

Water Security measure for future Sustainability – Rainwater Harvesting

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Abstract

Water is one of nature's greatest gifts and has been providing substance to life on Earth for millions of years.

The great Mahatma Gandhiji also reflected on this issue and said – “the world has enough for everyone's need; but not for anyone's greed.”

India is one of the most well endowed countries in terms of primary source of water. There is no natural reason why any single village in any part of India should remain short of water.

National annual av. Rainfall is 554 mm with 25% annual with 25 % less rain, drought occurs in over 80% of area.

According to a study by the Water Resources Group, India will have a 50% gap in demand and supply of water (754 billion m³) by 2030. 80% of this demand is projected to be for agriculture considering the fact that India has poor agricultural water productivity, produces water intensive crops, has an ageing and inadequate water supply infrastructure and increasing domestic food requirements. Due to rapid urbanization, India will see rapid increase in municipal and domestic water demand also (108 billion m³) by 2030. India has poor water storage capacity (200 m³ per person) compared to China's 2200 m³ per person and 6000 m³ per person in the US. India's three major river basins (Ganga, Indus and Cauvery) are projected to face shortages.

'Water Security' means the water which is physically available, with appropriate quality for drinking purpose and for agriculture & industries, accessible, when required and in necessary quantity.

So to ensure 24X7 water supply and as well the quality of water, there is need to conserve water and replenish it through rainwater harvesting technique assumes even greater significance in the present day context where the ground water consumption far exceeds the replenishment of aquifers.

Efficiency of utilisation in all the diverse uses of water should be optimised and an awareness of Water as a scarce resource should be fostered. Conservation consciousness should be promoted through education, regulation, incentives and disincentives.

Current Status

India is a home of 1.8 billion people, approximately 1/6th of world's population. This increased in population and emerging pattern of urbanization has lead to increase in demand for basic amenities i.e. safe drinking water and sanitation system. This leads to inadequate sanitation and water supply system. This turned rivers into sewers and have contaminated/exploited ground water supplies. While epidemics of cholera and typhoid occur infrequently, it is the recurring endemic diseases such as gastroenteritis, dysentery, diarrhoea and malaria. The per capita fresh water availability in India is on the decline, from 3450 m³/cap in 1951 to 1967m³ today, and it is estimated that it will fall drastically to between 1500 to

1800 m³ by 2025, even though annual precipitation is around 4000 billion cubic meters. It is the contamination of fresh water that is increasing the stress on availability of water.

Out of the available water resource on earth 97% is saline water and only 2.25% is in permanent ice caps and 0.75% is only fresh water available.

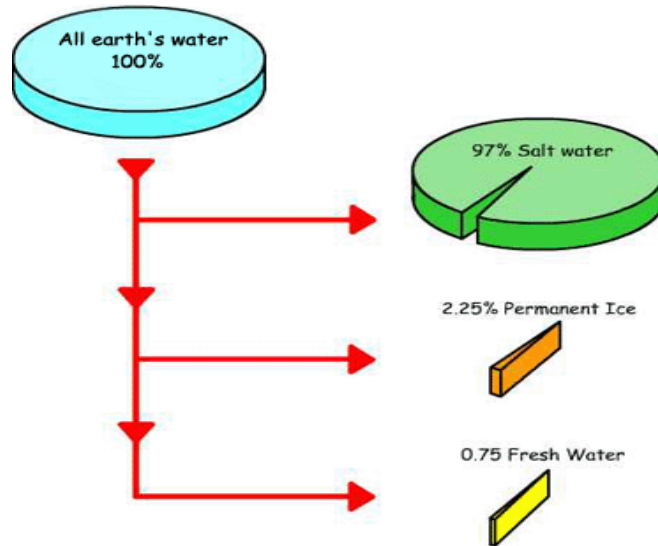


Figure 1 Availability of Drinking water on earth

Out of this freshwater almost 45% of water is used for toilet flushing, 30% for bathing, 20% for washing and only 5% is used for drinking and cooking which is a basic need of the person.

