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Consumer Perceptions of Water-Saving Devices in Water-Scarce Regions

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ABSTRACT

In light of climate change, population growth and urbanization, water resources are under severe pressure like never before. Many developing and even developed countries around the world have suffered from water scarcity, with more to come if no management actions take place. In response to these pressures, governments and water authorities have shifted from supply-side to demand-side policies. Pricing and non-pricing policies are the two main categories for managing the demand for water. Many studies have shown the inadequacy of pricing policies to reduce consumption due to the inelasticity of demand related to price. Hence, the trend in managing water resources has focused on non-pricing policies. Of these is the installation of water-saving devices, which can save up to 50% of water consumption. To date, remarkably, studies on the adoption of such devices are limited. This is attributed to the fact that the acquisition of data for this type of study is limited. Therefore, the purpose of this paper is to fill this gap by understanding the perception of water consumers about water-saving devices; the belief being that policy makers and water authorities need to better understand the perception of consumers of such tools before applying them. The research was undertaken in one of the poorest countries in terms of water resources by conducting a questionnaire-based survey of the water situation in Amman, the capital city of Jordan. A binary logistic model was developed based on the attributes of water consumers in Amman. Results suggest that as the amount of the water bill increases, the tendency to appreciate water-saving devices will decrease. On the other hand, those who are not willing to respond to water-demand management policies were found to be less recognizing of the importance of water-saving devices compared to those who are willing to respond to such policies. The study suggests that media and educational campaigns should be utilized to increase public awareness of water-saving devices.

KEYWORDS: Water demand management, Conservation, Amman, Water-saving devices, Perceptions.

INTRODUCTION

Water is not evenly distributed around the globe. Water scarcity is global and presents a serious environmental problem that is not challenging everyone fairly. Increased growth in population, environmental pollution, urbanization, agricultural demand, climate change and subsequent droughts has contributed to significant inequalities between the amount of water available and the required demand. The truth of the matter is that water resources for many countries are in decline, while ensuring their security is even more challenging because of the ever-increasing population (Jorgensen et al., 2009).

Variations in *per capita* demand are not occurring just between countries; rather, such disparities in demand are taking place between cities within the same country and even between neighborhoods in the same city (Inman and Jeffrey, 2006). It is widely

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acknowledged that the ability of many countries to meet their essential needs will be a challenge and protecting their environments will be threatened like never before if water resources are not managed efficiently.

In the past decades, many countries around the globe, both developed and developing, have faced water scarcity. The water security situation is more serious in developing countries. In response, water authorities have had to set regulations to manage demand on the scarce resources by shifting from supply-side to demand-side approaches. Since pricing-policies are not efficient in reducing water consumption due to the fact that demand is inelastic to price (Renwick and Green, 2000; Agthe and Billings, 1987; Barberán and Arbués, 2009), policy makers tend to rely on non-pricing policies, such as water-use restrictions (Millock and Nauges, 2010). In general, price elasticity of demand is defined as the percent change in demand as a result of one-unit increase in water price. Another tool available for non-pricing policies is the adoption of water-saving devices. These devices have shown significant reductions in water use that can, on average, reach up to 30-50% of the total domestic demand (Inman and Jeffrey, 2006; Renwick and Archibald, 1998). Remarkably, studies on the adoption of such devices are limited. This is attributed to the fact that the acquisition of data for this type of study is limited. Therefore, the purpose of this paper is to fill this gap by understanding the perceptions of water consumers of water-saving devices; the belief being that policy makers and water authorities need to understand the perceptions of consumers of such tools before applying them. In other words, to successfully implement any demand management policy, authorities need to be well informed of the opinions and beliefs of consumers on the prospective policy.

This paper is in line with Chu et al.'s (2009) suggestion that there is a need to understand both the internal and external factors contributing to urban water demand, such as the decision to reduce urban water demand through purchasing water-saving devices (Chu et al., 2009).

