

Rainwater Harvesting of College Campus-A Research paper

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1. Abstract - This study looks at how a college campus can use rainwater harvesting to tackle water shortages and support sustainability efforts. As campuses grow, more surfaces like roofs and walkways become impermeable, causing rainwater to run off instead of being absorbed and used. We propose a system that captures and treats rainwater, turning the campus into a self-sufficient unit that relies less on city water and underground sources.

2. Key words:

Rainwater harvesting, Quantity of rainwater collection, Bore well recharge

3. Introduction:

Rainwater harvesting (RWH) on a college campus is a practical engineering solution that transforms infrastructure into a water-generating asset. Rainwater harvesting is an important environment friendly approach. It is a Green Practice having double benefit of keeping the groundwater level undisturbed and charging the aquifer. The best part of the practice of rainwater harvesting, is that if unused, this water can be collected in natural ponds or artificial tanks and decanted to the ground thus charging the a aquifer. Collecting and harvesting rainwater and run-off water

would reserve the water for future generation. Rainwater harvesting is ecofriendly and economical. The cost of digging a catchment area can be saved by roof-top collection of rainwater. The catchments and settlement tanks reduce the ground heat and act as a natural Rainwater harvesting is a technology used to collect, convey and store rain water for later use from relatively clean surfaces such as a roof, land surface or rock catchment. RWH is the technique of collecting water from roof, Filtering and storing for further uses. Rainwater Harvesting is a simple technique of catching and holding rainwater where its falls. Either, we can store it in tanks for further use or we can use it to recharge groundwater depending upon the situation. RWH system provides sources of soft, high quality.

water reduces dependence on well and other sources and in many contexts are cost effective. RWH system is economically cheaper in construction compared to other sources, i.e. well, canal, dam, diversion, etc. Rainwater harvesting on a college campus involves the strategic collection and storage of runoff from rooftops and open grounds to replenish local aquifers and ensure a sustainable, self-reliant water supply.

4. LITERATURE REVIEW:

Latif Shaikh {2018}- The author used (RWH) and achieves one key of green building goal by reducing the water requirement and recharging ground water. It is necessary to adopt various approaches towards green building to protect health and environment and reduce the pollution. There are various methods of rain water harvesting which are explained above as per their IJIRT 159505 suitability by adopting proper method, we can put one step to protect environment and healthy lifestyle.

Ranjit Kumar Sharma {2019}- He finally concluded that implementation of RAINWATER HARVESTING PROJECT to the campus of N.I.T. Rourkela will be the best approach to fight with present scenario of water scarcity in all aspects, whether it is from financial point of view or from optimum utilization of land surface.

Tiara Anantika, Eka Wardhani, Nico Halomoan. {2019}-Using of green buildings for the apartment buildings it's very important for water saving, can be done with rain water harvesting or utilization of rain water as a flushing or watering plants. Total water needs of the apartment is 182.031 m3 /days, after doing the conservation water saving of 175.695 m3 /days.

Mohd Farooq a, Manpreet Singh Bedi b and M.K. Kaushik c {2016}- Rainwater harvesting is a cost effective method of conserving water there by solving the water crisis. The Indian town planners and civil authorities need to make rainwater harvesting compulsory in all new structures.

5. METHODOLOGY

As a part of background information rainfall details of Nagpur have been collected. The following figure show 2 Mean Annual Rainfall pattern of Dt. Nagpur.

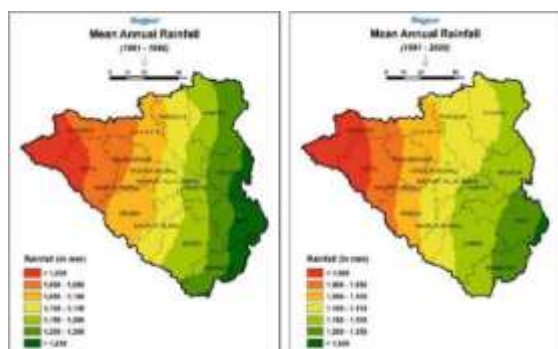


Fig1. Two Mean Annual Rainfall pattern

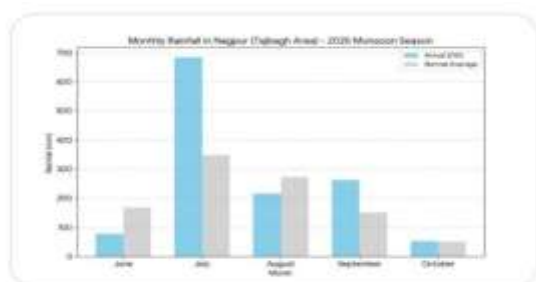


Fig 2. Graphical representation of average annual rainfall of Taj Bagh

The following figure shows the layout plan of college campus building s rainwater from roof top is to be collected from all buildings.

