WATER DEMAND MANAGEMENT IN THE FEDERAL CAPITAL TERRITORY, ABUJA-NIGERIA: A SURVEY OF PUBLIC ATTITUDES TOWARDS WATER CONSERVATION

BY

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ABSTRACT

The Federal Capital Territory, Abuja-Nigeria; is one of the fastest growing areas in Nigeria with its annual population growth rate presently at 9.3%. Less than one-fifth of the residents have access to public mains despite the increased investments in water infrastructures by the government. As the population continues to grow and water demand increases, more pressure is anticipated on the available water supply facilities in the territory. This study examines public attitudes to water conservation, which is a strategy for promoting water demand management. Using the Cochran formula, a sample size of 676 was obtained; and 676 households were administered the questionnaire. Completed questionnaire was retrieved from 649 households. About a third (34.1%) of the respondents who were administered the questionnaire believe water is limitless. The proportion of respondents who feel freshwater is overused was 45.6%. Approximately 47% of the respondents do not see any relationship between current water use and its availability in the future. While 60% of respondents speak about water conservation in their families, only 36.7% of respondents feel water conservation is practicable. Those who feel water conservation is not their responsibility were 39.1%. The study recommends a comprehensive public awareness campaign to counter cultural beliefs that are inimical to water conservation.

Key words: Federal Capital Territory, Freshwater, Public awareness, Water conservation, Water demand

INTRODUCTION

By 2025 an estimated 3.5 billion people will live in areas where water is scarce; despite the abundant global water stock (Getis et al., 2014). Water availability on earth is a contradiction of abundance and limitation. Only a negligible proportion (2.5%) of the total water stock of the Earth is freshwater (Gorjian and Ghobadian, 2015; Targa and Batista, 2015; Kaur and Mahajan, 2016). This low percentage means that while the world's water is an abundant resource, only a small fraction of it is usable, and this highlights water's precarious state of supply.

Globally, water demand is on the increase. In response to the increased demand, 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. Already, studies have shown that Sub-Saharan Africa (SSA) countries must develop over twice the quantity of domestic water in use today to meet future demand (Seckler, 1998). Also, the provision of water infrastructure alone cannot mitigate the

threat posed by freshwater shortages as only about a 10% - 20% reduction in threats to water scarcity is possible through investments in infrastructure (Green al., 2015). In light of this, there are growing calls around the globe for water supply management to be combined with water demand management to meet water needs (Altai, 2013).

The United Nations Human Settlements Programme refers to water demand management as 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). According to Brooks (2006) water demand management consists of the following goals: (i) reduction in the quantum or quantity of water requirement, (ii) tasks adjustments to reduce water use, (iii) reduction in water wastages along distribution network, (iv) optimising use during off-peak hours, and (v) increasing the robustness of the water system during droughts.

Water supply projects have had significant, and often unintended, social, economic, and environmental costs. For example, millions of displaced persons, loss of animal habitat, and increased ecological problems associated with water infrastructure providers such as dams, and interbasin transfer projects (Liu et al., 2013). The failures and problems induced by the supply management approach to water management have increased the call for a demand management approach; as demand management is an environmentally sustainable strategy and is suitable in the face of increasing water scarcity in the world (Gleick, 2003; Brooks, 2005; Rijsberman, 2006; Brooks and Brandes, 2011; United Nations, 2012; Adewusi, 2015). Essentially, water conservation, which is a strategy of water demand management, looks for ways to change tasks so that the use of water is reduced or eliminated. It concentrates action on demand management, to reduce the demand for water (Christian-Smith et al., 2012).

There exist linkages between attitudes of people toward water-related issues like conservation and conservation behaviour in water use (Willis et al., 2011; Makki et al., 2013; Stoutenborough and Vedlitz, 2014). Attitude is people's inclination to evaluate and react positively or negatively to their outside world (Ajzen, 1989). Researchers have identified attitude as a significant factor in conservation behaviour and can impact its effectiveness (Willis et al., 2011; Felding et al., 2012; Berenguer et al., 2013; Hong and Chang, 2014).

