

Review on Rooftop Rainwater Harvesting

Rajat R. Kadwe¹, Vishal R. Pimple¹, Sushant S. Kanake¹, Pravin S. Baraskar¹, Samyak S. Naraware¹,
Ankush N. Asati², Shrirang D. Borkar²

¹Civil Engineering Department, DBACER, Nagpur, Maharashtra, India

²Assistant Professor Civil Engineering Department, DBACER, Nagpur, Maharashtra, India

ABSTRACT

Water crisis is serious problem in our country. The rapid urbanization and population explosion have triggered massive demand for quality drinking water than ever before. Water for both irrigation and human consumption, is getting more and more scarce for vast masses of our people and in many regions of the country. Many of the water sources like rivers, ground water streams and lakes are drying up. Rainfall patterns are changing drastically, with the massive deforestation leading both to reduced rainfalls as well as to reduced recharging of underground water. So as an option to fulfil the demand due to unbalanced rainfall having water backup needs, rainwater harvesting system necessary for saving the water and would help in reducing water wastage. The aim of present study is to use rainwater and design the effective plan by which we can collect rain water into a storage for our campus. The rainwater harvesting system will be an alternative source of water at the campus and can be used for Laboratories in Civil and Mechanical Department, Washrooms, as well as for Horticulture and other Purposes. Present paper majorly focuses on Rooftop Rainwater Harvesting (RRWH) of the study area of Dr. Babasaheb Ambedkar College of Engineering & Research (DBACER) Campus, Wanadongri, Nagpur. The expected outcome of this study is the development of Rainwater Harvesting System for the catchment area of campus from Admin Building, CSE Department, Killa Building, Workshop Building and Mechanical Department. This study will fulfil the scarcity of water as our college campus lies within hilly region there is slightly greater demand of water than other areas.

I. INTRODUCTION

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.

The number of people who will suffer in future because of the scarcity of water is really alarming by 2050 more than that people would live under condition of high water stress. If we talk about the sufficiency of rain, that it not a big deal to say that its not on time and not

sufficient . Most of industries are depend on it and they also suffer a lot. United Nations environment programme (UNEP) warns water could prove to be a limited factor for a development in a number of reasons in the world. If we talk about India's rain it gets only 90% of its rain fall during the summer monsoon season , which is not sufficient. it last by the month of September after that there is hardly any rain because of this thing India can make use of more than 20% of its stored fresh water resources. Rain Water harvesting has been there practice for more than 3 or 4thousand years. Its an important water source in many areas whether its urban or rural. Its also way of future passport .It is also good option in the areas where good quality fresh surface water or ground water is lacking.Commonly used systems are constructed of three principal components; namely, the catchment area, the collection device, and the conveyance system.

A) Catchment Areas

Rooftop catchments: In the most basic form of this technology, rainwater is collected in simple vessels at the edge of the roof. As the rooftop is the main catchment area, the amount and quality of rainwater collected depends on the area and type of roofing material.

Land surface catchments: Rainwater harvesting using ground or land surface catchment areas is less complex way of collecting rainwater. It involves improving runoff capacity of the land surface through various techniques including collection of runoffs with drain pipes and storage of collected water. Compared to rooftop catchment techniques, ground catchment techniques provide more opportunity for collecting water from a larger surface area. By retaining the flows (including flood flows) of small creeks and streams in small storage reservoirs created by low cost (e.g., earthen) dams, this technology can meet water demands during dry periods. There is a possibility of high rates of water loss due to infiltration into the ground, and, because of the often-marginal quality of

the water collected, this technique is mainly suitable for storing water for agricultural purposes.

B) Collection Devices

Storage tanks: Storage tanks for collecting rainwater harvested using guttering may be either above or below the ground. Precautions required in the use of storage tanks include provision of an adequate enclosure to minimize contamination from human, animal or other environmental contaminants, and a tight cover to prevent algal growth and the breeding of mosquitos. Open containers are not recommended for collecting water for drinking purposes.

