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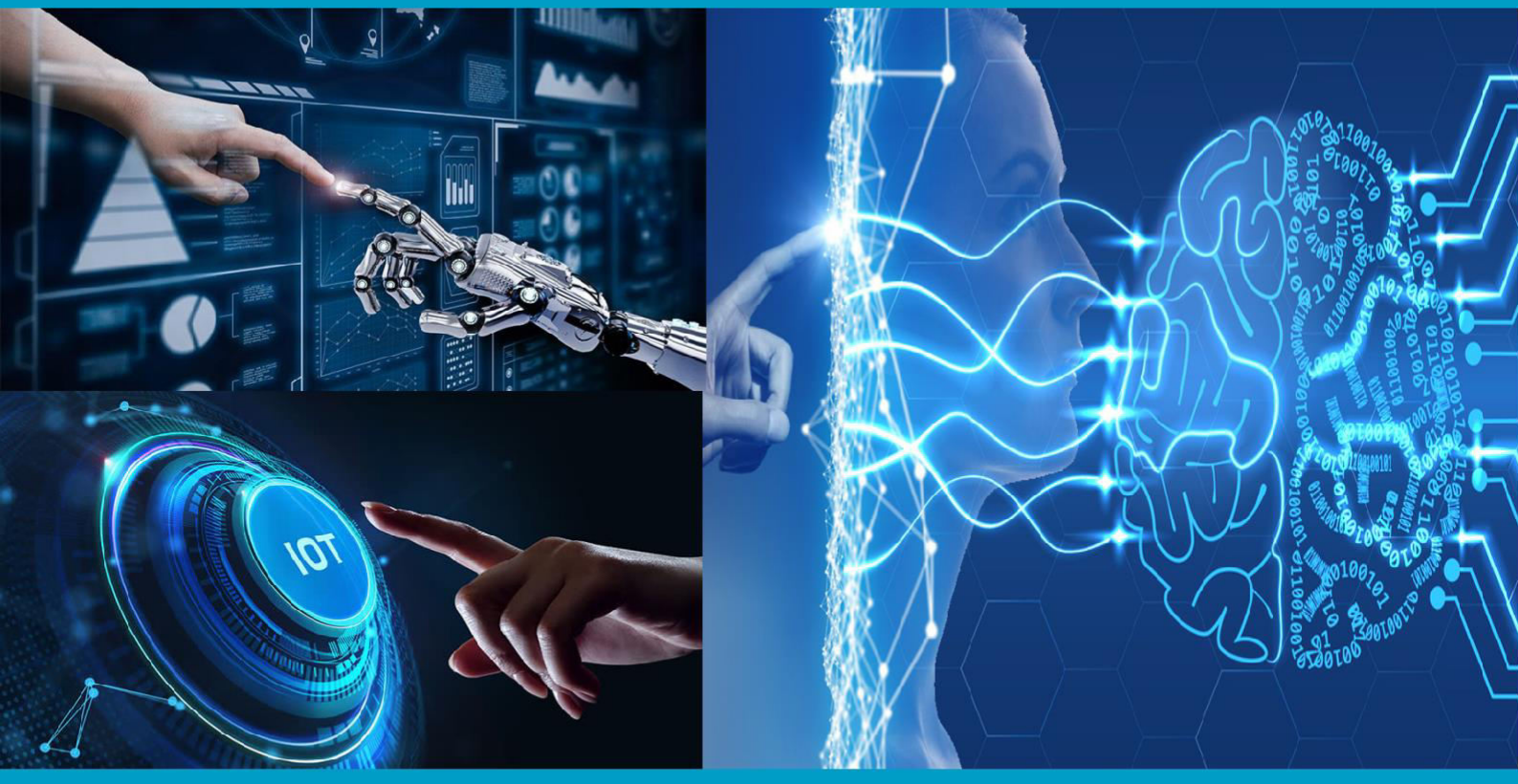

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Application of Rain Water Harvesting on SVSMD's Polytechnic Hostel Building

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ABSTRACT: Currently available sources of water face extreme pressures around the globe because of Oblivious human activities as well as changing climate. The rainwater harvesting system (RWHS) carries a huge potential to enhance surface and groundwater resources in regions Having a poor water supply. Recently, several countries have started to promote the updated Implementation of such practice to tackle the problem of growing water demand. These Considerations motivated our enthusiasm for looking at its current circumstances and the Possibility of RWHS in the future. In this regard, the study aims to identify the evidence gap Among different determinants (climate change, reliability, water quality and financial viability) Intertwined with RWHS. In the paper, studies related to the significance of RWHS amidst Scarcity of water around the globe, published in valued journals from 2000 to 2020, are Reviewed. We found that the RWHS becomes economically viable when certain steps and risk Assessment methods are executed in planning and maintaining this system. The study concludes That drinking water sufficiency is possible if a sustainable drinking water supply system is built Via RWHS.