Despite the appeal of water demand management, it is not entrenched as a water management option in Nigeria. The usual response to the shortfalls in water provision and sustainability issues in Nigeria is to concentrate on supply management (Federal Government of Nigeria, 2011; Abubakar, 2011; Ezenwaji et al., 2015). For example, the official Nigerian Government Policy Road Map for the water sector did not acknowledge or propose demand management as an option or strategy for tackling water shortage and sustainability issues in Nigeria. This is even though reliance on supply management has failed to address sustainability issues in water management (Emoabino and Alayande, 2007; Ezenwaji et al., 2015; Obeta and Nwankwo, 2015). Part of this problem is the lack of recognition of the potential of the demand management approach in contributing to the sustainable management of water in Nigeria. Water withdrawal in Nigeria during the 1990s was estimated at 28 cubic metres per person per annum (World Bank, 2003). It has been estimated that by 2030 and at the present rate of consumption and scenarios, Nigeria stands some risk of being water-stressed(Luo et al., 2015). Kano state, the most populous state in Nigeria, despite the great water investments made in water infrastructure, have the problem of water scarcity (Bello et al., 2021). There is a dire situation in the southwestern region, where many households cover more than 0.5km to access water, the region is credited as having a high water poverty index of 14.75 (Owolabi, 2012).

The Federal Capital Territory is Nigeria's administrative capital, its population growth is among the fastest in Africa. Its annual growth is estimated to be 9.3% (Abubakar, 2011; 2014). In 2006, the population was put at 1,406,239. By 2015, less than a decade after, it had doubled and was estimated to be 3,195,116 (National Bureau of Statistics, 2016). The rapid population growth and urbanisation have increased the water demand in the area resulting in water supply problems. As of 2012, it was estimated that only 14.4% of households in the Federal Capital Territory were being served by public mains (National Bureau of Statistics, 2012). The water authorities' effort at tackling the adequacy shortfalls through the expansion of the water network has not eliminated the problem (Abubakar, 2011). With the influx of people into the Federal Capital Territory, seeking better economic opportunities (Abubakar, 2011; Usman et al., 2015); and migration fuelled by insecurity in some parts of Nigeria, arising from terrorism and civil unrest (Adewale, 2016); more pressure is expected on the available water resources. Therefore, this study seeks to understand the attitudes of Federal Capital Territory residents to domestic water conservation as a means of water demand management.

THE STUDY AREA

The study area, the Federal Capital Territory of Nigeria, extends from Longitudes 6º45'E to 7º39'E and Latitudes 8º25'N and 9º20'N. It has a land area of approximately 8,000 km² and consists of six Area Councils namely; Abuja Municipal Area Council, Abaji, Gwagwalada, Kuje, Bwari and Kwali (Fig. 1). Of the six Area Councils, the Area Abuja Municipal Area Council (AMAC) is the most populated while the least populated is Abaji (Abubakar, 2014). It has a tropical continental climate, with distinct dry and wet seasons. The rainy season starts in April and ends in October with an annual amount that ranges from 1100mm to 1600mm, with the maximum monthly average being in August. The dry season extends from November to February (Tanko and Muhsinat, 2014; Ibrahim et al., 2016).

The Federal Capital Territory has several rivers and streams, howbeit, Rivers Gurara and Usuma, and their tributaries are major sources of water supply in the territory. The surface drainage traverses about three-quarters of the Federal Capital Territory. The geology of the Federal Capital Territory is made up of about 8% of igneous and metamorphic rocks of the Pre-Cambrian Basement Complex which generally have poor groundwater yield (Olugbenga and Dahiru, 2016), there are several areas where groundwater is found in sufficient quantities to support a large number of people. There is the presence of joints and fractures in the geology of the Federal Capital Territory, which is indicative of the potential for groundwater (Omada and Obayomi, 2012).

