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Domestic Household Water Consumption Trends In Virudhunagar District: Socioeconomic Influences And Sustainable Management Strategies

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ABSTRACT

The distribution of water usage across different socioeconomic categories and blocks is examined in this study on domestic household water consumption trends in Virudhunagar District, which reveals significant variations impacted by gender, marital status, education, and employment. Significant differences in water use between the top and bottom blocks are seen for tasks including drinking, cooking, maintaining personal cleanliness, and caring for animals. The study emphasizes how these differences are caused by elements such as agricultural techniques, water availability, and lifestyle. The study highlights the significance of comprehending local water consumption for efficient resource management and sustainability. To enhance overall water quality and availability, it suggests regulatory actions, community engagement, infrastructure upgrades, and focused projects, especially in the area of animal care. In order to solve the rising problem of water shortage, certain actions are essential.

Keywords: *Hygiene Standards, Public Awareness, Socio-economic Factors, Sustainable Management, Water Consumption*

Introduction

A major problem that many communities across the world face, especially in quickly expanding metropolitan areas, is the availability and use of clean, protected water for residential use. Extreme water shortages and environmental degradation have been caused in many areas by indiscriminate surface and subsurface water extraction along with spatial-temporal changes in rainfall. (Narayanan and colleagues, 2020) Over the next 25 years, the amount of water consumed by households and businesses in developing nations is expected to treble, underscoring the urgent need for sustainable water management.

These difficulties are not exclusive to Tamil Nadu, India's Virudhunagar District. Currently, groundwater resources provide around half of the region's water supply for homes, businesses, and agriculture. These finite water supplies have been severely strained by urbanization, industrialization, and population increase, which has resulted in water shortages and possible disputes between industrial, municipal, and agricultural users. (Kumar and Goyal, 2020). Investigating the factors influencing home water usage is crucial to comprehending the trends of residential water consumption in Virudhunagar District. Water harvesting, or collecting and storing rainwater for later productive use, is one of the quick-to-implement alternatives (Pauline et al., 2020). Four districts in Tamil Nadu were the sites of a research that included

Statement of the Problems

Water is a vital resource that supports a variety of household, agricultural, and industrial operations as well as life. Water is essential for everyday activities in private households, including drinking, cooking, cleaning, maintaining personal cleanliness, and, in rural regions, providing for agricultural and animal requirements. Understanding local water consumption patterns is essential for efficient resource management as concerns about water shortage and conservation continue to develop on a global scale. For examining residential household water usage trends, the district of Virudhunagar, which is situated in the southern region of Tamil Nadu, India, offers an intriguing case study. Examining how water is utilized in houses is made possible by Virudhunagar's unusual blend of rural and urban locations, varied economic activity, and various family kinds. By examining the patterns of consumption in

Objectives of the Study

The objectives of the present study are as follows.

- To determine how household water usage differs by gender, marital status, educational attainment, and employment by analyzing the activity-wise distribution of water consumption across several blocks.
- To investigate how household water consumption patterns are influenced by socioeconomic characteristics, such as occupation, family income, and educational background, and to pinpoint important trends in resource allocation and management.
- To evaluate the effects of demographic variables like gender and marital status on water usage for different domestic tasks and investigate the ramifications for water conservation and fair access measures.

Methodology

Eleven taluks make up the Virudhunagar district; six blocks were chosen for this study based on the Human Development Index (HDI). Sivakasi, Srivilliputhur, and Rajapalayam are the top three blocks, whereas Vembakottai, Narikudi, and Tiruchuli are the lowest three. There are two municipalities and fifty-four panchayats in these six blocks. Five panchayats were selected using a systematic sample technique, and 60 respondents were picked from each panchayat, for a total of 360 respondents from rural regions.

Domestic Consumption of Water

Researching daily household water use is essential for effective resource management, policy creation, and sustainability promotion. It facilitates demand-driven infrastructure design, promotes public health by guaranteeing sufficient water for basic family requirements, and boosts economic efficiency by streamlining water pricing and delivery. In the end, knowing how much water is used each day promotes better conservation techniques and helps avoid waste, especially in areas where water is scarce.

