Examining the effectiveness of residential water demand-side management policies in Israel

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Abstract

Increasing global water shortage is enhancing the need for water management policies, such as water demand policies. This study presents the main water demand-side management policies implemented in Israel, designed to reduce water demand in the urban sector, and subsequently examines their effectiveness by an econometric model, based on residential water consumption data. The main findings indicate that, among the economic policy tools, a smooth increase of water tariffs was not effective, while a drought surcharge led to a significant reduction in residential water demand. Educational policy tools also significantly reduced water demand, though the daily report on the Kinneret water level (a long-term educational tool) had a larger effect on residential water consumption than awareness campaigns (a short-term educational tool). These results may assist policymakers to make informed decisions regarding the implementation of such policy tools.

Keywords: Economic policy tools; Educational policy tools; Water conservation; Water pricing

1. Introduction

Water resources are limited and becoming more uncertain due to global climate change and growing populations and economies (Inman & Jeffrey, 2006). According to water experts, a global water crisis is evident today, as one billion ($1 \times 10^9$) people are currently without reliable supplies of water (Bigas, 2012), and it is estimated that by 2025, two billion people – over 40% of the world’s population – will experience severe water scarcity (CARE, 2006). Therefore, many countries are attempting to undertake water management policies designed for sustainable water development and management. This requires, in the first stage, substantial changes in current water use patterns. Thus, water demand-side management is an important tool required to impact water consumption patterns. However, policymakers and water utility managers face a lack of adequate information for determining the effectiveness of such policies in their communities (Renwick & Green, 2000).

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Israel suffers from a severe water shortage and an increase in water consumption, due to a high standard of living on the one hand and a restricted amount of available water resources on the other. To cope with this situation, along with the expansion of activities and policies associated with water supply, such as desalination and wastewater reuse, water demand-side management has become a major government policy objective in Israel in recent years. For instance, agricultural water quotas have been made more stringent and significant increases in water tariffs in all sectors have already taken place, or are planned in the near future (Kislev, 2001; OECD, 2011).

Water demand management is a relatively new policy measure, recommended to be implemented in conjunction with water supply-side policies and activities (Howarth & Butler, 2004; Inman & Jeffrey, 2006). In general, water demand management policy tools include water pricing and tariff structures, restrictions, educational tools such as public awareness campaigns and technological measures. In this study, we focus on water pricing and educational tools, which are the main tools implemented in Israel. The economic literature in this field suggests that the demand for water can be affected by changes in water prices (Kenney et al., 2008). According to Rogers et al. (2002), water pricing policies may help maintain the sustainability of water resources. Indeed, water pricing has been commonly used as an economic tool in water demand management policies to affect water demand and achieve water conservation, particularly in times of drought. In general, it is suggested in the theoretical and empirical literature that water pricing is a more cost-effective tool than other non-price policy tools (Olmstead & Stavins, 2009). However, some argue that residential demand does not respond to higher prices since demand is price inelastic, and thus price is a relatively ineffective demand-side management policy tool (Renwick & Green, 2000). Since there is no agreement on this issue, it would be appropriate to examine the effectiveness of this tool versus other policy tools.

Water demand-side management policies often combine public awareness campaigns with other policy tools. Opinions on this subject are controversial; while in some countries public awareness campaigns have had no impact on water demand, in other countries they have (Inman & Jeffrey, 2006). In more recent years, there has been a tendency for such campaigns to be used on a more long-term routine basis (Syme et al., 2000). However, little empirical literature exists on the effectiveness of such long-term educational campaigns in reducing water demand.

This paper seeks to deepen the understanding of the effectiveness of water demand policy tools. It does so by examining water demand policies implemented during the last decade in Israel which were intended to reduce residential water demand. Subsequently, the effectiveness of each measure is analysed by an econometric model. It should be noted that this paper does not intend to discuss water supply policies such as desalination and wastewater reuse or their implications for water demand.

The remainder of the paper is organized as follows: Section 2 reviews the main literature on water demand-side management policies; Section 3 presents the main water demand policy tools implemented in Israel during the last decade; Section 4 displays water demand data and the econometric model; the results of the model are presented in Section 5, whilst Section 6 discusses the results; Section 7 presents a summary and conclusions.