The population of the Federal Capital Territory was estimated to be 3,195,116 in 2015 (National Bureau of Statistics, 2016), and as of 2021, the FCT was estimated to have 3,464,000 people living in it (Otuchikere, 2021).
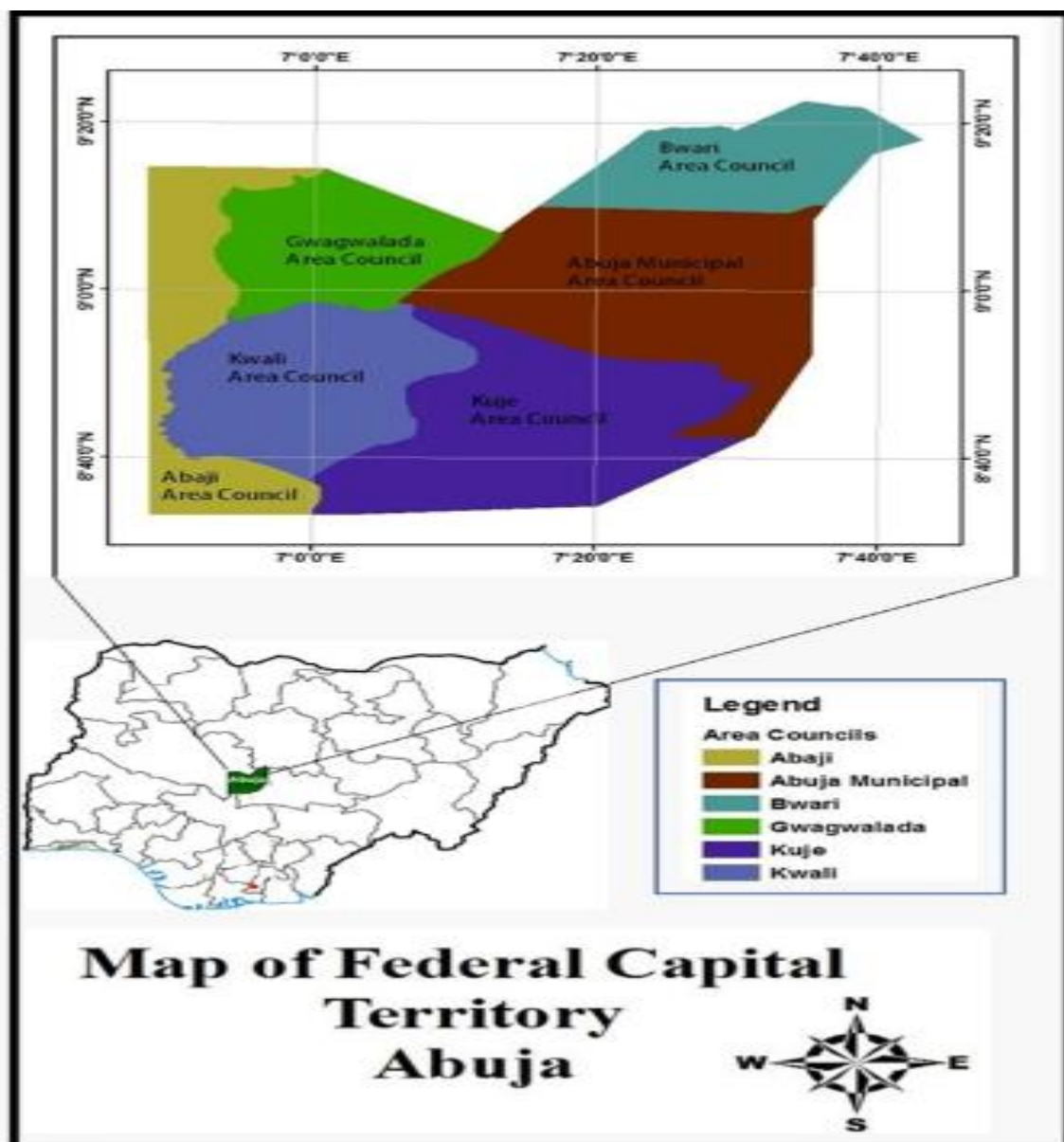
Figure 1: Administrative/Area Councils of Abuja FCT

MATERIALS AND METHODS

Sampling Technique

A multi-stage sampling technique, in which the sampling process was carried out in more than one stage, was used in this study. At the first stage of the sampling process, the selection of wards from within the six Area Councils that make up the Federal Capital Territory was carried out; where four wards were randomly selected from each Area Council. A probability sampling technique, systematic random sampling, was used in the second stage for the selection of households from the chosen ward. The steps outlined by Etikan and Bala (2017) for the use of systematic sampling, where ''only the first unit is selected randomly and the remaining units of the sample are to be selected by a fixed period''; were adopted in this study.

To determine the sample size, the Cochran(1977) formula was adopted;

$$n = \frac{p(1 - p)z^2}{e^2}$$

Where:

n = sample size

p = population proportion (p =0.5)

e = acceptable sampling error

z = z value at reliability level or significance level

Using a sampling error of 5% and significance level of .01 (z ~ 2.6), a sample size of 676 was computed for the study.

Questionnaire Administration

The questionnaire was administered to 676 households from February to March 2021. Out of the 767 administered questionnaire, 649 copies of the questionnaire were retrieved. The questionnaire had three sections (A-C), section A was on respondents' demographics, while sections B and C are the indicators of environmental beliefs and attitudes that influence water conservation. The items on environmental beliefs elicited responses on the nature of freshwater availability and use at household levels. On attitudes that influence water conservation, questions were asked on the level of water discussions in households, practicality of practicing water conservation and their roles in water conservation.