Activity-wise Distribution of Water Consumption in Blocks

In summary, resource management, infrastructure planning, public health, sustainability, and policy formation are all much improved by the activity-wise allocation of water use in blocks. According to the statistics, there seems to be a substantial difference in the amount of water used for drinking, cooking, personal hygiene, housekeeping, and animal drinking between the top three and bottom three blocks.

Table 1.1
Activity-wise Distribution of Water Consumption in Blocks
(Mean of Total Consumption by Households/Day)

Activity (Litres)	All the 6 Blocks	
	Top Three Blocks	Bottom Three Blocks
Drinking Water	30.90	32.62
Kitchen Water	51.71	48.66
Personal Hygiene	205.26	196.00
House Cleaning	191.23	199.45

Animals Drinking	471.00	379.85

Source: Primary data

The drinking water consumption of the top three blocks is marginally higher than that of the bottom three, indicating either greater need or better access. The bottom three blocks use more kitchen water than the top three, which can be a sign of differing cleaning or cooking methods. Compared to the bottom three blocks, the upper three consume less water for personal hygiene. This can be the result of different water availability or lifestyles. When it comes to house cleaning, the top three blocks consume less water than the lowest three. This implies that there can be more cleaning tasks or bigger areas to clean in the lower blocks. Animal water use is significantly greater in the top three blocks, which may be a sign of more livestock or more intensive farming methods. Notably, the top three blocks have significantly higher water usage for animals, likely due to more cattle or agricultural activities. These variations suggest variances in lifestyle, water leadership practices, or the availability of resources across the blocks. The patterns of water consumption in the top and bottom three blocks show significant differences: the top three blocks use more water for drinking and house cleaning, but less for personal hygiene and kitchen activities than the bottom three blocks. Therefore, effective water usage strategies could help balance consumption across all areas.

Gender and Consumption of Water Category wise distribution of Households

By analyzing gender and water consumption in households, we can better understand how traditional roles and responsibilities impact water usage patterns, support targeted interventions that address specific needs, ensure a sufficient supply of water for hygiene, and inform effective resource management. Additionally, it empowers women by allowing them to participate in water management decisions, which contributes to gender equality. In summary, this analysis is critical to promoting sustainable water management and equitable resource distribution.

Table 1.2
Gender and Consumption of Water Category wise distribution of Households

(Mean)

Activity (Litres)	**Gender**	
	Male	**Female**
Drinking Water	32.24	31.53
Kitchen Water	49.65	50.43
Personal Hygiene	199.73	201.06
House Cleaning	194.79	195.59
Animals Drinking	418.80	405.00

Source: Primary data

Households led by men use somewhat more drinking water (32.24 liters) than households headed by women (31.53 liters). The little discrepancy suggests that both sexes have comparable demands or access to drinking water. Compared to male-headed families (49.65 liters), female-headed households use somewhat more water for cooking activities (50.43 liters). This can indicate a slight variation in home size or cooking and housekeeping habits. Households led by women use somewhat more water for personal hygiene (201.06 liters) than households headed by men (19.73 liters). This small difference suggests that the two sexes have comparable hygiene habits, with women perhaps placing a little more emphasis on personal hygiene. Male households use 4.79 liters of water for housekeeping, while female households use 5.59 liters. This implies that house cleaning behaviors are stable regardless of gender, with just a minor differential in consumption. Male-headed families (418.80 liters) use substantially more water for animals relative to female-headed households (405.00 liters).

This might suggest that families led by men have more animals or are more active in the livestock rearing industry. According to the statistics, there are very little variations in the patterns of water usage between families led by men and women across all activities. Male-headed families use more water for their animals, which is the most obvious difference. This implies that households led by males could be more involved in managing their cattle. Overall, patterns of water usage in the majority of activities are not significantly influenced by gender, suggesting that both groups' household water demands are matched.

Educational Qualification and Consumption of Water Category wise distribution of Households

Finding trends that guide sustainable water management techniques is made easier by examining the relationship between water usage and educational attainment. While focused educational initiatives might further improve families' effective use of water, higher education levels often encourage knowledge, educated decision-making, and improved cleanliness habits. Developing strategies that enhance public health outcomes and water resource management need this understanding.

