Factors influencing water conservation behaviour amongst low-income communities in South Africa

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ABSTRACT

While economic incentives, technical developments, and government policies and regulations can all contribute to reduce residential water use, householders, on the other hand, can also help lessen overall water demands by using less water. In this study, we look at how to modify people’s behaviour to conserve water at home. Using the theory of reasoned action which suggest human behaviour is a construct of subjective norms, and attitude, this study aimed to identify the factors that influences water conservation behaviour in low-income households in South Africa. The study focused on the Waterloo Township, which is located north of Durban in KwaZulu-Natal. This study followed a positive paradigm and employed a descriptive cross-sectional research design and a quantitative survey design with a sample of (n=305). Both descriptive and inferential analysis was used to analyze and present the data. Path analysis using regression coefficient was performed to establish the factors that predict water conservation behaviour. The results suggest that although the knowledge of water conservation was high among the respondents, there was however a negative gap difference (-20.3) between their knowledge (94.4%) and actual behaviour (74.1%) towards water saving techniques. The regression analysis conducted revealed that subject norms were the strongest predictor towards water conservation intentions in the Waterloo LCH. This conclusively suggest that the conceptualisation of water conservation behaviour as a function of attitude and subjective norm may be appropriate in the context of the low-cost housing areas within South Africa.

Introduction

Water is seen as abundantly available in many parts of the world and reasonably priced for residential consumption. Nonetheless, countries globally are expected to face a 40% water scarcity by 2030 (Koop et al., 2019). Even though global consumption patterns place the greatest burden on the world’s dwindling freshwater supplies, household users may make a significant contribution to reducing total water requirements. As reported by the aforementioned study, the average daily residential water usage per person ranges from 300 litres to 575 litres per person per day in most European nations. Showering, bathing, toilets, and washing machines use the most water globally (Roshan and Kumar, 2020).

Achieving greater domestic water savings can be achieved by economic incentives, technological advancements, or governmental policies and regulations. However, householders may help lower overall water demands by consuming less water. In this paper, we focus on behaviour change as a means of increasing household water conservation.

Whilst many water conservation strategies such as water pricing, mapping of water scare areas, and codifying water practices for life cycle evaluation has been implemented to curb domestic water use, it was argued by Reddy et al. (2017) believed that conservation methods are only effective if human behavior changes fundamentally. In addition, as pointed out by Timm and Deal (2018), successful water demand management strategies involve knowledge of how individuals use water and the link between psychological

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and behavioral elements of water use. This infers that water management authorities can implement more effective and practicable water conservation techniques if they understand psychological elements such as attitude, beliefs, and social norms.

This study uses the Theory of Reasoned Action (TRA), which views human behavior as the product of rational reasoning (Marandu et al., 2010), to better understand the water conservation behavior of poor households in South Africa that receive a basic supply of free water.

As a result, it is hypothesized that better understanding towards household water conservation behavior would allow for the development of intervention methods to assist individuals in developing more ecologically friendly water consumption habits. There is limited study on domestic water consumption attitudes and behavior in South Africa, particularly households that are provided with a stipulated amount of free water as part of the government’s free basic water policy (Jacobs-Mata et al. 2018). This study explored the beliefs and attitude components, as well as subjective social norms, in connection to water conservation behavior. Attitude and subjective norms were used to test the hypothesis that water conservation behavior is predicted by attitude.

**Literature Review**

**Theoretical Background**

**Theory of Reasoned Action**

The Theory of Reasoned Action (TRA) by Ajzen (2015) has traditionally been regarded as a prominent model. The theory argues that people make behavioral judgments based on meticulous rational considerations. In this perspective, behaviour is viewed as the primary outcome of behavioural intention, which is controlled by an individual's attitude toward a certain behaviour, the person's belief about what others anticipate of them (subjective norm), and how challenging or effortless the behavioural change is believed to be. Additionally, Moura et al. (2017) believe that these intentions are shaped by the individual's attitudes toward the behavior, perceived norms about the behavior, and feelings of control over the behavior. This is illustrated in Figure 1. below.