The Likert-scaled questions were recoded numerically (strongly disagree =1, disagree = 2, neutral =3, agree = 4 and strongly agree = 5).

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 techniques. The descriptive measures were range, frequency and percentage while tables and figures were used for presentation.

RESULTS AND DISCUSSION

Respondents' Demographics

The socio-demographic characteristics of the respondents are presented in Table 1 where male respondents account for 62.1% of the total respondents while females were 37.9%. The prevalence of males in participation in the data gathering process is largely due to the fact that in many homesteads, women are not as accessible as men due to cultural reasons and the common patriarchal social system in most of the communities meant males were largely the ones who responded.

About a quarter of the respondents (26.3%) are made up of the youngest age group (18-24 years) and the oldest age group (over 55 years). Close to three-quarters of the respondents, 73.7%, were aged 25-35 years, 36-45 years and 46-55 years. This age range (25-55 years) is when people are most active in domestic and physical activities. The age groups that account for close to three-quarters of the respondents are in a position to give valuable insight into the issues under investigation as they as heads of households and have a greater say in the use of water in their homes.

Table 1: Socio-Demographic Characteristics of Respondents

Characteristics		Frequency	Percent
Gender	Male	403	62
	Female	246	38
	Total	649	100.0
Age	18-24 years	141	21.7
	25-35 years	261	40.2
	36-45 years	149	23.0
	46-55 years	68	10.5
	over 55 years	30	4.6
	Total	649	100.0
Highest Education Attained	No Formal education	26	4.0
	Primary/Secondary school	181	28.0
	Diploma/National Certificate of Education (NCE)	191	29.4
	First Degree	191	29.4
	Masters	43	6.6
	Others	17	2.6
	Total	649	100.0

Source: Fieldwork, 2021

The prevalence of educational institutions in the Federal Capital Territory is reflected in the high literacy rate, with 96% of the respondents having some form of formal education. More than a third (36%) of those with formal education, had a degree (first degree and Master's). While the figures are higher than the national average (56% enrolment in secondary school and 68% in primary school) as provided by the National Bureau of Statistics (2015), in the survey conducted by the agency; it was shown that there was a steady increase in the enrolment figures for primary and post-primary education in Nigeria from 1990 to 2015.

Environmental Beliefs about Freshwater Resources in the Federal Capital Territory

Earth has been referred to as the blue planet in literature, because of the amount of water (approximately 71%) that covers its surface. However, as stated in the introduction, freshwater cannot be said to be abundant. Respondents were asked questions on water resources, as their perceptions of it could be a factor in their acceptance or rejection of the need to conserve water. About 56% of the respondents consider water as a limited resource as they strongly agree and agree on the limited nature of the resource (Fig. 2). About a third of the respondents (34.1%) see water as limitless. The follow-up interview revealed the rationale behind the responses. The prevalence of large bodies of water and the different sources from which freshwater is sourced assures them that freshwater can never be exhausted. While a few others find comfort in religious and cultural beliefs that the water cycle is inexhaustible because it is "God-given". They do not think that God would make such a resource as vital as water limited.
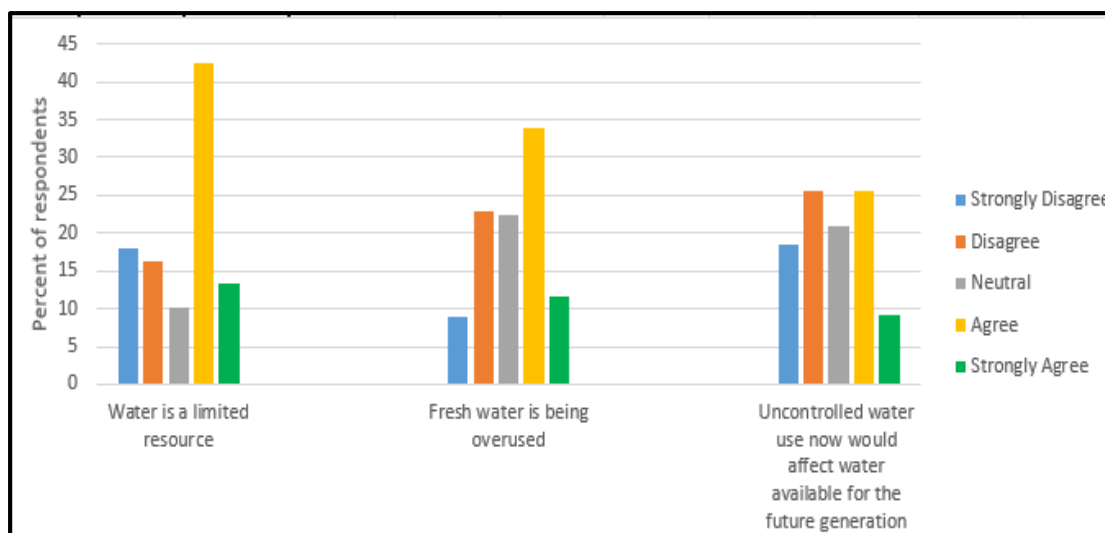
Figure 2: Respondents' Beliefs about Freshwater Resources
Source: Fieldwork, 2021

