

REVIEW ARTICLE

WATER KIOSKS IN ALLEVIATING WATER SHORTAGE AMONG URBAN POOR IN AFRICA: A REVIEW

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ABSTRACT

Water kiosks are very important in supplying water to slum dwellers of urban Africa and other developing nations of the world. They bring the commodity close to water users and allow them access if and when they can afford it. This research explores how the kiosks can be used to ensure better access to water and for poverty alleviation. As established in this review, kiosk water is not cheap if used as an exclusive source of water. The services offered by kiosk operators are unreliable due to supply disruptions and water prices fluctuate based on demand for the commodity despite pre-existent water tariffs from regulatory institutions. Kiosk water is at risk of contamination due to unhygienic practices by operators at the facility's vicinity and water consumers at the household level. To counter these challenges and make the kiosks a new avenue to alleviate poverty among water users, automation of water services, enforcement of water tariffs by regulatory institutions, installation of water reservoirs to use the commodity during disruptions and slum community education on safe water handling and storage practices were recommended. The recommendations once implemented would ensure slum dwellers reaped the health benefits associated with access to clean water for various consumptive uses that can result to sustainable development in developing nations.

KEYWORDS

Water kiosks, Access to clean water, Poverty alleviation

1. INTRODUCTION

Access to water is a basic human right and every individual requires water to enhance their wellbeing. In urban areas, provision of water to city residents promotes environmental sustainability, a productive economy and enhance public health (Naik, 2016). However, two trends are making the provision of water in African cities problematic now and in the future. First, is the rising trend in rural urban migration. According to the United Nations Department of Economic and Social Affairs, UN-DESA (UN-DESA, 2014), the urban population grew from 14% in 1950 to 26.7%, 34.5% and 40% in 1980, 2000 and 2015, respectively. Additionally, the urban population is forecasted to grow to 55.9% by 2050 (UN-DESA, 2014). Second, the trends favouring climate variation and change have threatened water resources and put the population vulnerable to water shortage and scarcity (Nyika, 2020; IPCC, 2014). Consequently, the two scenarios are pressuring urban regions to enhance the planning and management of water cycles through improved water resources conservation, improved water access to all urban population, efficient and effective use of water that incorporates safe disposal and reuse (Beard and Mitlin, 2021).

Most African cities lack universal access to public water due to underdevelopment of the water infrastructure and in some cases, inaccessibility of the water networks to users. The situation is dire in informal settlements where most urban dwellers reside (Adams, 2017). Such settlements are expected to grow in number and size with rising

trend of urbanization and the water demand is expected to supersede available supply. Furthermore, the supply of the resource will be intermittent, unreliable, unsafe and affordable (Mapunda et al., 2018). The quality of the supplied water is also severely affected. In addition to the public water networks, urban informal settlers access piped water from private vendors, kiosks, boreholes and shallow wells (Beard, and Mitlin, 2021).

To cope with the water inaccessibility in urban Africa for poor informal settlers, water regulatory agencies have adopted water kiosk technology (Baokye-Ansah et al., 2019). The technology involves installation of a device with one or multiple taps where a number of individuals can obtain water. Using designated attendants to oversee the operations, the kiosks link centralized water regulators to water users in three ways (Baokye-Ansah et al., 2019). First, the attendants could previously have served as informal water operators and have vast knowledge on water supply problems in slum areas. Secondly, the owners of the land where the water kiosks are set up could oversee its operations. In the last arrangement, water regulatory authorities give permits to groups of people who using their finances construct and operate water kiosks. The kiosk operators in the three cases acquire water from regulatory agencies in bulk volumes and resell to consumers who pay for the resource.

The role of kiosks in curtailing water shortage in urban informal settlements of Africa has been given little attention (Coulson et al., 2021). In existent studies, the role of water kiosks has been conflicting with some

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sources claiming it is an existing cartel that has been formalized to extort city dwellers off their money while others claim it is transformational in supplying water in underserved urban regions (Ahlers et al., 2013). This review is aimed at clarifying the realistic and unrealistic role of water kiosks in supplying water to the urban poor under five contexts: service management, water pricing, service reliability, water quality and consumer perceptions on the role of the kiosks. The five contexts will be weighed based on existent literature on water kiosk services in African informal settlements.