I. INTRODUCTION

Many cities in India and all over the world are dealing with depleting water supply, marked by Falling groundwater levels, vanishing water bodies, severe pollution and urban floods. With their Own supplies drying up, cities are forced to source water from further and further away. This is Expensive. City planners usually ignore a powerful source of water that they can access to – rain. Rainwater and run-off can be harvested . It can be collected and stored, or conveyed to the Aquifer to recharge groundwater .

❖ Rainwater harvesting system and its featuresRainwater harvesting is a simple technique of catching and holding rainwater where it falls. Either, one can store it in tanks or can use it to recharge ground water depending upon the Situation. The system is economically cheaper in construction compared to other sources like Dams, diversions etc. It is ideal for areas where there is inadequate ground water supply or Surface resources. The system helps in utilizing the primary source of water and prevents the Runoff from going into sewer or storm drains, thereby reducing the load on treatment plants. Rainwater harvesting systems used in housing schemes can provide water for potable and non Potable uses. The potable uses include drinking, bathing, cooking and dish wash. Usually the rain Water used for this purpose must be treated to remove the contaminants and generally the main Required treatment processes are filtration and disinfection unless the rainwater contains heavy Metals, then special treatment is needed. Non-potable uses of rain water harvesting include Flushing toilets, watering garden, and washing floors and for such uses treatment is not required . The rain water harvesting system recharges water into aquifers which help in improving the Quality of existing ground water through dilution.

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❖ Components of a typical rain water harvesting system A rainwater harvesting system Comprises of components for transporting rainwater through pipes or drains, filtration, And tanks for storage of harvested water. The common components of a rainwater Harvesting system are catchment surface, delivery system, and storage reservoirs.

II. LITERATURE SURVEY

The significance and effective use of water, one of the most basic requirements for Training vital activities, is gaining importance every day. Population growth and unprogrammed Industrialization accelerate the consumption of available water resources. However, drought, as a Result of climate change, poses a threat to water resources. Factors such as the exhaustibility of Water resources, rapid population growth, unscheduled industrialization and drought increase the Tendency towards alternative water resources. Rainwater harvesting is based on the principle of Using the rainwater falling into the regions after it is stored. Water collected through rain Harvesting can be utilized in many different areas, such as agricultural irrigation, landscape Irrigation and domestic use. Among agricultural activities, the idea of water harvesting in Greenhouse areas comes to the fore. Due to the gutters on the greenhouse roofs, water can be Stored. In Antalya, which has about half of the greenhouses in India, the amount of water in the Rain harvest that can be obtained in greenhouses is 224,992,795.8 m3 per year. Monthly Calculations throughout the year showed that the minimum water can be harvested in August (938,447.53 m3) and the maximum (54,771,210 m3)in December. Therefore, it is thought that Some plant water consumption can be met by building sufficient storage in areas close to the Greenhouse.

Water harvesting systems are traditional technologies that have met the needs of local Populations for many centuries indicating the systems are clearly sustainable. It is simply defined As a method for inducing, collecting, storing and conserving local surface run-off for future Productive use. It is one of the oldest and most commonly used sustainable water management Systems in India. There are various types of systems to harvest rainwater in India ranging from Very simple to the complex industrial systems. Examples of traditional rainwater systems in India Include bamboo pipes and Apatani systems of eastern Himalayas, Ghul of western Himalayas, Zabo and Cheo-ozihi of north eastern India, Dongs, Garh and Dara of Brahmaputra valley, Kund, Khadin, Talabs, Beri, Johad, Baoli etc. Of Thar desert and Gujrat, the Havelis of Jabalpur, bandh And bandhulia of Satna, virda of Gujarat, ahar-pynes of Bihar, Eri and Kulam of eastern coastal Plains, Jackwells of islands, most of which showed immense structural simplicity and high Efficiency. Almost all forts in India, built in different terrains and climatic conditions, had Elaborate arrangements for drinking water. Most of the old temples in south India built centuries Ago have large tanks in their premises. These tanks are either fed by harvested rain water or by Tapping underground springs. The traditional water-wisdom at all levels of the society ensured Adequate availability of water for all, which in turn, formed the basis for all round development And prosperity. We should again learn and implement the ancient knowledge and apply it in our Modern society to get rid of the present water stressed condition.