Table 1.3
Educational Qualification and Consumption of Water Category wise distribution of Households

(Mean)

Activity (Litres)	Educational Qualification					
	Primary School	Middle School	High School	Higher Secondary School	Graduate	Illiterate
Drinking Water	30.98	31.35	33.43	30.76	32.74	30.92
Kitchen Water	50.51	50.54	50.69	49.40	47.17	51.06
Personal Hygiene	199.80	201.69	201.00	200.43	197.67	201.16
House Cleaning	198.44	197.70	190.15	198.90	202.03	186.46
Animals Drinking	286.00	374.73	489.86	371.45	306.00	553.50

Source: Primary data

Drinking water intake ranges from 30.76 to 33.43 liters, which is pretty constant throughout educational levels. Higher secondary school graduates consume significantly less (30.76 liters), whereas high school graduates consume the highest (33.43 liters). This implies that drinking water intake is not much impacted by educational achievement. There are only slight differences in kitchen water use by educational level, with graduates using the least amount (47.17 liters) and illiterate families using the highest (51.06 liters). This might suggest that while less educated households may rely on conventional, water-intensive practices, greater educational levels may be associated with more efficient water use in kitchen-related activities. The amount of water used for personal hygiene is comparatively constant, with families with middle school education using 201.69 liters and those with graduates using 197.67 liters.

This suggests that there are very minor variations in personal hygiene behaviors depending on educational attainment. Households with illiterate members use the least amount of water (186.46 liters) for housekeeping, while those with graduates use the most (202.03 liters). This might imply that while illiterate households might use less water for cleaning, highly educated households might have bigger living areas or more meticulous cleaning regimens. The amount of water that animals use varies significantly depending on their educational attainment. Households with only a primary school education use much less water (286.00 liters), whereas households with no education use the highest (553.50 liters). This discrepancy implies that families with lower levels of education could have more cattle or practice more water-intensive animal husbandry, whereas those with higher levels of education might have more effective animal management or less

Marital Status and Consumption of Water Category wise distribution of Households

Analyzing the relationship between marital status and water use offers important insights into resource distribution and household dynamics. The need for tailored treatments and policies to address the unique water needs of various family types is highlighted by differences in consumption patterns across marital statuses. In the end, this strategy improves resource management initiatives and public health results.Table 1.4 highlights significant differences in usage patterns by displaying the mean water consumption (in liters) for various household activities according to marital status.

Table 1.4

Marital Status and Consumption of Water Category wise distribution of Households

(Mean)

Activity (Litres)	Marital Status			
	Unmarried	Married	Divorced	Widow
Drinking Water	31.57	31.73	31.89	33.46
Kitchen Water	49.38	50.73	50.83	49.03
Personal Hygiene	199.66	201.79	199.48	196.05
House Cleaning	195.33	191.84	219.72	202.50
Animals Drinking	318.32	442.91	576.00	324.00

Source: Primary data

The amount of water used for drinking varies very little depending on marital status. Unmarried homes use the least amount of water (31.57 liters), whereas widowed households use somewhat more (33.46 liters). Every group uses about the same amount of water for kitchen operations, with widowed families using slightly less (49.03 liters) and married and divorced households using slightly more (50.73 and 50.83 liters, respectively). The amount of water used for personal hygiene is rather consistent across all categories, ranging from 196.05 liters for widows to 201.79 liters for married people, indicating consistent hygiene habits irrespective of marital status. Married and single homes use somewhat less water for housekeeping (191.84 and 195.33 liters, respectively), whereas divorced households use the most (219.72 liters). Additionally, homes headed by a widow consume more water (202.50 liters).

The biggest variety is seen in this group. Married homes use 442.91 liters of water for animals, whereas divorced households use 576 liters. Widowed and unmarried families consume significantly less (318.32 and 324 liters, respectively). Marital status has an impact on water use habits, with the biggest variations observed in water use for cleaning and animal drinking. While other activities like drinking, cooking, and personal hygiene exhibit less variation across various marital situations, divorced families typically use more water in these categories, particularly for animal care.

Occupation and Consumption of Water Category wise distribution of Households

Analyzing the relationship between occupation and water use provides important information about family water needs and efficient resource management. Knowing the unique requirements of diverse professions may help policymakers create focused interventions that serve a range of communities and sectors, enhance public health programs, and help build policies for sustainable water consumption. The average water usage (in liters) for different home activities by employment is shown in table 1.5. Different jobs use water in different ways.