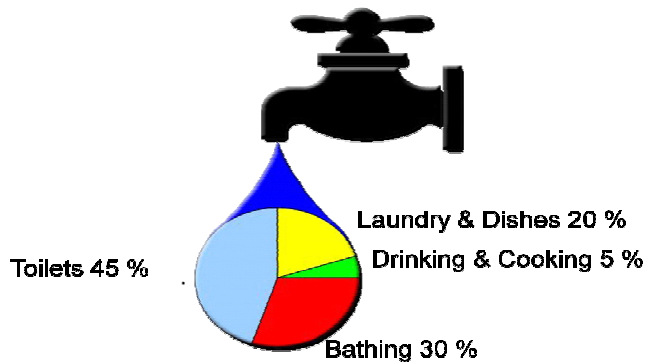


Figure 2 Water use at Domestic level

Water Security Measures:

It is necessary to see the path how water reaches to our tap. Huge dams are constructed, lot of money is invested not only in construction of dams but in transportation of water to our door step and out of which almost 90 % water we are using in generation of waste water which pollutes natural resources and contributed in more investments in water treatment systems.

Considering this there are three major water security measures i.e. the 'Reduction' of use of water means reducing the waste water generation, 'Recharging' of precious natural resource and 'Reuse' of water.

Reduce the use of fresh water:

It is expected that the optimal utilisation of water and reduction in generation of waste at the individual level as well as at community level.

It necessary to see that in our day to day life how much water I use and there is potential to conserve it.

- Water requirement for brushing:
 - a) If use Mug: 1-2 lit
 - b) If use Tab water in wash basin: 4-5 lit
- Water requirement for Shaving:
 - a) If use Mug: 2 lit
 - b) If use Tab water in wash basin: 16lit
- Water Requirement for Bathing:
 - a) If Bucket is used: 20 lit
 - b) If Shower is used: 80 lit
 - c) For Tub bath : 110 lit
 - d) While applying soap if close the shower tab can save up to 60 lit of water
- Water Requirement for Washing cloths:
 - a) If use bucket: 40 lit
 - b) Washing Machine : 260 lit
- Water wastage through leakage

Water leakage in tab	Duration	Quantity of water wastage (lit)
	One day	5.2
One drop per second	One week	36.4
	One year	1891.0
	One day	109
Drop wise continues flow	One week	754.6
	One year	39792.0

Recharging of aquifers through Rainwater Harvesting

Due to Increased population, urbanization, pavement of surface, and reduction the consumption of ground water is increasing day by day resulting in depletion of ground water level. It is our duty to give back the nature.

The Rainwater harvesting is the simple collection or storing of water through scientific techniques from the areas where the rain falls. It involves utilization of rain water for the domestic or the agricultural purpose. The method of rain water harvesting has been into practice since ancient times. It is as far the best possible way to conserve water and awaken the society towards the importance of water. The method is simple and cost effective too. It is especially beneficial in the areas, which faces the scarcity of water.

People usually make complaints about the lack of water. During the monsoons lots of water goes waste into the gutters. And this is when Rain water Harvesting proves to be the most effective way to conserve water. We can recharge the aquifers and prevent water from flowing into drains and being wasted. It is practiced on the large scale in the rural, peri-urban and urban areas.

Methods of Rainwater Harvesting by recharging ground water:

1. Catchment:

Any surface or the paved areas can be treated as catchment. Even the footpaths and roads can act as the catchment, as these areas to receive the direct rainfall. Rooftops are the best among them because of the large coefficient of runoff generated from them and there are less chances of contamination of water.

