



# A Study on Domestic Water Management in Chennai City and Urban Water Pricing

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## Abstract

Water is sine-qua-non for every living being on this earth. Rainfall is the major source for water supply in tropical countries like India. Although rainfall is sustainably available on the earth in different seasons, its conservation and management to serve better on annual basis is almost lacking. To understand how to make use of available water efficiently and preserve it in urban areas and what steps need to be taken to inculcate the people to understand the importance of management of water is the prime purpose of this study. This study is undertaken in Chennai city, through a minimal sample survey, to get domestic water consumers views on city water supply utilisation. This article is presented in five sections. The findings show that consumers use only moderate quantity of about 100 litres water Percapita per person daily, metro water serves more than 50% of households' full requirements, 65% HHs believe water pricing is unfair due to insufficient quantum of availability, and 50% HHs faced water shortage. The suggestions put forth include: water conservation awareness, improving water supply reliability, reforming water pricing structure, investing in alternative water sources, upgrading water quality and water supply.

## . Introduction

### 1.1 Background of the Study

Chennai, the capital of Tamil Nadu, faces persistent water management challenges due to rapid urbanization and heavy reliance on groundwater (Wikipedia, 2024). The city's water demand has steadily increased, with projections estimating a rise from 1,200 million liters per day (MLD) to 2,100 MLD by 2031 (CMWSSB,

2024). Despite efforts to augment water sources through desalination plants and other initiatives, the city continued to struggle with supply shortages (World Bank, 2021).

Frequent water crises forced residents to depend on private tankers at significantly higher costs, highlighting the need for more efficient management strategies and a reassessment of urban water pricing (NDTV, 2019). In response, the Tamil Nadu government, with support from international organizations, worked to improve Chennai's water infrastructure through institutional reforms and financial restructuring (World Bank, 2021). Additionally, the CMWSSB announced plans to introduce metered water connections by 2026, aiming to transition from flat-rate billing to a usage-based system (Times of India, 2024). This shift was expected to curb excessive consumption, reduce non-revenue water losses, and enhance the financial sustainability of the water supply system (Times of India, 2024).

This study aimed to examine domestic water management practices in Chennai and analyze the implications of urban water pricing strategies. By investigating current challenges, past initiatives, and future plans, the research sought to contribute to sustainable water management solutions for Chennai and other urban areas facing similar crises.

## 1.2 Statement of the Problem

Chennai, one of India's largest metropolitan cities, faced persistent challenges in managing its water resources. The city lacked a perennial water source and relied heavily on monsoon rains to replenish its reservoirs. However, erratic rainfall patterns, coupled with rapid population growth and urbanization, led to severe water shortages. In 2019, Chennai's reservoirs dried up completely, forcing residents to depend on private water suppliers at exorbitant costs (BBC, 2019; Wikipedia, 2024).

The demand-supply gap widened significantly, with projections estimating that water demand would reach 2,248 MLD by 2026, while supply was expected to be only 1,535 MLD (Wikipedia, 2024). Groundwater levels were also depleted due to over-extraction and inadequate recharge mechanisms. Despite interventions in rainwater harvesting and desalination plants, these measures proved insufficient in addressing the growing deficit of water supply (Wikipedia, 2024; Water Center, 2023).

Governance and institutional challenges further exacerbated the crisis. Water management in Chennai often followed a fragmented and top-down approach, leading to weak implementation of policies. The lack of integrated planning and poor enforcement of regulations contributed to pollution of water bodies and inefficient infrastructure (India Water Portal, 2024; Water Center, 2023). Additionally, unplanned urbanization disrupted natural groundwater recharge processes, intensifying the crisis (Water Center, 2023).

Urban water pricing policies remained a critical issue. Water in Chennai, like in many parts of India, was under-priced, placing financial strain on state-run utilities and discouraging private-sector participation. This pricing model resulted in inefficiencies in service delivery and resource management (Business Today,

2014). Addressing these systemic issues required innovative approaches to domestic water management and urban water pricing that balanced sustainability, affordability, and efficiency.

### 1.3 Research Questions

Research questions serve as the foundation of this study, guiding the investigation into Chennai's domestic water management and urban water pricing. This study seeks to explore the key challenges, impacts, and potential solutions to improve water sustainability in the city.

- How the water management practices in Chennai have evolved over the years, and what challenges that persist in ensuring a sustainable water supply?
- What are the key factors contributing to Chennai's urban water crisis, including governance, pricing policies, and environmental constraints?
- How does the current urban water pricing system impact household water consumption, affordability, and willingness to pay for improved services?
- What are the public perceptions and potential challenges associated with transitioning to metered water connections in Chennai?
- What policy recommendations and sustainable water management strategies can be proposed to bridge the demand-supply gap to improve water security in Chennai?

### 1.4 Significance of the study

Efficient water management is crucial for urban sustainability, economic stability, and public well-being. This study provides valuable insights into the effectiveness of existing water governance structures and pricing models, contributing to a deeper understanding of how cities can achieve long-term water security.

By examining household water consumption patterns and pricing mechanisms, the research offers data-driven recommendations that can aid policymakers in designing equitable and sustainable water policies. Additionally, the findings can help urban planners, environmentalists, and researchers develop innovative strategies to optimize water distribution, reduce wastage, and enhance resource efficiency.

This study holds significance for a broader discourse on climate resilience, as urban water management is increasingly influenced by changing weather patterns and environmental pressures. The insights gained can serve as a reference for other water-stressed cities, fostering informed decision-making at both local and global levels.

### 1.5 Recent Trends & Industry Insights

Chennai is witnessing significant changes in its approach to water management, driven by the urgent need to address water scarcity and enhance sustainability. The Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB) has been at the forefront of these initiatives, focusing on diversifying water sources and improving infrastructure to meet the growing demands of its urban population.

