
Exploring the Knowledge and Practice of Water Conservation Measures: A Case of Low-Cost Housing Setting in South Africa

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Abstract

The water crisis has reached a fever pitch in South Africa, with threats of ground zero and disruption of water supplies. The paper focuses on household knowledge and awareness of the water crisis and conservation efforts to reduce water consumption in a low-cost housing setting within the eThekweni municipality, KwaZulu-Natal, South Africa. A mixed method that consists of qualitative and quantitative phases was adopted to explore water practices. Focus group discussions were conducted with a representative sample of 22 people residing in the Waterloo area, situated north of Durban. Subsequently, the results from the discussions were used to design a questionnaire which was administered to 304 residents in the same location. Data was collected through an anonymised research questionnaire. The qualitative data was analysed using content analysis by generating codes to theme the data while descriptive analysis was performed on the quantitative data. In synthesising the results, three recurring key issues are identified, namely (1) access to knowledge; (2) community engagement as part of the solution; and (3) allocation of incentives. While participants had knowledge of water conservation practices, there was, however, a high amount of water consumption and high unaccounted water losses in the area. Although some of the participants held the view that providing incentives like free airtime and electricity could help influence water conservation, many were, however, in favour of installing water-harvesting facilities such as Jojo tanks. The study conclusively proposes economic nudging in the LCH areas as a cost-effective measure towards water conservation.

Keywords: *Low-income housing; water crisis; water conservation; incentives*

Introduction

Several studies regard water conservation as one of the most cost-effective measures towards ensuring a reliable supply of water for water-scarce regions (Feike and Henseler 2017; Tuncok and Eslamian 2017; Lede et al. 2019). Yet, government bodies engaged with water resource management fundamentally focuses on increasing water supplies, while ways to deal with reducing water demand get comparatively less attention. In South Africa, water is billed on a sliding scale (Njiraini et al. 2017), thus, the more you use, the higher the rate per kilolitre you will pay. That said, the pricing model is different for low-income households who receive a stipulated amount of 9kl of water free of charge per month as per the government's Free Basic Water Policy (FBWP). The amount of water used above the deemed limits is priced accordingly. Whilst access to water is acknowledged as a basic human right, as reported by Hazelton (2019), recovering the full cost for the excess water used over

and above the 9kl is problematic and has contributed further to the financial crisis plaguing many municipalities throughout the country. A report by the eThekweni Water and Sanitation unit (eThekweni Municipality 2015) revealed that the economic loss of treated water as a result of leaks, vandalism, and wastage, is estimated to cost the metropolitan city of Durban an estimated R600 million a year.

Furthermore, a culture of non-payment is to be blamed for the loss in revenue, particularly in areas receiving free basic services such as water and electricity in South Africa (Butler 2017). According to Sheik (2017) punitive measures to curb overuse beyond the 9kl monthly limit of water is futile because many municipalities face technical challenges with their billing system. Significantly, discussions with eThekweni municipality water officials suggest that the FBWP model has caused challenges when it comes to cost recovery for the usage of water above the FBWP limits. Studies (Feike and Henseler 2017; Katz et al. 2018; Tortajada et al. 2019; Lu et al. 2019) show that water pricing as an incentive to conserve water in order to reduce production and consumption costs have provided relief to the water supply system in countries like China, Australia, Germany, and Spain. However, data suggests that adoption of conservation practices is limited in vulnerable residential areas such as low-cost housing communities that receive a free basic supply of water, making it difficult to promote water conservation measures in South Africa. This study takes cognisance of the challenges related to water usage in low-cost housing (LCH) areas. LCH is a project that provides affordable houses to poor people and low-income earners. There is clearly a need for innovation of new concepts and strategies to instil water-saving cultural and behavioural changes. The paper focuses on household knowledge and awareness of the water crisis and conservation effort to reduce water consumption in one such area within the eThekweni municipality, KwaZulu-Natal, South Africa. Therefore, the purpose of this paper is to explore the knowledge and water conservation and preservation practices in low-cost housing areas.

Literature Review

Several researchers such as Wang et al. (2016), Francés et al. (2017), and Munasinghe (2019) have indicated that an appropriate water management strategy, including water conservation can improve the existing supply and demand balance in countries where water is considered a scarce resource. This is a gap in research because, as reported by Soto et al. (2018), there is a lack of public and private sector investments in research, development, and implementation of the water conservation behaviour frameworks that are required to balance the supply/demand ratio.