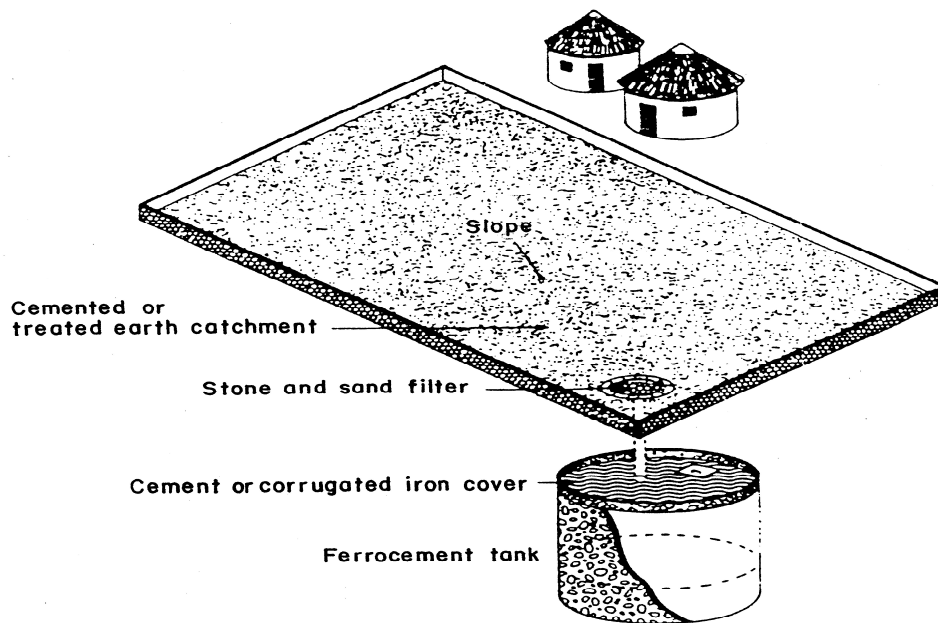


Figure 3: Catchment water harvesting

2. Rooftop Water Harvesting:

A natural resource presently wasted due to paved areas and building so roof top water harvesting by recharging ground reservoirs or storage of rainwater prevents ground water depletion which also can be a good supplement to piped water. This helps to prove positive cost benefit ratio which is relatively pollution free, and also gives aspect of water conservation & self-dependence.

Following are main features:

- Collection
- Filtration
- Storage
- Usage
- Recharge

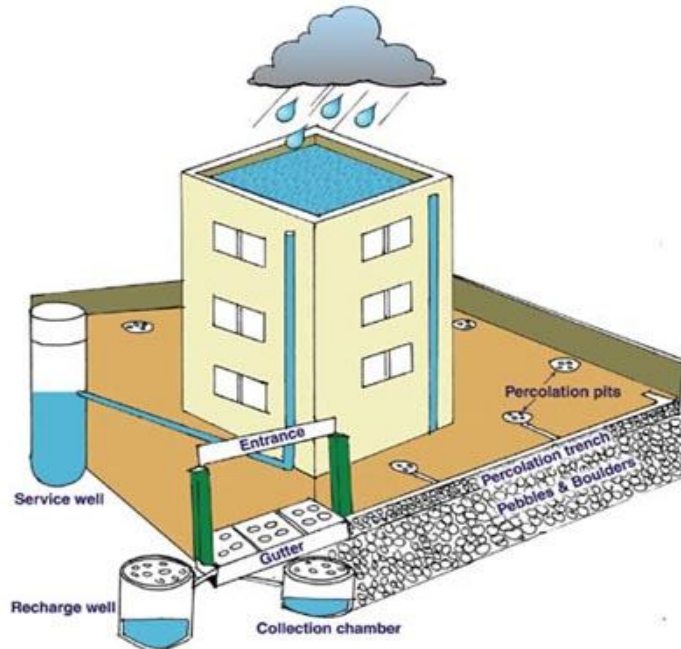


Figure 4 Integrated technological options in roof top water harvesting

- **Conveyance:**

Conveyance system basically includes rain gutters and down pipes which collect the rain water from catchment to the storage tank. These rain gutters are usually built during the time of construction. They need to be designed appropriately as to avoid the loss of water during the conveyance process.