![Figure 1: Theory of reasoned action; Source: Marandu et al. 2010](image)

In this study, TRA is useful because it allows researchers to identify beliefs and attitudes, as well as social norms and perceived control, in connection to low-income families' water conservation behavior. According to Marandu et al. (2010), the TRA is founded on the idea that human conduct is the consequence of logical thought. Its roots may be traced back to a number of scientific breakthroughs in the field of social psychology, which sought to identify, among other things, why and how attitudes influence behavior. More so, Haggar (2019) contends that the primary component of the theory is intention, a motivating idea that is seen to be the most deciding aspect of behaviour. Haggar (2019) defines intention as a consequence of attitudes and subjective standards. Subjective norms, on the other hand, imply the perceived social obligation to follow this behavior or not, according to Montano and Kasprzyk (2015). Water conservation behavior is considered to be preceded by attitudes and subjective norms. Although Fishbein and Ajzen (2011) portrayed norms as entirely subjective, this position has subsequently been abandoned (Gold 2011). In fact, norms are currently conceptualised in two ways: injunctive norms (inferring what important others want us to do) and descriptive norms (inferring what important others want us to do). TRA is defined by three constructs: behavior, attitude, and subjective standards.

**Behaviour, attitude and subjective norms constructs of TRA**

It has been found that the behavior, attitude, and subjective norms may be used to predict behaviors such as water conservation, ecological practices, and driving offences (Untaru et al. 2016; Paul et al. 2016).

**Behaviour construct of TRA**

Montano and Kasprzyk (2015) recognise that behaviour usually, but not always, reflects established attitudes. The behavioral intention which basically defines the actual behaviour (Ajzen 2015; Rivis and Sheeran 2003), is an additive feature of two variables: attitudes which may constitute a positive or negative evaluation of the performances of one’s behavior, and subjective norms which...
is the perceived influences others have on your actions. For example, Albarracin et al. (2017) argue that marketing and election organizations are both focused on the assumption that behavior reflects attitude. This is in line with Adeleh and Eleyab (2021), who observed how marketing campaigns modified customer behaviour through the effective use of innovative marketing techniques to either improve or deter their current behaviour. The work of the aforementioned authors suggests that social marketing is in fact "selling" attitudes which sublimely affects the subsequent behaviour. As such, it can be considerably assumed that an individual who firmly believes in the value of water conservation would more likely practice its conservation consistently.

**Attitude construct of TRA**

Darwin defined attitude as a “direct or dynamic impact on individual reaction to all objects and situations” (Marandu et al. 2010: 90). Behaviours like this might be vocal or non-verbal, Darwin noted. This tri-component model is the modern version. According to Lee et al. (2019), three factors impact attitudes and behaviors: cognitive, affective, and conative. The cognitive component says that to form an attitude towards any product or subject, one needs have knowledge (sometimes called belief) about it. The degree to which a person evaluates an object as “favourable” or “unfavourable”, “good” or “bad”, the author claims that the emotional component is the consumer’s appraisal of beliefs or knowledge about a product. The conative component is the inclination of an individual to perform or behave in a certain manner in respect to a product. Customers are more likely to buy products or behave in particular ways. The prevailing view that attitude and behaviour are interrelated is taken into consideration in this study.

**Subjective Norms construct of TRA**

Individuals in a social setting can impact one’s behaviour intentions, according to Chaudhary et al. (2017). Chang (2013) adds that this includes influence from others like friends, family, acquaintances, or business partners. Subjective norms represent a person’s sentiments about the social pressure they feel to do a certain action or not. Intentions are more likely to be favorable when a customer has positive subjective norms toward a behavior. According to Khare (2015), subjective norms and intents are positively linked. This suggests that people are more likely to recycle when they believe their significant others support them. In this study, respondents were asked to evaluate if individuals close to them, such as family, friends, and the municipality, would approve or disapprove of their actions, and whether they would change their behavior.