Research on the economic and social aspects of water conservation and consumption shows that there are barriers to reducing demand through water-use efficiency (Jorgensen et al., 2009). Jorgensen et al. claimed that successful implementation of water demand management policies depends on how well water authorities understand people's beliefs about water use. They also added that water conservation is noticeable when consumers believe that water is limited (Jorgensen et al., 2009).

Declared as one of the most critical sectors in water industry, residential water demand has become a priority for governments and planners. This is related to the fact that residential water makes up more than a half of the demand in urban areas (Kolokytha and Mylopoulos, 2004). If water scarcity remains at the current level, many nations will face economic and environmental damage due to the high cost of water supply and competition between different consumers (industrial, commercial and health needs) (Kostas and Chrysostomos, 2006).

Notwithstanding the efforts undertaken by the Jordanian Government to bridge the gap between supply and demand, water scarcity in Jordan is not likely to be reduced in the near future. In other words, given the fact that Jordan is one of the poorest countries in terms of water resources, the government is rigorously moving toward the demand-side approach (Al-Najjar et al., 2011; Iskandarani, 2001).

This study aims at understanding consumers' perceptions of water-saving devices in Amman, the capital city of Jordan. The severe water scarcity that the country faces is not a matter for debate.

Hence, this study runs in parallel with the "National Water Strategy" set by the Jordanian Government for 2008–2022, with the main aim of institutionalizing water demand management in the country (MWI, 2008). This National Strategy focuses on the awareness of consumers of water issues and therefore aims at installing water-saving devices in new buildings, starting with governmental buildings and schools.

This paper is structured in the following order: a review of the literature on water demand management is presented, followed by describing the study area and survey design and presenting the statistical model used to measure consumers' perceptions of water-saving devices. Finally, the paper concludes with a number of recommendations to increase public appreciation of water-saving devices.

PREVIOUS STUDIES

The literature gives several definitions for water demand management. In this research, demand management and demand conservation are used to cover the same meaning. SWITCH (2011), cited from Louw and Kassier (2002), offers a definition of demand management as: "any socially beneficial action that reduces or reschedules average or peak water withdrawals or consumption from either surface water or groundwater, consistent with the protection or enhancement of water quality".

Chesnutt et al. simply defined demand management as: "any actions taken to reduce water use regardless of whether this reduction might hinder other users and resources" (Chesnutt et al., 1997). Savenije and Van Der Zaag (2002) introduced the term sustainability when they considered water as a scarce resource and called for a need to implement strategies that are capable of utilizing water resources efficiently.

Many researchers have emphasized the importance of water conservation and demand management. It is not unexpected that scholars and policy makers consider demand management strategies as new sources of water supply or an "untapped source of supply" (Maddaus et al., 1996; Willis et al., 2013; Kolokytha et al., 2002). Maddaus et al. (1996) and Macy et al. (1989) highlighted the following benefits of demand management: (1) reducing operation and maintenance costs; (2) cutting down purchases of water supply; (3) delaying infrastructure expansion, hence delaying large cash outlays; and (4) decreasing system leakage.

There are numerous studies that addressed different tools that can be used to manage water demand, with the main focus on the residential sector (Beal et al., 2010; Ahmad and Prashar, 2010). In this regard, water suppliers and governments have made progress to introduce a wide range of demand management strategies (Kenney et al., 2008).

Managing water resources is a complex process. Many water providers are looking to increase supplies; for instance, by adding pipelines, new dams, desalination and water reuse. The demand and supply sides of water resource management will unquestionably involve economic, social and environmental considerations. When it comes to demand, issues of social equity and equality arise; while, on the supply side, costs to improve water availability will be covered by consumers.

Policies to manage water demand can be categorized into two groups: (a) pricing; and (b) non-pricing. While pricing policies have been utilized by many water authorities, non-pricing policies have gained interest and stimulated discussion.

Ensuring that all consumers are receiving a supply of quality water is a critical challenge facing almost every nation. Therefore, understanding what lies behind water demand helps in better planning and managing water systems (Galán et al., 2009; Arbués et al., 2004). The fact that water systems are a top priority for nations is simply attributed to the increasing population, especially in urban areas (White et al., 2003). It is not surprising that many researchers and commentators have offered a considerable number of studies on the aspects of urban water demand (Saurí, 2013; Inman and Jeffrey, 2006; Saurí, 2003; Arbués et al., 2010).

