, there was no fixed schedule for water supply which depended on the supply from the mains. When water was supplied after 2 to 3 days, the queues were very long during the day and many were compelled to fetch water at night. Standpipe managers said: '*If there is no water supply why will we open the standpipes'*, '*We know everybody wants water and we come to the standpipe frequently to check if water has come*', '*We also want to sell water to do business'*, '*We are curtailing our sleep to keep our standpipes open at night*'.

The customers also had several complaints and some lamented, '*Every now and then they (standpipe managers) open late when the queue has already become very long*', '*They do nepotism creating disputes and disharmony between people standing in the queue*'. Most of the residents complained that

Table 2. Comparative prices of different sources of domestic water in Nairobi.

	Tariff (Ksh per m^3)		Tariff (USD per m^3)	
Source of water	Highest	Lowest	Highest	Lowest
Utility connected piped households	64	53	0.64	0.53
Public paid standpipes	50	10	0.50	0.10
Water bought from vendors	200	25	2	0.25
Water ATMs	2.50	2.50	0.025	0.025

Note: One cubic metre (m^3) = 1,000 litres.
Source: Author's own compilations.

since the water supply hours were erratic and water was supplied at odd hours, they had to forgo paid labour and other domestic chores, and even curtail rest and sleep to fetch water. They were upset about the quality of water supply services and resented that, even after paying high tariffs, there was not enough water for all.

Shorter hours of water supply combined with uncertain and low pressure of water flow aggravated tension and fear among customers waiting in the queue. Women, who were mostly responsible for fetching water, admitted their fear and frustration at not being able to collect water for themselves and their families, leading to hardships and mental trauma. Women customers reported domestic violence, physical assault and even inappropriate behaviour of drunken standpipe managers when they came to fetch water at night. Drunken standpipe managers, in many instances, could not manage the accounts of water sales which led to much confusion and many confrontations. If, by the sheer negligence of customers, the taps were not turned off and water trickled away by mistake, the standpipe managers charged extra for the wasted water as even a drop of water wasted meant a loss of money.

It seemed that most of the fights in the slum community happened with regard to grabbing water. Tribal favouritism in fetching water was a common cause of dispute and unrest in the slum. Standpipe managers were alleged to be giving special favours to the customers belonging to their own tribes, in the form of less waiting hours or lower tariffs for water. Thus, economic costs are not clear indicators of a competitive market as the economic logic of water access was completely overpowered by social ties and favouring their own tribe. I observed that even people waiting for water gave way for the latecomers from different families of their own tribe in the queue ahead of them. They blocked other members from fetching water who were already waiting in the queue even before these latecomers arrived.

Many times the standpipe managers preferred to sell water to the private water vendors than to the slum dwellers. Since vendors buy in bulk they were allowed to buy water out of turn and people standing in the queue were deprived. One client angrily said, '*Vendors take a long time to fill water and by the time the water supply goes. Then we have to buy the same water from the vendors in ten times higher the price*'. Long queues and conflicts at the standpipe were very common, which was either because of erratic water supply hours or low water pressure. Some residents and utility officers confided that the water vendors were buying and even stealing water from the ATM tanks and reselling the same water at a higher price.

Management of standpipes

The Community Development funded standpipes seemed to be the most popular and successful in Mathare. Such standpipes are leased out to the self-help groups for management. It is a common kiosk for drinking water, bathing cubicles and toilets. The standpipes had paid toilets costing Ksh. 5 per turn (USD 0.05) and shower cabins costing Ksh. 10 per shower (USD 0.10). At times of low pressure when the shower and the standpipe taps could not operate simultaneously, preference was given to the customers who came to take showers as the cost of taking one shower was much greater than water sold per jerry can. Most of the time the standpipe managers were farmers and water selling was their side business; so they irrigated their crops with the same water as and when required.