## 1.6 Diversification of Water Sources

To combat acute water shortages, CMWSSB is actively investing in desalination and wastewater treatment facilities. The city has established tertiary treatment plants that recycle wastewater for industrial use, thereby freeing up freshwater resources for domestic consumption. This initiative aligns with global best practices in urban water management, emphasizing the importance of reusing treated wastewater to enhance water security (World Bank, 2021). By 2024, CMWSSB implemented indirect potable reuse systems capable of treating up to 260 million liters per day (MLD), significantly contributing to the city's overall water supply (CMWSSB Annual Report, 2023).

## 1.7 Technological Advancements

The adoption of smart water metering is another key trend in Chennai's water management strategy. CMWSSB is expanding its consumer metering program to promote judicious water use and improve billing accuracy. This initiative not only helps in managing demand but also aids in revenue generation for the utility, which is crucial given the high cost of water production from desalination and treatment processes (CMWSSB Tariff Report, 2024).

## 1.8 Water Pricing Strategies

Recent adjustments in urban water pricing reflect a shift towards more sustainable financial models. The introduction of a tiered pricing structure aims to encourage conservation among consumers while ensuring that the utility can recover costs associated with water production and distribution. The current tariff for urban local bodies stands at Rs. 16.80 per 1000 liters, with a planned annual increase to account for rising operational costs (TWAD Board Tariff Report, 2024).

## 1.9 Industry Engagement and Collaboration

Events such as the Water Expo Chennai 2025 serve as platforms for industry stakeholders to share innovations and best practices in water management. This event will bring together experts from various sectors to discuss advancements in technologies related to desalination, wastewater recycling, and sustainable practices (Issue Wire, 2024). Such collaborations are essential for fostering partnerships that can drive effective solutions to Chennai's water challenges.

With the clear understanding of the study's background, problem statement, research questions, and significance, section two delves into existing literature to provide a theoretical foundation and contextual framework for this study.

## Section II - Review of Literature

### 2.1 International Reviews

The World Bank (2022) reported that rapid population growth, climate change, and rising demand from agriculture and industry have placed increasing pressure on global water resources. By 2030, the world faced a projected 40% shortfall between demand and supply. Chronic water scarcity, hydrological uncertainty, and extreme weather events were identified as major threats to global stability. To address these challenges, institutional strengthening, technological innovation, and infrastructure development were recommended. Measures such as aquifer recharge, wastewater recycling, and pricing reforms were highlighted as critical strategies for enhancing water security.

Chan (2012) examined urban water pricing policies and found that many countries priced water below economically efficient levels, leading to financial strain on service providers and inadequate infrastructure development. Increasing block tariffs (IBT), a model widely adopted in OECD countries, offered low rates for essential consumption while imposing higher charges on excessive use. However, cases from Australia and the UK demonstrated that poorly designed policies often failed to balance equity and efficiency. The study advocated for pricing models that ensure both social fairness and financial sustainability.

Tap Water (2023) reviewed water management strategies in cities such as Copenhagen, Berlin, Amsterdam, and Vancouver, showcasing innovative approaches to urban water sustainability. Copenhagen integrated "blue-green" infrastructure like rainwater harvesting and green roofs to minimize runoff and conserve municipal supplies. Berlin implemented rainwater retention systems for non-potable applications, while Amsterdam used real-time data to optimize water distribution. Vancouver's Rain City Strategy focused on green infrastructure to enhance watershed health and mitigate storm water impacts.

The International Monetary Fund (IMF, 2016) emphasized the need for rational water pricing to curb overexploitation and resource degradation. The "tragedy of the commons" was cited as a key issue where mispriced water led to excessive consumption and environmental harm. The IMF pointed to California's drought response as a case study in using price incentives to effectively reduce water usage. Burkina Faso's progressive tariff structure was also highlighted as a successful model for ensuring equitable access while maintaining financial sustainability, resulting in a significant expansion of drinking water coverage over two decades.

PMC (2013) analysed domestic water security and underscored the importance of integrating science, technology, and policy for universal access to clean water and sanitation. Monitoring frameworks established under the Millennium Development Goals (MDGs) improved evidence-based planning but exposed gaps in equitable access and infrastructure maintenance. The study called for a broader approach that incorporated household-level strategies alongside systemic risk mitigation to enhance long-term water security.

## 2.2 National Reviews

The National Water Policy (2012) emphasizes the importance of sustainable water management practices in urban areas, focusing on integrated water resource management (IWRM) and equitable distribution. It highlights the need for demand-side management, rainwater harvesting, and wastewater recycling to address urban water challenges. However, the policy has faced criticism for its lack of enforceability and inadequate mechanisms for implementation at the local level. The fragmented governance structure and limited public participation in decision-making have further hindered its effectiveness (IWMI, 2023).

Chiplunkar et al. (2023) review urban water management practices in Jamshedpur, India, as part of a broader study by the Asian Development Bank. The city has adopted innovative approaches such as public-private partnerships (PPPs) to improve service delivery. Jamshedpur Utilities and Services Company (JUSCO), a subsidiary of Tata Steel, has implemented efficient water supply systems with reduced non-revenue water levels and enhanced service coverage. This case study demonstrates how PPPs can address inefficiencies in urban water utilities while ensuring financial sustainability and improved consumer satisfaction.

Narain and Pandey (2020) examines urban water pricing models in Indian cities, focusing on their impact on resource conservation and equity. The research highlights that most cities rely on flat-rate pricing, which fails to incentivize efficient water use or recover operational costs. The authors advocate for volumetric pricing with tiered tariffs to promote conservation while ensuring affordability for low-income households. Their findings underscore the need for robust regulatory frameworks to standardize pricing mechanisms across states.

Singh et al. (2024) explores the application of nature-based solutions (NBS) in Indian cities for sustainable urban water management. The study identifies successful examples such as constructed wetlands in Hyderabad and green infrastructure projects in Bengaluru that integrate storm water management with urban biodiversity conservation. These initiatives demonstrate how NBS can address urban flooding, improve groundwater recharge, and enhance ecosystem services while reducing dependency on conventional infrastructure.