Perhaps the studies by Gottlieb (1963) and later by Howe and Linaweaver (1967) were the first to understand the residential demand for water. Such studies were triggered by the fact that with an increasing population, water utilities faced shortages in funding to cover the operation of the infrastructure. As a result, policy makers started testing and developing a set of measures to cover the running costs and manage the demand for water.

Studies on understanding consumers' interaction with water consumption followed seven main themes; namely: (1) pricing, (2) metering, (3) education, (4) technology (water-saving devices), (5) behavior, (6) regulations and (7) operation and maintenance.

A range of studies investigated the impact of pricing on managing the demand for water. Generally, it has been suggested that indoor domestic demand is inelastic to price. By contrast, outdoor demand is seen as more elastic to price escalations (Espey et al., 1997; Renwick and Archibald, 1998).

One of the dilemmas of pricing policies is the social equity that has been widely discussed by scholars. In fact, when the same price of a unit volume of water is being charged for all consumers (low- and high-income), this will most likely affect low-income consumers rather than high-income consumers (Renwick and Green, 2000; Agthe and Billings, 1987; Barberán and Arbués, 2009). On the other hand, increasing water price when combined with metering can reduce *per capita* demand by 16%. This was confirmed in a study of 10,000 households (Mayer et al., 2004). In general, the price elasticity of demand ranges from -0.15 to -0.52. In other words, water is inelastic to price increase due to the fact that water is a basic need (Nieswiadomy, 1992; Olmstead et al., 2007).

When it comes to metering, the literature shows the positive impact of metering on residential water consumption (Beal et al., 2010; Inman and Jeffrey, 2006; Bartoszczuk and Nakamori, 2004). Metering is seen as a supportive tool for managing water systems in that it can provide insights into the operation of the system by quantifying the amount of water delivered to each connection and thus examine different pricing policies.

For instance, Dianderas and Yepes (1996) argued that some developed countries have revealed that 10-15% of water is not being metered due to losses in the network. Interestingly, Inman and Jeffrey (2006) claimed that it is not clear why consumption decreases when water meters are installed. They further added that this might be related to other influencing factors, such as education and public awareness.

Educational campaigns and demand management have been investigated by many commentators. Supporters of these "non-pricing" techniques claimed that awareness is related to such campaigns (Inman and Jeffrey, 2006). In a study conducted on 430 water suppliers in the U.S. by Nieswiadomy, he noticed that educational campaigns can have positive returns for water suppliers (Nieswiadomy, 1992). Later in 2000, Renwick and Green recorded average savings of 8% from each household as a result of education (Renwick and Green, 2000). In general, there is consensus that education can reduce demand; however, it is not obvious how it can enhance conservation practices. For instance, Pollard et al. argued that education is the glue holding all conservation policies together (Pollard et al., 2008).

Other tools include socio-political aspects. In that sense, water authorities enforce water-use regulations in order to ensure efficient consumption, and ultimately, enforce demand management policies (Inman and Jeffrey, 2006). Recent drought in California is a good example for governmental intervention to strictly regulate water use. For instance, authorities in New South Wales required any new housing unit to install water-efficient devices (Turner et al., 2005).

The physical aspect of the infrastructure plays a significant role in managing demand. In developing countries, leaks and non-revenue water issues pose real challenges to governments. Sharma and Vairavamoorthy (2009) showed that losses in networks vary from 20% to 70%.

Consumer behavior plays an important role in the successful implementation of demand management policies. Fielding et al. (2013) argued that the behavioral dimension can either support or hinder efforts in managing demand. Many authors claimed that demand management policies are not successful if policy makers don't take the behavior of consumers into account (Espey et al., 1997; Olmstead et al., 2007). A study conducted by Inman and Jeffrey (2006) concluded that although households are aware of the role of water-saving devices, water consumption might increase if households do not change their behavior toward water demand management. This phenomenon is referred to as offsetting behavior.