2. CONTEXTUAL ROLE OF WATER KIOSKS IN SUPPLYING WATER TO URBAN INFORMAL SETTLEMENTS

2.1 Service Management

Water service management at kiosks in regard to customers served, hours of operation and service disruption vary widely based on a number of factors. These include the supply of the resource from water regulators, seasonal variations in resource availability, set prices by kiosk attendants and purchasing power of water users. Contzen and Marks noted that demand for water is low during rainy seasons as informal settlers in urban Kenya capitalize on rainwater harvesting to reduce the cost of buying water (Contzen and Marks, 2018). A water kiosk on average can serve 500 to 3,000 people daily depending on the water demand whereby most of the water is carried in 20-litre jerricans. Figure 1 shows a water kiosk serving informal settlement dwellers of a Kenyan slum. The timely supply of water to kiosks also influences the operations of the facilities. For instance, in Blantyre, Malawi, water users' associations (WUAs) who operated kiosks complained of delays in supply of the commodity from the Blantyre Water Board (National Planning Commission, 2021). Similarly, in informal settlements of Kisumu, Kenya, kiosk operations were disrupted at an average of 3.3 hours daily as a result of delayed supply from the Kisumu Water and Sanitation Company (Nzengya, 2017). In some instances, kiosk operators control the pricing of water and in Kenya, such prices are shown to be hiked by the operators especially in dry seasons, which negatively affects the affordability of the commodity by poor urban informal settlers. Consequently, the residents result to other cheaper and unsafe alternatives (Baokye-Ansah et al., 2019). In Malawi, the water tariffs at kiosks fluctuate and their computation is not clear. As such, extra costs on water are transferred by kiosk operators to users making the commodity unaffordable (Coulson et al., 2021).

In Kenyan informal settlements, the use water kiosks dates back to the 1970s and the number of the facilities had grown to 650 by 1998 in one of the country's largest slums, Kibera (Snell, S., 1998). In Zambia's Lusaka, where kiosks were introduced in 2006, more than 300 such facilities had emerged after 2 years and served more than 500, 000 people daily in the slum areas across the country (The World Bank, 2010). In Malawi's capital, Lilongwe, about 50 kiosks were sampled but due to high water tariffs and unaffordable pricing to informal settlers, half of them were set to be closed (Coulson et al., 2021). The availability of kiosk operators also influenced the access to water in that although kiosks could be open for more than 11 hours, the attendants only rendered the service for an average of 4 hours (Nzengya, 2017).



Figure 1: Informal settlers of a Kenyan slum buying water from a kiosk

2.2 Service Reliability

The costs and financial burden associated with unreliable water supplies affect low-income households compared to higher ones (Majuru et al., 2016). Although kiosks are very important in supplying water to the urban

poor, their reliability is a concern. A survey on the reliability of water kiosks at three informal settlements of Kisumu city, Kenya, established that more than 80% of participants deemed kiosks as unreliable (Nzengya, 2017). The trend was attributable to lack of adequate water from suppliers and pipe bursts and vandalism that interrupted the service. Consequently, customers left the containers for filling at the kiosk once operations resumed. To alleviate the unreliability, some kiosk operators installed water storage tanks at an additional cost, which was transferred to the water consumers further increasing the water prices. Installation of tanks was not always possible for operators who had leased kiosks and, in that case, they connected the kiosk to alternative water sources such as shallow wells, which increased operation costs and compromised the quality of water as no additional treatment occurred. Mintz (Mintz et al., 2001) noted that the lack of facilities to store water for use when supply is disrupted made most water kiosks unreliable. In Lilongwe, Malawi, informal settlers rely heavily on water kiosks for supply of the commodity though unreliability of the facilities has forced them to seek alternatives such as wells, rainwater, boreholes and private household taps to meet their everyday water needs (Velzeboer et al., 2018). Informal settlers of Eldoret town in Kenya, also suggested that water kiosks were unavailable as operators could close a whole day or more while some of the facilities were too far from their proximity (Kimutai et al., 2018).

2.3 Water Pricing

Setting up of water kiosks is driven by the desire to provide the urban poor with affordable, accessible and reliable water services. In informal settlements of Lilongwe, Malawi, professional management of water kiosks has seen enhanced affordability of water due to financial accountability for water users and operators as well as uniform pricing of water regulated by WUAs (Velzeboer et al., 2018). The associations have also been able to use proceeds gained from sales to bring water close to consumers and eventually lower the resource's transportation costs (Adams and Zulu, 2015). In informal settlements of Kisumu, the cost of water ranged between Ksh 2-5 with each household spending an average of Ksh 485-666 monthly on water (Nzengya, 2017). The residents found the price considerable and friendly since they obtained the water based on affordability. The kiosks further shielded residents from exploitation by informal water vendors who overpriced the commodity once supply was limited.