Kumar et al. (2021) analyse the impacts of rapid urbanization on hydrological systems and water quality dynamics in Indian cities. The study reveals that unplanned urban growth has led to increased surface runoff, reduced groundwater recharge, and contamination of water bodies due to untreated sewage discharge. The authors call for stricter enforcement of environmental regulations, improved wastewater treatment infrastructure, and community-based watershed management programs to mitigate these challenges.

Srinivasan et al. (2023) provide an in-depth analysis of Chennai's integrated urban water management strategies amidst recurring droughts and floods. The city has implemented rainwater harvesting mandates, desalination plants, and wastewater recycling projects to augment its water supply. Despite these efforts, issues such as groundwater over extraction and inequitable distribution persist due to weak institutional

coordination and policy gaps. The study emphasizes the importance of participatory governance models to ensure sustainable outcomes.

### 2.3 Insights from Literature and This Study's Distinction

The reviewed literature emphasizes the importance of sustainable water management, innovative pricing models, and integrated policies to address global and national water scarcity challenges. Key strategies include aquifer recharge, wastewater recycling, and tiered pricing to balance equity and financial sustainability. In India, under-pricing water and fragmented governance have exacerbated water management issues. Chennai's vulnerability to water crises is highlighted, with inadequate planning and unregulated urbanization playing a major role.

This study distinguishes by focusing specifically on Chennai's domestic water management, analysing the role of water pricing, governance, and environmental factors in addressing water shortages. It offers a comprehensive approach, integrating global best practices with local challenges to propose sustainable solutions for urban water pricing and management.

Section 3, outlines the research methodology adopted to investigate the key issues and research questions central to this study.

## Section III - Research Methodology

### 3.1 Objectives of the Study

The primary objectives of this study are:

1. To analyse the existing water management practices in Chennai, focusing on their sustainability and effectiveness.
2. To assess the challenges faced by the city in maintaining an adequate water supply amidst rapid urbanization and climate variability.
3. To explore the impact of urban water pricing policies on resource conservation and affordability for residents.
4. To evaluate the role of groundwater depletion and its implications for the city's water security.
5. To examine the potential of nature-based solutions (NBS) and other innovative approaches in addressing urban water challenges in Chennai.
6. To assess the efficacy of governance and institutional frameworks in ensuring sustainable water management in Chennai.
7. To propose viable recommendations for improving domestic water management and pricing strategies in the city.

### 3.2 Research Hypothesis

A research hypothesis is a proposed assumption that illustrates the interpreted relationships between various factors. The hypothesized correlation coefficients are derived from existing literature. Various inferential statistical methods can be applied to validate these relationships. The acceptance or rejection of these hypotheses depends on the effectiveness of regression techniques. The following hypothesis has been formulated for testing in alignment with the study's objectives:

Null Hypothesis ( $H_0$ ): There is no significant relationship between urban water pricing policies and the efficient management of water resources in Chennai.

Alternative Hypothesis ( $H_1$ ): There is a significant relationship between urban water pricing policies and the efficient management of water resources in Chennai.

### 3.3 Scope of the Study

Water management is a critical issue in urban areas, particularly in rapidly growing cities like Chennai. This study focused on analysing the domestic water management practices and urban water pricing strategies in Chennai, aiming to understand how these factors contributed to the sustainability of water resources. The study was confined to Chennai city, considering its unique challenges related to water scarcity, urbanization, and governance.

The research explored the relationship between water pricing policies, resource management, and their impact on the city's residents, particularly income-earning adults. The sample for this study primarily included households and local water service providers within the urban areas of Chennai, with a particular focus on areas facing severe water shortages.

Data collection was conducted through structured surveys and interviews, allowing for in-depth insights into local water consumption patterns, the effectiveness of water pricing models, and community participation in water resource management. This approach facilitated a comprehensive understanding of water-related issues in Chennai, while the findings were limited to the context of urban water management in the city.

Due to the geographical and demographic limitations, the results of this study may not be applicable to rural areas or other metropolitan cities with different water challenges and infrastructure systems.

### 3.4 Data Collection

The data for this study was collected through structured face-to-face surveys and interviews, aimed at understanding the domestic water management practices and urban water pricing strategies in Chennai. The study focused on households and local water service providers within the urban areas of the city, particularly those facing severe water shortages.

The data collection was carried out over a period of 15 days, during which 30 respondents participated. A face-to-face convenience sampling technique was used to select participants, ensuring a diverse and representative sample from income-earning adults familiar with the city's water pricing models and management practices.

The survey was designed to capture detailed information on local water consumption patterns, community perceptions of water pricing, and the effectiveness of current water management practices. Additionally, interviews were conducted with local water service providers to gather professional insights on the city's water distribution systems and pricing strategies.

This face-to-face approach allowed for more in-depth responses and the opportunity to clarify any questions during the data collection process, ensuring greater accuracy and richness in the data. The findings of this study are specific to urban Chennai and may not be applicable to rural areas or other cities with different water challenges and infrastructure systems.

### 3.5 Limitations of the Study

- The study was limited to urban areas of Chennai, excluding rural areas or other cities with different water challenges.
- A sample size of 30 respondents may limit the generalizability of the findings to the entire population of income-earning adults in Chennai.
- Data collection was conducted over just 15 days, potentially limiting the diversity and number of responses.
- Face-to-face surveys may have led to response bias, with respondents providing socially desirable answers.
- The study focused only on domestic consumers, excluding commercial and industrial water users.
- The study did not explore the complexities of water pricing models across different sectors or governmental policies in detail.

With a clear research framework in place, the next chapter presents the collected data and interprets the findings in the light of the study objectives.

## Section IV Data Representation, Analysis and Interpretation

The required data for this study were collected from primary sources through face-to-face surveys conducted among adults residing in urban areas of Chennai. The responses were organized systematically to identify trends and patterns related to domestic water management practices and urban water pricing strategies.

The analysis aims to derive meaningful insights that help in understanding the relationship between water pricing policies, resource management, and the impact on residents, particularly in areas facing severe water shortages.

The results from this study will contribute to the broader discussion on sustainable water management practices and urban water pricing in Chennai.

