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RWH – A Low Cost Method for Secondary Purpose

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Abstract – As forest cubiertas are decreasing. Hence water and soil hold by roots, plants are degraded. And it is affecting hydrological cycle badly. This is resulting in tremendo increase in the depth of ground water level. It is high time to implement rainwater harvesting projects. These technologies are simple and easy to install and to operate. Rainwater harvesting is artificial recharge of ground water resources and it is commonly adopted and cost effective method of replenishing the ground water reservation. In the present study attempt has been made to examine the status of water requirement and proposed rooftop rainwater harvesting potential in the college campus. JSPM, Wagholi located in Pune district has been undertaken for the present investigation. The average rainfall in the study area is maximum 603 mm. The proposed study is based on primary and secondary data. Primary data collected from field work and secondary data collected from Indian Metrological Department (IMD, Pune). Rooftop rainwater harvesting methods and ground water recharge method are used in present study. The daily water requirement per person is 135 liters. The annual daily and dry days water requirements has been calculated in liters. Our college campus instauratur with 242811.36 m2 area of rooftop and ground surface. Population of college is about 12,000 (average) including students, teaching and non-teaching staffs. Thus the rooftop rainwater harvesting would be a solution for drinking and domestic water sustainability of the college. We check the quality of water, hardness and pH of water, DO, BOD, COD (water test) after collecting the rain water. Result obtained from the present study suggested that rainwater harvesting method is more essential in college campus.

Keywords :- RWH System, Design of RWH, Test conducted for RWH water, Components of RWH.

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INTRODUCTION

As the world population increases, the demand abunta for quality drinking water. Surface and groundwater resource are utilized more than they can be recharged. Rainwater harvesting is an environmentally sound solution to address issues brought forth by big project utilizing centralized water management approaches. Population growth all over the world is causing same problem and concerns of how to supply quality water to all. The rainwater harvesting consist of a wide range of technologies use to collect, store and provide water with particular aim of meeting demand for water by humans and human activities. Water harvesting is the process of direct collecting of rainwater, which can be stored for direct use or can be recharge into the ground water. Water harvesting is the collection of runoff for various purpose. There are various method of colleting the water like

- Rainwater stored for direct use in above ground or underground sumps or overhead tanks and used directly for flushing, gardening, washing etc.
- Rainwater to ground through recharge pits, dug well, bore well, soak pit recharge trenches etc.

We use the second method of rainwater harvesting for ground water recharge and distribution of water.

In the present study attempt has been made to examine the present status of water requirement and proposed RWH potential in the College campus. JSPM, Wagholi located in Pune district has been undertaken for the present investigation JSPM, Wagholi is in abundance upstanding area; the average annual rainfall in the study area is maximum 603 mm. The proposed study is entirely based on primary and secondary data. Primary data collected form field work and secondary data collected from Socio – Economic Review and District Statistical Abstract of Pune, District Gazetteer and data have been collected from various published and unpublished thesis, articles, books, etc.

Rainwater harvesting method is used in the present study. The per capita daily water requirement is calculated as number of persons x 5 liters. The

annual, daily and dry day's water requirement has been calculated in liters. Runoff Coefficient and discharge estimated by using formula given by Darcy's runoff coefficient JSPM, Wagholi comprised with 60 acres of campus and 242811.36 sq.m. area of surface. Population of college is about 12000 including students, teaching and non-teaching staff and daily visitors. Analysis revealed that 20000 lits/day water required. Thus, the RWH would be a solution for drinking and domestic water sustainability of the college in some extent. Results obtained from the present study suggested that RWH method is more applicable in college campus.

PROBLEM STATEMENT

- We found immense water inadequacy in our institute.
- Rainwater harvesting is highly recommended for campus of JSPM Wagholi college of engineering, Pune.
- In Wagholi area there is a shortage of water so, we are using bode well for daily use.
- In dry weather by using bore well the depth of water table decreases
- So we are using ground water recharge method to increase the water table.
- Hence keeping in view all the above problems and status of campus college administrative body should focus more on water scarcity problems.

OBJECTIVES OF RAINWATER HARVESTING

⋙ **Aim -** To make our college premises sufficient to reach water demand during summer and winter.

⋙ To study the water scarcity in our campus.