The price of kiosk water in urban informal settlements is set by the respective regulatory agency of a given country. For example, the Water and Sanitation Program (WSPs) of Kenya has set the price of a 20-litre container of water at Ksh 1.5-2 while Zambia charges 1 Euro cent, Douala of Cameroon and Dar es Salaam of Tanzania both charge 3 Euro cents for a 20-litre jerrican (Baokye-Ansah et al., 2019; IRC, 2008). The regulatory agencies however also give leeway to kiosk operators to regulate water prices based on demand and supply. For instance, in informal settlements of Nakuru, Kisumu and Kericho towns of Kenya water was priced at Ksh 3-20 during dry and high demand seasons, which was higher than stipulated prices (Baokye-Ansah et al., 2019). In the slums of Lagos, Nigeria and Kampala, Uganda, water kiosks sold the commodity at \$0.16USD, which was the same price as piped water services that were unavailable in the cities (Beard and Mitlin, 2021).

Therefore, if kiosk water is used exclusively as a source of water in informal settlements, it is not affordable. This was noted in a comparison of monthly costs affiliated to borehole water use and kiosks' in Mozambique, where the latter was at MZN 150 while the former was MZN 20 per household (Sequeira et al., 2019). Kiosks were found to hike water prices by 18 times more in Kenyan informal settlements where they acquired the commodity in bulk at Ksh 11/m³ and sold it at Ksh 128/m³. Although the high costs were justified as meeting the capital costs of setting kiosks up, transferring them to poor urban dwellers amounted to an organized cartel that made water unaffordable (Collignon and Vezina, 2000). The study has a different view claiming that pricing of kiosk water set by the Blantyre Water Board at MWK 2.46 does not account for operators' expense and if it did a 20-litre jerrican would cost MWK 10 (Collignon and Vezina, 2000). Baokye-Ansah and others observed that regulatory agencies were not concerned about water pricing by kiosk operators so long as they paid them their bills (Baokye-Ansah et al., 2019). As such, they have replaced post-paid meters with pre-paid ones and exerted punitive measures to non-payment by closing the kiosks. Equally, the kiosks are hiking water prices to survive and pay their capital expenses to the disadvantages of informal settlers who end up purchasing water from kiosks if no alternative sources are available. The high cost of kiosk

water also compromises on hygiene and sanitation of informal settlers so that they only use water for essentials such as cooking and drinking and compromise on washing clothes, bathing and cleaning dishes to reduce the resultant costs as noted by Nzengya (Nzengya, 2017).

2.4 Water Quality

In kiosk operations, water regulatory agencies supply treated water to operators who then resell it to slum dwellers. The handling of water at the kiosks particularly fetching and storage using contaminated containers could comprise on quality of the commodity with the precognition that sanitation and hygiene levels in informal settlements is wanting. This trend was confirmed in a survey of household water sourced from kiosks in Kisumu slums of Kenya where sampled water had thermotolerant bacteria and *Escherichia coli*, which was indicative of faecal matter contamination (Nzengya, 2017). In informal settlements of African cities such as Nairobi, Mzuzu, Maputo, Lagos, Kampala and Dhaka, the quality of kiosk water was reported to be questionable despite its high cost (Beard and Mitlin, 2021). A survey in Mozambique also established that 16.2% households had low quality water despite sourcing it from kiosks that had safe uncompromised water (Sequeira et al., 2019). Kiosks that had alternative sources of water such as boreholes and wells also mixed it with treated water, which compromised on some physicochemical aspects such as colour, suspended solids and turbidity. Two studies by Boankye-Ansah et al. [25] and Price et al. [2021] in Malawi compared water quality at kiosks and centralized water supply networks to household stored water in informal settlements by assaying the total coliforms and *E. coli*. Results indicated significant difference in the quality of water with household water having higher levels of contaminants compared to the kiosks where it originated. Water quality from kiosks must therefore be preserved by practicing hygiene and sanitation for kiosk operators at the facility and water users during acquisition, storage and use of the resource [9].