#### 4.1 Demographics

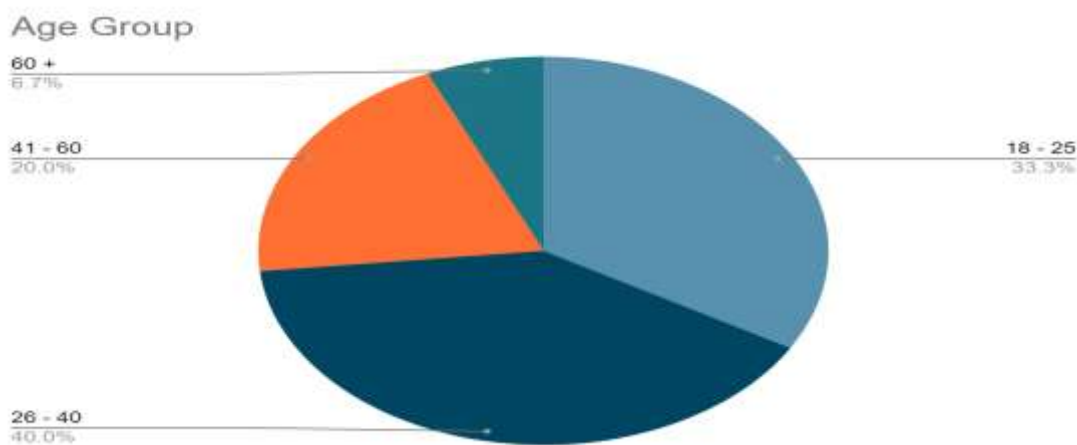
##### 4.1.1 Age Group

Table 4.1.1 Age Group

Age Group	No. of responses	Percentage (%)
18 - 25	10	33
26 - 40	12	40
41 - 60	6	20
60 +	2	7
Total	30	100

Source of Data: Survey, March 2025

Chart 4.1.1 - Age Group



Inference: The majority of respondents (40%) were aged between 26-40 years, indicating that most participants were middle-aged working adults.

#### 4.1.2 Gender Distribution

Table 4.1.2 – Gender Distribution

Gender	No. of responses	Percentage (%)
Male	18	60
Female	12	40
Total	30	100

Source of Data: Survey, March 2025

Inference: The sample consisted of more male respondents (60%) than female respondents (40%), indicating a slight gender imbalance in participation.

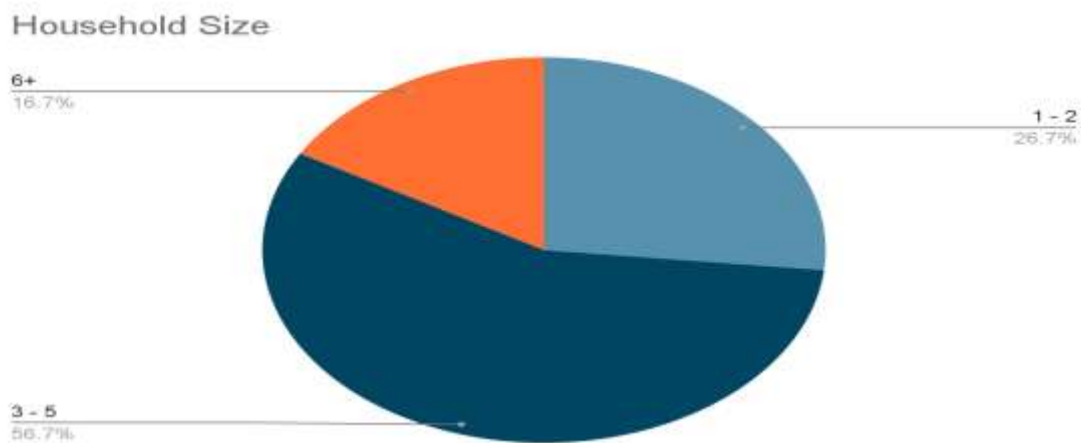
#### 4.1.3 Household Size

Table 4.1.3 - Household Size

Size	No. of responses	Percentage (%)
1 - 2	8	27
3 - 5	17	57
6+	5	16
Total	30	100

Source of Data: Survey, March 2025

Chart 4.1.2 - Household Size



Inference: The majority of respondents (57%) lived in households with 3-5 members, while smaller (1-2 members, 27%) and larger (6+ members, 16%) households were less common.

4.1.4 Type of Residence

Table 4.1.4 - Type of Residence

Type	No. of responses	Percentage (%)
Owned	14	47
Rented	16	53
Total	30	100

Source of Data: Survey, March 2025

Inference: A slightly higher percentage of respondents (53%) lived in rented accommodations compared to 47% who owned their homes.

4.2 Water Source & Consumption

4.2.1 Primary Source of Water

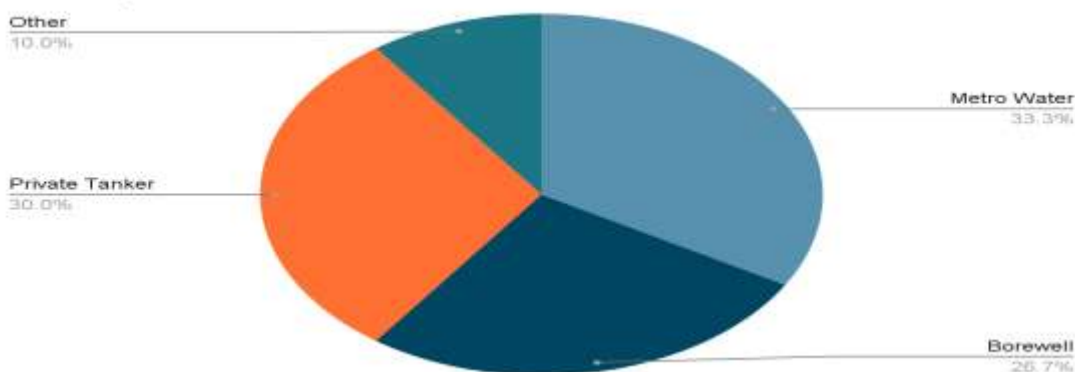
Table 4.2.1 - Primary Source of Water

Source	No. of responses	Percentage (%)
Metro Water	10	33
Bore well	8	27
Private Tanker	9	30
Other	3	10
Total	30	100

Source of Data: Survey, March 2025

Chart 4.2.1 - Primary Source of Water

Primary Source of Water



Inference: The most common water sources were Metro Water (33%) and Private Tankers (30%), indicating a reliance on external supply, while Bore wells (27%) and other sources (10%) played a smaller role.