**TRA and water conservation**

Yazdanpanah et al. (2015) and Mango et al. (2017) comment that there is a lack of academic attention to household domestic water conservation behaviour particularly in arid and semi-arid areas of developing nations. Shackleton et al. (2015) reiterate that water scarcity is a vital factor inhibiting sustainable social and economic development in sub-Saharan Africa and across the world. A study by Martos et al. (2016) believes that by understanding residential water conservation behaviour, an effort can be made towards designing intervening measures that help individuals develop more environmentally friendly water consumption behaviour.

In light of the above literature, a summary of four studies conducted between 2010 and 2017, which are related to the theoretical framework underpinning this study, are highlighted below.

**Study 01: Marandu et al. (2010)**

This study examines the power of the TRA to explain residential water conservation in Botswana. The research was considered timely because Botswana was in the midst of an unprecedented water crisis. In July 2007, the Gaborone dam’s water levels dropped significantly, when it contained water to last about four months. In response, the Government called on its citizens to familiarise themselves about water conservation.

Botswana, considered a semi-arid country afflicted with a drought prone climate, has only about 10% of the cultivable land. There is a shortage of surface water, and the main surface reserves are situated long distances from the demand areas. As a result, there are high costs associated with the use of available surface water resources. At present consumption levels, Botswana’s water supplies are expected to be depleted between 2028 and 2035.

The authors believe that policy tools, such as regulations, pricing and awareness campaigns, can help influence water use and conservation. In light of the above, a survey was conducted with 462 respondents residing in Gaborone which has a population of 186 007 people.

Data were obtained mainly at the Botswana Water Utility Collection Points in Gaborone from customers that were waiting to pay their water account. The questionnaire contained 13 questions that assessed knowledge and behavior with respect to water conservation practices, 7 behavioural belief strength statements, 7 outcome evaluation statements, 5 normative beliefs, 5 motivations to comply statements, and 1 intention statement. The study found that the two theoretical constructs (attitudes and standards) were statistically important predictors of conserving water. Secondly, the findings have validated previous work that attitude is a bigger factor in order to understand water conservation behavior.

Third, given statistical significance, the research revealed very low explanatory power for attitudes and norms. The implications for policy makers are that messages on conserving water should seek to change attitudes and norms. The research was important since most water studies in Botswana focus on water supplies and resource demand forecasts. The survey undertaken was important as it
examined residential water conservation behaviour and it was the first analysis to apply the Theory of reasoned action in the Botswana water context.

**Study 02: Chang (2013)**

This research, based on a questionnaire survey, analyses factors that affect the water conservation behavior of urban residents in Zhangye City, China. Zhangye City is located on the upper catchment of the Heihe River, which is China's second largest inland river, and has a population of 200,000. The climatic conditions at Zhangye are hot and dry, with 140 mm of annual precipitation compared to 1400 mm of annual evaporation making this area water scarce.

A survey was conducted with 900 participants during a public holiday from October 1–7, 2010. The target population were local visitors to the Zhangye Central Square and the northern Ganquan Park, as well as participants selected from three residential areas. The questionnaire included water conserving behaviour related to tooth brushing (using a glass), bathing (turning the water tap off after soaking), dishwashing of vegetables (filled the sink with water and then turned off the faucet), washing of clothes (washing with hand for little loads), re-using of water from the washing machine and the bathtub. The main findings in the study indicate that the beliefs of participants regarding local water supply have impacted their behaviour and attitude towards practicing water conservation habits. Significantly, while the findings indicated that researchers and local government representatives were worried with the current water shortages and its effect on economic and urban development, many urban inhabitants remained undaunted. Their attitude was that economic and social growth did not affect them, since they were acclimated to their local living standard and, as such, no intention was required on their part to improve it.