As a non-pricing tool, water-saving devices have been the main prevailing solution used to reduce water consumption. Such devices are attached at the point of water use and can be installed for both indoor and outdoor purposes (Beal et al., 2010; Makki et al., 2013). Efficient showerheads, efficient toilets and efficient faucets are typical examples of such devices. The literature shows significant reduction in water consumption as a result of installing water-saving devices. Mayer et al. claimed a saving of up to 47% that resulted from installing efficient devices in households in Tampa, Florida (Mayer et al., 2004). In Australia, the demand for domestic water can be reduced by 21,000 liters per household annually. Another supportive study by Inman and Jeffrey in 2006 examined the potential savings in water usage after installing efficient devices and found that almost 50% of consumption can be reduced (Inman and Jeffrey, 2006). The discussion above clearly shows that it is imperative to utilize water-saving devices if water authorities are vigorously looking to reduce water consumption.

Hence, this study will investigate how consumers perceive water-saving devices in one of the poorest countries in the world in terms of water resources. The belief is that by understanding consumers' perceptions of water devices, policy makers can examine different policies to promote water demand management practices. That is, policy makers have to recognize how consumers will react to water-saving devices before setting a specific water demand management policy in place with such devices as the core of the policy.

In other words, one should make the conditions right before asking consumers to install such devices; this can be achieved by evaluating the factors that could hinder or foster the installation of water-saving devices. Therefore, this study adds to the body of knowledge on the perception of water consumers of water-saving devices, particularity in developing countries. It has been noted from the literature that most studies investigated the role of water-saving devices in reducing consumption; yet, few studies evaluated how consumers react to such devices. Accordingly, this research treats consumers as active rather than passive players in water systems.

STUDY AREA

Data for this research was collected by using a survey in Amman, the capital city of Jordan. Before elaborating further on the data collection process, a brief discussion is provided about the water situation in Amman.

The climate of the country is classified as a Mediterranean climate, making the country's summer months hot and dry; while in winters, the country experiences heavy rains, with variable rainfall amounts around the country. It is estimated that around 94% of the country witnesses less than 200 mm of rainfall per year (Al-Ansari et al., 2014).

There is no doubt that Jordan is one of the poorest countries in the world when it comes to water resources. The challenges that the country faces get more serious when considering the other limited resources (energy and oil to name just two) and the extraordinary conditions amid intense conflicts that the region is experiencing.

To quantify the problem, the available renewable water resources *per capita* have drastically dropped from 3,600 m^3/year in 1946 to less than 80 m^3/year in 2018. A recent report by USAID declared the available water *per capita* to be around 77 m^3/year (USAID Water Management Initiative, 2018).

Notwithstanding its very limited resources, Jordan is one of the top three largest hosting communities for refugees (UNHCR, 2015; Al-Ansari et al., 2014). Sharp growth in population and climate change are the two main consequences of regional and global dynamics. Such a complex environment implies that planners and water suppliers in the country must take strict measures to forecast the required supply while managing the scarce resources. Moreover, the country's groundwater contributes to 60% of the estimated total supply

(Al-Ansari et al., 2014; K. Al-Hadidi, personal communication, March 2019).

Unlike many developing countries, 97% of Jordanian families are connected to water systems (USAID/ISSP, 2013). However, water supply is intermittent. This is related to the fact that water resources are very limited such that water cannot flow in the distribution pipes continuously. Leaks and non-revenue water represent other challenges facing the country. The Arab Countries Water Utilities Association, in its recent conference in 2019, acknowledged that 50% of piped water will not reach its consumers due to deficiencies in the water supply systems which suffer from illegal connections and leaks in the network (The Arab Weekly, 2019).