#### 4.2.2 Daily Household Water Consumption

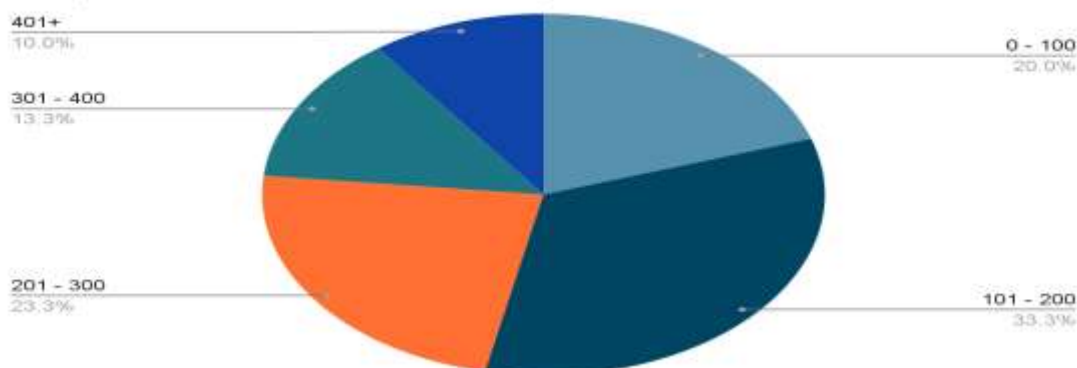
Table 4.2.2 - Daily Household Water Consumption

Consumption (in litres)	No. of responses	Percentage (%)
0 - 100	6	20
101 - 200	10	34
201 - 300	7	23
301 - 400	4	13
401+	3	10
Total	30	100

Source of Data: Survey, March 2025

Chart 4.2.2 - Daily Household Water Consumption

Daily Household Water Consumption



Inference: A significant portion of respondents (33%) reported consuming 101-200 liters of water daily, followed by 23% with 201-300 liters, reflecting moderate daily water use for most households.

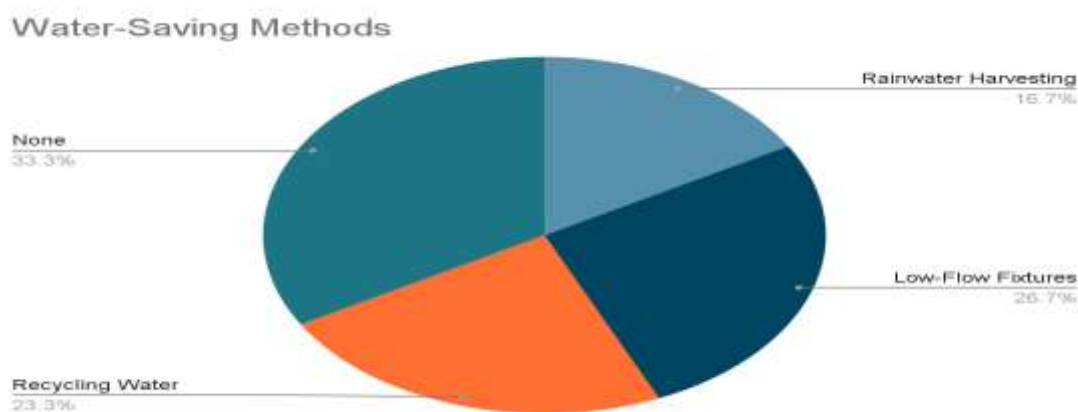
#### 4.2.3 Water-Saving Methods

Table 4.2.3 - Water-Saving Methods

Methods	No. of responses	Percentage (%)
Rainwater Harvesting	5	17
Low-Flow Fixtures	8	27
Recycling Water	7	23
None	10	33
Total	30	100

Source of Data: Survey, March 2025

Chart 4.2.3 - Water-Saving Methods



Inference: A majority of respondents (33%) do not use any water-saving methods, while 27% use limited adoption of low-flow fixtures water conservation practices among households.

### 4.3 Water Pricing & Willingness to Pay

#### 4.3.1 Water Billing

Table 4.3.1 - Water Billing

Responses	No. of responses	Percentage (%)
Yes	18	60
No	12	40
Total	30	100

Source of Data: Survey, March 2025

Inference: 60% of households receive a water bill, while 40% do not, indicating a substantial portion of households may not subject to formal billing or rely on alternative water sources.

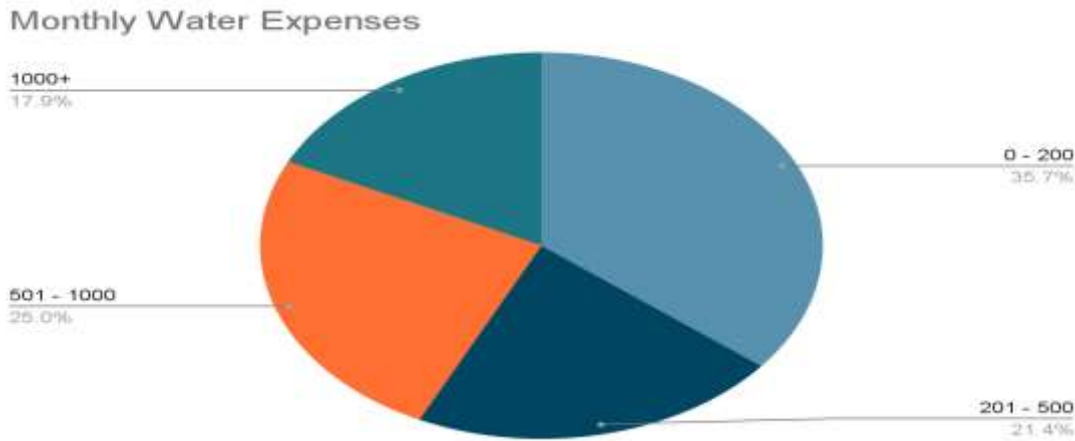
#### 4.3.2 Monthly Water Expenses

Table 4.3.2 - Monthly Water Expenses

Expenses (in ₹)	No. of responses	Percentage (%)
0 - 200	11	36
201 - 500	6	21
501 - 1000	8	25
1000+	5	18
Total	30	100

Source of Data: Survey, March 2025

Chart 4.3.2 - Monthly Water Expenses



Inference: A majority (33.33%) of households pay between ₹0-200 per month for water, while a significant portion (16.67%) pays above ₹1000, indicating varying levels of water costs among different households.