C) Conveyance Systems

Conveyance systems are required to transfer the rainwater collected on the rooftops to the storage tanks. This is usually accomplished by making connections to one or more down-pipes connected to the rooftop gutters. When selecting a conveyance system, consideration should be given to the fact that, when it first starts to rain, dirt and debris from the rooftop will be washed into the down-pipe. Thus, the relatively clean water will only be available some time later in the storm. There are several possible choices to selectively collect clean water for the storage tanks.

Advantages:

- Rain water Harvesting is a comparatively clean & totally free source of water.
- Rainwater harvesting is improved for scenery plants & gardens because it is not chlorinated.
- It lowers the water supply cost.
- It can provide an excellent backup source of water for emergencies.
- It is socially acceptable & envirovnmentally responsible.
- It can be used to recharge groundwater.
- It minimizes runoff which blocks the storm water drains.

Disadvantages:

- Unpredictable rainfall- Rainfall is hard to predict and sometimes little or no rainfall can limit the supply of rainwater.
- Initial cost- Depending upon the system & technology level. The cost can be recovered in years to come, which again depends on amount of rainfall & sophistication.
- Regular Maintenance- Rainwater Harvesting system requires regular maintenance, this also depends on system, self-cleaning rainwater filters helps to minimize maintenance & keep the water clean.

Study Area



Perimeter ?

746 m

Area

19,390 m²

Figure 1

WHY RAINWATER HARVESTING IN CAMPUS?

- As our college lies in the hilly area, run off of water takes place quickly and hence water does

not percolate as it is used to in the normal landscape.

- The stored water may be used in the laboratories of various departments by giving preliminary treatment.
- It can also be used for cleaning the floors of buildings, gardening purpose.

II. LITERATURE REVIEW

- [1] Project Report on Design of Rainwater Harvesting System Lingaya's University, Faridabad :-

The specialized parts of this paper are water gathering gathered from housetop which is thought to be catchment territories from all lodgings and Institutes departmental working at Lingaya's Institute of Management and Technology, Faridabad Campus. As a matter of first importance, required information are gathered i.e. catchment zones and hydrological precipitation information. Water gathering potential for the inns and workforce flats was ascertained, and the tank limit with appropriate plan is being considered.

- [2] Rain Water Harvesting-A Campus Study, Govt College of Aurangabad: -

The aim of this study is to use rainwater and thus taking close to the concept of nature conservation. In this study, the rain water harvesting system is analysed as a alternative source of water at campus of government college of engineering, Aurangabad in the state of Maharashtra, India. The expected outcome of the study is the development of rainwater harvesting system for catchment area of campus from parking area, workshop area, some of the electronics department area up to hostel. The result analysis shows that the present rain water harvesting system is having the storage 53,96,816 litres/year and construction cost of rs.5 lakhs respectively and is reasonably well in comparison with conventional water sources.

[3] Rooftop Rainwater Harvesting Dahivadi College Campus, Satara.

The main objective of this study is measures three type of surface rainwater harvesting potential in rural area; one is runoff rainwater harvesting potential in hilly area, second is recharge and storage of rainwater harvesting potential in plateau area and third is artificial ground water recharge through rainwater harvesting potential. We also suggest suitable sites of the rainwater harvesting structures with the help of physiography of the area and also estimated rainwater harvesting potential in the region.

III. CONCLUSION

The Present study deals with prospect of improving rain water availability in the DBACER, Nagpur campus by implementing Rain Water Harvesting (RWH) system. The effectiveness of RWH lies in its ability to meet the site requirements and end use preferences. The rain water harvesting is one of the cost effective measure to overcome the problems faced due to water scarcity and it is best option for times to come. The implementation of RWH system can last for many years providing water for Laboratories, Washrooms, Toilets as well as for Horticulture & Gardening purposes in the college campus. In this paper we conclude that RWH in the DBACER Campus is a good potential for rain water conservation and by implementing RWH project in the DBACER Campus runoff water conservation can be made and that can be meet the present water scarcity situation of this location. We propose Roof top Rainwater harvesting technique at DBACER Campus would result in the form of best approach to meet water deficit of this locality.

IV. REFERENCES

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