Regardless of governmental efforts to bridge the supply-demand gap (Disi project as an example), the country's flexibility in acquiring new sources of supply is very limited (Al-Najjar et al., 2011; Iskandarani, 2001). In other words, there is a dire need to shift from supply-side approaches to demand-side methodologies. As a result, many studies have been conducted to investigate the responsiveness of Jordanians to water demand management policies. For instance, Al-Najjar et al. examined the effect of pricing policy on consumers in Amman and concluded that pricing policies are not effective in reducing demand (Al-Najjar et al., 2011). Instead, they recommended the use of non-pricing policies, such as education and installing water-saving devices. Another study, which presented the impact of rainwater harvesting on water supplies, found that on average, rainwater tanks can save up to 115 Mm^3/year if all households in Amman installed such harvesting systems (Abdualla and Al-Shareef, 2009).

Consequently, the government introduced a "National Water Strategy" in 1997. The strategy declares that "resource management shall continually aim at achieving the highest possible efficiency in the conveyance, distribution, application and use of water resources" (Abdel Khaleq, 2008). This strategy aims to improve water resources by matching the available supplies with demand. It basically targets consumers to increase their awareness of the urgency to adopt demand-management practices. The required actions necessary for this strategy are: the introduction of the principles of demand management practices at the national level, applying water-use laws and plumbing codes and installing efficient water-saving devices. The latter calls for more investigation of consumers' readiness to install water-saving devices. In other words and in line with the National Water Strategy, there is a need to understand consumers' perceptions of water-saving devices. Accordingly, this research aims at identifying the perception of consumers of water-saving devices. Specifically, the paper investigates whether or not consumers are recognizing the importance of water-saving devices.

DATA COLLECTION

The study area for this research is Amman, the capital city of Jordan. Data for this research was retrieved from a field survey conducted over a period of three months. The survey covered a variety of topics, such as habits in using water, socioeconomic attributes, beliefs on water resources in Jordan and environmental beliefs.

TARGET POPULATION AND SAMPLING

The objective of the survey instrument is to gather data on how people in Amman perceive water-saving devices. In this research, it is assumed that one respondent represents one family residing in Amman. To account for variations between water consumers in Amman, in total, 353 completed surveys were returned for building the proposed model. This sampling methodology takes the distribution of consumers in different areas into consideration in order to reduce bias in data collection. Six out of nine districts in Amman were covered by the survey. The remaining three districts are served by a different water system in Amman (located in the southern side of the city).

Sampling of respondents followed stratified proportional sampling. The structure of the survey was built to collect data on five different aspects for each respondent; these aspects are: (1) demographic data, (2) housing unit data, (3) services of water sector, (4) behavior and attitude toward water and (5) psychological data.

The demographic data covers a range of socioeconomic variables, such as level of education, income and family size. The housing unit data represents location of the housing unit, age, size and existence of gardens. The water-sector services deal with duration of supply, water bill and price of water. The behavioral data deals with respondents' frequency of using water at specific end-uses. Finally, the psychological data measures consumers' preferences and beliefs on water conservation.

MODEL RESULTS

The Statistical Package for Social Sciences (SPSS) was used to build the model. To achieve the objective of this paper, that is understanding the perception of water consumers in Amman of water-saving devices, the dependent variable was clearly asking respondents whether they perceive water-saving devices as important in water-demand management. Respondents have to answer either yes or no.

Therefore, to statistically model respondents' perception, logistic regression was employed. In logistic regression, the dependent variable can have two or more categories. When the dependent variable has two categories, the model is called a binary logistic model. Thus, the paper adopts a binary logistic model. Moreover, a stepwise regression model was used to eliminate and add significant variables only.

The first test conducted to measure the significance of the model is the Omnibus test. This test, as presented in Table 1, shows that the model is statistically significant at $P<0.05$. This allows for further analysis of the model. In the case where P value is greater than 0.05, this implies that the model is not significant and no further analysis is required. Further analysis of the model reveals its ability of explaining from 7.3% to 15.7% of variance, according to the R-square values presented in Table 2.

Table 1. Omnibus tests of model coefficients[a]

		Chi-square	df	Sig.
Step 4	Step	5.178	1	0.023
	Block	26.490	4	0.000
	Model	26.490	4	0.000

a. Block 1: Method = Forward Stepwise (Conditional).

