***Review Article***

**Sustainable Water Consumption Practices among Household Consumers: A Systematic Literature Review**



**ABSTRACT**

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| **Aims:** This study aims to systematically review water-saving practices at the household level and identify effective behavioral, technological, and environmental interventions that influence conservation.  **Place and Duration of Study:** The review was conducted in Negros Occidental between April and June 2025.  **Methodology:** A total of 66 articles were reviewed, with 37 peer-reviewed articles included in the final analysis. Relevant literature was identified using keywords related to household water conservation, including behavioral, technological, and environmental interventions. Studies were screened using the following inclusion criteria: English-language articles and peer-reviewed articles—and evaluated for quality and relevance. A thematic analysis was conducted to extract key findings and implications.  **Results:** The review reveals that sustainable water use is shaped by consumer awareness, motivation, access to technology, and environmental consciousness. Behavioral interventions such as habit formation, education, and social norms influence conservation decisions. The Theory of Planned Behavior explains how attitudes, perceived control, and social expectations affect water-saving behavior. Technological solutions—like low-flow fixtures and efficient appliances—are effective but face barriers such as cost, lack of awareness, and discomfort with new devices. Environmental approaches, including awareness of climate change and ecosystem impacts, further strengthen conservation motivation. Notably, households with stronger environmental and water conservation attitudes reduced water use by as much as 18.6% to 53.0%.  **Conclusion:** Achieving water conservation at the household level requires integrating behavioral change, technology adoption, and environmental awareness into policies and community programs. Understanding the factors that drive water use can help policymakers and utility providers develop more effective and context-specific strategies. |

*Keywords: Sustainable water consumption, Household water conservation, Behavioral interventions, Technological interventions,, Environmental interventions*

**1. INTRODUCTION**

Water is essential for the survival of all forms of life (Kılıç, 2020), yet its availability is increasingly threatened by rapid population growth, urbanization, expanding agricultural and industrial demands (United Nations, 2023), climate change and environmental degradation. According to Mekonnen and Hoekstra (2016), approximately two-thirds of the world's population—around 4.0 billion people—experience severe water scarcity for at least one month each year.

A primary driver of this issue is unsustainable water consumption, especially in urban areas. A study by Savelli et al. (2023) reveals that excessive household water use by urban elites—who over consume both public and private water sources—significantly contributes to urban water crises, sometimes matching the impacts of climate change and population growth. Despite numerous awareness campaigns and conservation efforts, several barriers to household water conservation persists. These include the limited availability of water-efficient devices, lack of skills or knowledge to implement conservation measures, and the absence of adequate incentives or the presence of disincentives for adopting water-saving technologies (Addo et al., 2018). As water scarcity rises as a global issue, the importance of adopting sustainable water consumption practices at the household level becomes paramount (Prajapati et al., 2025). In addition to growing demand, the quality of available water resources is deteriorating due to pollution, overuse, and the degradation of both surface and groundwater bodies (Mishra et al., 2021).

The growing global water scarcity (Zhang et al., 2020) emphasizes the urgent need for sustainable water consumption practices at the household level (Prajapati et al., 2025). In response to this global concern, promoting sustainable water consumption through behavioral, technological, and environmental interventions emerges as a critical strategy. Behavioral interventions, such as awareness campaigns and habit formation strategies, can encourage mindful water use (Razali et al., 2021). Technological solutions, including water-efficient appliances and leak detection systems, offer practical tools for reducing consumption (Aina et al., 2023). Environmental interventions, such as ecosystem protection and climate-resilient infrastructure, support broader water security goals (Thapa et al., 2022). Understanding these factors are essential for developing effective conservation strategies.

This review systematically examines these strategies to identify effective interventions and understand the barriers that limit the adoption of sustainable water practices. Specifically, this study explores consumer awareness, attitudes, and motivations towards water conservation, the role of water-efficient technologies, and environmental factors influencing household behavior. By synthesizing existing research, it aims to provide insights that will inform water utility operators, guide policymakers, support technological innovators, and strengthen consumer awareness to promote water conservation at the household level.

**2. METHODOLOGY**

This study employed a systematic literature review (SLR) approach to explore sustainable water consumption practices among household consumers. The SLR method involves a structured, transparent, and replicable process of identifying, evaluating, and synthesizing relevant studies to generate comprehensive insights grounded in existing literature. This approach was chosen to ensure the credibility and depth of the review by drawing from multiple peer-reviewed sources across various disciplines.