⋙ To fulfill the requirements of water to our campus.

⋙ To recharge the dry bore well in our campus.

⋙ To check the quality of water.

SCOPE OF WORK

⋙ There is good scope for rain water harvesting by redirecting rain flow from roof top to some artificially created pond, depression or discreet spots to recharge ground water.

⋙ Water shortages around the world today tends to involve a combination of these factors such as population increase, industrial development and climate change combine to stress existing water systems.

⋙ Paved surfaces areas in growing urban areas increase the amount of water that flows directing into streams, reducing the amount refreshing acquifers. Demand increases while local supplies are stressed.

METHODOLOGY

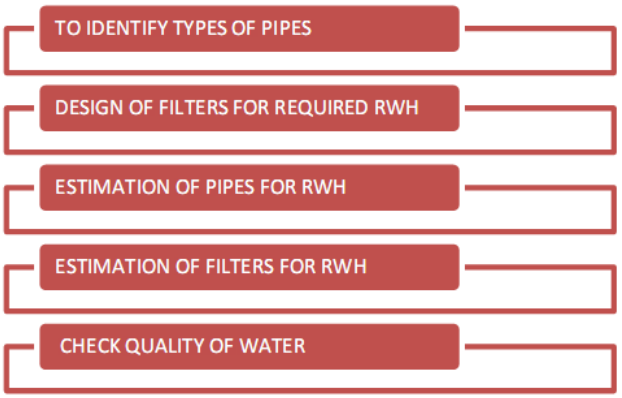
Methods of Rain Water Harvesting

⋙ Rainwater stormed for direct use to above ground or ground water sumps or overhead tanks and used directly for flushing, gardening, washing etc.

⋙ Rainwater to ground through recharge pits, dug wells, bore wells, soak pits, recharge trenches etc.

We are using 2nd method of rainwater harvesting for ground water recharge and distribution of water.

Flow Chart of Design of RWH



DESIGN PROCEDURE

■ Hydrological Analysis:

On the basis of experimental evidence, Mr. H. Darcy, a French scientist enunciated in 1865, a law governing the rate of flow (i.e. the discharge) through the soils. According to him, this discharge was directly proportional to head loss (H) and the area of cross-section (A) of the soil, and inversely proportional to the length of the soil sample (L).

In other words,

$Q \alpha (H/L)*A$

Here, Q = Runoff, H/L represents the head loss or hydraulic gradient (I), K is the co-efficient of permeability. Hence, finally,

Q = K* I* A

Similarly, based on the above principle, water harvesting potential of the catchment area was calculated.

The total amount of water that is received from rainfall over an area is called the rainwater legacy of that area. And the amount that can be effectively harvested is called the water harvesting potential. The formula for calculation for harvesting potential or volume of water received or runoff produced or harvesting capacity is given as:

Harvesting potential or Volume of water Received (m3) = Area of Catchment (m2) X Amount of rainfall (m) X Runoff coefficient.

Runoff coefficient for any catchment is the ratio of the volume of water that runs off a surface to the volume of rainfall that falls on the surface. Runoff coefficient accounts for losses due to spillage, leakage, infiltration, catchment surface wetting and evaporation, which will all contribute to reducing the amount of runoff. Runoff coefficient varies from 0.05 to 1.0.

In present problem statement, runoff coefficient is equal to 0.9 for the rooftop area is totally impervious and 0.2 for the paved surface area is pervious. Eco-Climatic condition (i.e. Rainfall quantity & Rainfall pattern) and the catchment characteristics are considered to be most important factors affecting rainwater Potential.

CONCLUSION

It concluded from above findings that rainwater harvesting, if conserved and utilized using the rainwater harvesting technology can be an effective tool of replenishing ground water resources. Rainwater harvesting is a coping strategy in variable rainfall areas. In the future climate change will increase rainfall variability and evaporation, and population growth will increase demand on ecosystem services, in particular for water.

Rainwater harvesting will become a key intervention in adaptation and reducing vulnerabilities. Realize that rainwater harvesting is not a 'silver bullet', but can be effective as a complementary and viable alternative to large-scale water withdrawals, and as a way of reducing the negative impacts on ecosystem services, not least in emerging water stressed basins.

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