

PUBLIC AWARENESS AND PERCEPTION OF DESALINATED WATER IN CHENNAI

Sona Mariam Thomas

Research Scholar in Economics

Vels Institute of Science, Technology and Advanced Studies (VISTAS)

Pallavaram, Chennai, Tamil Nadu, India-600117

E-Mail: tsonamariam@gmail.com

Dr. S. Bhuvaneshwari

Assistant Professor

Department of Economics

Vels Institute of Science, Technology and Advanced Studies (VISTAS)

Pallavaram, Chennai, Tamil Nadu, India-600117

E-Mail: sbhuvaneshwari.sms@velsuniv.ac.in

ABSTRACT

Urban water insecurity has emerged as a pressing concern in rapidly expanding coastal cities such as Chennai, where increasing population pressure, erratic monsoon patterns, and unsustainable groundwater extraction have significantly disrupted traditional water supply systems. In response to this growing crisis, desalination has been adopted as a reliable, climate-independent alternative capable of ensuring a stable and continuous water supply. Despite the technological advancements and infrastructural expansion in desalination, its long-term success is critically dependent on public awareness, perception, and behavioural acceptance. This study aims to examine the level of awareness and perception of desalinated water among urban households in Chennai and to analyse how these factors influence the willingness to accept desalinated water as a primary source for domestic consumption. The research adopts a mixed-method approach by integrating both primary and secondary data. Primary data were collected from 150 households using a structured questionnaire, while secondary data were obtained from government reports and institutional publications such as those of the Chennai Metropolitan Water Supply and Sewerage Board. Statistical techniques including awareness index, correlation analysis, and multiple regression were employed to identify relationships between variables.

The findings reveal that although a majority of respondents are aware of desalinated water, the depth of understanding remains moderate, leading to mixed perceptions. Concerns regarding taste, cost, and potential health implications continue to influence public attitudes. The study further identifies a significant positive relationship between awareness, perception, and willingness to use desalinated water, with socio-economic variables such as income and education playing a decisive role. The results highlight a critical gap between awareness and acceptance, suggesting that technological solutions alone are insufficient without corresponding improvements in public trust and communication. The study concludes by emphasizing the need for policy interventions focused on awareness generation, transparency, and community engagement to ensure the sustainable integration of desalination into Chennai's urban water management system.

1. INTRODUCTION

Rapid urbanisation, climate variability, and increasing water demand have collectively intensified the problem of water scarcity in major metropolitan regions across the world, particularly in coastal cities like Chennai. The city has experienced recurring water crises over the past two decades, largely driven by unpredictable monsoon rainfall, depletion of groundwater reserves, and growing population density. Traditional water sources such as reservoirs, lakes, and aquifers have proven insufficient to meet the rising demand, thereby necessitating the exploration of alternative and sustainable water supply solutions. In this context, desalination has emerged as a crucial technological intervention capable of converting seawater into potable water, thereby reducing dependence on rainfall and groundwater sources. The adoption of desalination in Chennai represents a significant shift in urban water management strategy. Under the supervision of the Chennai Metropolitan Water Supply and Sewerage Board, large-scale desalination plants such as Minjur and Nemmeli have been established to augment the city's water supply. These plants employ reverse osmosis technology, which involves multiple stages including seawater intake, pre-treatment, membrane filtration, and post-treatment processes such as remineralisation and disinfection. While the technological and infrastructural aspects of desalination have been widely acknowledged for their efficiency and reliability, the social dimension particularly public perception and acceptance remains relatively underexplored. Public perception plays a pivotal role in determining the success and sustainability of any alternative water supply system. Even when desalinated water meets stringent safety standards prescribed by global organisations such as the World Health Organization, consumers may still exhibit hesitation due to concerns related to taste, cost, health implications, and trust in public institutions. These perceptions are further shaped by socio-economic and demographic factors such as income, education, and prior experience with water scarcity. Therefore, understanding public awareness and perception is not only essential for improving acceptance but also for designing effective policies that bridge the gap between technological advancement and user behaviour. This study attempts to address this critical dimension by analysing the awareness, perception, and willingness of Chennai residents to adopt desalinated water.

