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Practices and Barriers of Water Use Efficiency in the Federal Capital Territory, Abuja, Nigeria

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ABSTRACT: The fast rate of population growth and increased urbanisation has exacerbated the domestic water supply problem in the Federal Capital Territory, Abuja; Nigeria. This study examines water use efficiency practices and the barriers inhibiting it among residents of the Federal Capital Territory, Abuja, Nigeria using appropriated standard techniques. Data obtained shows that about 70% of respondents say they turn off the public tap whenever they see water dripping from them unattended, more than 50% admit to being agents advocating water use efficiency in their communities and more than 40% consider water-saving appliances when they make purchases of domestic appliances. The inhibitors to water- use efficiency in the study area, include a poor grasp of sustainability principles and cultural beliefs that promotes the idea of inexhaustible water resources; lifestyles that do not promote water use efficiency; and the inclination to only use water efficiently when it in short supply or when the price of water rises. Residents of the Federal Capital Territory should be made to understand their roles in efficient use of water and embrace sustainable water use.

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Rapid population growth and increased urbanization are among factors responsible for high fresh water demands, which has created the problem of water scarcity in many regions of the world (Lenzen *et al.*, 2013; Besada and Werner, 2015; Kaur and Mahajan, 2016). In response to the increased water demands, governments around the world have invested considerable resources in developing and expanding water supply infrastructure. However, investments in water supply systems have not mitigated the threat of water shortages as shown in many studies (Seckler, 1998; Abubakar, 2011). Essentially, there are two paths to water management: supply management and demand management. The supply management approach focuses on increasing water supply to people through the provision of water infrastructures such as dams, reservoirs and treatment plants (Christian-Smith *et al.*, 2012; Wutich *et al.*, 2014). On the other hand, demand management according to the United Nations Human Settlements Programme refers to the "implementation of policies and/or measures, which serve to control or influence the amount of water used and thereby lead to improved efficiency in production, transmission, distribution and use of water" (UN-Habitat, 2006). The water demand management approach primarily focuses on water use efficiency and water conservation, which are strategies to reduce water demand and increase the productivity of water (Brandes and Maas, 2009). The UN supports the implementation of water management going forward given its strong sustainability credentials (UN-Habitat, 2006). The Federal Capital Territory (FCT), Abuja; is the administrative capital of Nigeria and has a very high population growth, which is estimated to be as

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high as 20-30% in some areas (Jibril, 2006 cited in Ezeah, 2010). The population of FCT which was 1,406,239 in 2006 increased by more than one hundred percent to 3,195,116 in 2015 (National Bureau of Statistics, 2016). The population growth, which has also led to rapid urbanisation in the territory has further increased the water demand in the area resulting in water supply problems. It was estimated that only 14.4% of households in the Federal Capital Territory were being served by public mains in 2012 (National Bureau of Statistics, 2012). The use of supply management by the government, which focuses on expanding the water network in the FCT has neither tackled adequacy shortfalls nor brought about a comprehensive coverage (Abubakar, 2011; Acinwu, 2021). The United Nations states that Nigeria is suffering from economic water scarcity (UN, 2012); occasioned by poor access (low investments and lack of human capacity to satisfy demand) even though water as a natural resource is abundant. Therefore, there is a need to consider other approaches to water management in the FCT and promote sustainable water use. Water demand management has the potential of expanding coverage by utilising the current water stock in the FCT. This potential is very important as it presents a cheaper alternative to water expansion in the FCT and a huge leap forward in water use efficiency. While water use efficiency is being promoted by water agencies and international organisation given an increasingly water-stressed world, there are significant barriers. Therefore, this study evaluates the water use efficiency practices in Abuja FCT and examine the barriers to adoption of water-use efficiency.

MATERIALS AND METHODS

Reconnaissance Visit to Study Area: The data collection involved reconnaissance visit for face-to-face interview and structure questionnaire administration. During the reconnaissance visits, selection of wards from within the six Area Councils was done. Four wards were randomly selected from each Area Council that makes up the Federal Capital Territory, Abuja (see Figure 1). Then, systematic sampling was adopted as described and outlined by Etikan and Bala (2017). From four out of the six of the Area Councils (Abaji, Bwari, Kuje and Kwali), two participants were chosen while from the two most populous Area Councils, Gwagwalada and AMAC, four and five participants were selected respectively. A total of seventeen (17) participants were engaged in the face-to-face interviews.