Table 1.5
Occupation and Consumption of Water Category wise distribution of Households

(Mean)

Activity (Litres)	Occupation					
	Education	Agriculture	Kooli (Informal Works)	Private	Business	Government
Drinking Water	31.81	30.12	33.93	32.66	28.87	29.03
Kitchen Water	49.00	49.78	49.64	50.45	51.76	51.39
Personal Hygiene	193.66	198.64	194.72	205.10	208.22	206.87
House Cleaning	198.42	199.98	202.40	193.63	179.75	186.24
Animals Drinking	225.00	479.25	364.91	277.20	360.00	0.00

Source: Primary data

Government and commercial homes report the lowest drinking water use (28.87 and 29.03 liters,

respectively), whereas those engaged in informal (kooli) labor consume the most (33.93 liters). Each occupation uses almost the same amount of water for culinary purposes, with business families using the most (51.76 liters) and education homes using the least (49.00 liters). Households with government and business employees use the most water for personal hygiene (208.22 and 206.87 liters, respectively), which may indicate that hygiene practices are prioritized or easier to get. The lowest consumption is reported by families in education (193.66 liters). Occupational differences in water use for housekeeping are more pronounced. Businesses and government employees use the least amount of water (179.75 and 202.40 liters), whereas families with informal workers use the highest. The reliance on livestock in agriculture is reflected in the much greater water use for animals (479.25 liters) reported by households in this sector. Due to their urban location or lack of interest in animal husbandry, households with government jobs report using zero water in this category. Patterns of water use differ greatly among professions. While households with casual jobs use more water for drinking and housekeeping, agricultural households use the most for their livestock. Government and business houses use less water for housekeeping and animals but place a higher priority on personal cleanliness. These differences show how water usage is influenced by various lifestyle and work demands.

Family Income Level and Consumption of Water Category wise distribution of Households

Based on family income levels, the average water use (in liters) for different home activities is shown in table 1.6. Significant variations in water use across income levels are shown by the statistics.

Table 1.6

Family Income Level and Consumption of Water Category wise distribution of Households

(Mean)

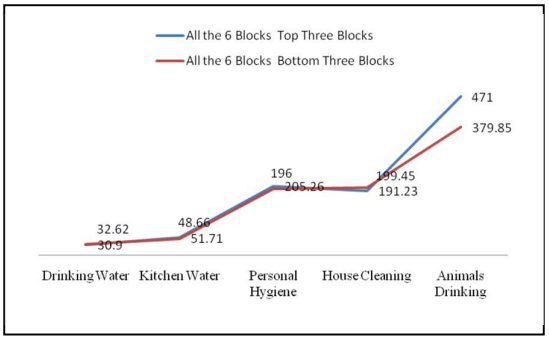
Activity (Litres)	**Family Income Level**					
	Below ₹ 10,000	**₹ 10,000 – 20,000**	**₹ 20,000 – 30,000**	**₹ 30,000 – 40,000**	**₹ 40,000 – 50,000**	**Above ₹ 50,000**
Drinking Water	32.11	32.08	30.35	34.61	29.04	29.70
Kitchen Water	49.67	50.18	50.38	49.65	41.23	59.40
Personal Hygiene	207.64	195.34	205.54	220.96	194.98	202.00
House Cleaning	186.22	190.94	227.78	203.88	196.77	191.10
Animals Drinking	474.00	425.40	224.00	468.00	0.00	0.00