Loucks and Van Beek (2017) report that water demand reduction is a more viable option than increasing water supplies and could be accomplished through various conservation actions. This requires that consumers understand the value of water and the long-term effect of water wastage and change their behaviour accordingly. Akhmouch and Clavreul (2016) believe that the water sector cannot successfully address water challenges without the co-operation of users and therefore, education plays a pivotal role. Mahlanza et al. (2016) concur that if users are not educated about the importance of water conservation, they may view conservation measures as punitive. Du Plessis (2017) lists some strategies to promote water conservation which include installing prepaid meters, regulations, and by-laws, and improving reticulation design and plumbing standards. In addition, the study further notes that water utilities could enter negotiations with developers and offer incentives to those that can show that they are adopting water conservation methods in their developments.

Water scarcity in South Africa is a growing concern as the government strives to provide every citizen with this necessity. According to Förster et al. (2017), water-stressed areas urgently need effective water conservation and demand management. These water conservation practices must, in turn, be sustainable interventions to allow for the restoration of depleted resources (Loucks and

Beek 2017). While South Africa is well-known for strategic planning and policy development, the implementation of water demand management remains the foremost challenge in improving service delivery to the 5 million South African citizens who remain without a basic consistent supply of water and sanitary services (Govender 2016).

At present, South Africa remains in the grip of its worst drought in decades and according to Onyenankeya et al. (2018) local municipalities are engaged in a battle to curb increased water use in the face of a growing water crisis and ensure that available water supplies are used in a more sustainable way. Musavengane and Leonard (2019) observed that conservation efforts tend to differ between urban and rural areas, as many rural water residents are unaware of the methods for reducing water demand and do not actually understand the importance of water conservation. Onyenankeya and Salawu (2018) argue that issues of water are not the only protection of urban residents and commercial bodies, particularly the judicious use of water. In fact, to enable positive water behaviour, a measure such as a water saving campaign has the possibility of turning itself into a social movement that requires the awareness and participation of all South Africans. Zolli and Healy (2012) maintain that participation in the water conservation drive of all South Africans, including rural communities, is vital not only to build resource sustainability but also to build the resilience needed by citizens in the face of physical water shortages.

Stavenhagen et al. (2018) believe that water pricing is an appropriate tool in water demand management at the household level. This is grounded in the belief that the demand for water is decreased when prices increase, and as such, will inform users on the value and real cost of supplied water. In this way, it will promote effective water conservation behaviour towards water resources. Wichman et al. (2016) states that the benefits of using a pricing mechanism allows households to respond to rising water prices in the way they want, rather than implementing a mandated technology or reducing specific uses. For example, high water tariffs in countries like Germany, Austria, and Spain have been shown to reduce demand significantly, at least by 10 per cent (Stavenhagen et al. 2018). This study takes cognisance of the excess water consumption in LCH areas and aims to support the local authorities (municipalities) in identifying mechanisms towards promoting effective water conservation behaviour. In general, Addo et al. (2019) observed that approaches towards implementing water conservation behaviour measures can either be 'command and control', which relies on policies and regulations; or 'voluntary' which involves economic and social incentives that encourage good water use. It is important to mention that according to Gianfrate et al. (2017) whilst technological devices are readily accepted by domestic water users, the savings resulting from their use is minimal compared to those that can be achieved through behavioural changes.

Research Methodology

This study used a mixed-method approach to explore water practices at a low-cost housing community under the jurisdiction of the eThekweni municipality. Focus group discussions were conducted with a representative sample of 22 people residing in the Waterloo area, situated north of Durban. Subsequently, the results from the discussions were used to design a questionnaire which was administered to 304 residents in the same location. Each focus group comprised of five to six participants. The sample size was ideal to gain insight about people's experiences and interpretation of water conservation measures and how they influenced water use practices. Interested respondents for the focus group discussions were informed of the study at a monthly community meeting held by the area's ward councillor. The incentive to participate was described as helping the local government to formulate solutions to assist the community with better water management in the area. The venue for the discussions was a local crèche in the area. The researcher provided the

councillor with dates and times and four sessions were held. The dates, times, and venue were communicated to the respondents verbally by the councillor. A discussion guide was developed through examples from the literature review and issues presented by participants during the semi-structured interviews. Each session was between 50 to 60 minutes. The discussions were digitally recorded. Coding and analysis were performed using Nvivo (version 11). Before the collection of data, ethical approval was obtained from the Durban University of Technology. Permission to conduct the study was obtained from the eThekweni municipality.