2. Literature review

Traditionally, policymakers have focused their attention on the supply-side of water management. Due to water-related issues escalating in many parts of the world, policymakers are increasingly
emphasizing non-structural approaches (which require behavioural change to reduce water demand), such as demand management policies.

Water pricing has been commonly used as an economic tool in demand management policies to affect water demand and achieve water conservation, particularly during droughts. It is generally suggested in the theoretical and empirical literature that pricing is a more cost-effective tool than other non-price policy tools (Olmstead & Stavins, 2009). Nataraj & Hanemann (2011) showed that the introduction of a third price block in an increasing block pricing schedule for water in Santa Cruz, California, had a significant effect on high-use households, decreasing their water consumption. Kenney et al. (2008) studied the water demand management in Aurora, Colorado, during a drought period (2000–2005), which consisted of pricing and restriction policies. The pricing policy was based on introducing increasing block tariffs (IBT) – a pricing structure composed of three blocks. The study showed that price increase through the IBT structure had a significant effect on water demand. However, the pricing policy effectiveness varied among different classes of households; in particular, high-use households were more responsive to price changes than low-use households. In Australia, during the ‘big dry’ in the last decade, state governments and water utilities used mandatory water restrictions to reduce demand by banning various outdoor water uses. Based on demand-side analysis, Grafton & Ward (2008) estimated the loss of consumer surplus associated with this policy. They showed that a pricing policy that led to the same level of water consumption would lead to a much lower loss of consumer surplus. Krause et al. (2003) found differences among consumer groups regarding their response to pricing policies in drought periods. They argued that policymakers could achieve their conservation goal by shaping a compatible pricing system with minimum welfare loss. Other researchers claim that water price increase may harm its affordability and thus harm low-income groups in the community (e.g., Salman et al., 2008). Thus, pricing policy reforms should take into account protecting poor households (Whittington, 2003). Contrary to these studies, some research suggests that water pricing is a relatively ineffective demand-side management policy tool (Renwick & Green, 2000).

In general, the empirical literature on water demand-side management policy attempts to estimate the price elasticity of water demand in order to assess the effect of price changes on that water demand (Arbués et al., 2003). Commonly, the literature suggests that water demand is relatively price inelastic, that is, most studies have estimated that price effects are less than 1 in absolute value1 (Renwick & Green, 2000; Martinez-Espineira, 2007). Still, price elasticity has important policy implications as long as it differs from 0. Such elasticity implies that price increase may lead to reduced water demand. However, the estimated elasticity varies considerably among the different studies, ranging between 0.1 and 0.8 (Espey et al., 1997; Arbués et al., 2003; Olmstead et al., 2007). Olmstead et al. (2003) found in empirical work that price elasticity is greater under an IBT structure than it is under a uniform price structure.

In addition, variations of the estimated elasticity are found in different regions and various income groups. This result was well documented in Dalhuisen et al. (2003), who studied price elasticity in different regions in Europe and the USA. In the UK, for instance, it has been reported that both

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1 Price elasticity of demand measures the percentage change in demand caused by a percent change in price. This elasticity is usually negative and is expressed in terms of absolute value. If elasticity is between 0 and 1, demand is inelastic; if elasticity equals 1, demand is unit-elastic; if the elasticity is greater than 1, demand is elastic.
low-income and high-income households were less responsive to price increase in their water consumption than middle-income households (UKWIR, 1996). This can be explained by the fact that low-income households already consume their basic needs while, for high-income households, water consumption constitutes only a small percentage of their total income, and thus rising water prices have a minor effect on them. In Israel, a positive correlation exists between wealth and water consumption in the domestic sector, while lower income households consume less water and are more willing to voluntarily reduce water consumption (Portnov & Isaac, 2008).

Demand-side management policies often combine public awareness campaigns with other policy tools. The results of studies that estimated the effect of public awareness campaigns on water demand are controversial (Inman & Jeffrey, 2006). Abu Qdais & Al Nassay (2001), for instance, showed that despite intensive public awareness campaigns in Abu Dhabi, their average water consumption rate remained the highest in the world. The researchers demonstrated, however, that a new pricing policy used later by the authorities had a significant effect on water consumption. In contrast, other studies indicate that public awareness campaigns reduce demand by 2–5% (Baumann et al., 1998; USEPA 1998). In general, public awareness campaigns are expected to have a greater effect on demand in places that are more prone to water scarcity (Nieswiadomy, 1992; Renwick & Green, 2000; Inman & Jeffrey, 2006).