On the other hand, those that believe freshwater is limited in this study, base their observations on population explosion, pollution and the limit of technologies to counter water overuse. Similar findings were made by Brandes and Kriwoken (2006) in the study of water conservation in Canada, where the myth of abundance of water also exists, which frustrates conservation efforts. This finding is important because where there is no acceptance of the finite nature of a resource, there is a lot less incentive to conserve it. Information is key in water conservation, if people are to leave cultural beliefs that are not promoting water conservation and sustainability, this position was confirmed by Boylu and Gunay (2017), Mthethwa (2017) and Dadvar et al. (2021) in their studies which were conducted in Turkey, South Africa and Sweden respectively. They all observed that limited knowledge of water conservation and water demand management strategies among respondents negatively affected their perceptions of water demand management.

Comparatively, more respondents (45.6%), agree and strongly agree that freshwater is being overused than the proportion of respondents (32.1%) who opined that freshwater is not being overused. The affluence in some areas like AMAC and the low amount paid for freshwater (from the mains) can potentially encourage wastage. For example, some respondents believe that wastages during domestic activities like showers and washing are prevalent as people leave taps running. Conversely, in areas where there are no municipal services, and costs of accessing alternative sources are higher, people are incentivised to manage their water use and cut down wastage. Approximately, only 35% of the respondents strongly agree and agree that uncontrolled water use now, would affect the water available for future generations. A relatively larger proportion of the respondents (47.2%) do not see the relationship between uncontrolled water use now, and its effects on future generations.

The three statements that have been used to elicit responses from respondents on their environmental belief values on water resources all revolve around sustainable water withdrawal. Comparatively, more respondents' perceptions align with the fact that water is limited (56%) and freshwater is being overused (45.6%). However, they largely (47.2%) could not relate their present water use to the availability of freshwater in the future (Fig. 2).

Attitudes Towards Water Conservation in the Federal Capital Territory

The Reasoned Action Approach (RAA) model of Fishbein and Ajzen (2011) shows that attitudes (whether emotional or cognitive) cannot be measured directly but inferred through observed or reported behaviour. In this study, to examine the attitudes of respondents to domestic water conservation, they were asked to respond to the following statements: 'we talk about conserving water in my family'; 'water conservation is practicable' and 'water conservation is my responsibility'. The responses of the respondents are presented in Figure 3.
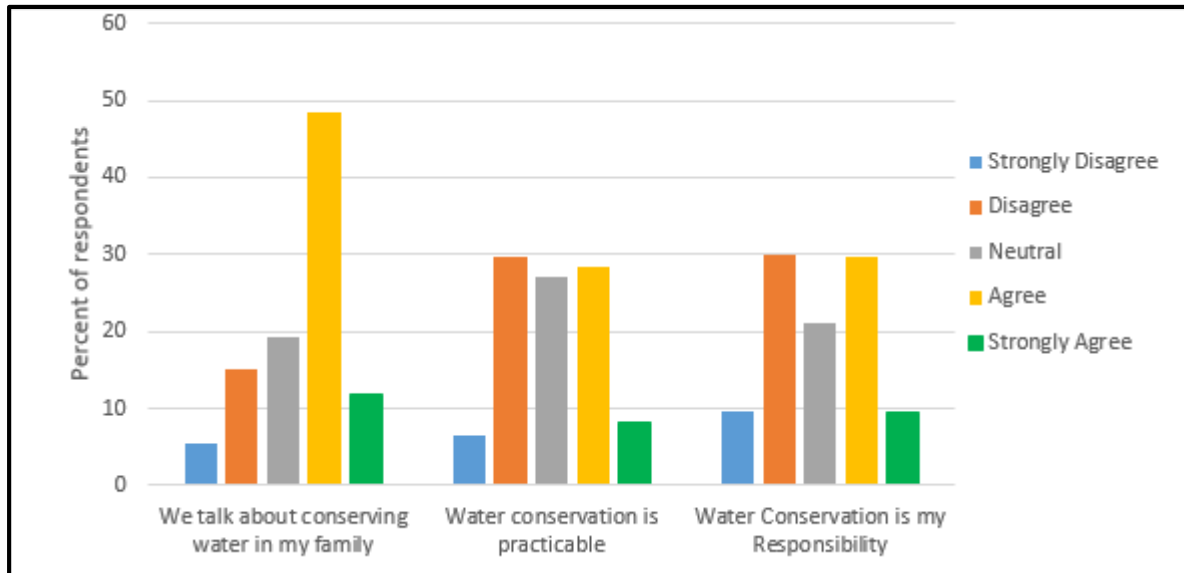