III.PROBLEM DEFINITION

In Akkalkot there are limited source of water in case of any festival or in Function they have to buy water from water supplier. Water is most important Need of our life so we have to save water. In case of hostels schools & colleges There is heavy needs of water. As per IIT researchers 135 liters of water need per head. In water saving Method there are lot of method, But this project is designed for rainwater Harvesting method This project evaluates the potential for water saving by using rainwater in S.V.S.M.D Hostel a residential building at **Shree Vatavriksha Swami Samarth Maharaj Devasthan, College of Polytechnic Engineering In Sub district Akkalkot** Located in the south-east state of Maharashtra in India. The building houses on An average 136 boys students every year. The roof top of the hostel is the Catchment area. Using average rainfall data, calculations for rainwater Endowment and water harvesting potential were made. Volume of water that can Be collected in one year was calculated. Suitable hydro cyclone for

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removing Suspended particles and reducing turbidity has been proposed. The project cost Was calculated making use of prices prevailing currently in India. Annual Monetary savings were calculated based on the volume of water collected by Rain water harvesting and payback period was arrived at.

IV. METHODOLOGY

The different steps involved in designing RWH system are listed in the following table:

Different steps in designing a RWH system

1 Obtaining the rainfall data

2 Obtain the number of students supplied with water

3 Estimation of water demand

4 Calculation of total roof area

5 Determination of volume of water that can be harvested

6 Sizing and selection of filter

7 Design of delivery system

8 Cost Estimation

9 Calculation of annual savings and payback period

V. RESULTS

The determination of the volume of water that can be harvested in a year involves several factors. Firstly, the rainwater endowment, which is the total amount of water received as rainfall over a given area, is calculated. This is achieved by multiplying the amount of rainfall by the catchment area. In this case, with a rainfall of 510.91 millimeters and a catchment area of 447.294 square meters, the rainwater endowment is found to be 228.53 cubic meters. The next step is to consider the run-off coefficient, which represents the portion of rainfall that can be effectively harvested. Given the type of catchment area as a well-constructed roof, a run-off coefficient of 0.9 is applied. Multiplying the rainwater endowment by the run-off coefficient yields the rainwater harvesting potential, which amounts to 205.68 cubic meters. Therefore, in this scenario, approximately 205.68 cubic meters of water can be harvested annually from the given catchment area.

VI. CONCLUSION

This project deals with aspect of improving the rain water availability in the Sri Vatavriksha Swami Samarth Maharaj Devasthan, Akkalkot campus by Implementing rain water harvesting (RWH). This implementation of RWH system

Can last for many years providing water for drinking and other uses. A little Maintenance and manual work is needed to clean the catchment area, storage tanks And hydrocyclones. This work focused on implementing rainwater harvesting (RWH) for the Gents hostel „S.V.S.M.D" which houses around 136 boys students Every year.

 The water demand per year has been calculated and found to be 67,01,400Liters.

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 Catchment area for S.V.S.M.D hostel was calculated as 447.295 m^2.

 Rainwater endowment for the area has been computed to be 238.072 m^3.