In Israel, Grinstein & Nisan (2009) examined the response of minority groups and the entire population to water awareness campaigns. According to their findings, awareness campaigns between 1999 and 2001 led to a decrease of approximately 6% on average in water consumption for the entire population, while responses amongst minority groups were much lower.

It should be mentioned that awareness campaigns are often used in drought periods and adjacent to more rigorous policy measures, such as price increases. It is argued that public awareness campaigns are politically acceptable, and may assist in applying more harsh conservation measures and make them appear socially responsible (Lant, 1993; Syme et al., 2000; Howarth & Butler, 2004; Dietz et al., 2009; Allcott, 2011). Nonetheless, the literature generally indicates that awareness campaigns usually have a temporary effect (e.g., Verhage, 1978; Wang et al., 1999; Syme et al., 2000). Wang et al. (1999), for example, used panel data to examine the effectiveness of pricing, participation in a watersavings device programme and an information campaign in achieving water conservation. Their results reveal that the information programme seemed to be marginally effective for 1 year only. Other studies indicate that the durability of awareness campaign effects may decline over time, and thus repeated communication works better than one-shot communication (Ostrom et al., 1993; Campbell et al., 2004). Indeed, in more recent years there has been a tendency for such campaigns to be used on a more long-term, routine basis, to reduce water demand (Syme et al., 2000). Michelson et al. (1999) examined the effect of non-price water conservation programmes including long-term educational activities in seven cities in California. Their regression analysis revealed that the effects of these programmes varied between 1 and 4%.

3. Demand policy tools in Israel

This study attempts to estimate the effectiveness of water demand policy tools, implemented in Israel over the last decade (2000–2009), on residential water consumption. We focus on two main policy tools: (i) economic policy tools, i.e., increasing water tariffs and a drought surcharge imposed in 2009; and
(ii) educational policy tools, i.e., public awareness campaigns and long-term educational activity – the daily report on the Sea of Galilee’s (the Kinneret) water level. Thus, we distinguish between four types of policy measures:

1. Long-term increasing water tariffs: water pricing in Israel is based on an IBT structure composed of three blocks. During the last decade, water tariffs have been raised almost annually in order to control the increasing water demand. In general, all three block tariffs have been increased annually by 1–15%.

2. Short-term surcharges: in mid-2009, following several years of drought which had led to a serious water crisis in Israel, a drought surcharge was imposed on the excess consumption of water. The drought surcharge was added to the third block tariff per cubic meter, leading to an increase of approximately 350% in the marginal price of this block.

3. Short-term public awareness campaigns: two intensive campaigns were carried out during the period under examination. These campaigns ran for short periods and were initiated following periods of drought. The first campaign was carried out during 1999–2001, and the second campaign began in mid-2008 and lasted until the end of 2009. These campaigns were characterized by comprehensive public awareness and educational activities through the media and other channels. The purpose of the campaigns was to encourage water conservation by increasing public awareness of the water supply problem on the one hand, and instructing the public on the importance of the proper and efficient use of water on the other.

4. Long-term educational activity: Lake Kinneret is the main open source of freshwater in Israel. The Kinneret’s water level is reported daily via the media as part of an information water policy, intended to inform the public about the water supply situation. The report also reminds the public of the risk of the current water level by reporting the water level in relation to the ‘red line’, the lowest permitted water level in the Kinneret, set by the Israeli Water Commissioner. The theory behind this policy is that, as the water level declines, so will water consumption. Hence, this policy is considered to be a long-term educational tool which may affect water demand.

4. Empirical examination of residential water demand

This paper focuses on residential water consumption during 2000–2009. Residential water consumption constitutes approximately 71% of total municipal water consumption. The model used utilized data on residential water consumption obtained from the Israeli Water Authority, based on reports from 193 councils and local authorities, which constitute more than 90% of the residential water consumption in Israel. The data included the aggregate residential water consumption for each local authority.