The initial stage involved defining the research question and scope. The primary research question sought to examine the effective strategies for promoting sustainable water consumption among household consumers. This question guided the entire review process, ensuring that only studies relevant to household-level factors influencing water use behavior were included. The literature search was conducted using several academic databases including Google Scholar, Mendeley, Proquest, ScienceDirect and Philippine E-Journals. The search was guided by carefully selected keywords such as "sustainable water consumption”, "household water conservation", “sustainable household practices”, “technological interventions in water use", "behavioral interventions in water use", and “environmental interventions in water use”. These keywords were selected to ensure that the studies captured were directly relevant to household-level water consumption and sustainable practices. The inclusion criteria focused on English-language, peer-reviewed journal articles, while studies published in languages other than English were excluded.

The next stage focused on the selection and evaluation of studies. This process involved screening studies by reviewing titles and abstracts to identify potentially relevant works. Full-text reviews were then conducted to obtain and assess the quality of selected studies.

To ensure the reliability and validity of this review, a quality assessment was conducted on all the selected studies. Each article was reviewed based on several criteria, including the clarity of its research objectives, the appropriateness of its design and methodology, the relevance of the sample, the rigor of data collection and analysis, and its overall contribution to understanding household water consumption practices. Studies were then classified as high, moderate, or low in quality. Those rated as high or moderate quality demonstrated sufficient methodological soundness and were included in the final analysis. On the other hand, studies with significant limitations, unclear methods, or a high risk of bias were excluded. This process helped ensure that the findings and conclusions drawn from the review are based on credible and well-executed research.

Out of the 66 studies identified, 37 peer-reviewed articles were retained in the final synthesis, having met the minimum quality threshold.

Finally, the actual writing of the literature review began. The main findings were summarized, and their implications for policy, practice, and further research were discussed. A complete list of all sources cited in the review was provided at the end of the document.

**3. results and discussion**

**3.1 Sustainable Water Consumption Practices Among Household Consumers**

**3.1.1 Understanding Sustainable Water Consumption**

Sustainable water consumption refers to the management and utilization of water resources in a manner that meets current developmental needs while ensuring their availability for future generations (Madias & Szymkowiak, 2022). Specifically, Kang et al. (2017) define sustainable water consumption as a broad range of consumer behaviors related to water not only to habitual actions of water conservation—such as minimizing water use during household activities—but also to proactive actions, like making purchasing decisions that consider the water footprint of a product across its entire lifecycle. This concept encompasses both the quantity and quality of water used in households and involves long-term planning and efficiency.

Similarly, Gómez-Llanos et al. (2020) argue that sustainable water consumption requires a comprehensive understanding of both direct and indirect water use. This means that, beyond activities like bathing and cooking (direct water use), consumers must also recognize the water embedded in the production of goods and services (indirect water use) they use daily.

**3.1.2 Consumer Awareness and Attitude**

Water awareness pertains to the level of understanding individuals have about the significance of conserving water resources and the potential consequences of excessive usage (AlHamad et al., 2023). As stated by Vieira et al. (2017), household consumers play a vital role in enhancing water efficiency when they are conscious of their water consumption and when they are willing to opt for water-efficient technologies and practices. These include basic water conservation actions such as turning off the taps when not in use, taking shorter showers, promptly repairing leakages and reducing unnecessary water use.

Attitudes toward water conservation are shaped by education, information dissemination, and effective household communication. To encourage sustainable practices, communication must reach a broad audience, capture attention, raise awareness, and motivate behavioral change (Abu Bakar et al., 2021). Consumers’ preferences for saving water also strengthen the link between intention and behavior, improving the accuracy of conservation models and supporting the development of more effective strategies (Pervaiz & Iqbal, 2023).

**3.1.3 Motivation and Barriers**

While many consumers are motivated by environmental concerns or the desire to reduce water bills, several barriers hinder the adoption of sustainable practices, including limited access to water-efficient technologies, low awareness of conservation benefits, cultural norms, and misconceptions about individual impact. Some may also feel their efforts are insignificant in the broader water management context. Zhao et al. (2019) argue that awareness of water scarcity and basic conservation habits alone are insufficient to drive further water-saving behaviors; instead, understanding actual consumption, recognizing environmental impacts, and maintaining a cost-conscious attitude have a stronger influence. Similarly, Ismailov and Krivins (2023) emphasize that both personal values and practical constraints shape sustainable behavior.

In this review, the barriers are not ranked by frequency across studies but rather discussed based on their relative impact on household decision-making. This includes how strongly each factor interferes with or discourages the adoption of water-saving behaviors. For example, the lack of access to affordable water-efficient technologies and a weak perception of personal efficacy were among the most consistently reported as having high impact. Identifying these motivators and barriers is crucial for developing effective interventions, especially in developing countries where socio-economic challenges uniquely influence household consumption.