A semi-structured cross-sectional survey was conducted to identify the level of awareness and knowledge of water use and conservation practices in this study area. A convenience sampling technique was used. The list of items for the survey was formulated from the results of the focus group discussions. The list of incentives in the questionnaire was generated during the focus group discussions when respondents were asked *what some are of the nudges, they thought were appropriate to promote conservation behaviour*. The common incentives mentioned included: *the municipality writing off any outstanding water debt; certain amount of free electricity per month; free airtime and data; and the installation of a 10 000-litre water tank per household*.

Results

Demographic characteristics

The demographical profile of the respondents in this study are described in Table 1. Majority were females (52.3%), African (63%), within 30 to 39 years of age, hold a high school qualification (45.9%), are renting (89.2%), lived in their present residence for more than 10 years (43.2%), and earned less than R5000 a month (59.2%).

Table 1: Demographical profile of respondents

Profile	Frequency	Percent
<i>Age:</i>		
18-29	65	21.4
30-39	92	30.3
40-49	74	24.3
50-59	39	24.3
60 +	34	12.8
Total	304	100
<i>Race:</i>		
African	192	63
Indian	88	28.9
Coloured	22	7.2
White	3	1
Total	305	100
<i>Gender:</i>		
Male	145	47.7
Female	159	52.3
Total	304	100
<i>Education:</i>		
No schooling	40	13.1
Primary school	51	16.7
High school	166	54.4

College/Certificate	32	10.5
University	16	5.2
Total	305	100
<i>Housing Status:</i>		
Owner of property	89	29.2
Renting	216	70.8
Total	305	100
<i>Years of residence:</i>		
< 1 year	2	5.4
1-5 years	6	16.2
6-10 years	13	35.1
>10 years	16	43.2
Total	37	100
<i>Household income:</i>		
<R5000	98	32.1
R5000-R10000	105	34.4
R10000-R20000	82	26.9
>R20000	4	1.3
Total	289	100

Sample size (n=289)

Qualitative data: Focus group discussions

One main theme and four subthemes were extracted from the focus group discussion (Table 2).

Table 2: Themes and subthemes extracted from the focus group discussion

Theme	Subthemes
Current water situation in South Africa	a. Understanding of water scarcity b. Source of information on water scarcity
Water conservation methods	a. Water management b. Water consumption knowledge c. Cost of excess water consumption d. Municipality interventions

Theme 1: Current water situation in South Africa

a. Understanding of Water Scarcity

Pasquin et al. (2015) postulates that understanding the science of people's behaviour towards conservation is very important. It was thus sensible to know the understanding of what drought and water scarcity means to the participants. While some of the participants in the focus group discussion attributed water scarcity to mean water restriction, others acknowledge that they do not have a good understanding of its meaning.

Water restriction means we have to use limited water.” (Focus Group #1)

“The way they are wasting water in this area, I do not think they know we in drought.”
(Focus Group #3)

“I know drought is when there is no water, but I do not know what water scarcity means.” (Focus Group #2)

b. Source of information on water scarcity

Given this gap in knowledge and understanding of the meaning of water scarcity, the participants were asked the following question: *“Where do you get your information regarding the water situation in the country?”*

Most of the participants related that television was the most common source of information when it involves current affairs and other news. Some participants listed other sources such as friends at work, the radio, newspapers, and the internet. Regardless of these, one of the participants points out that:

“I haven't heard anything.” (Focus Group #2)

Echoing similar sentiments, many participants revealed the following:

“We only hear about a water crisis when there is no water or when the municipality cuts our water because we owe them money.” (Focus Group #1)

Theme 2: Water conservation methods

Water conservation is an important strategy to address the impacts of a water crisis given that the amount of available clean water is relatively scarce and as such needs to be conserved to ensure its continuous and vital availability (Griffin 2016). This theme therefore aimed to gain an insight into the water conservation methods amongst residents of the low-cost housing. The water conservation methods are discussed under the following subthemes: water management; water consumption knowledge; cost of excess water consumption; and municipality interventions on water conservation.

a. Subtheme 1: Water management

According to Griffin (2016), high water usage in households can be drastically reduced by implementing smart conservation habits such as harvesting rainwater, wastewater reuse and recycling, efficient laundry washes, and raw water flushing, amongst others. However, a mixed reaction emerged from the conversation with the participants. It was uncovered that while some conserve water by using a bucket to bath and closing their tap tightly, others appear to have no water management strategy. These views are reflected in the narratives below.