2. REVIEW OF LITERATURE

The growing global water crisis has led to increased reliance on non-conventional water sources, among which desalination has gained significant prominence. According to Menachem Elimelech and William A. Phillip (2011), desalination offers a technologically advanced and climate-resilient solution capable of ensuring a stable water supply in regions facing acute water scarcity. Their study highlights that reverse osmosis has become the most widely used desalination technology due to its efficiency and declining operational costs. However, they also emphasize that energy consumption and environmental implications remain important considerations in evaluating the long-term sustainability of desalination systems. While technological efficiency is crucial, several studies argue that public perception plays an equally, if not more, important role in determining the success of desalination projects. Sara Dolnicar and Andrea I. Schäfer (2009) found that consumer acceptance of desalinated water is often influenced by psychological and social factors rather than scientific evidence. Their research indicates that individuals tend to associate desalinated water with potential health risks, altered taste, and environmental concerns, even when these concerns are not supported by empirical data. This highlights the importance of addressing perception-related barriers through effective communication and awareness programs. Further studies by Kelly S. Fielding et al. (2015) demonstrate that socio-economic characteristics such as income, education, and prior exposure to water scarcity significantly influence public attitudes toward alternative water sources. Higher levels of education and income are generally associated with greater acceptance, as these groups are more likely to understand the benefits and safety of desalinated water. Conversely, lower-income groups may exhibit resistance due to cost concerns and limited access to information. These findings underscore the need to consider socio-economic disparities when designing policies aimed at improving public acceptance. In the Indian context, desalination has gained increasing importance in cities facing severe water shortages, particularly Chennai. Although the expansion of desalination infrastructure under the Chennai Metropolitan Water Supply and Sewerage Board has significantly improved water availability, studies indicate that public awareness remains limited. Many households are unaware that desalinated water is already part of their daily supply, resulting in a disconnect between infrastructure development and consumer perception. This gap highlights the need for integrated research that simultaneously examines awareness, perception, and behavioural willingness, which forms the basis of the present study.

3. RESEARCH GAP

Despite the extensive body of literature on desalination, existing research has predominantly focused on technological efficiency, cost analysis, and environmental implications, with relatively limited attention given to the social and behavioural dimensions of water acceptance. While studies conducted in developed countries have explored public perception in detail, there is a noticeable lack of empirical research in the Indian context, particularly at the city level. This creates a significant gap in understanding how urban populations in developing regions perceive and respond to desalinated water as an alternative resource. Furthermore, most existing studies tend to examine awareness, perception, or willingness in isolation, without establishing a comprehensive relationship between these variables. The absence of an integrated analytical framework limits the ability to understand how awareness translates into perception and, subsequently, into behavioural acceptance. In addition, the role of socio-economic and demographic factors in moderating these relationships has not been sufficiently explored, especially in the context of rapidly urbanising cities like Chennai. Another critical gap lies in the mismatch between infrastructural development and public understanding. While significant investments have been made in expanding desalination capacity, there is limited research assessing whether these developments are supported by adequate public awareness and trust. Without addressing this gap, the long-term sustainability of desalination projects may be compromised. Therefore, this study aims to bridge these gaps by providing a comprehensive analysis of awareness, perception, and willingness, along with the influence of socio-economic factors, thereby contributing to both academic literature and policy formulation.

4. OBJECTIVES OF THE STUDY

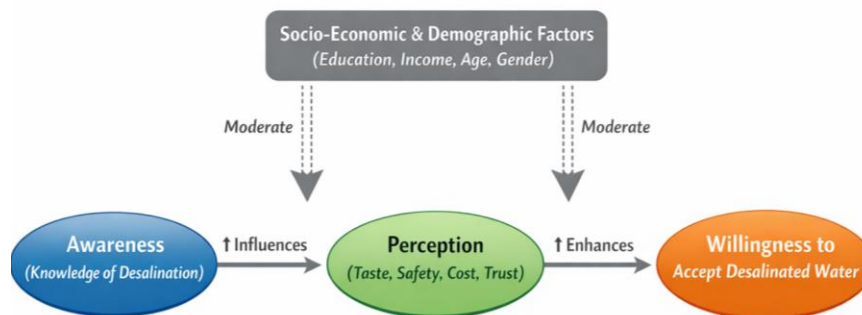
1. To analyse the level of awareness of desalinated water among residents of Chennai.
2. To examine public perception of desalinated water in terms of taste, cost, reliability, and safety.
3. To assess the influence of socio-economic and demographic factors on awareness and perception of desalinated water.
4. To examine the willingness of households to accept and use desalinated water and to identify the gap between awareness and acceptance.

