RESIDENTIAL WATER AUDITING

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ABSTRACT

Water is one of the most important elements of the environment of our planet earth. All of us know that water is essential for living of all forms of life and is also an integral part of an environment. It is needed for variety of purpose such as domestic, agricultural, fishing, industrial, navigational, recreational etc. A study was carried out on a sample of 60 families, 20 each from group A (income Rs. 500-2000), group B (income between Rs. 2001-8000) and group C (income above Rs. 8001) from suburban areas of Mumbai to determine the consumption of water according to family size, family income and family life cycle, and amount of water optimally required for each activity and also to assess the wastage. The results of the survey revealed that consumption of water increases as the family size and income increases but family life cycle does not have impact on water consumption. The wastage of water is found to be more in higher income group families (income above Rs. 8001). Experiments which were conducted show that on an average an Indian adult require 100 litres of water per capita for various activities.

Key Words : Water auditing , Family size,Family income,Family life cycle, Water consumption

INTRODUCTION

Water is one of the most important elements of the environment of our planet earth. It occupies more than two third of its surface area and has a profound influence both on its climate and life. All of us know that water is essential for living of all forms of life and is also an integral part of an environment.[1] It is needed for variety of purpose such as domestic, agricultural, fishing, industrial, navigational, recreational etc. Being one of the most simple and readily available low cost cleaning agents, it is widely used for collection and conveyance of all types of wastes and for keeping the environment clean and to maintain essential hygiene level I sanitation.[2] It is thus a paradox that the best cleaning agent of the world the water both cleans and pollutes its environment.[3] The gross requirement of fresh good quality water on the earth is continuously rising especially in the last few decades due to rapid increase in population and also on account of the expectation of the people for better quality of life requiring large per capita quantity of water. The importance and value of water as a great natural resource is often underestimated. In fact: "Water power is the only really big source of energy that can be

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counted as income and not capital" by Charles Darwin (1809 -1882).

Only when there is shortage of water, one values it more.[4] There are two main sources of water and i.e. surface water sources which include lakes, streams, ponds, rivers and underground water sources like infiltration galleries, infiltration wells, springs, tube wells and wells.[5] Water has multipurpose uses like domestic, agricultural, industrial, institutional, fire fighting, hydro power and navigational. Where as quantity of water required for domestic purpose can be divided as follows: drinking, cooking, bathing, washing hands, face, household sanitary purposes and washing vehicles. Water being one of the most precious resources needs to be conserved and saved for future. The study was undertaken with the objectives to know the various ways through which the water is being wasted and how it can be reduced.[6]

OBJECTIVES

1. To determine the consumption of water according to family size, family income and family life cycle.
2. To determine the amount of water optimally required for each of the activity.
3. To assess the wastage and make recommendation for water management at domestic sector.

MATERIAL AND METHODS

The study was conducted to determine the consumption of water according to family size, stage of family life cycle and family income and also to determine the amount of water optimally required for each of the activities experimentally. The study was conducted in the city of Mumbai on a sample of 60 families: 20 each from group A (income Rs. 500-2000), group B (income between Rs. 2001-8000) and group C (income above Rs. 8001). Study conducted for group A was on stored water and while for group B and group C were carried out where water supply was on 24 hour basis. Consumer survey was conducted through questionnaire, interview and observation for the study. This study was done in two phases :

i. Assessment of water consumption for various purposes for the sample.
ii. Experimentation to see the actual water requirements for various purposes.

In the first phase consumers were asked for the information such as quantum of water required for various domestic purposes etc. There were two categories of water consumers: those who collect and store water and those who have the facility of running water all the time. Assessment of quantum of water for those who store was done through usual technique. While estimation of quantity of running water consumed was done by calculating the water used per minute from the rate of flow and the time for which the water was used.

While in the second phase experiments were conducted to standardize the quantum of water required per day per capita for each of the various domestic activities like bathing, brushing teeth, flushing, washing clothes, washing utensils, mopping and cooking. For the purpose of experimentation the respondents who were using stored water were provided with measured quantity of water for all the activities and were asked to perform all the activities with maximum conservation of water, the experiment were repeated with each subject three times in order to standardize the quantity of water required for each domestic activities. Time taken for each domestic activity and the rate of flow of water was recorded for the subjects who were having running water supply at there homes.

Information collected was statistically analysed by calculating simple mean, standard deviation, percentages and f-test.

RESULTS AND DISCUSSION

The results of the study are discussed under the following points:

1. The factors influencing the consumption of water i.e. family size, family life cycle/ family stage and family income. (**Fig. 1** and **Table 1**)
2. Water requirement for the various domestic activities. (**Table 2**)
3. Assessment of wastage of water. (**Table3**)