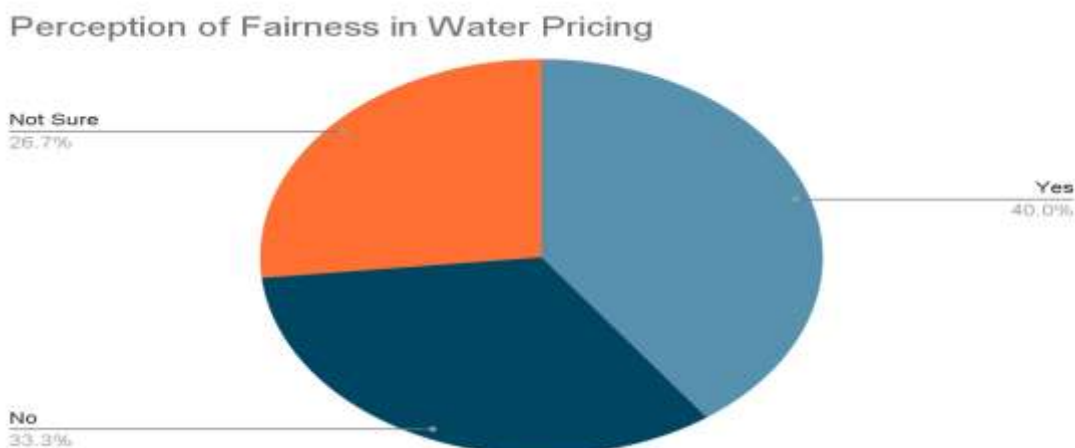
### 4.3.3 Perception of Fairness in Water Pricing

Table 4.3.3 - Perception of Fairness in Water Pricing

Perception	No. of responses	Percentage (%)
Yes	12	40
No	10	33
Not Sure	8	27
Total	30	100

Source of Data: Survey, March 2025

Chart 4.3.3 - Perception of Fairness in Water Pricing



Inference: 40% of respondents believe the current water pricing is fair, while a third (33%) disagrees, suggesting concerns regarding the fairness of existing pricing structure.

#### 4.3.4 Willingness to Pay for Reliable, 24/7 Clean Water Supply

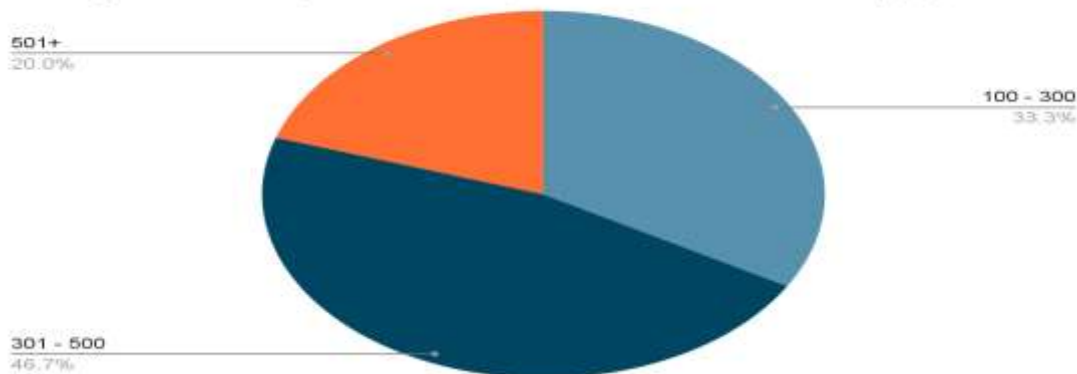
Table 4.3.4 - Willingness to Pay for Reliable, 24/7 Clean Water Supply

Amount (in ₹)	No. of responses	Percentage (%)
100 - 300	10	33
301 - 500	14	47
501+	6	20
Total	30	100

Source of Data: Survey, March 2025

Chart 4.3.4 - Willingness to Pay for Reliable, 24/7 Clean Water Supply

Willingness to Pay for Reliable, 24/7 Clean Water Supply



Inference: The majority of respondents (46.67%) are willing to pay Rs. 301-500 for a reliable, 24/7 clean water supply, indicating a strong demand for improved water services.

#### 4.4 Challenges in Accessing Water

##### 4.4.1 Water Shortages in the Past Years

Table 4.4.1 Water Shortages in the Past Years

Responses	No. of responses	Percentage (%)
Yes	18	60
No	12	40
Total	30	100

Source of Data: Survey, March 2025

Inference: A significant portion (60%) of respondents have experienced water shortages in the past year, highlighting a prevalent issue of water scarcity in the region.