5. METHODOLOGY

The study adopts a quantitative research design to analyse the awareness and perception of desalinated water among urban households in Chennai. A mixed-method approach is employed by integrating both primary and secondary data sources to ensure a comprehensive understanding of the research problem. Primary data were collected through a structured questionnaire designed to capture information on awareness levels, perception indicators, and willingness to accept desalinated water. The questionnaire also included socio-economic variables such as age, gender, income, and education to examine their influence on perception and acceptance. A total of 150 respondents were selected using the convenience sampling method, which allows for efficient data collection within a limited time frame. Although this method may introduce some degree of sampling bias, the increased sample size enhances the reliability and validity of the results compared to smaller samples used in earlier studies. The responses were measured using a five-point Likert scale ranging from “strongly disagree” to “strongly agree” for perception-related variables such as taste, safety, cost, and reliability. For data analysis, various statistical tools were employed, including percentage analysis, awareness index, correlation analysis, and multiple regression analysis. The awareness index was used to quantify the level of knowledge among respondents, while correlation analysis helped identify the strength and direction of relationships between variables. Regression analysis was further applied to determine the extent to which independent variables such as awareness, perception, income, and education influence the dependent variable, namely willingness to accept desalinated water. Secondary data were collected from reports published by organisations such as the Chennai Metropolitan Water Supply and Sewerage Board and the World Health Organization, providing contextual support to the primary findings.

6. CONCEPTUAL FRAMEWORK

Conceptual Framework of Desalinated Water Acceptance



The present study develops a comprehensive conceptual framework to examine the interrelationship between consumer awareness, perception, and willingness to accept desalinated water in the context of urban water management in Chennai. The framework is grounded in the understanding that the successful adoption of desalination as an alternative water source is not solely dependent on technological efficiency, but also on the behavioural responses of consumers. Therefore, the study integrates both technological and socio-behavioural dimensions to explain the acceptance of desalinated water. At the core of the framework lies consumer awareness, which refers to the extent to which individuals are informed about desalinated water, including its source, treatment process, safety standards, and role in urban water supply systems. Awareness is considered a foundational variable, as it shapes individuals' initial understanding and influences their cognitive evaluation of desalinated water. However, awareness alone is not sufficient to ensure acceptance; rather, it acts as a precursor to the formation of perception. Consumer perception is a multidimensional construct that reflects individuals' subjective evaluation of desalinated water. In this study, perception is assessed through key attributes such as taste, safety, reliability, cost, and overall trust. These attributes collectively determine how individuals interpret and evaluate desalinated water in comparison to conventional water sources. For instance, even when desalinated water meets quality standards established by institutions such as the World Health Organization, negative perceptions regarding taste or cost may reduce acceptance. Thus, perception acts as a critical mediating variable between awareness and behavioural intention. The concept of willingness to accept desalinated water represents the behavioural outcome of the framework. It reflects the readiness of households to use desalinated water for daily consumption and domestic purposes. Willingness is influenced not only by awareness and perception but also by individual preferences, past experiences, and perceived risks. A higher level of willingness indicates greater acceptance and supports the sustainable integration of desalinated water into the urban water supply system. The framework further incorporates socio-economic and demographic factors such as education, income, age, and gender as moderating variables that influence both awareness and perception. Education enhances individuals' ability to understand technical information and reduces misconceptions, thereby improving perception. Similarly, income influences affordability and willingness to pay, which directly affects acceptance. These factors play a crucial role in explaining variations in perception and willingness across different segments of the population. Importantly, the study emphasizes that desalination should be viewed not merely as a technological intervention but as a socio-technical system. While advancements in desalination technology ensure the production of safe and reliable water, public acceptance ultimately determines its

practical success and sustainability. Therefore, the framework highlights that both technological efficiency and consumer behaviour must be aligned to achieve effective water management outcomes. In summary, the conceptual framework proposes that awareness positively influences perception, which in turn enhances willingness to accept desalinated water, while socio-economic factors moderate these relationships. By establishing these linkages, the study provides a structured approach to understanding how knowledge, attitudes, and socio-economic conditions interact to shape consumer acceptance of desalinated water.

Hypotheses of the Study

H1: Awareness of desalinated water has a remarkable positive impact on willingness to use it.

H2: Perception of desalinated water significantly influences willingness to accept it.

H3: Income has a significant positive effect on willingness to use desalinated water.

