A Review on Water Conservation and Consumption Behavior: Leading Issues, Promoting Actions, and Managing the Policies.

Singha, Bipasha
Water and Environmental Engineering Laboratory, IGSES, Kyushu University

Eljamal, Osama
Department of Earth System Science and Technology, Interdisciplinary Graduate School of Engineering Sciences, Kyushu University

https://doi.org/10.5109/4102484

出版情報：Proceedings of International Exchange and Innovation Conference on Engineering & Sciences (IEICES). 6, pp.171-178, 2020-10-22. Interdisciplinary Graduate School of Engineering Sciences, Kyushu University
バージョン：
権利関係：

A Review on Water Conservation and Consumption Behavior: Leading Issues, Promoting Actions, and Managing the Policies.

Bipasha Singha[1, 2] & Osama Eljamal[1, 2*]

[1]Water and Environmental Engineering Laboratory, IGSES, Kyushu University, Japan

[2]Department of Earth System Science and Technology, Kyushu University, Japan

*Corresponding author email: osama-eljamal@kyudai.jp

ABSTRACT: *Securing supplies of freshwater is now a big concern for policymakers worldwide. Water saving represents significant pro-environmental behavior for a sustainable water resource. In this paper we present the determinants of conservation and use of household water to establish the relative influence of psychosocial, environmental, and demographic bases. We evaluate the predominant study on the factors influencing excessive water consumption, the various ways in which water agencies can control over-consumption, promote residential water conservation, and claim for the demand-side programs. If we maintain the positive attitude and intention toward conservation, change our daily water use behavior, build the habit to use less water as we can, involve the pro-environmental activities, and if the government properly manage the water demand of every household, this can help to conserve water for our future generation and develop the capability to better implement water conservation agendas that respond to short-term to long term water scarcity crises.*

Keywords: behavioral change, demand management, psychology, water conservation, consumption

1. INTRODUCTION

Water has been recognized as among the natural resources of greatest importance. Water scarcity and pollution are the major environmental issues faced in the 21st century worldwide and water conservation is an important environmentally friendly action for a healthy way of human life on earth [1]. There is growing evidence that human activities placed unmanageable demands on freshwater reserves [2]. At the same time environmental damage, population increase, climate change and financial development would put water supplies more under pressure in the coming periods [3]. Determining factors of household water usage behavior obtained from the earlier studies attempt to predict household water consumption [4]. Individuals emotion about water and water usage influences the effective management of water demand strategies [5].

Household water conservation usually includes practices to reduction of water consumption. Over-consumption is a main driver of environmental change globally. The following table about the water use profiles for several regions (i.e., Europe, USA, and Australia) will support the reader to understand better the amount of water usage [6].

Table 1. Household water consumption in different countries (%)

	USA	Australia	England	Scotland	Switzerland
Toilet flushing	11	20	33	31	33
Bathroom (Shower and other jobs)	8	26	20	32	32
Kitchen	16	20	17	35	19
Miscellaneous	7	--	27	<1	14
Outdoor	58	34	3	1	2

Typically, consumption behavior are implemented by acts of 'curtailment' or 'efficiency' [7] [8]. Curtailment involves replacing leakage taps, reusing grey water, taking shorter baths, shutting off taps when brushing teeth and using full load dishwasher. Performance involves greater personal participation and includes the use of water efficient facilities such as low-level shower heads, water effective cleaning machine and dishwasher, dual-flush bathroom, and rainwater tank [9] [10].

This paper looks at current literature that examines the psychological, financial, situational, along with infrastructural factors influencing the actions of individuals, and then explores methods of water administration to minimize water use. By recognizing these factors that influence water use, water-managing agencies will adopt policies which are much more successful and sustainable.

Around the years, several researchers have sought to explain the underlying processes that form human behavior from the behavioral psychology viewpoint. The Comprehensive Action Determination Model (CADM) [11] puts together the two of the most commonly mentioned theoretical frameworks in conservation works, , the theory of planned behavior [12] and the value-belief-norm theory [13], to develop an integrative structure for classifying conservation behavior drivers. CADM predicts that behavior is directly determined by the psychosocial determinants of intention, which acts as an integrative variable in joining the impact of attitudes, social norms, perceived behavioral control and personal norms. CADM further contains habits as a powerful element of behavior, and this distinguishes the model from prior psychological models.