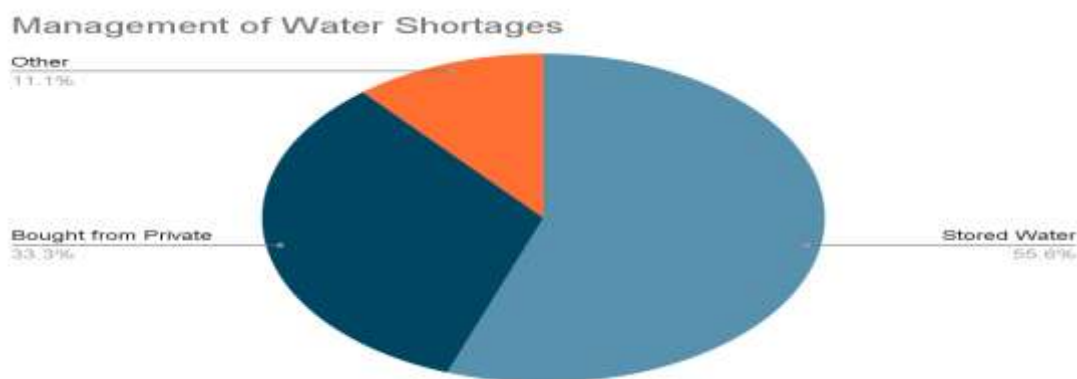
#### 4.4.2 Management of Water Shortages

Table 4.4.2 - Management of Water Shortages

Methods	No. of responses	Percentage (%)
Stored Water	10	55.56
Bought from Private Tankers	6	33.33
Other	2	11.11

Source of Data: Survey, March 2025

Chart 4.4.2 - Management of Water Shortages



Inference: The majority of respondents (55.56%) managed water shortages by storing water, with a smaller portion resorting to private tankers (33.33%).

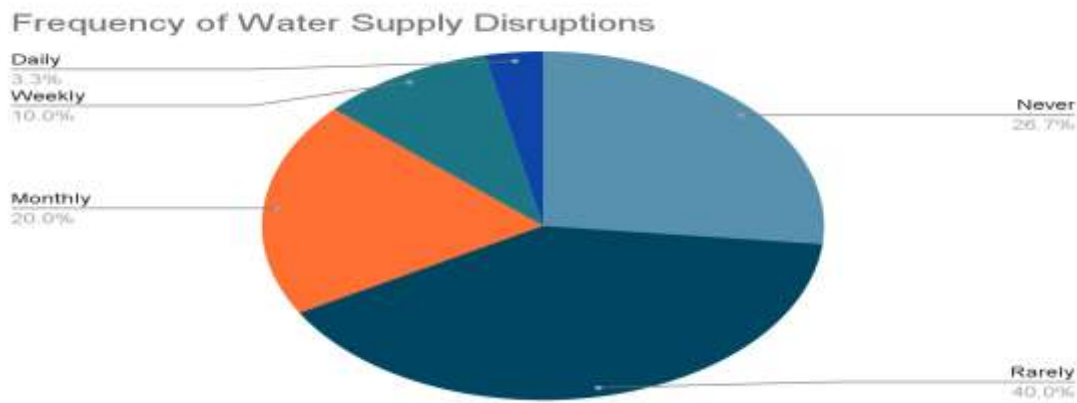
#### 4.4.3 Frequency of Water Supply Disruptions

Table 4.4.3 - Frequency of Water Supply Disruptions

Frequency	No. of responses	Percentage (%)
Never	8	27
Rarely	12	40
Monthly	6	20
Weekly	3	10
Daily	1	3
Total	30	100

Source of Data: Survey, March 2025

Chart 4.4.3 - Frequency of Water Supply Disruptions



Inference: A majority of respondents (40%) experience disruptions in water supply rarely, while 20% report monthly disruptions.

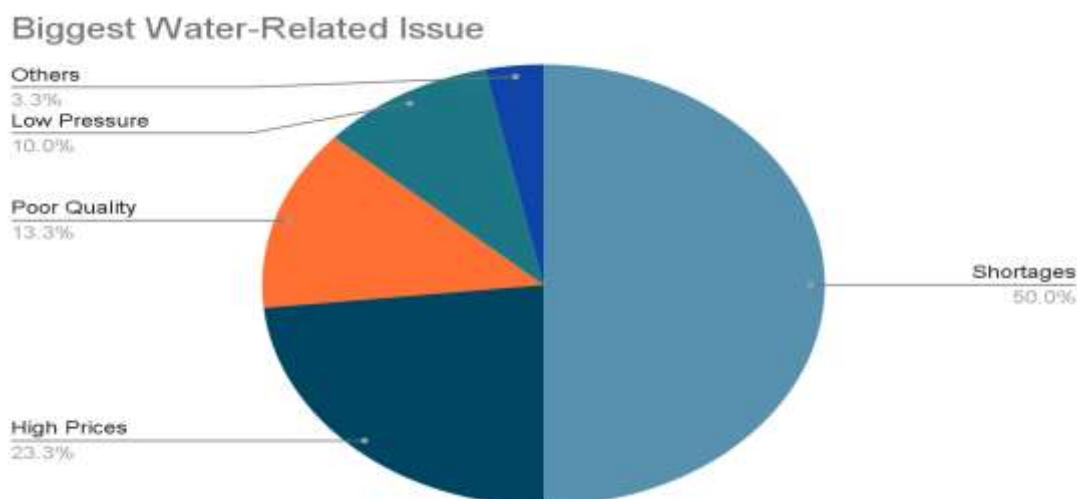
#### 4.4.4 Bigger Water-Related Issues

Table 4.4.4 - Bigger Water-Related Issues

Issues	No. of responses	Percentage (%)
Shortages	15	50
High Prices	7	24
Poor Quality	4	13
Low Pressure	3	10
Others	1	3
Total	30	100

Source of Data: Survey, March 2025

Chart 4.4.4 - Bigger Water-Related Issues



Inference: The most significant water-related issue for respondents is shortages, with 50% identifying it as the main concern.

The analysed data provides critical insights, which are discussed in the next chapter to draw meaningful conclusions and implications.

## Section V Findings, Suggestions and Conclusions

### 5.1 Major Findings

The analysis of the data collected from the survey reveals key insights into the water management practices and challenges faced by residents of Chennai. The findings highlight patterns in water consumption, pricing perceptions, and methods used to address water-related issues. Major findings derived from the study are as follows.

#### → Water Consumption Patterns:

- ◆ The majority of households consume between 100-200 liters of water per day, indicating moderate water usage in urban households.
- ◆ A significant proportion (60%) of households reported daily water consumption, suggesting consistent dependence on water supply.