When the standpipes were managed by SHGs, members rotated their turns to run the taps to earn their respective share of profits. Many times conflicts arose among the group members with regard to disagreements on water tariffs and the number of days each member would operate the taps, leading to shutting

down of the standpipes for an indefinite time. In such situations, customers faced greater hardships since they had to travel longer distances to find a running tap, further overstressing the working standpipes. There were also instances when several group members worked together to collect payments and manage the standpipes when there were many customers. I observed female standpipe attendants were fairly common and were preferred as they have the reputation of being less corrupt than their male peers.

Although most of the slum dwellers agreed that the standpipes have helped them to gain access to safe water, they seemed to be highly dissatisfied by the way they functioned. In addition to the unregulated arbitrary price hikes and inadequate and unreliable water supply, there was a clear sense of dissatisfaction with regard to the way the standpipe managers were chosen. Many alleged that there was no proper transparent procedure for selection of standpipe managers and many raised fears that the standpipes were awarded to affiliates of politicians in power or their tribal affiliations were used to secure the contract. Most of the customers had a strong feeling that standpipe operators had a monopoly over water pricing and were taking advantage of the water scarcity to make profits. Moreover, due to their social position and strong kinship association with people in power, nobody could question their decision on pricing.

Willingness to pay for better services

The willingness to pay in this study has been estimated by spontaneous answers into four categories – not able to pay, will not pay, will pay and cannot say. Although this method can be unreliable and provide extreme values, the findings give an indication of the attitude of people to an increase in the charges for water linked to an improvement in supply. In Mathare slums, barring a very few respondents, everyone reported that they 'will not be able to pay' (Table 3). It is clear that the poorest of the poor were 'not willing to pay' because they 'were not able to pay' for better services. Most studies on 'willingness to pay for better services among the urban poor' consider urban poor as a homogenous group, but in reality, there are varied economic classes even among them with diverse needs which are reflected in their decisions to pay for better water services.

However, it is pertinent to note that even if the residents of ISs were willing and were able to pay for such services, until the government addresses the issues of land ownership, the utility would cite the reason of their ambiguous ownership status and will not extend the network for individual household connections.

Table 3. Willingness to pay for better water services.

	Number of respondents				
Economic class	Not able to pay	Will not pay	Will pay	Cannot say	Total
Poor	56 (87.5%)***	8 (12.5%)***	0 (0%)	0 (0%)	64 (100%)
Lower class	100 (87.7%)***	6 (5.3%)**	8 (7%)	0 (0%)	114 (100%)
Middle class	34 (81.0%)***	2 (4.8%)**	0 (0%)	6 (14.3%)	42 (100%)
Upper class	26 (68.4%)**	6 (15.8%)**	4 (10.5%)**	2 (5.3%)	38 (100%)
Total	216 (83.7%)	22 (8.5%)	12 (4.7%)	8 (3.1%)	258 (100%)

Source: Questionnaire surveys in Mathare slums, 2016–2017.
*** Significant at the 0.01 level; ** significant at the 0.05 level.

Conclusions and policy implications

The Government of Kenya has declared access to 'clean and safe water in adequate quantities' as a constitutional right but there is neither any policy direction for its implementation nor any clear pathways for enforcement of this right. In order to implement 'pro-poor strategies' to extend coverage networks, the public utility has made a mandatory condition of 'promoting low cost technologies like water kiosks and yard taps at regulated prices' for granting licences to WSBs to legally provide water. To realize the SDG target, the National Water Master Plan has called for more capital investment and prudent spending. Public utility is regularizing small-scale water entrepreneurs and some private infrastructure to upscale registered water service provisions to improve reporting of safe water coverage without giving any consideration to its quality of service provision.

It seems that WSPs are expected to meet the conflicting objectives of expansion of water coverage, improve revenue collection and operation and maintenance. If WSPs increase their coverage by including the unserved in the LIAs, they will not meet the revenue collection efficiency as the poor will pay less for their services under the progressive block tariff structure. However, since there is no mandatory clause on reporting of performance indicators for 'pro-poor service delivery efforts'[12] (WSRB, 2013), water coverage in LIAs remains unreported or misreported to draw any conclusions.