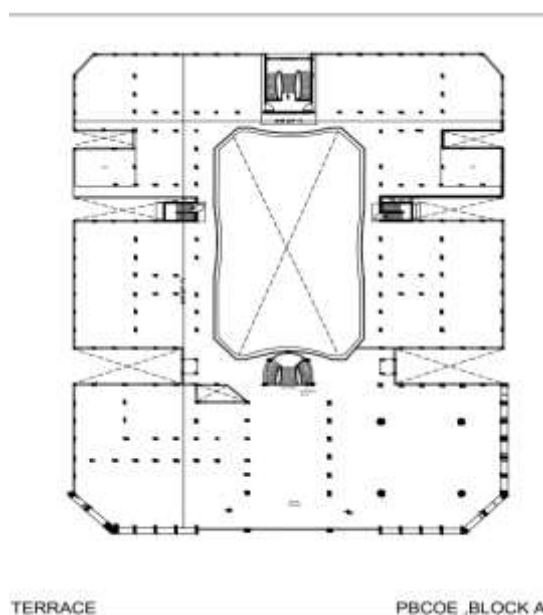


Fig 3. Details of Rainwater Harvesting Plan for Building of Priyadarshini College of Engineering Block A

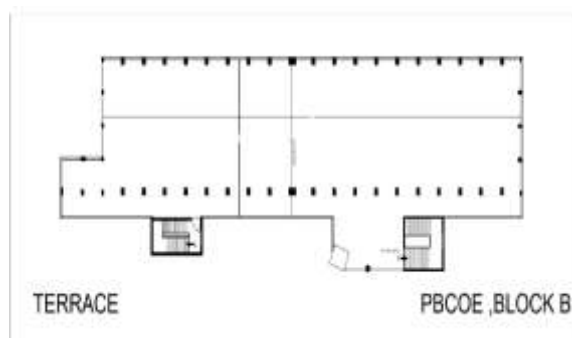


Fig 4. Details of rainwater harvesting plan for building of Priyadarshini College of Engineering Block B

3.1 The runoff coefficient for various catchment.

Table -1: Runoff Calculation of Block A

Sr. No.	Parameter	Description/ Calculation	Value
1.	Catchment Area (A)	64.780m x 16.459m	1069.34 m ²
2.	Annual Rainfall (R)	Nagpur / Maharashtra Average	1.0 m
3.	Runoff Coefficient (C)	Standard for RCC Terrace	0.85
4.	Harvesting Volume (V)	A x R x C	908.94 m ³
5.	Total Liters	908.94 x 1000	908,940 Liters

Table -2: Runoff Calculation of Block B

3.2 Water Use: The collected rainwater from roof top is send to recharge of tube well in front of Administrative buildings and remaining part is stored in RCC tank of 1,00,000 Ltr. Capacity. Constructed at back end of civil engineering near computer centre since the natural slope of all campus comes at this one site. This water storage tank is covered with steel BCR mesh along with green coloured net shade for this cover will control rate of evaporation and will stop entry of leaves and other materials into water tank.

Rainwater harvesting (RWH) on college campuses collects roof and surface runoff, storing it for non-potable uses like landscaping, toilet flushing, and cooling towers, or for recharging groundwater. It acts as a sustainable, economical solution to reduce reliance on municipal water, prevent water logging, and decrease high water bills.

Sr. No.	Parameter	Description/ Calculation	Value
1.	Catchment Area (A)	83.478 m x 66.780 m	5575.17 m ²
2.	Annual Rainfall (R)	Average for Nagpur	1.0 m
3.	Runoff Coefficient (C)	Standard for RCC Terrace	0.85
4.	Harvesting Volume (V)	A x R x C	4738.89 m ³
5.	Total Liters	4738.89 x 1000	4,738,895 Liters

Landscaping and Gardening: The primary use for harvested rainwater on campuses is irrigation for lawns, sports fields, and gardens, using sprinklers for efficiency. **Toilet Flushing:** Collected rainwater can be treated or filtered for use in restroom flushing, reducing high potable water demand, especially in hostels. **Cleaning and Maintenance:** Stored water is used for washing vehicles, cleaning laboratory equipment, mopping floors, and cleaning hard scapes. **Cooling Tower Makeup:** Large, centralized air conditioning systems can use filtered rainwater for cooling towers. **Groundwater Recharge:** Rainwater is directed into borewells and recharge pits/trenches, increasing groundwater levels to combat scarcity. **Emergency Supply:** Stored, filtered water can serve as a contingency for firefighting or during water shortages.

6. Result & Discussion:

The total rain water collected in rainy season is 1387835 Litres. Considering 5 % of water for initial cleaning. The reaming water is distributed for well recharge 1318443.25 Litres And water storage purpose 1318443.25 Litres .

7. Conclusion:

Rainwater harvesting in a college campus is a sustainable solution that ensures efficient water management, reduces dependency on external water sources, and promotes environmental responsibility

among students and staff. By collecting, filtering, storing, and recharging rainwater, the campus can meet a significant portion of its non-potable water needs such as gardening, toilet flushing, and cleaning, while simultaneously replenishing groundwater reserves.

The implementation of rainwater harvesting on a college campus is a transformative step toward institutional self-sufficiency and environmental leadership.

8. REFERENCES

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