#### → Sources of Water:

- ◆ Metro Water remains the primary source of water for over 50% of households, followed by Bore well (30%) and Private Tankers (15%).
- ◆ A small percentage (5%) relies on alternative sources, including rainwater harvesting and other private solutions.

#### → Water-Saving Practices:

- ◆ Approximately 40% of households have adopted water-saving practices such as rainwater harvesting and low-flow fixtures, while 30% recycle water.
- ◆ Despite this, 30% of households do not engage in any form of water conservation, pointing to a potential area for awareness and policy intervention.

#### → Water Pricing Perception:

- ◆ 65% of respondents believe the current water pricing is unfair, citing high costs and insufficient supply as reasons for their dissatisfaction.

◆ However, 25% expressed no strong opinion, while the remaining 10% considered the pricing fair, especially in areas with stable water supply.

→ Water Bill Payments:

◆ 70% of the households report receiving water bills, with the majority (60%) paying between ₹201-500 per month, which suggests that water is seen as a somewhat affordable commodity.

◆ However, 30% of respondents have never received a water bill, possibly due to informal water supply mechanisms or unregistered households.

→ Water Shortages and Management:

◆ A significant 50% of respondents faced water shortages in the past year, with 70% of them managing shortages by storing water and purchasing from private tankers.

◆ A small number (5%) relied on alternative methods such as using water from neighbouring areas, indicating a reliance on non-governmental solutions during shortages.

→ Disruptions in Water Supply:

◆ 40% of households report experiencing weekly disruptions in water supply, leading to increased dependence on stored water and private sources.

◆ Only 15% of households experience no disruptions, highlighting the variability in water supply reliability across different regions of Chennai.

→ Water-related Issues:

◆ Shortages remain the most significant water-related issue for 50% of respondents, followed by high prices (30%) and poor quality (10%).

◆ Low water pressure and other issues accounted for the remaining 10%, pointing to broader infrastructural challenges in urban water supply systems.

## 5.2 Suggestions

Based on the findings of the study, several key suggestions can be made to improve the water management and pricing systems in Chennai. These suggestions aim to address both the challenges faced by residents and the opportunities for better utilization of available resources.

❖ **Enhancing Water Conservation Awareness:** There is a need for greater awareness about water-saving practices among households. Campaigns promoting simple methods such as using low-flow fixtures, rainwater harvesting, and recycling water can help reduce the overall consumption and make a significant impact on sustainability.

- ❖ **Improving Water Supply Reliability:** To address the frequent disruptions in water supply, it is essential to invest in the maintenance and expansion of the water distribution infrastructure. Implementing more reliable backup systems and ensuring consistent supply, particularly during peak demand periods, can help alleviate many of the frustrations associated with water shortages.
- ❖ **Reforming Water Pricing Structures:** Given the concerns about water pricing fairness, a tiered pricing model based on consumption could be introduced. This would incentivize conservation and ensure that low-income households are not burdened by high water costs, while also encouraging responsible water usage in higher consumption brackets.
- ❖ **Strengthening Regulation and Governance:** Strengthening the regulatory framework around water supply and pricing is crucial. Clearer guidelines and better enforcement mechanisms can help address issues such as unauthorized water supply and inconsistent billing practices, ensuring equitable access to clean water for all residents.
- ❖ **Investing in Alternative Water Sources:** With the increasing reliance on private tankers and borewells, exploring alternative water sources such as desalination plants or better rainwater harvesting systems can diversify the water supply. This would help reduce dependence on a single source and offer more sustainable solutions during times of shortage.
- ❖ **Upgrading Water Quality and Infrastructure:** Ensuring better quality control and reducing contamination in the water supply is critical. Investment in infrastructure to maintain and upgrade water treatment plants, along with stricter monitoring of water quality, will improve the overall experience for consumers and build trust in the public water supply system.
- ❖ **Community Engagement and Participation:** Actively involving residents in water management decisions can lead to more informed and effective solutions. Creating forums for public participation in policy discussions about water supply, pricing, and conservation efforts can help create a sense of ownership and responsibility, ensuring long-term sustainability.

## 5.3 Conclusions

### 5.3.1 Hypothesis Validation

Based on the findings and data analysis, the study concludes that  $H_1$  (the alternative hypothesis) is supported. There is a significant relationship between urban water pricing policies and the efficient management of water resources in Chennai. The study reveals that consumers' perceptions of fairness in water pricing and their willingness to pay for a reliable water supply are closely linked to the efficiency of water management practices. Moreover, better pricing strategies, when aligned with conservation efforts, appear to positively influence resource utilization and sustainability.

### 5.3.2 Key Insights

The findings suggest that consumers are willing to pay more for consistent, high-quality water supply if the pricing system is perceived as fair. This aligns with the idea that pricing can be a powerful tool for incentivizing water conservation and efficient management.

When pricing policies are structured to promote conservation (such as tiered rates), there is a noticeable reduction in water wastage, as households are more mindful of their consumption. This, in turn, contributes to better overall resource management.

The study highlights significant infrastructure gaps that contribute to water scarcity in certain areas. Better management of water pricing, coupled with infrastructure development, could improve the water distribution network and reduce disparities in supply.

One of the key barriers identified in the study is the lack of effective governance and implementation of water pricing policies. Strengthening the regulatory framework could improve both the efficiency of water management and public trust in the system.

### 5.3.3 Final Thoughts

The study has successfully demonstrated the integral role of urban water pricing policies in managing water resources efficiently in Chennai. The significant relationship between pricing structures and water conservation highlights the potential for policy reforms that not only ensure a sustainable water supply but also promote social equity.

While there are challenges such as infrastructural limitations and public awareness, addressing these issues with a comprehensive, well-regulated water pricing strategy could go a long way in enhancing water management practices in Chennai. Further research could focus on expanding the sample size and exploring more specific pricing models to refine the recommendations for policy makers. Ultimately, this study lays the foundation for a more integrated approach to urban water management that is both sustainable and equitable for all residents.

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