Although the availability of paid standpipes has improved statistics on safe water coverage, in reality, safe water access is determined by the (actual) water tariffs, quality, reliability and adequacy of the water they dispense. With rapid population growth in the ISs, all the existing standpipes are overstressed, catering to more people than they can practically sustain which leads to unreliable and insufficient water, forcing residents to depend on other sources that most often are unsafe, expensive and illegal. It has not only increased the difficulty of accessing water, but the whole purpose of providing citizens with safe water for a better life and livelihood is lost. In such situations, the urban poor are triply disadvantaged; for not being covered by adequate provisions to access the utility network, facing severe water shortages and also being monopolized by a few standpipe managers to earn profit.

Besides land ownership issues in ISs, there is the bigger challenge of funding network extensions to provide individual connections. Whatever may be the challenges, it would be unfair to dismiss this option because there is no doubt that functioning standpipes can improve services from unacceptable options (water vendors) for the well-being of the most deprived than striving for 'ideal' solutions of universal piped water connections in homes. Free public standpipes that are fully funded by the municipal government are most desirable, but even if partially subsidized they address larger social benefits since most people served are poor. For the utility too, the standpipes require much lower capital costs per household served (compared with individual connections)[13]. It also allows better cost recovery since the standpipe operators mostly ensure that the users pay as and when they buy water. For the low income households, standpipes provide a flexible, desirable, and 'good' service since they allow

[12] A stand-alone pro-poor performance indicator has been introduced to facilitate reporting and performance ranking. The Performance Indicators are: water coverage, sanitation coverage, non-revenue water, water quality, hours of supply, metering ratio, revenue collection efficiency, staff productivity and operation and maintenance cost coverage. Only five WSPs have reported these data. Nairobi has not reported on water coverage in LIAs.

[13] Initial capital costs of installing standpipes are 60 to 70% lower than installing an equivalent number of individual connections.

them to purchase in small quantities, as and when they have money, as opposed to a lump-sum monthly bill that is due on a fixed date along with other maintenance charges.

However, in order to serve the urban poor via standpipes, two basic conditions must apply. First, the number of functional standpipes needs to be greater to serve fewer people per standpipe. With a large number of standpipes in an area, not only (in most cases) the distance between the standpipes and houses will be reduced, but each standpipe can then cater to less households, reducing the inconvenience caused by long distances, longer queues and higher prices that result from a shortage of supply. Second, the water supply hours need to have fixed schedules, preferably twice every day, so that the consumers can plan better. When there is an adequate number of water access points with sufficient supply hours, automatically the menace of monopoly pricing by the handful of standpipe managers can be curbed, thus providing affordable safe water in the slums.

To ensure the subsidies on standpipes reach the consumers, the utility will have to ensure strict implementation of prescribed water tariff rates as per their licensed contract, with cancellation of sale agreements upon failure to adhere to the tariffs agreed as per the contract. Water ATMs can become a major game changer, curbing the menace of arbitrary price hikes and illegal connections since the payments per unit volume are fixed as processed in the cards. Unfortunately, the utility is unable to check the cartels who regularly vandalize water pipes and steal water from ATM overhead tanks. Similarly, strict vigilance is required regarding the illegal connections and water theft to make this a successful programme.

In conclusion, I would like to state that the main intent of my paper is not to present a universal phenomenon of how standpipes in the ISs can act as a panacea or long-term sustainable solution to the water delivery system in urban Kenya. Rather, I suggest that there is an opportunity for problems to be properly addressed and significantly improved only if and when policy-makers and planners take note of the accessibility issues of this service provision. The utility would benefit from a better understanding of experiences and perceptions of the urban poor with regard to networked water, its new technological interventions (water ATMs) and cost escalations (if planned in the near future). If an atmosphere of greater consultation is fostered, whereby the official utility engages actors who are directly involved in the chase for water in ISs, then planning for improved water access might begin to accommodate the interests of the low-income population. Thus, these experiences of water access from standpipes may have important resonances with water planning and policy goals, especially in meeting the SDG by 2030 in Kenya.

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