

RAINWATER HARVESTING SYSTEM

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Abstract: Rain water harvesting is defined as the process of collecting and storing rain for later productive use. Rainwater harvesting is a mini-scale water resources project that collect stores rainwater by structural measures and regulates and make us use of it for domestic and production use. The term water harvesting refers to the collection and storage of natural precipitation and also other activities aimed at harvesting surface and all other hydrological studies and engineering interventions aimed at conservation and the efficient utilization of the limited water enforcement of a physiographic unit such as a watershed It is also defined as the process of collection and storing water from the area that has been treated to increase precipitation runoff.

1. Introduction

The use value of a water was never undermined, but its about time that even its exchange value is given due importance. Fresh water today is a scarce resource, and it is being felt all over the world. Water is the lifeline of any society. Water is essential for the environment, food security and sustainable development. All the known civilizations have flourished with water source as the base and it is true in the present context too. Availability of drinking water and the provision of sanitation facilities are the basic minimum requirements for healthy living.

Features of Rainwater Harvesting

- Reduces urban flooding.
- Ease in cheaper in construction compared to other sources, i.e. dams, diversion, etc constructing system in less time.
- Economically. The Rainwater harvesting is a ideal situation for those areas where there is inadequate groundwater supply or surface resources.
- Helps in utilizing a primary source of the water and prevent the runoff from going into sewer or storm drains, thereby reducing the load on treatment plants.
- Recharging water into the aquifers which help in improving the quality of existing groundwater through dilution.

2. Related Work

P.Sai Rukesh Reddy and A.K.Rastogi (2008)[1] In their paper entitled, "Rainwater Harvesting in hostel 12 and hostel 13 of IIT Bombay", The Indians society for Hydraulics and Journal of Hydraulic Engineering. Rainwater is being conserved/ harvested only for the two hostel areas. And they used be the two methods of distribution of harvested rainwater (Rapid depletion method & Rationing method). Finally, the cost for construction of the tank was calculated.

Dr.Shanon Reckinger, Joseph Bocchino, John Perry, (2014) [2] In this paper, A team of three mechanical engineering senior undergraduate students and one faculty member designed and installed a rainwater harvesting system in the University's student center. After an extensive analysis of the piping system, the team was able to use existing rain leaders and piping to move all the rainwater from the third floor ratio to the mechanical room located on the first level of the building. In the mechanical room, the piping system was redesigned to route the collected water into a large storage tank.

Ayog J. L., Bolong, N. and Makinda J. (2015) [3] In this paper, This study highlights the findings from a preliminary feasibility investigation in the proposed rainwater harvesting systems in University Malaysia Sabah, in support of the Eco Campus initiative. Since its inception was on 7th February 2013, the initiative strives to promote the blend of campus development and ecological sustainability. Hence, in line with this aspiration, rooftop rainwater harvesting (a form of green infrastructure) was introduced to selected residential colleges in the campus and assessed for its potential in supplying untreated water for the non-consumptive activity as well as in reducing the water bill.

Shubham Jain, Pankaj Thakur, Mehul Srivastava (2015) [4] In this paper, Rainwater harvesting was introduced in Tamil Nadu in 2001, by the State Govt., has had substantial Influenced on the availability of drinking water for the People. It had been implemented on more than 95% of the households and other commercial buildings in the state.

3. Methodology



Figure 1. Components of Rainwater Harvesting

In this chapter, we discuss about the various methods adopted. All the methods of rainwater harvesting system is to be discuss with proper explanation and representation.

As discussed earlier in the section of introduction – importance of rainwater harvesting at JSPM'S RCSOE II, we clearly came to know the all the advantages which we can draw out by implementing this small but highly efficient technique in this campus. Thus to increase the potential, benefits of this system and draw maximum advantages from it, we need to have large rooftop areas which will be going to act as catchment areas. More the catchment areas more will be the surface runoff and thus more will be the amount of the harvested water.