It was further found that majority of the urban residents were only concerned with their household water supply, assuming that there was no scarcity in Zhangye water supply since there was no interruption on their domestic water source. Therefore, this study concluded that the belief in sufficient water supply can lead to water waste or a dearth of water conservation practice. This study is relevant to the current study since there is a perceived belief that water is an infinite resource and as such there is no intention to use it judiciously. This is, according to Jacobs-Mata et al. (2018) prevalent predominantly among residential water consumers.

**Study 03: Hurlimann and Dolnicar (2010)**

This survey research of 1495 people reveal that Australians are usually very positive about the conservation of water. Such positive attitudes, however, are not consistently reflective of actual behaviour. The major obstacles identified in the study to adopting water conservation behaviours are the perception of inconvenience and impracticality, and also the expenses associated with having water-saving devices.

In recent years, due to the widespread drought in many areas across Australia, the focus was on attempting to address the water problem in several ways, ranging from increasing behaviours in conserving water to reducing water demand. The results in this study illustrate the fact that, despite water conservation initiatives, there is still considerable potential to be generated in this area. Respondents were asked whether or not they agree with a series of 19 questions about water conservation. Overall, respondents display a positive attitude to water conservation with 97% saying that it is necessary to conserve water.

In addition, the majority of respondents in this study agree that water conservation is important due to water scarcity (94 percent) and that they conserve water wherever possible (92 percent). However, while attitudes towards both water conservation and energy-efficient appliances are favourable, this study shows that these attitudes are sometimes not translated into practice. The study concludes that while almost all Australians claim that water conservation is relevant, self-reported behaviours indicate that there is still a substantial room for improvement. It seems that attitudes are converted into practice where it has been easy to do so; when water conservation may not bother people.

This study is significant because it shows that although Australians are open to the idea of water conservation, it is important for water authorities to provide citizens with more knowledge to change their behaviour, as well as to provide incentives that will mitigate the economic strain and probably reduce the perceived difficulty of implementing water-saving measures in their daily lives. The study concludes that this shift of attitude can be accomplished by further implementing public policy initiatives such as financial incentives, as well as social media strategies to communicate relevant information on water-saving devices.

**Study 04: Ramsey, Berglund and Goyal (2017)**

In this study it is reported that social norms, income, age, and self-efficacy (the perception of one’s actions capacity to make a difference) have an influence on water conservation behaviours. A household survey conducted in Jaipur State in India studied the conservation attitudes and behaviours of water users and the impact of their demographic characteristics, environmental beliefs, and social pressures. Out of the 248 households, 29 houses were situated in the informal settlements. Jaipur, a semi-arid region with a population of 5 million, receives 525 mm of rain per annum. Water is supplied through the Baisalpur Reservoir which has 40 percent dependability of continuous water supply during drought conditions. At these times the supply of water is limited, and households have access to clean water at least 2 hours each day.

The study argues that policies on pricing, such as block pricing and higher tariffs, had a minimal effect on water usage given the limited capacity for local government to implement such pricing. Non-price policies (NPPs), that include awareness campaigns and
water-efficient technology rebate programs, can however reduce domestic water demands. The study further avers that the efficacy of NPPs can be partially determined through current technologies and the possible reasons of water consumption behaviour. Accordingly, majority of the respondents report having practiced at least one measure in conserving water. When water saving behavior increases in cost or commitment, its popularity decreases. The study found that turning the faucet off when brushing teeth was the most popular known-practice in 94% of households.

It was found that water-conservation behaviours requiring some degree of effort but no financial cost, such as water reuse from water filtration systems, were substantially less popular. An important finding of the study shows that conservation technology measures such as water saving devices which require financial costs but no additional effort after installation, are less common than initiatives that require effort but no financial costs. The study concluded that the most critical component of cultivating conservation habits is to standardise behaviour; that is, if people believe someone else is doing their share to conserve water, they will be more motivated to participate in conservation behaviour.