With reference to the use of a bucket to have a bath, many participants stated that they always used a bucket as opposed to using a shower.

“In my home, we use a bucket to bath, and we try to use very little water, because we get charged when we use a lot of water.” (Focus Group #4)

“My children and I always use a 20-litre bucket to bath. I think if we use the shower, it will use more water.” (Focus Group #4)

“I was told that you use lesser water when showering, but I'm not sure.”

It was apparent from the statement above that most participants believe that using a bucket is more cost-effective than a shower.

On the question of whether the respondents ensure that taps are closed tightly in their homes, one participant claimed that her kids are always instructed to do so, even when she is not at home. However, she conceded that she is unable to verify whether her children followed her instructions.

"I am always telling my children to close the tap tightly. However, most time I'm not home. I'm working so I do not know if they do that." (Focus Group #2)

The uncertainty of whether children were practicing water saving measures during the day was highlighted in the statement:

"I'm working during the day. I only use water early in morning to bath. When I come from work, I use water to cook. I do not know how much of water is being used during the day when my children come from school." (Focus Group #4)

Further to the above, it was found that water saving efforts are minimal. Another participant believed that the current drought did not affect her as she is able to pay-off her water account each month.

"In my house, we use water the same way all the time. It is the same amount we use. If I get a bill, I pay it. It's not more than R200." (Focus Group #2)

Despite the above statement, many of the participants raise the concern of lack of water-saving culture within their community.

"People here don't save water because we not asked to." (Focus Group #4)

"Besides, water gets wasted so much when the pipes on the roads burst..." "...There is so much wastage, so I don't understand why they are saying we must save." (Focus Group #4)

"Once the municipality vehicle drove caused a burst pipe outside my house because the roads are not properly tarred. Water was gushing out. That same month my bill came R6000. I think it was from that burst pipe." (Focus Group #1)

"Sometimes the municipality takes very long to repair leaks. This makes me think that it's not a problem if water is leaking and getting wasted." (Focus Group #3)

"I feel like I am always using less water, but I do not know why my bill comes high. Then I cannot pay." (Focus Group #4)

Nevertheless, one of the participants accentuates the importance of saving water. While narrating the benefits of having water, the participant noted the following:

"I spent most of my life not having a tap inside my house. I used to collect water from a standpipe. Therefore, now that I have a tap inside my home, I value water. I try to save every drop." (Focus Group #1)

In addition, the above participant blamed what she believed was a "culture of free provision" for poor water behaviour in the area.

“Some people got free things, houses, water. They do not know what it is like to walk far distance to a standpipe to collect and carry water back to their homes.” (Focus Group #1)

Echoing similar sentiments, another of the participants voiced concern on the influence of apartheid on peoples’ general behaviour.

“We come from apartheid regime. Minds not transformed. Free houses, free education, free grant. So, if everything is free it would be very difficult to ask them to be responsible for water.” (Focus Group #3)

More so, the lack of development and dearth of infrastructure, such as recreation centres, was blamed for the poor water-saving techniques in the area.

“This area is lacking development. There is no swimming pool, no place for the children to go to when the weather is hot. Now they use hose pipes to water themselves. They walk far distance to use the public pool. So, to them water is not serious, it is something to play. We are not taught how to be responsible. You cannot go to the river to swim its unsafe, so kids fill large containers with water to sit and play.” (Focus Group #3)

In summary, participants attributed their high-water bills, due to consumption above the stipulated 9kl limit, to burst pipes. Participants also shared the perception that the municipality had a long response time to fix leaks. Apart from that, the psychological concept of the free provision of water (Focus Group#1) was hinted as the factor behind the culture of irresponsibility towards water usage in the area.

b. Water consumption knowledge and practice

It has been reported in literature that 40 per cent of municipality-supplied water is lost through leaking or burst pipes and dripping taps resulting in an estimated economic loss of more than R7 billion annually in South Africa (Mavundla 2016). Moreover, some of the participants suspected that the high cost of their water bill was a direct result of the above-mentioned scenarios. As such, this influences their decision not to pay their water bills. While there is no physical evidence to support this claim, Shan et al. (2015) note that the public may be more receptive to water conservation initiatives if they believed that water agencies are trustworthy. Therefore, it becomes highly important to know whether the participants could measure how much water they use per day. Although most of the participants conceded that they do not know how to measure their daily water consumption, some gave a glimpse of their daily water consumption as well as the number of members in their family.