Based on this data, the residential water consumption trends and the effects of each policy tool were initially examined, through a descriptive analysis of water consumption as a function of the characteristics of urban water demand. In the second stage, the trends and changes in water consumption were examined by an econometric model. This model examined whether the identified consumption trends are significant and to what extent the various parameters effect water consumption. In addition, the relationship between the socio-economic status and the impact on water consumption were examined. The water consumption data and the econometric model are described below.
4.1. Water consumption data

The average water consumption in the municipal sector in the examined period reached 368 MCM (Million Cubic Meters) per year. In Figure 1, an increasing trend in water consumption over the period 2001–2007 can be observed. After 2007, a prominent downward trend began, as the water quantity supplied to consumers in the residential sector during 2009 totalled 355 MCM/year, a decrease of approximately 11% compared to 2007 – a record year for water consumption (Figure 2). Parallel to this decline, in mid-2008 and until 2009, an educational campaign was launched, and in 2009 the drought surcharge was imposed. It should be noted that the population growth rate over the examined period was approximately 18%, which reflects a decrease in consumption per capita of 13.7%.

In addition, a reduction in consumption of approximately −1.15% between the years 2000 and 2001 was identified (Figure 2). This reduction occurred in tandem with the first public awareness campaign. It should be mentioned that water tariffs continued to rise over the entire period. In order to estimate the magnitude of the impact of each policy measure on the residential water demand, an econometric model is presented in the following subsection.

4.2. The econometric model

The econometric model was based on a panel-data regression method, which allows for the examination of data of different groups over a particular time span. Constructing a database in this manner allows a statistical analysis of the 193 different local authorities (i: group index; t: time index) over the years 2000–2009. The equation determined in the model was defined as a logarithmic equation, which represents the rate of change in water consumption as a function of the rate of change in the explanatory variables.

The variables expected to determine the residential water demand of a city/town are detailed below.

![Fig. 1. Residential water consumption in Israel (MCM/year).](https://iwaponline.com/wp/article-pdf/15/4/585/406281/585.pdf)
Socio-economic status: water consumption varies according to income level and standard of living in a city. This variable could be represented by the socio-economic status of a city. The higher the socio-economic level of a city, the higher water consumption expected. The socio-economic ranking of the different cities was based on the ranking of the Central Bureau of Statistics (CBS) in Israel according to a scale of values from 1 to 10. For the purposes of the statistical analysis, the city authorities were divided into three groups:

- low socio-economic level – cities ranking from 1 to 3;
- medium socio-economic level – cities ranking from 4 to 7; and
- high socio-economic level – cities ranking from 8 to 10.

The effect of the socio-economic level is captured in the model by the variables \(L_{i,t}\) and \(H_{i,t}\) which are described below.

Water tariff: water price is expected to be one of the determinants of water consumption. As already stated, the water pricing structure in Israel is an IBT structure. It could be argued that the effect of the tariff level on water demand in an IBT pricing structure depends on the block which the household consumption level is associated with. As a result, estimating water demand using a simple average of the tariffs may be misleading. However, notice that our data are not household-level data but aggregated data at the city level. Due to this data limitation, we cannot consider the heterogeneity of the consumption levels according to each tariff block in our estimation. Consideration of this heterogeneity is important in the context of estimating the price elasticity, which is not our focus here. However, our purpose in this study is to assess how the policy of increasing tariffs over the last decade has affected aggregate water demand. The policy increased all block tariffs by an equal rate each year. Thus, we can take the average tariff in our estimation as an explanatory variable to estimate how water consumption responded to these tariff updates.
Population size: as our data are city-level data, it is natural to consider the population size of the city to capture the differences in water consumption between cities, which emanate from population size, as well as the increase in consumption due to population growth.

Municipal status: this variable examines whether there is a difference in water consumption between municipalities and local councils.

Policy tools and steps: in addition to the water tariff variable which captures pricing policy, we introduced variables that capture the effect of the other water demand tools. In particular, three explanatory variables were introduced: a variable representing the 2009 surcharge, a variable representing the public awareness campaigns, and a variable representing the Kinneret water level report.