Research and Method

Research Design

Study setting

The Waterloo Township which is a low-cost housing area, situated north of Durban, KwaZulu-Natal, South Africa, is the focus area of study. Established in 1996, following the first South African democratic elections, the area houses approximately 8 000 households, all forming part of a low-income community who are beneficiaries of the governments free water policy. As this study hypothesizes that consumer behaviour, such as attitude, perception, and willingness to pay for service, affects how this resource is managed, as such, a low-income housing community was chosen for this study.

Methodology

This study used a descriptive cross-sectional research design, and a quantitative research approach, which followed a positive paradigm. The choice of a descriptive research design was based on the premises that the authors had a preexisting knowledge of the phenomenon under investigation (Saunders et al. 2019). Respondents residing within the Waterloo low-costing housing area were randomly selected (n=305) using a probability sampling technique.

Study instrument

The close-ended questionnaire was used as the study instrument to elicit responses from the participants about water conservation behaviour. The questionnaire was divided into four sections. Section A focused on the demographic information. Section B centred on the respondent’s knowledge of water-saving techniques. These were measured by 11 items and with a response category of “yes”, “no”, “unsure”. Section C solicited data on the respondent’s behaviour towards water-saving techniques. This was measured by 11 items and comprised of a five-point Likert scale questions ranging from ‘5 - Never’ to ‘1 - Always’. Section D was sub-divided into three sections that measured attitude towards water conservation (2 items); water conservation intentions (2 items); and subjective norms towards water conservation (3 items). The afore-mentioned section comprised of a five-point Likert scale questions ranging from ‘5 – Strongly disagree’ to ‘1 – strongly agree’.

Data analysis

Descriptive and inferential analysis was performed to analyse the data in each section of the research questionnaire. Cronbach’s Alpha was used as a measurement for internal consistency of the research instrument. Pearson Correlation was further used to evaluate the relationship between the knowledge of water saving techniques and behaviour towards water-saving techniques. In addition, regression analysis was performed to establish the factors that predict water conservation. SPSS® Version 26 Chicago, IL, USA was used for the analysis.

Validity and reliability

The questionnaire was pre-tested for validity and reliability. Construct validity ensures that the instrument used in the measurement of the variable, should measure what it is intended to measure (Clark and Watson 2019). The questionnaire was adapted to ensure that relevant questions measuring factors contributing to water conservation were included. In order to test reliability, the Cronbach’s alpha tests were used for internal consistency and result of 0.74–0.93 showed a good internal consistency.

Ethical consideration

Before the collection of data, ethical approval was obtained from the Durban University of Technology and permission was sought from the provincial councilors in the study setting. The questionnaire was anonymised and distributed to the respondents. Informed consent, in the form of a written letter, was first sought from the respondents to indicate their willingness to be part of the study.
Results

Demographic characteristics

The demographical profile of the respondents in this study are described in Table 1. It can be seen that most of the respondents were females (51.4%), and relatively young, aged between 18-29 years (35.1%). In terms of their race, majority of the respondents indicated to be African (62.2%) and have a high school qualification (45.9%). Examining the respondents housing status, majority are renting (89.2%), and indicated to have lived in the present residence for more than 10 years (43.2%). Equally, and regarding the household income of the respondents, it was revealed that majority (59.2%) earned less than R5000 a month.

Table 1: Demographical profile of respondents

| Profile          | Frequency | Percent |
|------------------|-----------|---------|
| **Age:**         |           |         |
| 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     |
| **Race:**        |           |         |
| African          | 192       | 63      |
| Indian           | 88        | 28.9    |
| Coloured         | 22        | 7.2     |
| White            | 3         | 1       |
| **Total**        | 305       | 100     |
| **Gender:**      |           |         |
| Male             | 145       | 47.7    |
| Female           | 159       | 52.3    |
| **Total**        | 304       | 100     |
| **Education:**   |           |         |
| 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     |
| **Housing Status:** |       |         |
| Owner of property| 89        | 29.2    |
| Renting          | 216       | 70.8    |
| **Total**        | 305       | 100     |
| **Years of residence:** | | |
| < 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     |
| **Household income:** | | |
| <R5000           | 98        | 32.1    |
| R5000-R10000     | 105       | 34.4    |
| R10000-R20000    | 82        | 26.9    |
| >R20000          | 4         | 1.3     |
| **Total**        | 289       | 100     |
Differences between Knowledge and Behaviour