Table 2. Model summary

Step	2- Log Likelihood	Cox and Snell R Square	Nagelkerke R Square
4	192.348[a]	0.073	0.157

a. Estimation terminated at iteration number 6, because parameter estimates changed by less than 0.001.

More importantly, Table 3, the classification table, shows that 90.3% of data can be correctly predicted by the model.

Table 3. Classification table

Observed			Predicted		
			X6		Percentage Correct
			0	1	
Step 4	X6	0	0	33	0.0
		1	1	317	99.7
	Overall Percentage				90.3

a. The cut value is 0.500.

Before discussing the model results, it is imperative to explain some descriptive statistics about the sampled population. Table 4 shows the demographics of the respondents accompanied by items used in building the model.

Table 4. Descriptive statistics of respondents

Item	Mean	Std. Dev.	Min.	Max.
Current Devices	0.278	0.443	0	1
Water (JD)	39.837	50.20	3	600
Response	0.886	0.301	0	1
House Type	1.344	0.466	1	2
Family Size	5.243	2.369	1	23

For the variables shown in Table 4, the zeros represent a No answer, while ones mean a Yes answer. For instance, when asked whether they currently have a water-saving device, on average 27.8% of respondents have acquired such devices. Another example is the “Response” variable. From Table 4, it can be said that around 88.6% of households are willing to respond to water demand management policies. It should be noted that the variable Water (JD) measures the amount of the quarterly water bill.

Regarding education, Figure 1 depicts the distribution of educational levels of respondents. For this study, five levels were considered as follows: (1) elementary, (2) secondary, (3) community college, (4) bachelor and (5) postgraduate.

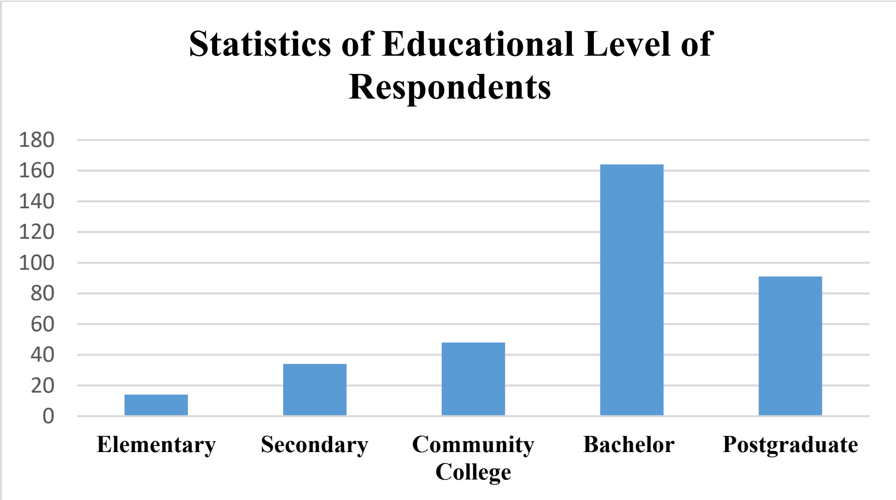

Figure (1): Level of education of respondents

Model results are presented in Table 5. In total, four variables were found to be statistically significant in predicting the outcome.

Table 5. Model results in terms of variables of the equation

		B	S.E.	Wald	df	Sig.	Exp (B)
Step 4[a]	housetyp(1)	-1.046	0.498	4.411	1	0.036	0.351
	waterJD	-0.007	0.003	6.001	1	0.014	0.993
	Response(0)	-1.786	0.455	15.373	1	0.000	0.168
	Current Devices(0)	-1.515	0.675	5.045	1	0.025	0.220
	Constant	4.933	0.843	34.236	1	0.000	138.776

a. Variable(s) entered in step 4: housetyp.

All the independent variables were statistically significant at $P<0.05$. In this regard, Table 5 shows four independent variables that were found statistically significant in their effect on the perception of water-saving devices. These variables are: (a) type of household; (b) amount of water bill (JD); (c) response to water authorities in terms of participation in water demand management strategies; and (d) current possession of water-saving devices.