Hence, the estimation equation is described as follows:

\[ w_{i,t} = \beta_0 + \beta_1 \text{POP}_{i,t} + \beta_2 \text{m}_{i,t} + \beta_3 \text{L}_{i,t} + \beta_4 \text{H}_{i,t} + \beta_5 \text{P}_{i,t} + \beta_6 \text{DS}_{i,t} + \beta_7 \text{PAC}_{i,t} + \beta_8 \text{KWL}_{i,t} + \epsilon_{i,t} \]  

where: \( w_{i,t} \) is the natural logarithm of residential water consumption of a local authority \( i \) in year \( t \); \( \text{POP}_{i,t} \) is the natural logarithm of the population size in the area of local authority \( i \) in year \( t \); \( \text{m}_{i,t} \) is a dummy variable representing the municipal status of local authority \( i \), which takes the value of 1 if the local authority is a municipality, and 0 otherwise; \( \text{L}_{i,t} \) is a dummy variable, which takes the value of 1 if the city/town has a low socio-economic level (levels 1–3) and 0 otherwise; \( \text{H}_{i,t} \) is a dummy variable that takes the value of 1 if the city/town has a high socio-economic level (levels 8–10) and 0 otherwise; \( \text{P}_{i,t} \) is the natural logarithm of the average tariff in year \( t \), where this variable represents the pricing policy; \( \text{DS}_{i,t} \) is a dummy variable that represents the drought surcharge policy, which takes the value of 1 for the year 2009, and 0 otherwise; \( \text{PAC}_{i,t} \) is a dummy variable that represents the public awareness campaigns, which takes the value of 1 for the years in which a campaign was carried out, and 0 otherwise; and \( \text{KWL}_{i,t} \) is the natural logarithm of the Kinneret water level (with an absolute value).

5. Results

5.1. Policy tools impact

The estimation results are presented in Table 1. All the variables are statistically significant at the 5% level. The results indicate an approximate unitary elasticity of the residential water demand with respect to population size. The municipal status of a city was found to affect water demand. In particular, the results reveal that municipalities consume more than local councils by 13%. The results show significant differences in domestic water consumption between authorities of different socio-economic levels. Authorities ranked in the lower socio-economic levels (1–3) used 29% less water on average than authorities ranked in the medium socio-economic levels (4–7), while authorities ranked in the higher levels (8–10) used 35% more water than the medium socio-economic levels.

The results indicate that increasing water tariffs over the examined period was not an effective policy tool, as water consumption continued to rise despite the increase of the tariffs. On the other hand, the drought surcharge of 2009 reduced water consumption by 12%. Note that the marginal water price increased significantly as a result of imposing the drought surcharge (an increase of 350% of the third block marginal price), while the price increase resulting from the increasing tariff policy was moderate in size and smoothed over the entire period.
The public awareness campaigns were found to be effective in reducing water consumption. However, their impact is weaker than the impact of the drought surcharge, as the public awareness campaigns reduced annual residential water consumption by 1.7%, compared to a 12% reduced consumption obtained by the surcharge.

Interestingly, residential water consumption responded positively to the daily report of the Kinneret water level. The elasticity of residential water consumption with respect to the Kinneret water level is estimated at 0.63. That is, a reduction of 1% of the Kinneret water level caused a reduction of 0.63% of residential water consumption. This result reveals that the reduction in the water level of the Kinneret, which occurred between 2004 (the year with the highest water level) and 2009 (the year with the lowest water level) caused a reduction of 1.7% in water consumption. Note that this educational policy tool has a long-term effect on water consumption, while public awareness campaigns have only temporary effects, as other studies have suggested.

5.2. Socio-economic aspects

According to the findings of the econometric model, there are significant differences in the impact of the policy tools on domestic water consumption between the various socio-economic levels. These differences could be observed in the data, which indicates direct proportionality between socio-economic status and water consumption per capita: the higher the socio-economic status, the higher the average water consumption per capita. Figure 3 illustrates direct proportionality between the rate of change in consumption per capita over the years and the socio-economic level. As seen in Figure 3, a greater reduction in water consumption occurred in 2009 at the higher socio-economic levels, reflecting a stronger response to the policy tools carried out in that year. In addition, the lower socio-economic levels show a constant increase in consumption over the years, yet this increase became moderated over the last years. This may be due to the minimal consumption of the lower socio-economic levels, who use an ‘iron ration’ of water.

The presented trends indicate that the policy tools used for reducing water demand, particularly the drought surcharge, are progressive measures. The imposed surcharge affects mainly the higher socio-economic levels and allows the lower socio-economic levels to consume their ‘iron ration’. In fact, the lower socio-economic levels are the least affected by the economic policy used. This is because the surcharge was imposed on high-consumption users through the third block.

Table 1. Results of panel estimation for Equation (1).