Factors Influencing Residential Water Consumption

1. **Family Size**

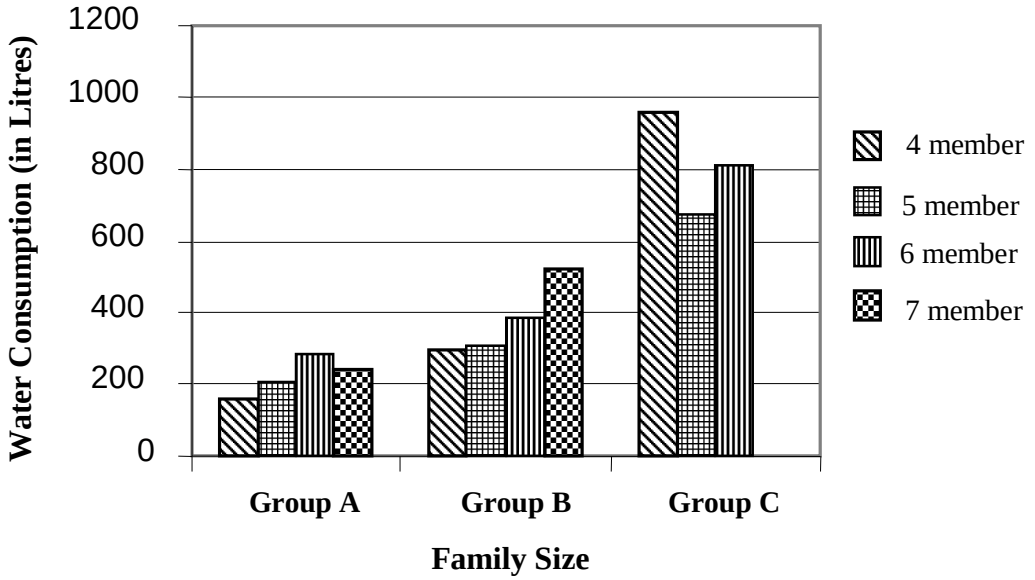

Fig. 1 : Water consumption according to family size

In more than 90% of the families the consumption of water found to be increasing as the family size increased. Whereas in group A in the family size of 7, the consumption of water was less because it was a family where all the members were college going or adults who were consuming water from other outside sources rather than home. In the survey it was also found that in group C the maximum consumption of water is by the family of 4 members because they had big rooms, garden to water car to wash and have pets in the house which require additional water for maintaining essential hygiene.

Family Life Cycle/ Family Stage

Each family passes through a cycle that begins with the marriage of two young persons, grows normally into a large group of assorted ages and finally returns to a group of two older persons. According to Nickell and Dorsey family life cycle is divided into following stages :

- Beginning Stage: new married couple.
- Pre School Stage: families having children of age group between1-3 years.
- Schooling Stage: families having children of age group between 4-16 years.
- College and Adults: families having children of age group above 17 years.
- Contracting Stage: when children moves out of the family and start there own family and an older couple is left.

Table 1 : Distribution of sample according to family life cycle and water consumption

Family Stage	Water Consumption(in litres)								
	Group A			Group B			Group C		
	Personal use	House related use	Other use	Personal use	House related use	Other use	Personal use	House related use	Other use
Beginning	20	15	-	34	33	18	62	71	13
Pre-School	14	10	-	31	28	13	63	88	17
Schooling	12	5	-	58	46	5	56	116	130
College and Adults	5	4	-	34	19	5	59	71	7

Through findings of the survey it was concluded that the consumption of water was maximum in families with school going children. The number of children and their age composition made a difference in the quantum of water used. The families with more number of members who are adult or college going consumed less water because they were more dependent on sources of water which are outside home; but attitude of the people using water also makes a difference since it is a cheap commodity.

Water Requirement (Experimental Research Findings)

Per capita requirement of water for various purposes by an adult person experimentally is:

Table 2 : Per capita requirement of water for various purposes by an adult person

S.No.	Domestic Activities	Water Consumption (in litres)
1	Bathing	30
2	Brushing Teeth	7
3	Washing Clothes	30
4	Washing Utensils	20
5	Flushing	10
6	Cooking	6
7	Total	103

The experiments which were conducted shows that on an average an Indian Adult requires 100 litres of water per capita for various activities.

Table 3 : Distribution os sample according to family income and water consumption

Family Income	Family Size	Total Use of Water		Per Capita Use of Water	
		Personal use	House related work	Personal use	House related work
3000	4	120	105	30	27
6000	4	156	153	39	38
9000	4	243	326	61	81
11000	4	290	693	73	173

Assessment of Wastage of Water

From the analysis of the survey it was found out that the consumption of the water increases as the income of the family increases. From the data tabulated it can be concluded that the consumption of the water depends upon the income of the family and the variety of requirements.

CONCLUSION

Water is the most precious resource for all living beings. Keeping this in view, the optimal per capita requirement of water is studied along with the existing pattern of consumption. The difference between the two was studied for all the three groups. From the information collected it was found that use of water mainly depends upon income. It was found that as the income of the family increased, the amount of water used also increased. The amount of water used by the consumers was affected due to the domestic habits of the consumers. Consumption of water was found to be more erratic especially on holidays. It was also reported that people use large amount of water for washing clothes and bathing. The demand for water increased as the family member increased. Family life cycle does not directly affect the consumption of water, though the maximum consumption was found to be in the schooling stage. Wastage of water was also found to be maximum in schooling stage and in the high income group. It was also seen that the amount of water consumed by group A was very less as compared to group C. And it can be said that wastage of water was more in high income group and it can be reduced by a little care.

RECOMMENDATIONS

1. When washing, brushing your teeth, or shaving never let the tap running continuously. Fill a glass with water for mouth rinsing while brushing your teeth.
2. Take shorter showers whenever possible. Turn off the water while you are soaping and shampooing, then rinse off quickly.
3. Never flush garbage of any kind down the toilet.
4. Regularly check leaks, and repair properly. One small leak can waste thousands of litres of water a year.
5. If you wash dishes by hand, don't leave the water running for rinsing. If you have one sink, gather washing dishes in a dish rack and rinse them with a pan full of hot water.
6. When cleaning fruits and vegetables never let the tap run continuously. Instead, wash them in partially filled tub, and then rinse them quickly under the tap.
7. When boiling vegetables, use only enough water to cover them and use a tight-fitting lid. Steaming uses even less water while conserving more nutrients.

8. Keep a bottle of drinking water in the refrigerator instead of running the tap until the water gets cool each time you want some.
9. Never put garbage of any kind down the sink drain.
10. When watering your lawn and garden, use a hand held hose pipe for watering or use a sprinkler that delivers large flat droplets to reduce waste and unnecessary evaporation.

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