Sampling and Sample Collection: A total of six hundred and seventy-six (676) structured questionnaires were administered in the sampling area, out of which six hundred and forty-nine (649) were retrieved.

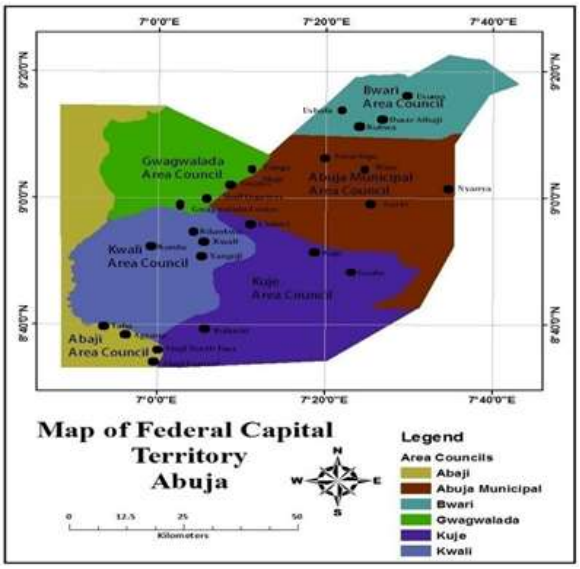

Fig 1: Study Area and Location of Wards for the Administration of Questionnaire

Data Analysis: The Statistical Package for the Social Sciences (SPSS) V23.0 and Microsoft Excel software was used to analyse data obtained from the field, using descriptive measures: range, frequency and percentage. The audio recording of the face-to-face interviews produced qualitative data, which was transcribed and analysed using Nvivo software to know the common themes in the data produced.

RESULTS AND DISCUSSIONS

Demographic Characteristics of the Sample: The majority of the respondents (62.1%) are males, this high participation rate for males reflects the cultural practises in many homesteads which are primarily patriarchal, and hence, women are not as accessible as men. This cultural influence on gender participation in the study is evident in Area Councils that have a relatively high concentration of locals that are predisposed to this cultural behaviour where access to the opposite sex is restricted. The respondents who are aged between 25 – 45 years account for 64% of the participants in the study (Table 1). People in this age group are usually among the most active in domestic and physical activities in the communities. In addition, this age range (25 – 45 years) is made up of people with young families, who as heads of households have a significant say in the use of water in their homes. This implies that most of the data were obtained from the component of the population that are most active and are in a position to give valuable insight into the issues under investigation. The National Bureau of Statistics (2012) estimates that the average family size

in the FCT is 4.5 persons per household. The data corresponds to the NBS, as the household sizes from this study reveal a median of five persons. The majority of the respondents surveyed (96%) have a form of formal education. Over 66% of the respondents have at least a Diploma. This is expected as the Federal Capital Territory enjoys relatively good quality educational facilities. The prevalence of educational institutions is reflected in the high literacy rate of young people between the ages of 25 -45 years (82%) in the FCT as against the national average literacy rate of 66.7% (National Bureau of Statistics, 2017). It, therefore, means that a very proportion of the respondents being literate are capable of comprehending the issues being asked and are more likely to give reliable answers to the questionnaire items.

Table 1: Respondents' Demographics

		Frequency	Percent
Gender	Male	403	62.1
	Female	246	37.9
	Total	649	100.0
Age	18-24years	141	21.7
	25-35years	261	40.2
	36-45years	149	23.0
	46-55years	68	10.5
	over 55 years	30	4.6
	Total	**649**	**100.0**
Household Size	1-3	247	38.1
	4-6	232	35.7
	7-9	102	15.7
	10-12	45	6.9
	over 12	23	3.5
	Total	**649**	**100.0**
Highest Education Attained	No Formal education	26	4.0
	Primary/Secondary school	181	27.9
	Diploma/NCE	191	29.4
	First Degree	191	29.4
	Masters	43	6.6
	Others	17	2.6
	Total	649	100.0

