IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

CONSUMPTION OF WATER FOR RESIDENTIAL BUILDINGS

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Abstract: Water is center of life. There is high reliability on water as humans. To fulfil the needs of 17% of the world's population, India only possesses 4% of the world's fresh water. Unlike industrial and commercial sectors, urban residential neighborhoods are primarily used for dwelling. The consumption of water for residential buildings is different as per different legislations. The study aims to perform a comparative analysis and get to a definite conclusion.

Index Terms **- Water consumption, residential buildings, domestic.**

I. INTRODUCTION

In 2017, just 45% of the world's population had access to a safe sanitation service. According to UN estimates, there are 4.2 billion people without access to adequate sanitation. To fulfil the needs of 17% of the world's population, India only possesses 4% of the world's fresh water. [1] To meet their demands, water is used for a variety of things, including residential purposes like drinking, cleaning, cooking, etc., and industrial ones like processing, fabricating, manufacturing, etc. Every sector needs a specific amount of water each year in a given proportion to achieve it. This is known as water demand, and it differs amongst industries. Water is extracted from a source (surface or subsurface) and transferred to the required place to satisfy this need. Water intake is the quantity of water withdrawn. Water discharge is the process of releasing extra or surplus water back into a reservoir. The residual quantity, or the amount of water utilized to accomplish a certain task, is referred to as water consumption if the amount of water release is subtracted from the amount of water intake.

II. STANDARD DATA

Domestic and non-domestic sectors are used to determine water use. In contrast to non-domestic consumption, which includes irrigation, industries, commercial enterprises, mining, livestock, etc., domestic consumption comprises drinking, cooking, cleaning, and other home chores. The quality required for each application may typically be decreased as water demand rises; for example, water used to clean a floor doesn't have to meet drinking water standards, and water used to produce food for survival can be of much lower quality. Therefore, several choices must be taken before the amount of water can be determined. [2].

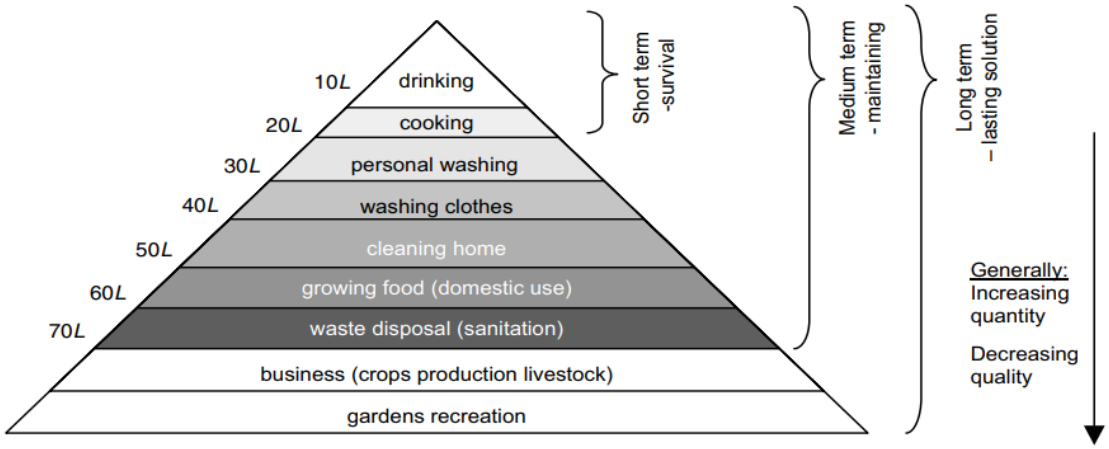

Figure 1: *Hierarchy of water requirements (Inspired by Abraham Maslow's (1908-1970) hierarchy of needs)*

Everyone has secure access to enough water for drinking, cooking, personal and household cleanliness. Public water sources are close enough to shelters to allow usage of the bare minimal amount of water. Even if there is an abundance of water available, there may still be restrictions on its usage, such as the time required for people to travel and line in order to access it. People will gather less water if they take longer than 30 minutes to do so. (See Figure 2). [3]

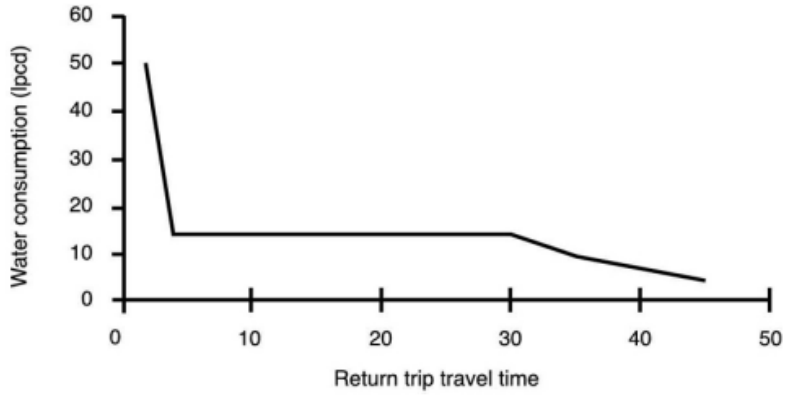

Figure 2: *Typical relationship between water collection journey time and domestic consumption (after Cairncross & Feachem 1993)*