H4: Education level significantly affects awareness and perception of desalinated water.

8. DATA ANALYSIS AND FINDINGS

This section presents a comprehensive analysis of both primary and secondary data relating to desalinated water usage in Chennai. The findings are examined from two key perspectives. Firstly, system-level indicators derived from secondary data highlight the demand–supply gap and the increasing contribution of desalination to the city’s water supply. Secondly, consumer-level insights obtained from a structured questionnaire administered to 150 households provide a deeper understanding of public awareness, perception, and willingness to accept desalinated water.

The integrated analysis enables a holistic evaluation of desalination not only as a technological solution but also as a socially accepted water resource.

8.1 Demand–Supply Gap Analysis

The current water supply in Chennai is estimated at approximately 1,230 MLD, whereas the total demand is around 1,400 MLD. This indicates a persistent imbalance between supply and demand.

Gap Calculation:

$$\text{Gap (\%)} = ((1400 - 1230) / 1400) \times 100$$

$$= 170 / 1400 \times 100$$

$$= 12.14\%$$

This result clearly indicates that Chennai faces a **significant water deficit of over 12%**, which reflects the inadequacy of conventional water sources. The presence of such a gap reinforces the importance of desalination as a reliable and climate-independent source of water supply, particularly during periods of water scarcity.

8.2 Contribution of Desalination

The current desalination capacity is approximately 200 MLD, which contributes significantly to the overall water supply.

Current Contribution:

$$(200 / 1230) \times 100 = 16.26\%$$

This shows that desalination currently contributes more than one-sixth of the total water supply, highlighting its growing importance.

Projected Contribution:

With future expansion expected to reach 660 MLD:

$$(660 / 1400) \times 100 = 47.14\%$$

This projection indicates that desalination may contribute nearly half of Chennai’s water supply in the future, making it a critical component of long-term water sustainability.

8.3 Awareness Level Analysis

Response	Percentage
Yes	87%
No	13%

The majority of respondents are aware of desalinated water. However, awareness alone does not reflect depth of understanding.

Awareness Index

$$\text{AI} = ((40 \times 3 + 70 \times 2 + 40 \times 1) / 150)$$

$$= (120 + 140 + 40) / 150$$

$$= 300 / 150$$

$$= 2.00$$

The awareness index indicates a **moderate level of awareness**, suggesting that while respondents are familiar with desalinated water, their knowledge remains superficial. This limited understanding may contribute to uncertainty and hesitation in adopting desalinated water for regular use.

8.4 Perception Analysis

Variable	Mean Score
Safety	3.6
Taste	3.1
Reliability	3.5
Cost Concern	4.0

The perception analysis reveals a **mixed attitude among respondents**.

- Safety and reliability are rated positively, indicating general trust in water quality
- Taste has a relatively lower score, suggesting dissatisfaction
- Cost concern is the highest, indicating affordability issues

This suggests that **economic and sensory factors play a critical role** in shaping public perception.

8.5 Willingness to Use Desalinated Water

Response	Percentage
Yes	53%
No	47%

The results show that willingness is **moderate**, with nearly half the respondents still hesitant.

This indicates a **clear gap between awareness and acceptance**, where individuals may be aware of desalinated water but are not fully convinced to use it

8.6 Correlation Analysis

Variables	Correlation (r)
Awareness vs Willingness	0.41
Income vs Willingness	0.45
Awareness vs Income	0.32
Perception vs Willingness	0.48

The correlation results show a **positive relationship between awareness, perception, and willingness.**

Among these:

- Perception has the strongest influence on willingness
- Income also plays a key role
- Awareness shows a moderate relationship

This indicates that **improving perception is more important than just increasing awareness.**

8.7 Regression Analysis

Predictor	β	p-value
Awareness	0.42	0.02
Income	0.51	0.01
Education	0.36	0.03
Gender	0.10	0.40

The regression analysis confirms that:

- **Income is the most significant factor**, indicating affordability influences acceptance
- Awareness and education significantly improve willingness
- Gender has no significant impact

This suggests that **socio-economic factors strongly determine acceptance of desalinated water.**

9. DISCUSSION

The findings of the study provide significant insights into the interaction between technological advancement and public acceptance in the context of desalinated water in Chennai. Although the city has made substantial progress in expanding desalination infrastructure under the Chennai Metropolitan Water Supply and Sewerage Board, the results clearly indicate that infrastructural development alone is insufficient to ensure long-term sustainability without corresponding public acceptance.