Water use Efficiency Practises in the FCT: Water use efficiency in households: In the items included in the questionnaire, the daily behaviour of the respondents is examined to determine if they were in tandem with efficient use of water. First, the respondents were asked if water-saving devices were chosen over other types of devices when making purchasing decisions through the statement "I consider water-saving devices when making my purchases". The responses show that 41.9% of the respondent affirmed that they consider water-saving devices in their purchases. In the interviews, respondents that dissented (58.1%) said cost and ease of use of the equipment are the primary concerns when purchasing water appliances. Furthermore, interviews with respondents revealed that many do not consider the long-time economic cost of owning water-saving appliances or devices (even if their efforts at efficient water use were driven by economic costs) but consider the short-term gains such as the initial set-up costs of the devices they are purchasing. Water wastage could be reduced during domestic activities like showers and washing. In the study, only about one-third (34.2%) of respondents do not let the water run all the time when taking shower; this practice helps in reducing the quantities of water used. However, the majority of respondents (65.8%) allow water to run thus using up fresh water that would otherwise be conserved. Efficient water use, where the toilet is not flushed after every use was not commonly practised. The statement 'I do not flush the toilet after every use' has less than one-tenth (7.5%) of respondents, responded in the affirmative. It thus shows that even in cases where the respondents urinate and it is slightly yellow, a full toilet flush is still used as shown by the majority of the respondents (92.4%). A contrary finding was observed in Dolnicar and Hurlimann's (2010) study, where 85% of the respondents admitted to minimising toilet flushing, hence helping to cut down water use in their households. During the rainy season, gardens do not require irrigation, however, the survival of garden plants during the dry season is dependent on irrigation. This practice if embarked upon on daily basis increases the water use of households. Table 1 shows that a little more than three-quarters (78.3%) of the respondents do not water their garden daily during the dry season. The result is comparable to 68% of respondents from Gilbertson *et al*.'s (2011) survey. The proportion of respondents that carry out daily irrigation of the garden in this study was 21.7% of the total respondents. Community social-responsibility: Dripping taps is a major source of water loss. In many cases, public taps are not properly shut and hence continue to drip water and incur losses. Sometimes, mechanical failures cause incomplete shut-off taps leading to water loss. Because the majority of these losses are outside the scope and reach of water authorities, the remedy to the situation depends on the action of the public. The majority (69%) of the respondents affirm that they turn off public taps that drip unattended, while the remaining respondents (31%) do not engage in this social responsibility that would reduce water loss and promotes efficient water use (see Table 2). The action of turning off public taps that drip by the majority of the respondents is an indication of the value attached to water. The result in this study is comparable to what Dolnicar and Hurlimann (2010) found in their study, howbeit, their figure was much higher at 98%. The drive for water use efficiency is best citizen-driven. When citizens recognise the need for efficient water use, they are

more likely to respond and implement measures required without coercion and also encourage other people to adopt similar water use efficiency practices. In the study area, more than half (52.1%) of the respondents engage in advocacy for water use efficiency, an indication that with the right outcome more residents of the study area are expected to embrace efficient water use practices. Advocacy can help counter strong opposition to the regulation of the use of natural water and reduce fresh water withdrawal in the territory.

Table 2: Practises that Promotes Water use Efficiency in the FCT

		Frequency	Percent (%)
Water use efficiency in households			
I consider water-saving appliances when I make purchases of domestic appliances	Yes	272	41.9
	No	377	58.1
	Total	**649**	**100.0**
While taking a shower, I do not let the water run all the time	Yes	222	34.2
	No	397	65.8
	Total	649	100.0
I do not flush the toilet after every use	Yes	49	7.6
	No	600	92.4
	Total	**649**	**100.0**
I do not irrigate my garden every day during the dry season	Yes	141	21.7
	No	508	78.3
	Total	**649**	**100.0**
Community Social-responsibility			
I turn off the public tap when I see water dripping from them unattended	Yes	448	69.0
	No	201	31.0
	Total	**649**	**100.0**
I advocate water –use efficiency in my community	Yes	338	52.1
	No	311	47.9
	Total	**649**	**100.0**