Domestic water use in India accounts for 4% of the country's water footprint, or roughly 135 liters per capita per day (lpcd) for urban areas and 75 lpcd for rural areas. Despite having insufficient resources, clean drinking water is available to about 30% of the nation's population. The amount of household water used by each individual varies depending on their lifestyle. Domestic water use accounts for between 50 and 60 percent of overall water use. According to IS 1172-1993, the figure no. 3 shows, India's metropolises and small towns' minimal residential water usage. Moving on to non-domestic consumption, it is divided into four categories: fire demand, institutional and commercial purposes, industrial, and public usage. The industrial sector is reported to have the highest water consumption among them, both domestically and internationally. Almost 8% of the nation's entire water supply, according to CPCB, is being withdrawn, compared to 13%, according to the World Bank. [4]

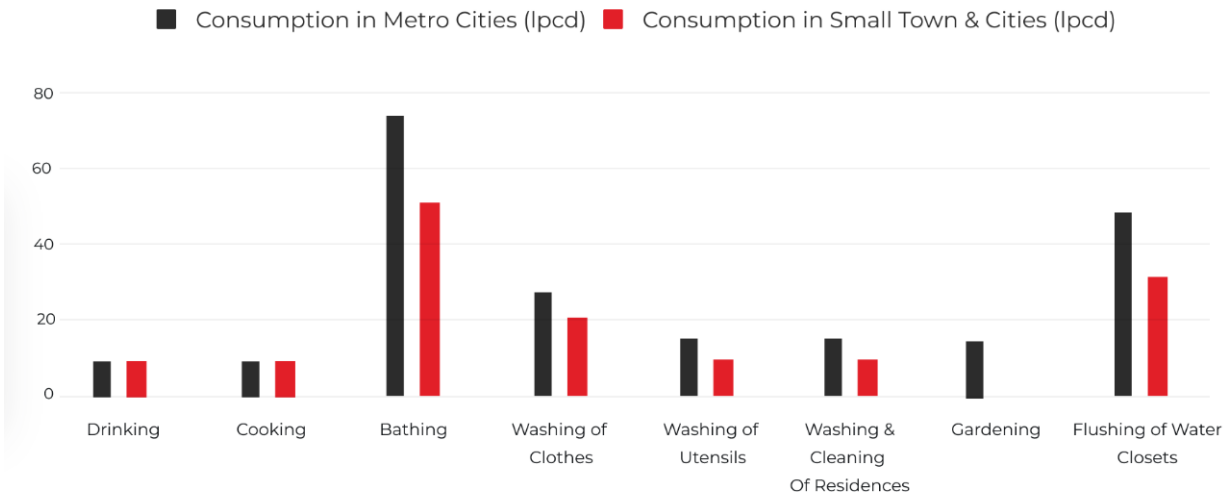

Figure 3: *Consumption in metro-cities and small towns & cities*

- **Ministry of Housing and Urban Affairs**

The standard for urban water supply has been suggested as 135 liters per capita per day (lpcd) by the Ministry of Housing and Urban Affairs.

Sr.No.	Way of water consumption	Capacity
01	Drinking	5L
02	Cooking	5L
03	Bathing	55L
04	Cloth washing	20L
05	Utensil washing	10L
06	House washing	10L
07	Flushing of W.C	30L

Table 1: *Way of water consumption as per Ministry of Housing and Urban Affairs*

Controlling rainfall and groundwater can reduce water usage and waste. Draining the site, home, assembly, opening, component, and substance will accomplish this. [5]

- **Bureau of Indian Standards, National Building Code and GRIHA (Green Rating for Integrated Habitat Assessment)**

A minimum of 70 to 100 liters per person per day may be judged adequate for residential needs in metropolitan settings, excluding non-domestic needs like flushing. The rates per capita per day for domestic and non-domestic requirements are listed as a rough guideline. A minimum of 70 to 100 liters per person per day may be judged adequate for residential needs in metropolitan settings, excluding non-domestic needs like flushing. The rates per capita per day for domestic and non-domestic requirements are listed below as a rough guideline: [6]

1)	For communities with population up to 20 000 and without flushing system	
	a) water supply through standpost	40 lphd (*Min*)
	b) water supply through house service connection	70 to 100 lphd
2)	For communities with population 20 000 to 100,000 together with full flushing system	100 to 150 lphd
3)	For communities with population above 100 000 together with full flushing system	150 to 200 lphd