“It's very hard. We use a bucket to bath. But for other things, like cooking and washing the windows, we can't calculate how much we are using.” (Focus Group #1)

“I think we use a few 25 litres of bucket a day. But I don't know how much we are using.” (Focus Group #2)

“I have a 20-litre bucket which I use for washing dishes. I have another bucket also 20 litres for bating. I use many buckets of water for washing clothes. Altogether there are eight people in my house.” (Focus Group #2)

“I live with my sister and her children. There are six of us. We use lots of water. I do not know how much.” (Focus Group #3)

"I think it is very little because I am hardly at home. But my kids are at home, and I do not know how much they are using. We do not talk about how much water we use."
(Focus Group #4)

The above quotes suggest that the participants could not accurately estimate their daily water consumption. As such, it is sufficient to assume that they cannot justify their high-water bill to burst pipes. Given that they believed that water wastage was a result of burst pipes outside their properties, it was expedient to know who they reported the leaks to when there is an incidence. The councilor, municipality, and the owner of the premises were mentioned as some of the people to whom the leaks were reported. Some indicated that they called the councilor first because of difficulties in getting the municipality to respond timeously. This is reflected in the statements below:

"Sometimes I call the municipality, but they take a full day to come." (Focus Group #3)

"I call the municipality. Sometimes they come same day or next day. I'm not sure why they take long. They tell us we are in queue." (Focus Group #4)

Another concern noted for the failure to report leaks to the municipality was attributed to some apathy that exists particularly for those who are renting the property.

"... sometimes people are wary of phoning the municipality if they are renting the house. Because it is not their property, they may feel it does not concern me. The same can be said for people walking on the street and see a leak. They feel it's none of my business. It is the municipality's job." (Focus Group #1)

Participants who indicated that they reported leaks to the owner of the property further lamented on the delay in response times to fix the leak.

"I am renting. I call the landlord. But she takes very long to come and fix the leak. Maybe she can only come weekend." (Focus Group #3)

"Sometime the owner tells me he doesn't have money to call a plumber. So, there's nothing I can do except live with the leak until it gets fixed." (Focus Group #4)

Apart from the above-mentioned difficulties, some of the participants indicated that the cost of phoning to report the leaks was also a setback. It was uncovered that while the municipality had a toll-free call centre for reporting leaks, accessible from a Telkom call box, they claimed there are no working Telkom call boxes in the area. Furthermore, calling a plumber was not entertained as an option due to the cost of paying from one's own pocket. Given the economic status of the people residing in the low-cost housing (Figure 2), it was easy to understand the challenge of paying from your own money to make a cellphone call to report leaks.

From the above comments by participants in the focus group discussions, it was apparent that some of the participants faced challenges calling or reporting water leaks. Given these scenarios, it was prudent to know what measures they undertook to address the water leaks in their houses. It was found that some attempted to fix the leaks by themselves or with the support from their neighbours whilst others opted to call the owner of the property. Some participants pointed out that as a preventive measure they turned off their water meter.

One participant seemed unburdened by the leaks on his property.

"The leaks are small, so we just leave it." (Focus Group #2)

This was of concern given the high economic cost of water leaks. This agrees with Seyoum et al. (2017) who noted that small leaks in household premises account for the high numbers of water wastage, as these leaks are often unreported or are not fixed. Consequently, and as advised by Seyoum et al. (2017) the detection, locating, and correction of water leakages on time, would help in minimising water loss as well as save water and money.

c. Cost of excess water consumption

It is worth reiterating here that residents in LCH areas are benefactors of the FBWP, which provides 9kl of water free of charge to indigent households- implemented through meters. Usage above the FBWP is priced and used as a measure to alert communities that water is scarce and therefore it must be conserved (Maphela 2015). A report by van Wilgen and Wannenburg (2016) concludes that most indigent households in South Africa use above the stipulated 9kl and as such, contribute towards a monetary water loss of R602.6 million rand within the eThekweni municipality per year. To verify this supposition, the residents were asked whether they pay for the extra water. A mixed reaction emerged from the discussions. For example, while some claim to pay for the extra water, others pointed out that many residents in the area do not pay for the extra amount. They attributed this inability to pay to unemployment.