2. LITERATURE REVIEW APPROACH

A systematic literature review was performed using Scopus and Web of Science to gain a current view into the practically validated strategies for improving conservation behavior in residential water use tasks. The theme, keywords, and summary were analyzed for the entire number of articles (n=150), and only articles were chosen that were relevant to domestic water usage, elements and saving ideas (n=65). All these 65 papers were further assessed for inclusion. We utilized the reference section of publications to check for other related empirical research on water conservation. Consequently, the analysis was based on a total of 35 articles.

2.1 Conceptual framework

Situational Causes: Economists argue that the quantity demanded, or the quantity of water used will decrease as prices rise [14]. During the current drought in the south-eastern United States, this approach was used effectively by many municipalities, and it is possibly the most effective solution to over-use in both the long and short term. Another situational issue is restriction. Water utilities and/or governments frequently put water restrictions in drought situations, and this clearly significantly reduces demand [15]. The restriction of water usage would be more effective and preferable for planners in many cases and to introduce alternative approaches [16].

Water efficient appliances: An Australian study on attitudes to water conservation and their reported practices suggested that Australians generally had very positive attitudes to water conservation and water-saving equipment at the time of the study [17]. An analysis of U.S., Australia and UK studies found that retrofitting projects installing efficient appliances resulted in water consumption reductions of between 9 and 12 percent. More extensive programs replacing current appliances with highly water-efficient devices can save between 35 and 50% water [18].

Socio-demographic characteristics: Research showed direct findings for the link between certain demographic variables and the use of household water. No wonder

households with more residents use more water [8] [19]. Even households with higher incomes and education had greater plans to launch water-efficient appliances [20]. Higher-income households use more water than households with lower incomes [21]. Some research has shown that older householders use less water [19], the water consumption may be influenced by the stage of life rather than by age. Being retired or having adolescent children, for example, will increase water usage. In an Indian analysis, social standard, income, age, and household size affected behaviors in water conservation. Personal capacity is also an important element in the general understanding of conservation behavior [13]. This capacity such as expertise and abilities can promote conservation activities and socio-demographic variables such as age, education, and income can be proxies for personal ability. For example, someone with higher education and income can have a greater understanding of the need to conserve water and a greater potentiality to install water-efficient appliances that can substantially reduce household water consumption.

Psychosocial determinants: Researchers reviewed the current paradigm in social and environmental psychology and constructed a model for the study of significant water consumption predictors [22]. For water consumption behavior, the following factors have predictive ability: environmental awareness, attitude, behavioral control, intention, and habits. Participants in the United Kingdom show a positive outlook towards water conservation with 83 per cent reporting that households need to conserve water. This is however a lower proportion than similar studies in Australia which found that water conservation is important among 94-98 percent of participants. This difference could be due to the increased awareness that Australians have water scarcity issues in many areas [23]. Study of perceptions regarding water stress problems reveals a mixed impression of the UK's water shortage risk. Studies have found a strong connection between water scarcity encounters with water awareness and water conservation action. For those who perceived that there was a low water scarcity chance, the majority (69 percent) also identify as not water conscious [24]. According to the theory of planned behavior, the most immediate predictor of behavior is intentions which represent a motivation or desire to engage in an action. In addition, intentions are influenced by attitudes (positive or negative behavioral evaluation), subjective norms (perceptions of social encouragement from important others for specific behavior) and perceived behavioral regulation (perception of how self-controlled the behavior is) [12]. Furthermore, personal moral beliefs about the environment are expressed as feelings of responsibility to use natural resources in a restricted manner and these feelings may have a positive impact on pro-environmental behavior [25]. Moreover, habits connected with water consumption activities may include washing clothes and dishes, taking showers and baths, and watering the lawn. These practices are the product of automated cognitive processes, established by repetition, which can lead to a reduction in the amount of cognition required to make daily decisions [19].