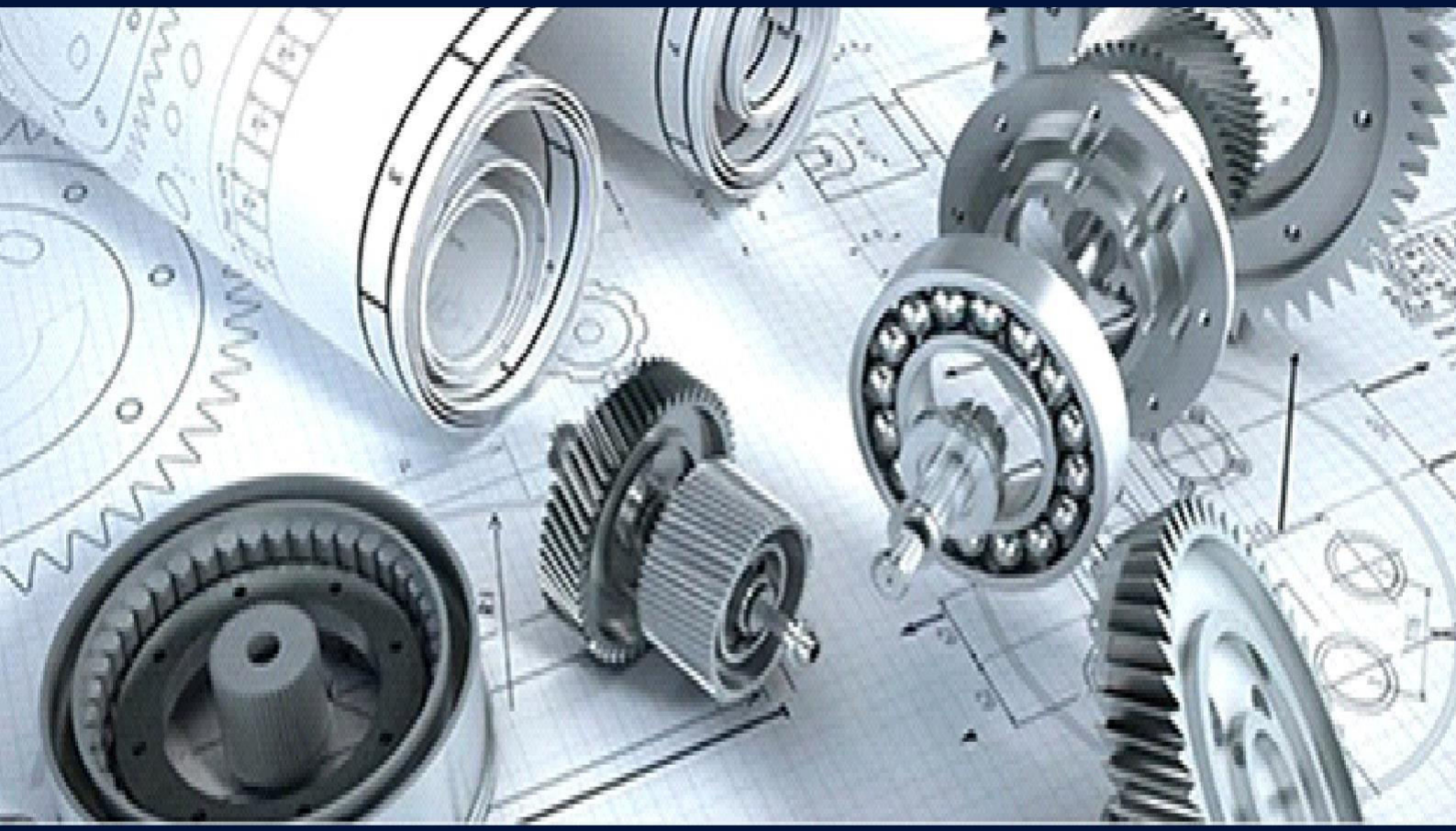
 Assuming a run off coefficient 0.9, rain water harvesting potential is Calculated as 2,14,265 liters/year.

 A layout (piping diagram) has been proposed which includes three Hydrocyclones for separation of suspended particles. List of parts have been Identified and cost estimation was made. The total cost for implementing RWH system worked out to be Rs. 76, 150.00.

 Considering the amount of water collected annually through the rain water Harvesting system, annual savings is found to be Rs. 36,100.00. The payback Period for project calculates to be 2.11 years. It is a worthwhile investment Since the payback period is near the ideal payback period range of 3 to 5 Years. Hence it is strongly recommended for implementation of RWHSProject which will result in monitory savings and will help in increasing the Water availability and recharging the ground water. Amount of rainwater harvesting potential is 3.47% of the total demand for The hostel. This percentage can be higher if there is a greater rainfall in the Year than the average. The water can be effectively used for non potable uses Which does not need any further treatment.

 Also more catchment area can be brought into use by considering other Buildings such as administrative building, library, departmental blocks and Other hostels. This will improve the overall rainwater harvesting potential of The institution.

 This project does not require power for its operation or maintenance



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