Methods for Storage of Harvested Rainwater In Tank

Rapid Depletion Method (RDM)

To explain these both methods, let us first apply it on **ARKP and AIKTC**. The detail calculation is carried out to get the valuable steps.

Rationing Method (RM)

The Rationing method (RM) distributes stored rainwater to target public in such a way that the rainwater tank is able to service water requirement to maximum period of time.

4. Results

Depth to Water Level-Pre Monsoon (May-2011)

The premonsoon depth to water level monitored during May-2011 ranges between 0.40 m.bgl (at Chinchwad) in west-central part and 20.10 mbgl (at Latur) in northern part of the district.

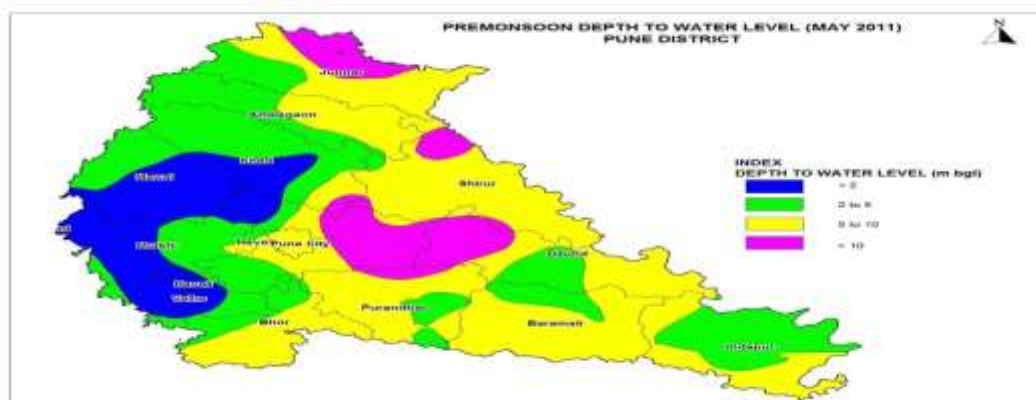


Figure 2. Premonsoon Depth to Water Level (May 2011)

Depth to Water Level –Post Monsoon (November-2011)

The depth to water level in district during post-monsoon (Nov.2011) varies from 0.65 at Dorlewadi to 15.65 m bgl at Latur.



Figure 3. Postmonsoon Depth to Water Level (Nov. 2011)

Seasonal Water Level Fluctuation (May to November-2011)

Seasonal Water Level fluctuation analysis between pre monsoon and post monsoon season for year 2011 reveals that rise in water levels is found between 0.20m (Lonawala & Kalamb) to 12.35 m (Lonikand).

Water Level Trend (year 2002-2011)

Decadal Trend of water levels for pre monsoon and post monsoon periods for last ten years (2002-2011) have been computed for Ground Water Monitoring Wells (GWMW) of the district. Analysis of Long term water level trend data indicates that rise in water levels in pre monsoon period has been recorded at 31 GWMW and its ranges from negligible (0.006 m/year at Parne) to 0.75 m/year (Dhumalwadi).

Aquifer Parameters

The aquifer parameters of phreatic aquifer are available from Systematic Hydrogeological Surveys conducted by CGWB earlier. In Deccan Trap Basalt, the unit area specific capacity of dugwells ranges from 0.77 to 18.9 lpm/dd/sq.m., while permeability ranges from 12 to 65 m/day. The transmissivity of phreatic aquifer ranges between 18 and 89m²/day. The Specific Yield vary 1.7 to 9.7% in the district. In Alluvium, the unit area specific capacity ranges from from 5.95 to 32.00 lpm/dd/sq.m, transmissivity vary from 97 to 248m²/day and specific yield ranges between 5 to 9%.

5. Conclusion

- One of the best way to solve world burning facing issue: Water Scarcity.
Most useful for large scale applications.
- Saving of the energy per lifting of well and the saving of Water bills.
- Harvested water can be used for the Daily household needs.
- The more the business and industries involved = greater environmental and economic benefits.

References

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