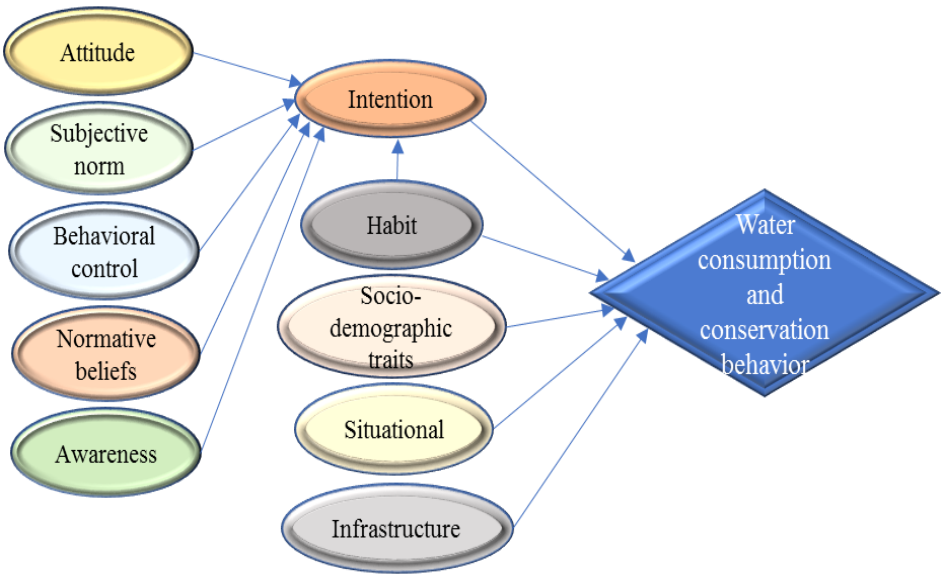

Figure 1: Theoretical model of determinants.

3. WHO IS THE WATER WASTER?

People who confess to participating in antisocial acts will reject the notion of ecological responsibility and report acting accordingly, behaving in an anti-environmental way. Researchers found a strong association among citizens of two Mexican cities between tolerance of antisocial behavior and water waste [26]. It also found the connection between environmental degradation and a series of criminal acts including violent incidents, violations of human rights, weapons trafficking, and improper exploitation of resources [27]. Another hypothetically important factor that affects pro-environmental actions is confidence in the possible effectiveness of environmental legislation. One could stick to the principle of ecological norms but could also doubt the practical effectiveness of legal sanctions in supporting the conservation of resources. At the level of the individual, the lack of faith in environmental laws and legal actions contributes to reduced efforts in pro-environmental behavior [28]. This uncertainty about the law may have a detrimental impact on one's own pro-environmental initiative. In addition, as an intervening factor in water use behavior, the degree of participation and knowledge of an individual can influence his or her regular water use activities. For example, if the user feels threatened with water security, he or she may become motivated to conserve water. Then the need for water conservation becomes personally important, increasing the level of engagement in water consumption activities. Where there are high levels of participation and understanding, we would expect individuals to improve pro conservation behavior, directly leading to lower levels of water wastage [19].

4. HOW WE CHANGE OUR WATER USE BEHAVIOR?

Communication gives the people an incentive to engage less water usage, as this allows them the ability to make clear commitments and assurances about what they are going to do. Communication and collaboration offer a sense of social obligation to the communities; individuals understand a common interest and trust that their neighbors will also protect water [29].

Even the development of technology to save water is important. Researchers studied the community's receptivity to the use of alternative water sources and technologies and found that individuals' willingness and capacity to obtain and implement household water conservation and reuse programs is a fundamental factor in behavioral change [30]. They found after further

research that having the opportunity to buy more water-saving equipment led to water-saving behaviors.

Education is equally important. Conservation needs knowledge and more information about water use and the impact of the public on water supply. Water providers may use information sharing to educate customers of the need to improve water saving habits and offer advice about how to do so [31].

5. WATER DEMAND MANAGEMENT POLICIES:

Many water practitioners hold the view that a deeper understanding and effective management of water supply is crucial to our ability to meet the needs of a rising population and economic growth despite destroying the ecosystems that maintain water supply systems. This paper offers a summary of the initiatives in demand management.