The gap differences between the knowledge of water-saving techniques and the actual behaviour towards water saving-techniques are given in Table 2. It was observed that the proportion of the respondents who had knowledge of water saving techniques ranged from 78% for “Use water in a glass during tooth brushing” to 100% “Tightly close taps to avoid dripping”. Overall, the total mean percentage measured for the knowledge of water saving technique (11 items) was noted to be 94.4%.

On the other hand, it was found that respondents’ actual behaviour towards water saving techniques ranged from 51.9% for “Use water in a glass during tooth brushing” to 97.7% for “Tightly close taps to avoid dripping”. The average mean percentage measured (11 items) for the actual behaviour was 74.1%.

It was also observed that there is a negative gap difference (-20.3) measured between the respondent’s behavior and their knowledge of water saving techniques and the difference is statistically significant (P<0.05).

| Table 2: Gap differences between knowledge and behaviour towards water saving technique |
|---|---|---|---|
| 1 | Tightly close taps to avoid dripping | 100 | 97.7 | -2.3 |
| 2 | Turning tap water off during tooth brushing | 97.7 | 64.8 | -32.9 |
| 3 | Repairing leaking pipes or reporting them to landlords | 99 | 92.7 | -6.3 |
| 4 | Use water in a glass during tooth brushing | 78 | 51.9 | -26.1 |
| 5 | Turning the showers off while soaping | 95.7 | 62.9 | -32.8 |
| 6 | Save water when washing a car: by using a bucket or putting spray nozzle on the end of your hose to prevent the hose from continuously releasing water | 97 | 76.8 | -20.2 |
| 7 | Washing vegetables using water put in a basin or sink rather than under flowing tap water | 95.7 | 74.1 | -21.6 |
| 8 | Reusing water: for example, watering plants with used water | 97.4 | 71 | -26.4 |
| 9 | Collecting rain water for uses around the house | 96.4 | 75.7 | -20.7 |
| 10 | Watering gardens or plants during the evening or night | 92.1 | 67.7 | -24.4 |
| 11 | Flush sparingly; for example after urinating one does not have to do the whole flush. | 89.5 | 80.3 | -9.2 |
| Average score | 94.4 | 74.1 | -20.3 |

The Pearson correlation coefficient was further used to support the results in Table 2. As shown in Table 3, it can be gathered that knowledge of water-saving techniques correlate positively with actual behaviour towards water-saving technique (r=0.644; P=0.033).

| Table 3: Pearson Correlation |
|---|---|---|
| Knowledge of water saving technique | Behaviour towards water saving technique |
| Knowledge | Pearson Correlation | Sig. (2-tailed) | N | Behaviour | Pearson Correlation | Sig. (2-tailed) | N |
| Pearson | 1 | .644* | 11 | 11 | .644* | .033 | 11 |

* Correlation is significant at the 0.05 level (2-tailed).
Attitudes, subjective norms, and intentions on water conservation

Attitude towards water conservation

The mean, standard deviation, and Chi-Square of the respondent’s attitude towards water conservation are given in Table 4. The mean values for the two statements measuring attitude are less than 2. This means that the respondents “strongly agree” with the two statements which refers to I don’t have the right to use any amount of water whenever and however I want to (73.8%; M=1.52); and I don’t believe the recent rainfall has made up for any previous water shortages in my area (72.1%; M=1.53). Based on the level of significant indicated in Table 4, the Chi-Square test suggested that there was a statistically significant scoring pattern for two the statements (P<0.01).