<table>
<thead>
<tr>
<th>S.D.*</th>
<th>Coefficient</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.025</td>
<td>0.9</td>
<td>Population</td>
</tr>
<tr>
<td>0.055</td>
<td>0.13</td>
<td>Municipal status: municipality</td>
</tr>
<tr>
<td>0.03</td>
<td>−0.29</td>
<td>Low socio-economic level</td>
</tr>
<tr>
<td>0.06</td>
<td>0.35</td>
<td>High socio-economic level</td>
</tr>
<tr>
<td>0.028</td>
<td>0.11</td>
<td>Tariff</td>
</tr>
<tr>
<td>0.009</td>
<td>−0.12</td>
<td>Drought surcharge</td>
</tr>
<tr>
<td>0.005</td>
<td>−0.017</td>
<td>Public awareness campaign</td>
</tr>
<tr>
<td>0.205</td>
<td>−0.63</td>
<td>Kinneret water level</td>
</tr>
</tbody>
</table>

*S.D.: standard deviation.
6. Discussion

The findings indicate that a gradual increase of water tariffs is an ineffective tool, although the accumulated increase of water tariffs over the entire decade was relatively high, being approximately 50%. It seems that a moderate annual increase of water tariffs had no significant effect on residential water consumption. This result contradicts the findings of studies that found that water pricing is an effective tool and supports the results of studies such as Renwick & Green (2000) which argue that residential demand does not respond to higher prices. In contrast, the advent of the drought surcharge resulted in significantly reduced residential water demand, particularly since this surcharge was imposed on high-consumption users. This result is consistent with the economic literature, indicating the importance of economic tools in designing demand-side management policies in the water sector.

The role of the educational policy tools were also found to be important in reducing water demand. Public awareness campaigns were found to affect residential water demand; however, their estimated effect was limited, so that the magnitude of the campaign effect is moderate relative to the effect of the drought surcharge. On the other hand, as outlined in the literature (Syme et al., 2000; Howarth & Butler, 2004), the importance of the public awareness campaigns may be reflected in other aspects. In particular, increasing water prices are associated with political and regulatory difficulties, since water is a basic product; therefore, increasing the water price requires massive public and political support. This support could be achieved through the public awareness campaigns. For example, the drought surcharge imposed in 2009 was preceded by intensive public awareness campaigns; although its impact on water consumption seems to be minor, perhaps such campaigns assisted authorities in imposing the drought surcharge.

As many other studies have suggested, it could be argued that public awareness campaigns, which are usually carried out for short periods of time, have short-term effects on water consumption. The long-term educational tool examined in this study – the daily report of the Kinneret water level – was found to
have a greater effect on residential water consumption. In contrast to the public awareness campaigns, this educational tool has a long-term and large effect on water consumption.

In accordance with other studies, this study found differences in the effect of policy tools on water consumption between the various socio-economic groups. This result could be explained by the fact that, while low-income users consume their ‘iron ration’ of water, and thus cannot reduce their basic consumption, high-income users do not respond to a moderate increase in water price since their spending on water consumption constitutes only a small part of their income. Therefore, water price increases should be significant in order to cause high-income users to reduce their water consumption, such as in the case of the drought surcharge.

7. Summary and conclusions

This study examined the effectiveness of policy tools implemented in Israel during the last decade to manage and reduce water demand. Based on data on residential water consumption, an econometric model was applied to estimate the effect of each policy tool on residential water consumption.

The results of the study indicate that the initiated policy measures indeed led to reduced water demand; however, they emphasize the need to distinguish between the effectiveness of different policy tools, their timing and the population to which the policy tools are aimed at.

Among the economic policy tools, increasing water tariffs was found to be an ineffective tool, while the drought surcharge significantly reduced residential water demand. Amongst the educational policy tools, the daily report on the Kinneret water level (a long-term educational tool) had a larger effect on residential water consumption than the awareness campaigns (a short-term educational tool).

The introduced policies on water demand are uniform policies for the entire economy, yet the achievements of these policies are not uniform and are dependent on the characteristics of the various communities, such as their socio-economic level. Adjusting policy tools so that they consider the unique characteristics of different population groups will increase efficiency both economically and in terms of water savings achieved.

The results of this study may assist policymakers to make informed decisions regarding the implementation of policy tools to reduce water demand, and encourage them to refrain from continuing to use tools that have been found to be ineffective.

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