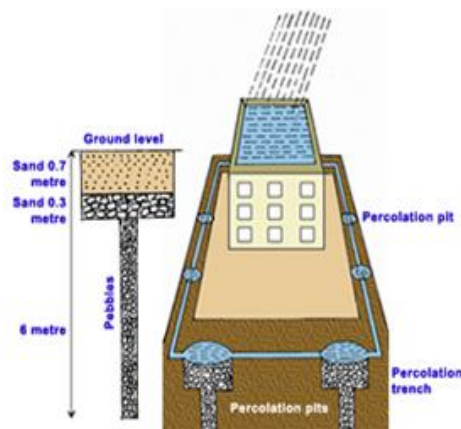


Figure 5 Water harvesting with trenches in run gutters

Reuse of stored Rainwater :

- **Storage of Rainwater:**

The most important part of the rain water harvesting is the storage system. The storage system is designed according to the amount of water that is to be stored. The design and site (location) of the storage or the recharge system should be properly chosen. The areas which receive the

rainfall frequently, there a simple storage system could be constructed, to meet the daily water requirements. Otherwise the areas which receive the lesser rainfall, there the storage systems are quite essential. Rain barrels, underground or open slumps are mostly used to collect rain water. Make sure that the storage system is properly sealed and does nor leak. Use Chlorine from time to time to keep the water clean.

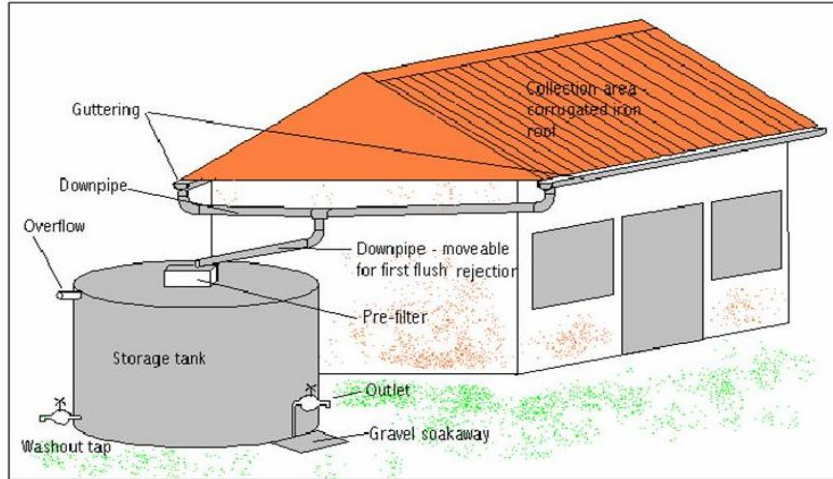
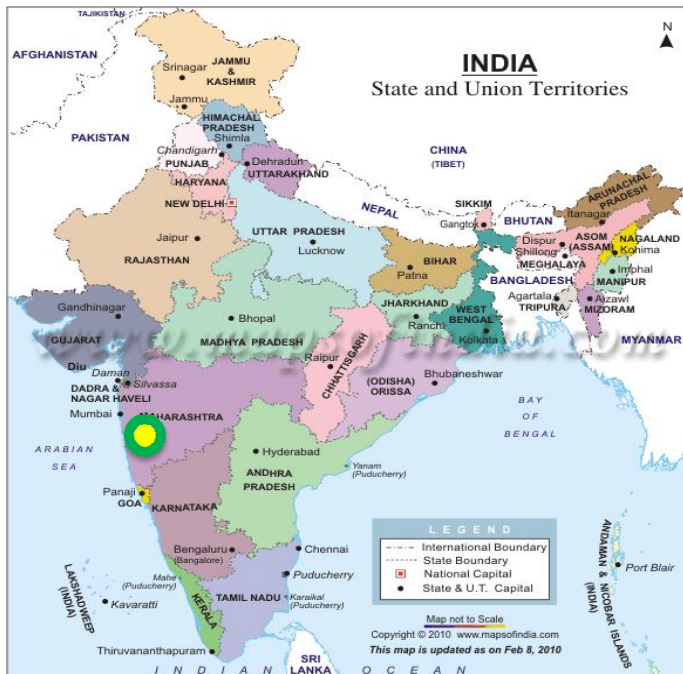


Figure 6 Method of storage of water harvesting

- **Quality of Stored Rainwater: A case Study**

Location of the Project: Enviro- Vigil's Treatwaste division

Behind Boiler House, Chhatrapati Shivaji Hospital Campus,
Kalwa, Thane (West).