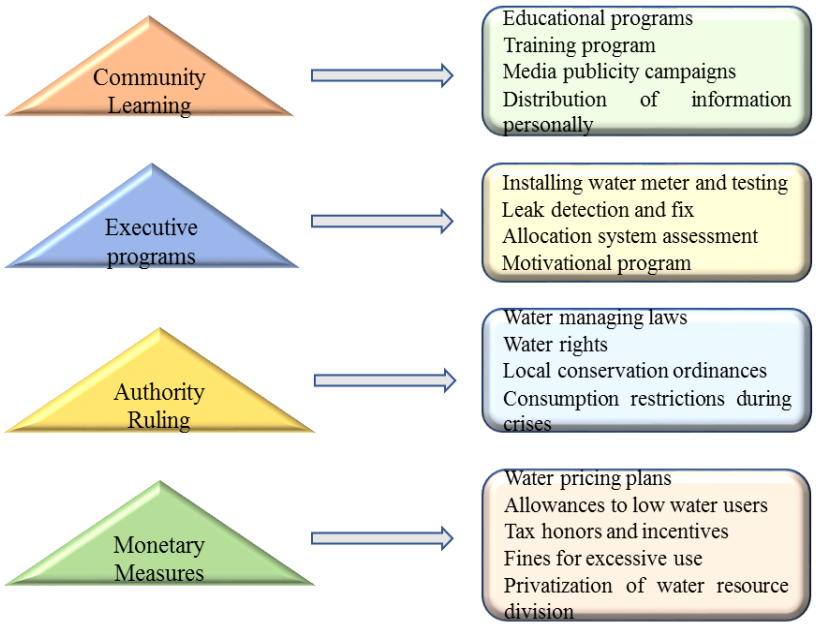

Figure 2: Proposed demand managing tactics.

6. PROMOTING DOMESTIC WATER CONSERVATION

An antecedent approach, according to Environmental Psychology, fosters conservation by seeking to shift attitudes to water resources. Antecedent strategies are suggested to bring about change by manipulating the behavioral determinants, e.g. by finding a commitment to saving water, setting targets, or providing information. From the other hand, consequence strategies are said to modify actions by manipulating determinants after action has been enacted [32]. Providing incentives for saving water, for example, could improve water conservation practices. Equally, providing households information on their community's level of water use can provide knowledge on what is "normative" and thus change the attitudes and behaviors of individuals. Other researchers differentiate between informational (focused on changing perceptions, values, motivation, and standards) and structural approaches (focused on changing contextual issues, such as product and service availability, legislation, or financial incentives) [33]. Structural approaches are designed to minimize self-conflict with common interests. An example of this is the implementation of water meters which charge users for their water usage instead of having

fixed charges. These Psychological methods can change the way people view the resources and think.

7. RESEARCH REQUIREMENTS

This review emphasizes the practical value of recognizing the main drivers of behaviors for residential water conservation. Gaining a systematic understanding of the fundamental factors of water conservation offers useful knowledge to social scientists to guide policymakers regarding water resource management. The study also underlines the importance of context and variations in the capacity of individuals to bring about improvements in their water use. Considering the contribution of psychology literature provides to our understanding about conservation of water, it is also clear that the current literature has some limits. First is the inability to realize that water conservation typically requires the behavior of several members of the household, and thus happens in a group situation. Therefore, household dynamics will play a significant role in the conservation of residential water. Moreover, longitudinal studies of water-conservation activities are required to fully understand the driver and barrier impacts. Longitudinal studies allow researchers to differentiate between causality and correlation. A further limitation of almost all the data is the self-reported information. It was not possible for the households to keep water meter readings or to obtain water-use records from utility providers, so self-reported water bill evidence was used. That is a weak indicator. Finally, research about how to encourage water conservation has not been well known, including how to use communication methods, how to frame and aim messages, and how success is affected by faith in the source of knowledge, etc. Thus, A thorough and precise water use model is required which could assist water managers develop sensitive and efficient water management strategies to achieve both short and long-term water safety outcomes.

8. CONCLUSION

The present review has found that psychosocial, behavioral, demographic, and contextual indicators all play a role in assessing expectations for household water conservation and consumption. This information will remind future research that is testing interventions to encourage water conservation in households. Therefore, the findings of this study will help policy makers in making strategic decisions on the best way to protect potential water resources. However, our knowledge of water conservation behavior still has several gaps, particularly as to how we can enable water conservation practice stick when the pressure of water shortages or some other threat is no longer prevalent in the minds of people. We have a long road ahead in predicting accurately the response of individuals to water conservation awareness and education initiatives, which consider consumer preferences and motivations.

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