2.5 Consumer Perceptions on Water Kiosk Operations

Apart from reliability concerns, informal settlers using water from kiosks raised concerns of hygiene and sanitation among kiosk operators and the environs the facilities operate, which compromised on quality [14]. Respondents of the survey were concerned of high costs of the commodity and water interruptions due to pipe bursts that resulted to intermittent supply of the commodity. Although they raised the concerns, the water users did not change patronage for kiosks to other alternatives to cement their dissatisfaction. The trend could be because the kiosks were their only convenient and affordable source of water compared to alternatives. In Lilongwe, Malawi, informal settlers preferred water kiosks to direct connections since they could not afford connection charges, chose what to do with the kiosk water and bought it on demand, which prevented overspending on water services [27]. Most consumers of kiosk water when asked on improvement measures to take for better services suggested infrastructural modifications on the facility in addition to hygiene enhancement at the cost of operators [14]. None of them were concerned with institutional changes such as public health monitoring of the kiosks to maintain high water quality standards. Unlike in the case in Malawi, consumers of kiosk water in Mozambique suggested capacity building and capital financing to set up the facilities and provide services that enhance water quality and effective operations citing the success of such initiatives in water kiosk projects of Kenya and Zambia [23].

3. DISCUSSION AND RECOMMENDATIONS

Urban sprawl resulting to the expansion of slums in Africa comes with an added challenge of setting up the infrastructure required for delivery of water services to the urban poor. Consequently, the informal settlers have no access to safe and clean water for their consumptive uses. The use of water kiosks therefore comes in handy to bring the commodity close to users. As Nya et al. [28] explained kiosks sell the same water from a centralized source as piped networks and as such are not a new source of water but rather, they redistribute the same water through different access points. In this delegated model of water, the urban poor who cannot afford piped water can access water when they need it. This review however aimed at examining the mirage and realities of using this approach to provide water for informal settlers of urban Africa under five contexts: service management, water pricing, service reliability, water quality and consumer perceptions of the service. These contexts are important considerations to rate if the use of kiosks to supply water to the urban poor improves their health and well being [29].

Evidently informal settlers were able to access water on demand from the kiosks and in accordance to their affordability and convenience. However,

the operators in some instances overcharged them compared to the stipulated prices by the regulatory agencies. Water consumers also complained of unreliable services as a result of disruptions by pipe bursts, lack of supply from regulatory authorities, and closure of the kiosks by operators. This observation was despite the fact that slum dwellers require a reliable supply of water since they have limited storage capacity [18]. To counter supply disruptions some kiosk operators installed storage tanks but this was not always possible. Some operators also have installed water ATMs where consumers pre-pay for the card, load it with money and have access to water at their convenience without requiring an operator. According to Sarkar [30], the technology has proved effective in Kenyan slums of Nairobi city though its acceptance is low among consumers. The collective attention of slum residents and regulatory agencies is needed to prevent pipe vandalism leading to pipe burst. Such measures include applying punitive measures to vandalisers of water pipes. Water regulatory agencies are also challenged to enforce their prescribed water tariffs to prevent extortion of kiosk water users by operators and city cartels and enhance professional management of water kiosks. Additionally, the authorities should take into account the expenses the kiosk operators incur while setting up and operating the facilities since the extra expenses were attributable to the hiking of water prices [14]. Additionally, they should also facilitate kiosk operators with flexible loans during kiosk setup in collaboration with public, private and non-governmental entities.

Many consumers of kiosk water raised concerns on hygiene and sanitation of the kiosks and their environs. Due to overcrowding and complex organization of slums, kiosks are vulnerable to dirt from dumped wastes and water spills, which favours the bleeding of pathogens. Regulatory institutions must therefore enforce hygiene standards to ensure water kiosk users get clean commodity free of contamination. This is through policy revision and institutional overhaul on water kiosk regulation. To prevent contamination of kiosk water at household level, there is need to educate slum dwellers on safe and clean water collection, storage and treatment practices they can adopt to optimize on the health benefits that the commodity offers [14].

4. CONCLUSION

Water kiosks are alternative sources of water that bring the commodity close to informal settlers in urban Africa. In this case, the slum dwellers access water whenever they need it based on their ability to afford it. The facilities are advantageous to the poor who cannot afford connection fees and monthly bills associated with piped water. The water supplied to kiosks is usually treated and safe for consumption. However, this review showed that some kiosk operators hike the prices of water compared to the stipulated tariffs, serve customers intermittently, are unreliable and do not practice hygiene at the facilities, which could contaminate water. To counter these challenges, this study recommends the enforcement of water tariffs by water resources regulators to prevent extortion of kiosk water consumers and at the same time, take account of kiosk operation costs. To counter unreliability, kiosk operators can install storage tanks for constant supply when there is disruption or install water ATMs for self-service by consumers. Improvement of slum infrastructure to enhance hygiene at kiosks and their vicinities as well as education to consumers to ensure they practice safe collection, treatment and storage of water is recommended to reap the ultimate benefits of water kiosks.

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