**3.1.4 Role of Household Practices in Developing Countries**

In developing countries, particularly in urban settings, household consumers face challenges that influence water consumption. The growing populations and the limited infrastructure programs, particularly in the water supply system and transmission and distribution line expansions, intensify the pressure on existing water resources. According to Ngcobo et al. (2023), the active participation of households is vital in managing this demand. Practical strategies such as water reuse, rainwater harvesting, and collective community awareness campaigns have shown promising results in addressing urban water challenges. Moreover, sustainable practices are not only environmentally beneficial but also economically advantageous for households with limited water supply.

**3.2 Behavioral Practices**

Water conservation behavior refers to the habits and practices that customers are adopting to save water (AlHamad et al., 2023). These practices are shaped by individual attitudes and perceived ability to carry out conservation initiatives. Understanding the dynamics of water-conservation behaviors and consumption is thus helpful when formulating demand-management policies, as well as when planning and designing water infrastructure (Ramsey et al., 2017).

#### 3.2.1 Application of the Theory of Planned Behavior (TPB)

The Theory of Planned Behavior by Ajzen (1991) provides a wide perspective in understanding the sustainable consumption practices undertaken by consumers at the household level. This theory posits that an individual's behavior is guided by three factors: attitude toward the behavior, subjective norms, and perceived behavioral control. In line with water consumption, this theory suggests that individuals are more likely to adopt conservation behaviors if they believe such actions are beneficial, if they perceive social expectations supporting those actions, and if they feel confident in their ability to perform them.

For instance, a positive attitude might involve believing water-saving helps reduce bills; subjective norms might involve perceived expectations from environmentally conscious peers or communities; and perceived behavioral control may relate to having access to and awareness in using water-saving tools. The TBP offers a comprehensive explanation as to why some households engage in sustainable water use and some do not.

**3.2.2 Adoption of Water-Saving Behaviors**

Conserving water is not just about the technical aspects of saving water, but also about how individuals perceive their responsibility and understand the consequences of their water use decisions (Almulhim & Abubakar, 2025). Household water conservation typically involves specific behaviors aimed at reducing water usage, such as limiting the duration of showers, turning off taps when not in use, and using water-efficient appliances (Addo et al., 2018). These simple behaviors, when consistently done, can collectively lead to significant reductions in household water consumption. A study conducted by Mitev et al. (2024) observed that even in the absence of targeted interventions, households demonstrated positive behavioral changes, indicating that self-awareness and social reinforcement are great motivators of water conservation.

According to AlHamad et al. (2023), individuals with greater self-awareness and efficient behaviors are more likely to manage their water consumption effectively and in contrast, those with limited awareness of water scarcity are less inclined to conserve water or invest in efficient technologies, making water pricing a more influential factor in shaping their usage behavior.

**3.3 Technological Water Practices**

**3.3.1 Use of Water-Efficient Technologies**

Adopting efficient appliances can help reduce residential water consumption (Garcia-Valiñas et al., 2013) and are becoming vital components of household water conservation efforts. These water-saving technologies include low-flow faucets and showerheads, dual-flush toilets and water-efficient washing machines. These innovations not only reduce water waste but also provide consumers with greater control over their consumption patterns, thereby supporting sustainable water management at the household level (Tan & Zou, 2023).

**3.3.2 Barriers to Technological Adoption**

Despite these benefits, many households are reluctant to adopt new technologies. Li et al. (2021) note that limited awareness of their value often leads to resistance. Addo et al. (2018) further identify barriers such as lack of capability, motivation, opportunity, and discomfort with new devices. These challenges mirror earlier-discussed behavioral constraints, underlining the need for integrated solutions (see Section 3.1.3).

**3.4 Environmental Approaches**

**3.4.1 Influence of Environmental Awareness**

Environmental awareness significantly influences household water consumption behaviors. When individuals understand the environmental consequences of misusages of water, they are more likely to adopt sustainable practices. This links with the study conducted by Willis et al. (2011) that households with higher levels of environmental concern tend to demonstrate lower water usage, indicating a strong link between awareness and conservation. Households with higher levels of environmental concern and positive attitudes toward water conservation would demonstrate significantly lower overall water consumption.

**3.4.2 Relationship between Water and Ecosystem**

Water is a vital, life-sustaining resource that transports oxygen and nutrients to humans, animals, and plants, playing a crucial role in the survival of all living organisms on Earth (Ejiohuo et al., 2024). As populations grow and economic activities expand, the demand for freshwater has surged, leading to increased pressure on natural water systems (Narmilan et al., 2021). This rising demand has resulted in the overexploitation of water resources, which is closely linked to various forms of environmental degradation.

**3.4.3 Climate Change and Water Security**

As global water demand continues to rise due to population growth, urbanization, and agricultural intensification, the need to conserve and manage freshwater resources becomes increasingly urgent. Strategic efforts in water conservation are essential not only for sustaining current supplies but also for mitigating the environmental degradation caused by overuse, pollution, and inefficient practices (El-Nwsany et al., 2019).