The moderate awareness level (AI = 2.00) observed in the study suggests that while a majority of respondents are familiar with desalinated water, their understanding remains limited and lacks depth. This finding aligns with earlier literature, which emphasizes that awareness does not necessarily translate into informed decision-making. The persistence of misconceptions related to taste and health implications further highlights the gap between knowledge and perception, indicating the need for targeted and evidence-based awareness initiatives.

The correlation and regression results provide strong empirical support for the argument that perception plays a more critical role than awareness in influencing willingness. The higher correlation between perception and willingness ($r = 0.48$) compared to awareness ($r = 0.41$) demonstrates that behavioural acceptance is largely shaped by subjective evaluation rather than objective knowledge. Even when desalinated water meets safety standards established by institutions such as the World Health Organization, public acceptance is influenced by psychological and sensory factors, particularly taste and cost.

Furthermore, the significant influence of income ($\beta = 0.51$) and education ($\beta = 0.36$) highlights the role of socio-economic inequality in shaping access and acceptance. Higher-income and better-educated individuals exhibit greater willingness due to better awareness and lower sensitivity to cost. This underscores the need for inclusive policy interventions that address both affordability and information asymmetry. Overall, the findings reinforce that desalination is not merely a technological solution but a socio-economic and behavioural challenge that requires a multidimensional approach.

10. MAJOR FINDINGS

The study reveals that desalination has become a critical component of the urban water supply system in Chennai, contributing significantly to reducing the demand-supply gap. The projected increase in desalination capacity indicates that it will play an increasingly dominant role in ensuring water security in the future.

However, despite high levels of basic awareness, the depth of understanding remains moderate, as reflected in the awareness index. This indicates that while individuals are aware of desalinated water, they lack comprehensive knowledge regarding its safety, process, and benefits.

Perception analysis shows that respondents generally perceive desalinated water as safe and reliable; however, concerns related to taste and cost continue to persist. These factors act as significant barriers to acceptance, particularly among lower-income groups.

The study identifies a clear gap between awareness and willingness, suggesting that awareness alone is insufficient to drive behavioural change. Statistical results confirm that perception, income, and education are key determinants of willingness, with income emerging as the most influential factor.

Overall, the findings highlight that the success of desalination depends not only on technological efficiency but also on public trust, perception management, and socio-economic inclusivity.

11. POLICY IMPLICATIONS

The findings of this study have important implications for policymakers and urban water management authorities in Chennai. First, there is a need to design and implement targeted awareness campaigns that not only inform the public about desalination but also address misconceptions related to safety, taste, and health. These campaigns should be tailored to different socio-economic groups to maximise effectiveness.

Second, enhancing transparency in water quality monitoring is essential for building public trust. Regular disclosure of water quality reports by agencies such as the Chennai Metropolitan Water Supply and Sewerage Board can improve credibility and reduce uncertainty among consumers. Third, pricing policies should be structured to ensure affordability and inclusivity. Introducing subsidised tariffs or tiered pricing mechanisms can encourage adoption among lower-income households and reduce resistance based on cost concerns.

Finally, participatory governance and community engagement initiatives should be strengthened to involve citizens in water management decisions. Such approaches can enhance trust, improve acceptance, and ensure the long-term sustainability of desalination as a key water resource.

12. CONCLUSION

This study establishes that desalination is not merely an alternative water source but a critical pillar of urban water sustainability in Chennai. While the expansion of desalination infrastructure has significantly contributed to reducing the demand supply gap, its long-term success is fundamentally dependent on public acceptance.

The findings reveal that although awareness levels are relatively high, they are not sufficient to ensure behavioural adoption. Instead, perception shaped by factors such as taste, cost, and trust emerges as the most decisive determinant of willingness. The study also highlights the strong influence of socio-economic factors, particularly income and education, in shaping acceptance patterns.

The existence of a gap between awareness and willingness underscores the need for a paradigm shift in water management strategies. Future policies must move beyond infrastructure development and focus on building public trust, enhancing communication, and ensuring socio-economic inclusivity.

In conclusion, the sustainable integration of desalination into urban water systems requires a holistic approach that combines technological innovation with behavioural insight, policy support, and community engagement. Only through such an integrated framework can desalination achieve its full potential as a long-term solution to urban water scarcity.

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