Method and Material:

- Rooftop area - 200 sq. ft.
- Rooftop material – Asbestos sheet
- Water has stored in two syntax tanks of 500 lit each. Total water stored was 1000lit.
- Syntex tanks are inter- connected.
- Rooftop water has stored through locally made sand filter.
- Tanks are covered from sunlight and lids and tab outlets are sealed after overflow of water.
- Rainwater is collected in September 2007 and analyzed till May 2007.
- Analysis of rainwater has done every week.
- For physical parameters sample has collected in 1lit plastic can and for microbial analysis sample was collected is sterile glass bottle. Sampling containers are provided by the laboratory.
- After collection of sample immediately it has delivered to laboratory for the analysis.
- No chemical even chlorine is added in to water for treatment.
- Parameters for analysis has decided as standard parameters by Water Act
- Method of analysis was as per APHA and IS methods.

Observations:

- pH is normal in the range of 6 to 8.
- Turbidity is constant throughout analysis.
- Dissolved oxygen is also constant, not much variation.
- Gradual decrease in Hardness.
- Not much variation in Chlorides.
- Remarkable variation in Microbial flora i.e. Total bacterial count, Most Probable No. and E. coli.
- Gradual decrease in microbial flora from September 06 to October 06.
- During October 06 to November 06 E coli absent and MPN and total bacterial count very much less.
- Again from December 06 E coli were present initially till January 07 it has increased.
- High increase in MPN and total bacterial count during December 06 and January 07.
- Gradual decrease since February 07 till April 07 in all microbial results.
- Since May 07 E coli were Nil and MPN and total bacterial count were observed as very negligible.
- In May 07 the quality of water mentioned in the report was **Non-contaminated**.

Analysis Results of key parameters:

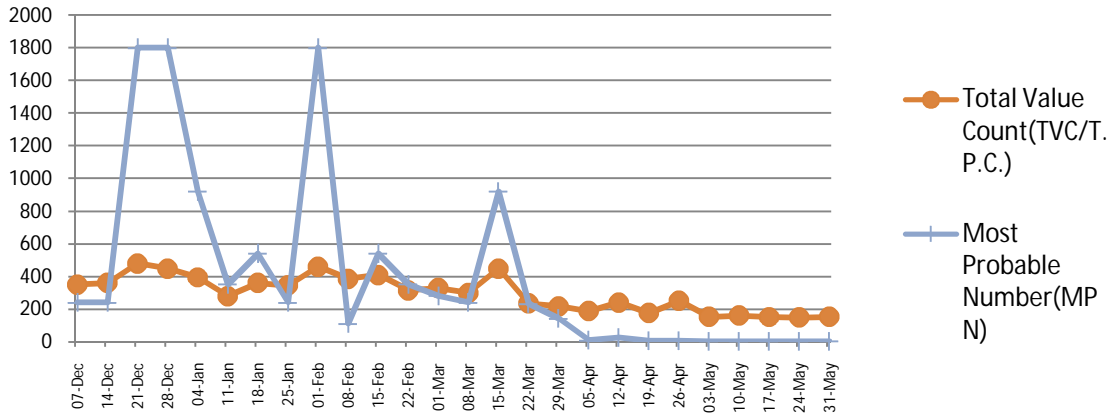


Figure 7 Results of bacterial count and MPN no. in Stored Rainwater

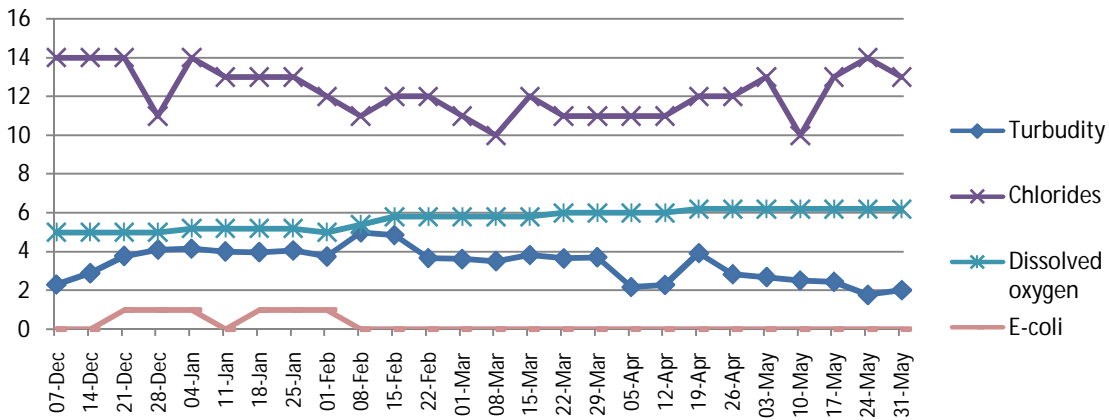


Figure 8 Analysis results of Turbidity, Chlorides, and Dissolved Oxygen & E coli

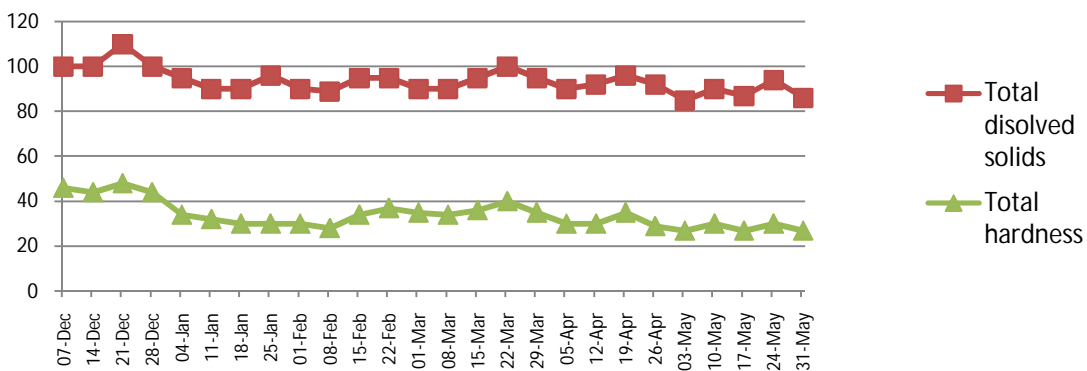


Figure 9 Analysis results of TDS and Hardness

Conclusion:

The observation indicates that there is seasonal variation in microbial results as decrease in microbial count when temperature goes high during October heat and summer. The rainwater if stored properly and away from the sunlight does not get contaminated even by the microbes. This may help to prove in dependability for portable water at the door step in affordable cost.

Rainwater harvesting first of all increases water security. It is the perfect solution to meet water requirements especially in the areas which do not have sufficient water resources. It helps in improving the quality of the ground water and increasing the level of the ground level. It also helps in improving the overall floral system. It reduces the loss of top layer of the soil. If we capture the water directly we need not to depend much on the water storage dams. It is the good solution to the increasing water crises. Rain water harvesting reduces the flooding on roads and further prevents it from contamination. And in the last it conserves precious natural resource 'Water'.

Capacity Building:

There are many organizations in India working on capacity building and awareness generation for water conservation measures since last many years. Many local government bodies like municipal councils or corporations made rainwater harvesting mandatory for new constructions. But still lots of efforts are required to develop participatory approach towards water resource management by involving not only government officials but different stakeholder groups, users in the various aspects of planning, design and development of water resource management projects. Special focus should be given for involvement of women in this process.

Acknowledgement:

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