Barriers Impeding Domestic Water use Efficiency: Barrier arising from cultural beliefs and poor grasp of sustainability principles: The proportion of respondents who falls within the group that sees water as an inexhaustible resource is 45.5%. This figure is much higher than those who have a contrary perception (32.8%). This perception of water being inexhaustible would negatively impact their readiness to adopt water use efficiency practices. Some participants in the face-to-face interview, who falls in the category of people who feel water is inexhaustible feel that what they need to worry more about is the cost of extraction of freshwater when more readily available sources such as wells and rivers dry up. While a few others find comfort in religious and cultural beliefs that the water cycle is inexhaustible because it is "God-given" and such a vital resource is therefore limitless. The prevalence of large bodies of water in the FCT; and the different sources from where freshwater is sourced assure some residents that fresh water can never be exhausted. Along with the poor grasp by residents of the precarious state of water resources in the FCT, the principles of sustainability are lost to residents. All of these give a false sense of perpetual freshwater availability.From the analysis in Table 3, slightly more than half (51.8%) of respondents concur that their actions can contribute to water shortage, while the remaining respondents are made of 27%, did not think their actions contribute to water shortage and 21.2% were ambivalent. The proportion of the respondents who did not connect their action to water shortage indicates the proportion of respondents who have not fully understood their role in sustainable water use. This stance would be an inhibitor to efficient water use practices in the FCT. Barrier arising from respondents' lifestyle: Water supply from the mains is not completely reliable in Abuja. Furthermore, groundwater availability, in many instances varies with the seasons. In the rainy season, the water supply improves as the groundwater is recharged and the wells and boreholes have relatively good yields. During such times rainwater harvesting complements other water sources. However, in the dry season, the water table drops and water yields from wells and boreholes reduce. Also, there is an increased demand for the public mains supply to complement the dwindling output of groundwater. Table 3 shows that about two-thirds (76.8%) of respondents in Abuja say that they reduce the quantities of water they use when water is in short supply. However, 11% of respondents say they do not, while 12.2% were ambivalent. The result indicates that for most respondents, the willingness to reduce water use is associated closely with water availability. The implication of this is the unrestrained withdrawal from groundwater sources and increased use from the main when the inhabitants of the Territory feel water is in ample supply, and this affects water stock in the long run. Barrier arising from unmetered water services and low water price. Water price varies through the

year in the FCT (except for public mains), the noticeable price increase is observed during water scarcity which coincides with the dry season. The resultant effect is a decrease in the quantity consumed. Table 3 shows that 47.5% of the respondents' water use is not dependent on environmental considerations but rather on economic reasons such as water price (particularly during dry periods). This result indicates that the use of price as a way of incentivizing efficent use of water could be explored by the government, however, the pricing must not be such as to make the water too expensive for an average citizen as that would be perceived as working against the welfare of the masses. In the FCT water meters are not widespread, rather people are billed a flat rate regardless of the quantity of water consumed. This tendency works against efficient water use, unmetered freshwater supplied by the municipal services is overused as there is no incentive (such as price) to save water.

Table 3: Barriers to Efficient Water use in the FCT

Barriers		Responses					
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	**Total**
Cultural beliefs/ Poor Sustainability Principles: The water supply can never be exhausted.	Frequency	63	150	141	220	75	**649**
	Percent	9.7	23.1	21.7	33.9	11.6	**100**
My actions can contribute to the shortage of water in the FCT	Frequency	46	129	138	246	90	**649**
	Percent	7.1	19.9	21.2	37.9	13.9	**100**
Lifestyle: When water is in short supply, I reduce the quantity I use	Frequency	26	46	79	360	138	**649**
	Percent	4.0	7.0	12.2	55.5	21.3	**100.0**
Economic barrier: The quantity of water I use depends on the cost	Frequency	49	154	138	229	79	**649**
	Percent	7.6	23.7	21.3	35.3	12.2	**100**

Conclusion: The study found that economic reasons rather than environmental reasons drive efficient use of water. The implication of this is that water use of citizens are likely to shift based on the socio-economic levels of people living in the FCT, irrespective of the environmental needs of the moment and the increased global advocacy for sustainable water use. There is a need for a comprehensive public awareness programme on the themes of sustainability, efficient use of water and the state of water supply so that people can make informed decisions about these issues and imbibe sustainable water use.

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