Before elaborating on the results, the variables used in the model need further explanation. The variable "housetyp" is an indicator variable used to specify whether the respondent lives in a single house (separate house) or in an apartment (multifamily complex). The variable "water JD" refers to the amount of the water bill paid by the respondent every three months (quarterly). The "Response" variable indicates whether a respondent is willing to respond to a demand management policy. Lastly, the "Current Devices" variable specifies whether the respondent currently has any water-saving devices.

The results in Table 5 can be interpreted by investigating the sign of the significant variables. For instance, respondents living in an apartment are predicted to have a lower perception of the importance of water-saving devices compared to those living in a separate house. This is clear from the sign of the coefficient.

In other words and considering a separate house as the reference group, the odds ratio, holding all other variables constant, of not appreciating water-saving devices, will decrease for respondents living in apartments. In mathematical form, an odds ratio of 0.351 will result in a 65% decrease in the odds for those who live in an apartment compared to those who live in a separate house.

In terms of water bill, as the amount of the water bill increases by one unit, this will decrease the likelihood of a household of being able to recognize the importance of water-saving devices. That is, an odds ratio of 0.993 will give us about 1% decrease in the odds at any value of water bill.

When respondents were asked whether they will respond to policies set by water authorities, the model shows that those who are not responding to water authorities are less likely to recognize the importance of water-saving devices. The odds ratio of appreciating the importance of water-saving devices will decrease for those who are not responding to water authorities. That is equivalent to an odds ratio of 0.168 resulting in about an 83% decrease in the odds of appreciating the importance of water saving devices for those who do not respond to water authorities compared to those who respond. This means that when respondents stated that they are not willing to respond to water authorities to save on their water consumption, those respondents are predicted to not appreciate water-saving devices more often than those who are willing to participate.

Respondents who currently do not have any water-saving devices are less likely to recognize the importance of these devices. This is clear from the model results as shown in the Table 5. The odds ratio of 0.22 will imply a 78% decrease in the odds of appreciating the importance of water-saving devices for those who do not have such devices compared to those who have.

In other words, moving from (0), which means that a respondent does not have any water-saving device, to (1) which means having current water-saving devices, the respondent is predicted to have appreciation more often to water-saving devices and the odds ratio of recognizing the value of these devices will increase by 22%.

In total, the variables with their coefficients can be interpreted mathematically based on logistic regression, as shown in Equation 1:

$$\mathbf{log(p/1-p)} = 4.933 - 1.046*housetype(1) - .007*water - 1.786*response(1) - 1.515*Current\ Devices(1) \quad (1)$$

CONCLUSION

This paper presents an attempt to understand consumers' perceptions of water-saving devices. The targeted population consisted of the residents in Amman, the capital of Jordan. A total of 403 returned surveys were used in building a binary logistic regression model. Water in Jordan is seen as a critical challenge facing all sectors (residential, commercial and industrial). Four main variables were found to have significant impact on the perception of consumers. Amount of the water bill, type of house, ability to respond to water authorities and the possession of water-saving devices are the main factors shaping consumers' perception of water-saving devices. Jordan is one of the poorest countries in terms of water resources. Recent efforts by water authorities in the country aim at increasing consumers' awareness of the benefits of water-saving devices. Generally, there are two approaches for managing water demand; these are classified as pricing and non-pricing. Many studies have shown that demand is inelastic to price and that greater savings come from water-saving devices. Due to the sensitivity of pricing policies in Jordan, the government seeks to focus on the awareness of water resources through non-pricing approaches. Therefore, to aid in achieving a "water culture", this study was conducted; the belief being that successful implementation of a demand management policy requires understanding consumers' attitude and perception of available demand management policies. The results suggest that water-saving devices should be mandated in current building regulations. Although the amount of the water bill is conversely related to the perception, this is in line with many findings that show that as the unit price of water increases, consumers' participation in demand management will not change (demand is inelastic to price). More importantly, educational campaigns are required to motivate consumers to respond to water authorities regarding reducing their demand.

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