Figure 3: Indicators of Respondents' Attitudes to Water Conservation in the Study Area
Source: Fieldwork, 2021

Domestic use constitutes a significant portion of freshwater usage in the Federal Capital Territory. Therefore, conservation, if practiced, should start from practical steps taken in households. To find out how much of a topical issue water conservation is in homes, respondents were asked if conservation is a topical issue in their homes. They were asked to state the level of agreement to the statement "We talk about water conservation in my family". About 60% of respondents affirmed that they talk about water conservation in their families, while 20.5% say they do not (Fig. 3). Further enquiry revealed the pressure of living in the city was robbing them of time, hence discussions with the family were limited to what they felt were the most important things. Clearly, for these respondents, discussion on conservation is not as important as other social, economic or environmental issues. More conversation around the issue of water conservation could promote advocacy work. A similar result was observed in Dolnicar and Hurlimann's (2010) study; where a high proportion of respondents (77%) affirm that they speak and advocate for water conservation among their friends and family members.

In this study, 36.7% of the respondents feel water conservation is practicable. This figure is much lower than the 88% reported in the study conducted by Dolnicar and Hurlimann (2010) in Australia; a nation where some regions have experienced long-term drought (Allon and Sofoulis, 2006). There is very little difference in the proportion of respondents who consider water conservation as being impracticable in this study (36.2%), and those who feel water conservation is practicable (36.7%); the remaining respondents (27.1%), were ambivalent (Fig. 3). Expectedly, the perception that water conservation is practicable disposes the respondent to

embrace water conservation strategies. Conversely, those who consider water conservation to be impracticable are not likely to engage in activities that would promote domestic water conservation.

Although a comparatively high proportion of respondents (60%) speak about water conservation in their families, lower figures were observed among respondents who consider water conservation as being practicable and water conservation as their responsibility. Respondents' answers to the statement 'water conservation is my responsibility'', show that an almost equal proportion of responses for those who feel it is their responsibility (39.1%) and those who do not consider it as their responsibility (39.7%). Those who see water conservation as their responsibility are better positioned to adopt water conservation practices and promote demand management. The findings in this study run contrary to results reported in some other surveys, where many (> 50%) respondents see water conservation as their responsibility and exhibited positive attitudes towards water demand management (Dolnicar and Hurlimann, 2010; Boylu and Gunay, 2017; Dadvar et al., 2021).

CONCLUSION

In this study, which examined public attitude to domestic water conservation, it was apparent that cultural beliefs of the myth of the inexhaustible nature of water is held by many. There is a poor grasp by residents of the precarious state of water resources in the Federal Capital Territory. Also, the current socio-economic pressures and lack of awareness negatively affected how individuals prioritise issues regarding domestic water conservation.

Based on the findings made in this study, there is a need for a comprehensive public awareness programme on the themes of sustainability, water conservation and the state of water supply; so that people can make informed decisions about these issues and improve the chance of the success of water demand management in the Federal Capital Territory. Cultural beliefs that do not recognise curbing water usage and perpetuate the myth of the inexhaustibility of water can be countered through advocacy. The advocacy should be used to promote efficient water use and entrench environmental beliefs that support sustainability. Also, through grassroots community training by water agencies and Non-Governmental Organizations, residents should be made to realize the impact of their actions on available water stocks and how they can reduce their water demands at household levels.

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