| No. | Likert scale | Mean | Std. | Chi-Square test | P-value |
|-----|--------------|------|------|-----------------|---------|
| I don’t have the right to use any amount of water whenever and however I want to | 305 | 1.52 | 1.00 | 26.505 | 0.000 |
| I don’t believe the recent rainfall has made up for any previous water shortages in my area | 305 | 1.53 | 0.983 | 27.132 | 0.000 |

Subjective norms on water conservation

The mean, standard deviation, and Chi-Square of the influence of subject norms on water conservation are given in Table 5. The mean values for the three statements measuring the influence of subjective norms on water conservation were less than 2. This means that the respondents “strongly agree” with the three statements which refers to My family members want me to save water (79.3%; M=1.24), My friends want me to save water (78.6%; M=1.25), and the municipality wants me to save water (84.3%; M=1.17). The results also suggest that the 3rd statement has the most support. Based on the level of significant indicated in Table 5, the Chi-Square test suggested that there was a statistically significant scoring pattern for three the statements (P<0.01).

| No. | Likert scale | Mean | Std. | T-test | P-value |
|-----|--------------|------|------|--------|---------|
| My family members want me to save water | 305 | 1.24 | 0.520 | 41.773 | 0.000 |
| My friends want me to save water | 305 | 1.25 | 0.525 | 41.627 | 0.000 |
| The municipality wants me to save water | 305 | 1.17 | 0.399 | 51.049 | 0.000 |

Water conservation intentions

The mean, standard deviation, and Chi-Square of the influence of subject norms on water conservation are given in Table 6. The mean values for the two statements measuring water conservation intentions were less than 2. This means that the respondents “strongly agree” with the two statements which refers to It is important to save water (93.8%; M=1.06), and I am concerned about the future availability of water (84.9%; M=1.16) The results also suggest that the 1st statement has the most support. Based on the level of significant indicated in Table 6, the Chi-Square test suggested that there was a statistically significant scoring pattern for three the statements (P<0.01).
Table 6: Respondents water conservation intentions

|                                | No  | Likert scale | Mean | Std. | T-test value | P-value |
|--------------------------------|-----|--------------|------|------|--------------|---------|
| It is important to save water  | 305 | 93.8%        | 6.2% | 0%   | 0%           | 1.06    |
| I am concerned about the future availability of water | 305 | 84.9%        | 14.4%| 0.7% | 0%           | 1.16    |

Likert scale= SA-Strongly Agree; A-Agree; D-Disagree; SD-Strongly Disagree

P<0.01

Predictors of water conservation

Part of the inquiry of this study was to determine the predictors of water conservation. As a consequence, factors like subjective norms (My family members want me to save water; My friends want me to save water; The municipality wants me to save water), and attitude to water usage (I do not have right to use any amount of water whenever and however I want to; I do not believe the recent rainfall has made up for any previous water shortages in my area), were measured as the independent variable to predict water conservation (It is important to save water; I am concerned about the future availability of water in my area).

The multiple regression analysis of water conservation predictors given in Table 7. The F test revealed a significant difference in the model. The regression coefficient (r=0.549) suggests a strong causal relationship in the predicted model. The standardize beta coefficients for subjective norms (0.465), and attitude (0.144) revealed a significant relationship exists between the two predictors and the predicted (water conservation intentions). The R^2 values measured suggests that there was a good explanatory power (30%) for the predictors in the model. Overall, beta coefficient measured for subjective norms (0.465) was stronger when compared against attitude (0.144), and knowledge (0.025) in explaining water conservation behaviour.