Table 2: *Water consumption for communities*

- **Consumer council of water**

According to the Consumer Council of Water, 145 lphd of water is used each day, including 13 l for showers, 80 l for baths, 9 l for toilets, 50 l for washing machines, 14 l for dishwashers, 30 l for vehicle washes, etc. [7]

- **Department for environment food and rural affairs**

As per Department for environment food and rural affairs, 142 lphd of water is consumed by every person every day. [8]

Sr.No.	Way of water consumption	Capacity
01	Washing machine	9%
02	Hand wash dishes	4%
03	Dishwasher	1%
04	Bath	8%
05	Shower	25%
06	Toilet	22%
07	Bathroom hot tap	7%
08	Car	1%
09	Garden	1%
10	Other (cold taps)	22%

Table 3: *Way of water consumption as per Department for environment food and rural affairs*

III. COMPARATIVE ANALYSIS

Sr. No.	Name	Consumption of water for residential buildings
01	Ministry of Housing and Urban Affairs	135 lphd
02	Bureau of Indian Standards	135 lphd
03	National building Code	135 lphd
04	GRIHA	135 lphd
05	Consumer council of water	145 lphd
06	Department for environment food and rural affairs	142 lphd

Table 4: Comparative Analysis

IV. RESULTS AND DISCUSSIONS

According to the comparative study above, total water usage is 135 lphd, with 5 liters used for drinking, 5 liters used for cooking, 55 liters used for bathing, 20 liters used for washing clothes, 10 liters used for cleaning utensils, 10 liters used for washing the home, and 30 liters used to flush the toilet.

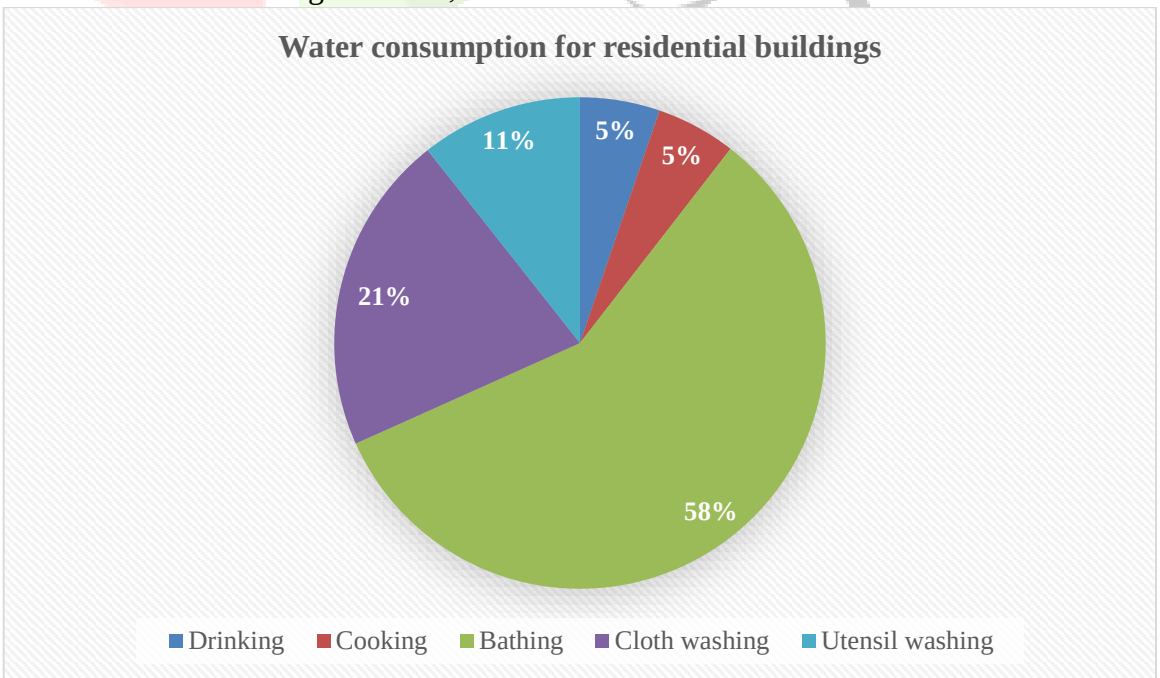

Figure 4: *Water consumption for residential buildings*

V. CONCLUSION

Using the above data we can conclude that 135 liters per person per day (lpcd) or 4% of India's water footprint is accounted for by residential water consumption which includes domestic water uses like cooking, cloth & utensil washing, drinking and bathing as per Ministry of Housing and Urban Affairs, Bureau of Indian Standards, National Building code and GRIHA.

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