"Lots of people don't pay because they don't have money or are not employed." (Focus Group #1)

"I haven't paid for many months, but I still have water." (Focus Group #2)

Some, however, claimed to pay only when they could afford the payment.

"Sometimes when I have the money. But it is also a problem because I must take off from work to go to town to pay it." (Focus Group #4)

In an attempt to recover the high cost of extra water consumption, participants claimed that the municipality used a strategy of restricting water supply or threatening to cut-off supply to homes.

"I am staying with my mum in her house. We don't have water for the last 4 years because the municipality cut it. We use the communal tap. We owe money to the municipality. We have to walk far to collect water every day." (Focus Group #2)

The threat of being disconnected from the water supply seems to force the payment of water bills. For example, one of the participants admitted to paying their bills after receiving a threat of disconnection, thereby deeming this strategy somewhat effective.

"My Gogo owed a lot of money to the municipality, and they came here and threatened to cut off the water supply. She had to go to town to pay the account. However, I have seen people who owe thousands of rands, and nothing is done to them." (Focus Group #3)

Others, however, believed the high-water bills were a technical fault on the part of the municipality. This is illuminated in one of the participant's statements.

"Some people here they bill comes to R12 000. They say it's a mistake. They do not know why the bill is coming so high. It has to be the municipality's fault." (Focus Group #4)

The above statement may be a contributing factor why most participants refused paying bills timeously. The mentioned observation supports the earlier assertion made by Nkosi (2010) that attributes to the lack of payment and poor water conservation to distrust in water authority bodies by the public.

“One month we are paying R200, next month we are charged R1000.” (Focus Group #1)

In response to the above, many participants believed that it is necessary to educate communities on how they are being charged for water.

“They need to educate us on how we are charged for water per litre.” (Focus Group #2)

From the above narratives, while it can be assumed there is some element of public distrust, it will be premature to regard it as the sole cause of the excessive water consumption. Particularly, given the poor water conservation practices, apathy, and delay in fixing burst pipes, it could be rightly said that the high-water bills may be attributed to the aforementioned factors. Hence, switching off the meter may be an effective preventive measure to avoid high billing.

“Yes, I do. I shut off the meter when I am not needing water because I know if I use extra water, I have to pay for it.”

d. Municipality interventions

In view of the above, and the call for the municipality to educate the residents on water billing, it was imperative to know from the participants whether the municipality was helping the community with information to help conserve water. The participants were unanimous in their response that there is no help nor information on how to conserve water from the municipality.

While accusing the municipality of lack of concern on the water wastage, one of the participants noted the following:

“No, there is no information. We see how long they take to fix the leaks on the roads. We also see how the taxi drivers are wasting water from the communal taps to wash their taxis. So, we feel there is no water problem. If the municipality is not caring for all these things, why should we?” (Focus Group #1)

From the foregoing, one could say that the blame on water wastage and poor water conservation practices in the area is not a sole responsibility of the residents. As can be drawn from the above statement, and consistent with the assertion of Hay et al. (2012), the municipality lacks clear strategy programmes on the conservation of water in such areas. This may however be related to the constant burst of pipes as a result of taxi movement in the area. In addition, it was uncovered that information on water conservation practices is only conducted in schools and not in the community. Although, in an interview with a representative of the municipality (unpublished report), it was stated that the municipality, in the past, introduced water restrictors to minimise water consumption in this area, however, this was not sustainable due to the concern of service delivery protest.

Since the prime objective of this study is to suggest ways to promote good water conservation behaviour amongst residents in the LCH areas, it became highly important to ask the participants what could be done to help the community become more water conscious and use lesser water. It emerged that information on water conservation measures was the prominent suggestion made by the majority of the participants.

“There is no transformation without information. If we can't inform people, how to use water, how to save water. We need to be responsible. Remember people living in Waterloo are coming from the squatter camps. They became recipients of the RDP houses. To them the issue of services is new. Some of them used to steal electricity. But now it is a location, so we need to be responsible. Information is very important. Our people are not well informed on how to save water. We need to teach our children.” (Focus Group #2)

“I think the municipality must educate people on how to save water. Remember as human beings we all have a conscious. So, if you teach me something, I will remember it. Language barrier is a concern. There are different levels of education here.” (Focus Group #4)

Added to the above suggestions, a few participants were open to the idea of the disconnection of water when they reach the free allocated amounts, in order to avoid excess consumption and the challenge of paying for the extra amounts. However, many believed this was not a solution and would prefer advice on how to use within the stipulated FBWP levels.