Table 7: Multiple regression on predictors of water conservation

| Predictor        | F-value | P-value | R     | Beta coefficients | R Square | Predicted          | P-value |
|------------------|---------|---------|-------|-------------------|----------|--------------------|---------|
| Subjective norms | 43.22   | 0.000   | 0.549 | 0.465             | 0.302    | Water conservation | 0.008***|
| Attitude         |         |         |       | 0.144             |          | Intentions         | 0.000***|
| Knowledge        |         |         |       | 0.025             |          |                    | 0.628*  |

P* >5%; P*** <1%

Implications and Discussion

According to Reddy et al. (2017), behavioural sciences can advance conservation by systematically identifying behavioural barriers to conservation and how to best overcome them. The purpose of this study was to identify the beliefs and attitude components, and subjective social norms in relation to the behaviour of conserving water in low-income households. In line with several other studies (Marandu, Moeti and Joseph 2010; Montano and Kasprzyk 2015; Moura et al. (2017), TRA was used as the underlining theory to guide the study. Based on the study finding, the hypothesis was accepted as both subjective norms and attitudes predict water conservation behaviour (P<0.05).

Overall, it was found that the knowledge of water conservation techniques (94.4%) was significantly higher than the actual behaviour (74.1%) towards water-saving techniques (P<0.05). The gap difference (-20.3%) measured between knowledge of water-saving techniques and actual behaviour towards water-saving techniques may perhaps be attributed to the provision of the 9kl of free water under the FBWP policy. According to van Wilgen and Wannenburgh (2016) low-income housing areas are recipients of the FBWP and are only liable for the amount used after exhausting the stipulated amount of 9kl. Their study argues that because the first 9kl of water was free of charge, householders were not keen to pay for the extra amount of water they consumed thus contributing to the culture of non-payment of water services.

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). 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 (Mavundla 2016).
While it is reasonable to agree that access to safe drinking water is a basic human right and highly essential to people’s health and wellbeing (Rodina 2016), the finding from the this suggests that the efficient use of water resources in Waterloo may present a major concern for water utilities and authorities. Moreover, and contrary to the report that knowledge of water conservation ultimately results in the adoption of sustainable attitudes and behaviours (Seyranian et al. 2015), the negative gap results in Table 2, however, suggest that actual knowledge of water-saving techniques does not translate into behaviour towards water-saving techniques. This finding is also in direct disagreement with the popular notion that people are disinclined to engage in pro-environmental behaviour because of a knowledge deficit (Heeren et al. 2016), as it reveals that knowing about water-saving techniques does not translate to actual behaviour towards saving water.

Early studies have shown that the personal beliefs were most likely to play an important role in decisions relating to water conservation (Marandu et al. 2010; Untaru et al. 2016), the regression coefficient evidently confirmed that subjective norms perform better than attitude in explaining behaviour towards water conservation (Table 7). This could be attributed to the concept of collectivism formed amongst social groups. For example, Chang (2013) argues that the water conservation behaviour of the older members in the family can serve as an example for the rest of the family. However, Fielding et al. (2016) in their study, found that attitude is a better variable than subjective norms in explaining water conservation behaviour. The difference between these studies may be associated with other factors that could potentially moderate behaviour, such as difference in culture, situation factors, and type of behaviour (Marandu et al. 2010). Resonating further, Reddy et al. (2017) notes that the factors that influence human behaviour are complex. Understanding these complexities will be of particular importance in formulating measures that would invariably encourage the doctrine and practice of water conservation amongst the Waterloo residents. Reddy et al. (2017) resonates with the claim made by Bennett et al. (2017) that a better understanding of the human or social dimension of environmental issues can improve conservation.

Conclusion

In summary, this paper provides an explicit insight on factors influencing water conservation behaviour amongst respondents living in the Waterloo low-cost housing area. The findings showed that the two explanatory factors namely: attitude and subjective norms were statistically significant predictors of water conservation behaviour. It can be inferred that the conceptualisation of water conservation behaviour as a function of attitude and subjective norm may be appropriate in the context of the Waterloo area. This may help municipalities develop more effective and sustainable water conservation approaches in these communities. Furthermore, knowing and understanding the behaviour of water consumers in such areas where there is high consumption, can enable a more proactive approach to water demand management. This may in fact serve as the building block towards the development of sustainable intervention plans that can lead to a significant decrease in domestic water consumption.

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