The interdependence of water and the environment underscores how human activity can deeply affect ecosystems. This reality necessitates the responsible management of water resources to ensure sustainability (Tabinda Amtul Bari et al., 2024). Integrated water resource management, climate-resilient infrastructure, and adaptive policymaking are therefore essential to address the growing uncertainties surrounding water security in the face of climate change.

**3.5 Summary of Interventions and Barriers**

The findings from the reviewed literature show that promoting sustainable household water consumption requires a balanced approach involving behavioral, technological, and environmental interventions. However, their effectiveness is influenced by motivations such as environmental concern and cost-saving, as well as by barriers like limited awareness, cultural norms, and lack of access to efficient technologies.

To enhance clarity, Figure 1 presents a conceptual framework that links the main types of interventions to their respective motivations and barriers. This framework serves as a practical summary that may inform policy development, program planning, and future research aimed at designing targeted and context-sensitive strategies for household water conservation.

**Figure 1. Conceptual Framework**

**BEHAVIORAL INTERVENTIONS**

**ENVIRONMENTAL INTERVENTIONS**

**TECHNOLOGICAL INTERVENTIONS**

**MOTIVATIONS AND BARRIERS**

**SUSTAINABLE WATER CONSUMPTION PRACTICES OF HOUSEHOLDS**

Additionally, Table 1 provides a comparative summary of behavioral, technological, and environmental interventions. It outlines common strategies, associated motivators, and the typical barriers to adoption—offering a quick reference for researchers, practitioners, and policymakers.

**Table 1. Summary of Interventions in Household Water Conservation**

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| --- | --- | --- | --- |
| **CATEGORY** | **COMMON STRATEGIES** | **MOTIVATIONS** | **BARRIERS** |
| **BEHAVIORAL** | - Awareness campaigns  - Household common practices/habits  - Peer/social influence  - Educational programs | - Environmental concern  - Urge to reduce water bills | - Little to no awareness  - Cultural resistance  - Belief in low personal impact |
| **TECHNOLOGICAL** | - Low-flow fixtures  - Water-efficient appliances  - Leak detection systems  - Smart metering | - Convenience  - Cost savings  - Environmental impact | - High cost of technological equipment or appliances  - Lack of access or knowledge  - Resistance to use technology |
| **ENVIRONMENTAL** | - Climate change education  - Ecosystem protection  - Water policy reforms | - Climate change awareness  - Ecological Protection  - Long-term sustainability | - Weak environmental education  - Policy gaps |

**4. Conclusion**

This systematic literature review highlights the importance of sustainable water consumption practices at the household level in response to rising global water scarcity, climate change, and increasing urban demands. It is evident that water conservation is not solely a technical challenge but also a behavioral, social, and environmental one. Effective strategies must therefore be multifaceted, combining awareness, motivation, technology adoption, and environmental stewardship.

Findings emphasize that consumer awareness and attitudes play a foundational role in shaping water-saving behaviors. Households with higher awareness of water issues and stronger environmental values are more likely to adopt sustainable practices. However, barriers such as low access to water-efficient technologies, lack of skills or information, and perceived insignificance of individual efforts continue to hinder wider adoption.

Behavioral frameworks, particularly the Theory of Planned Behavior, provide valuable insights into how attitudes, social norms, and perceived control influence water conservation decisions. Motivational factors, including environmental concern and cost-saving potential, serve as important factors for encouraging change, especially when reinforced through education and community engagement.

Technological interventions, including water-efficient appliances and leak detection systems, offer tangible solutions but are limited by affordability, user familiarity, and contextual suitability—especially in developing countries. Overcoming these barriers requires not only innovation but also improved policy support, financial incentives, and community-level programs.

Lastly, the review reveals that environmental interventions and ecosystem awareness are essential in building long-term water sustainability. The link between water consumption, ecosystem health, and climate resilience highlights the need for integrated water resource management and climate-adaptive infrastructure.

To conclude, promoting sustainable water consumption at the household level demands a holistic and interdisciplinary approach. Policymakers, water utility providers, technology developers, and communities must work collaboratively to implement context-specific strategies that address behavioral, technological, and environmental dimensions. By doing so, we can foster a culture of conservation that not only ensures water security today but also preserves this vital resource for future generations.

Hence, to support this goal, policymakers should invest in awareness campaigns that promote the environmental and economic benefits of water conservation. Community programs that engage households in conservation efforts, along with pricing structures that reward efficient use, can further reinforce sustainable behavior. These strategies, implemented in combination, can enable sustainable development toward responsible water use at the household level.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

The author hereby declares that generative AI technology, specifically the large language model ChatGPT, was used solely for the purposes of editing, rephrasing, and revising portions of this manuscript.

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