“We'd like the municipality to come and talk to us. I'm aware of the free water when you reach that allowance, they stop water and only next day it's reconnected.”

Taken into cognisance that the provision of water is free in these areas, the participating residents were asked what incentives would appeal to them to curb over-consumption of water. The common suggestions included free data, writing off historical debt, and provision of extra electricity and free installation of water tanks.

Quantitative Data

Awareness and knowledge of water conservation

The awareness of the water crisis and the need for water conservation practices in South Africa is presented in Figure 1. The majority of respondents (n=299; 98%) indicated that they are aware that SA is a water scarce country. A high proportion of the respondents (n=291; 95.4%) indicated that they know what conservation means. A total of 200 (65.6%) are aware of how much water they use on a daily basis. Similarly, 209 (68.5%) acknowledged that they are familiar with the FBWP, and 187 (61.3%) indicated they know how to read their water meter.

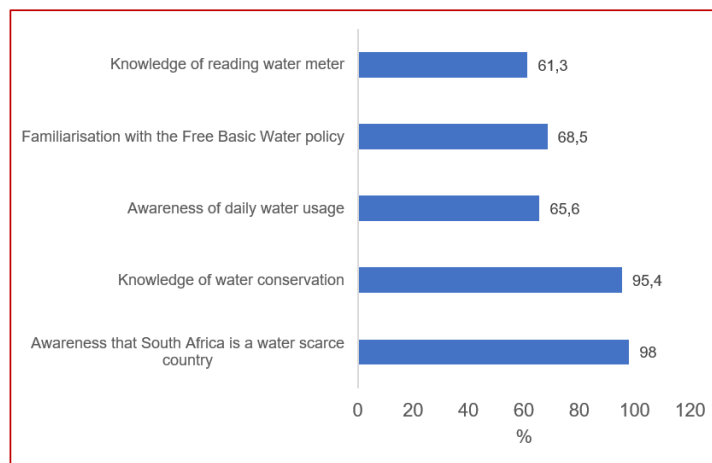


Figure 1: Respondents' levels of awareness on water-related crisis

Economic incentive (nudging) to conserve water

Part of the inquiry of this study was to influence the change in behaviour towards water conservation practices. As shown in Table 3, the majority of respondents (n=304; 99.7%) indicated that installing a portable water tank, such as JoJo water tanks, free of charge to collect rainwater will encourage them to use water more sparingly as well as pay their water accounts timeously.

Other notable incentives proposed in this study to encourage behaviour change include: the municipality agreeing to write-off previous water debt (n=291; 96%), free airtime and data (n=269; 88.5%), and a certain amount of electricity (apart from the already stipulated free amount) offered to them free of charge (n=264; 87.1%).

Table 3: Respondents responses towards behaviour change through incentives

Which of these incentives will encourage you to use water more sparingly and pay your water account timeously	Responses	
	Yes n (%)	No n (%)
Free airtime and data	269 (88.5%)	35 (11.5%)
Certain amount of electricity free of charge	264 (87.1%)	39 (12.9%)
The municipality agreeing to write-off previous water debt	291 (96%)	12 (4.0%)
Installing a water can tank free of charge to collect rainwater	304 (99.7%)	1(0.3%)

Discussion

Knowledge and awareness of water conservation

One of the pivotal goals of this paper was to contribute to the existing body of knowledge and identify water conservation strategies that could assist the municipality in reducing high water losses and consumption in the LCH areas. The quantitative results suggest that an overwhelming number of the respondents are aware of water scarcity as well as having knowledge of water conservation. However, it was uncovered from the qualitative findings that there is a high amount of water consumption and high unaccounted water losses in the area. The consequence of this may have overreaching effects in terms of water sustainability, as it is noted to have both a direct economic cost of unaffordable high bills and a huge monetary loss to the municipality. In fact, studies show that municipalities are struggling to manage FBWP due to administrative and technical capabilities associated with widespread theft and vandalism of monitoring devices on residential properties (Maphela 2015; Larsen et al. 2016).