Source: Primary data

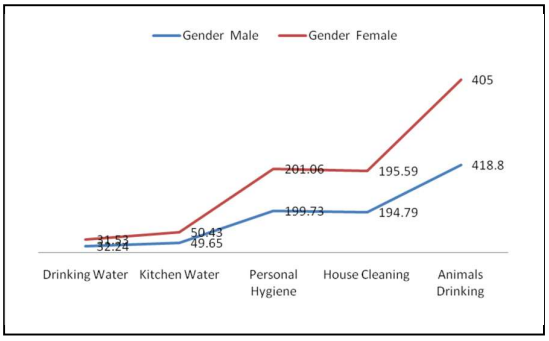
Across income levels, drinking water consumption is comparatively constant, ranging from 29.04 liters for households making ₹ 40,000–50,000 to 34.61 liters for homes earning ₹ 30,000–40,000. Higher-income households are shown to consume the least. Families earning above ₹50,000 report using the most water for cooking (59.40 liters), whilst households earning between ₹40,000 and ₹50,000 use much less (41.23 liters). Kitchen water use is comparatively constant among lower- and middle-income groups. Households with incomes between ₹30,000 and ₹40,000 use the most water for personal hygiene (220.96 liters), suggesting that cleanliness is more important to them. On the other hand, people who make between ₹40,000 and ₹50,000 use the least (194.98 liters). Families with incomes between ₹20,000 and ₹30,000 use the most water for housekeeping (227.78 liters), while those with incomes under ₹10,000 use the least (186.22 liters). Animal water use is much greater in families with incomes under 10,000 and those with incomes between 30,000 and 40,000, at 474.00 liters and 468.00 liters, respectively. This indicates that lower-income households are more likely to possess cattle. Families with incomes over ₹40,000 report using no water for their pets, which suggests a lower level of livestock-related activity. Family income levels have a substantial impact on water use habits. While higher-income families use more water for personal hygiene and the kitchen but less for animals, lower-income households often use more water for animals and maintain constant water use across categories. Due to their larger households or easier access to water resources, middle-income groups (those earning between ₹20,000 and ₹40,000) consume more water overall.

Figure 1.1
Domestic Consumption of Water

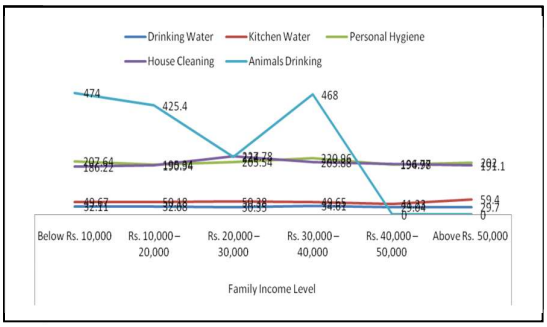
(Liters per day)



Blocks and Water Consumption



Gender and Consumption of Water Category



Educational Qualification and Consumption

Marital Status and Consumption of Water

Occupation and Consumption of Water

Family Income Level and Consumption of

Suggestions

Based on the findings of the hygiene assessment of water usage, the following recommendations can be considered:

- To make sure the water satisfies the necessary hygienic requirements, conduct routine testing and monitoring of water excellence across several categories.
- To inform the public about the value of water cleanliness and safe water consumption practices for a variety of purposes, including drinking, cooking, personal hygiene, and animal care, launch public awareness campaigns.

- Investing in infrastructure upgrades will help to maintain high-quality water standards for all activities by improving water treatment and distribution systems. Regulatory Compliance:
- To guarantee safe and sanitary water use, enforce stringent rules and guidelines for water quality in commercial, residential, and agricultural contexts.
- Encourage citizens to report any water quality problems and take an active role in upholding safe water practices by promoting community involvement and participation in initiatives aimed at improving water quality.
- To improve the health and well-being of animals, including pets and livestock, special measures should be put in place to guarantee that they have access to safe and clean drinking water.

By putting these suggestions into practice, it will be feasible to enhance the general cleanliness of water in all categories and guarantee that safe, clean water is available for a variety of uses, which will benefit the environment and the community's health and well-being.

Conclusion

A thorough examination of water use across various socioeconomic classes and geographic blocks can be found in the publication on residential home water consumption trends in the Virudhunagar District. Particularly between the top three and bottom three blocks, it shows notable variations in water usage for a variety of purposes, including drinking, cooking, personal hygiene, housekeeping, and animal care. Key findings show that while the bottom blocks consume more water for cleaning and personal hygiene, which may be a reflection of lifestyle differences or larger living spaces, the top blocks tend to use more water for drinking and animal care, probably as a result of larger livestock numbers or agricultural practices. The study highlights how socioeconomic characteristics, such as education, marital status, and gender, affect patterns of water use. In view of the growing urbanization, population, and dependence on groundwater supplies, the study emphasizes the urgent need for sustainable water management techniques. It implies that in order to overcome water shortage and provide fair access to water, focused interventions—like water harvesting and effective resource allocation—are crucial. The study's overall goal is to support improved water management techniques that are suited to the unique requirements of the Virudhunagar District and may be applicable to other comparable areas.

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