Furthermore, the focus group findings suggest the respondents found it challenging to read their water meters and as such, could not accurately estimate their daily water consumption. This is supported by the quantitative results as the knowledge of water meter had the lowest positive response. As a means to address this challenge, the proposition by Tom et al. (2011) that the use of data loggers attached to household water meters to track water data every 10 seconds and provide households with detailed reports of the amount of water used per water future, may be useful. This agrees with Chang (2015) who believes that a link between resident's water consumption behaviour and water-related problems would lead to more frugal use of water.

Previous studies (Lowe et al. 2015; Mini et al. 2015; Stavenhagen et al. 2018) indicate that households that accurately estimate their water consumption have the best water saving practices. Other research (Safari et al. 2017; Onyenankeya and Salawu (2018) suggests that householders who know about their daily water consumption significantly reduce their water consumption.

While the quantitative data indicates that there is high knowledge of water conservation practices (Figure 2), the findings extracted from the focus group discussions suggests that the inhabitants do not have any definite strategies on how to conserve water. This is in contrary to the report that knowledge of conservation ultimately results in the adoption of sustainable attitudes and behaviours (Seyranian et al. 2015).

Moreover, many of the respondents reveal that there is limited information from the municipalities with respect to the use of water. This perhaps may help explain the number of the respondents who indicated to have knowledge on the free water policy (Figure 2).

Economic incentive (nudging) to conserve water

According to the suggestion of Bennett et al. (2017), conservation policies and practices can and should be guided by the best available information and adequate conceptual frameworks. While several theories and ideas on the best way to reduce water conservation have been proposed in the literature (Datta et al. 2015; Farley and Bremer 2017), the practicality of many of these theories may be elusive in the context of South Africa. For example, while water pricing and restriction have reportedly worked in other countries (Koop et al. 2015), this present study has exhaustively argued on its demerit in the LCH. From a historical context, and apart from further marginalising the people, it will no doubt create a culture of unrest and conflict. Furthermore, as argued by Reddy et al. (2017), most of the proposed strategies in literature are restrictive since they do not encourage voluntary individual behavioural change, they are more of a demand-approach strategy. Given the drawbacks of some of these water conservation strategies, it is assumed that the use of incentives and nudging may influence individual behavioural change. According to Reddy et al. (2017), the primary approaches used to encourage conservation behaviour are organised into three categories namely: promoting awareness and concern; incentivising behaviour, and nudging behaviour.

Of particular interest to the eThekweni municipality, this study found that awareness alone may not adequately address behavioural change. Notably, while most respondents are aware of the country's water situation, their current behaviour does not reflect this knowledge. This finding is consistent with previous studies (Schultz 2014; Schultz et al. 2015), which suggests that information on its own is not as successful in stimulating water conservation. While the majority of the respondents showed interest in incentives like free airtime, a certain amount of electricity given free of charge, and municipality agreeing to write-off water debt (Table 4), Frederiks et al. (2015) warn that the use of such measures may only motivate behavioural change for those individuals who have the least to lose or most to gain. Moreover, according to an early study by Gneezy et al. (2011), low financial incentives maybe counter-productive, as this may invariably communicate to the water user that the behaviour is not valuable, which could result in decreases in conservation. In addition, and in agreement with Allcott and Taubinsky (2015), incentives may also fail since the water user is unaware of the potential benefits of saving water.

Nudging the community may be an ideal approach towards behavioural change. According to the seminal report of Thaler and Sunstein (2008), nudging makes little changes to the decision context without restricting choices or substantially changing economic incentives, thus promoting pro-conservation behaviour. As highlighted in their report, nudges work by making the desired behaviour easier, simpler, more engaging, or more intuitive. Schultz et al. (2011) observe that installing trash bins for example, decreases littering by making disposing trash in the bin easier than littering waste. Consistent with this, this study found that nearly all the respondents agreed that installing water-harvesting facilities such as a JoJo water tank could influence positive water conservation behaviour.

Conclusion

In summary, this paper has highlighted the knowledge and water conservation practices in LCH. The study has found that awareness of the current water situation itself may not motivate good water use behaviour, which suggests that the knowledge deficit model may not be applicable in the community. As such, nudging was proposed as a strategic intervention measure. The chapter suggests that residents will be willing to engage in water conservation if they are aware of their daily water consumption. Alternatively, this study conclusively suggests that installing water-saving devices may help conserve water in the community.

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