Rain Water Harvesting : A Solution for Problem of Water In Urban Sector

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Abstract

A brief discussion and review of the importance of rainwater harvesting for compensating the effect of water shortage, which are repeatedly occurring due to current climate change and ever increasing utilization of water for drinking, irrigation and industries has been presented here. Unpredictable rain and rapid urbanization cause majority of the cities to suffer from the water shortage and problem of urban flooding. In urban areas, restricted rainfall in absence of proper management creates acute scarcity of water on one hand and on the other, the flood like situation during monsoons. Though the concept of rainwater harvesting is not new, there is a lack of awareness. The rainwater harvesting offers ideal solution in areas where there is inadequate supply of groundwater or insufficient surface sources. It also reduces urban flooding such as roads, subways, railway lines etc. The other major benefit of rainwater harvesting is improvement of quality of groundwater by recharging water into the aquifers.

INTRODUCTION

The water is an essential need of all forms of life and used in many different ways. But now a day the supply of water is decreasing rapidly. Lack of water is caused by low water storage capacity, low infiltration, larger annual fluctuations of precipitation (due to monsoon rains) and high evaporation demand. Majority of the water comes from the underground sources. These sources depend on the percolation of rainwater in to the ground (recharge of groundwater). In India, the rainfall is restricted to monsoon. However, this rainfall occurs during short spells of high intensity. Because of such short duration of heavy rain most ' of the rain falling on the surface tends to flow away (runoff) rapidly leaving very little for recharge of groundwater. Because of this urban centers in India are facing an ironical situation today. On one hand there is the acute water scarcity and on the other, the streets are often flooded during the monsoons. This has led to serious problems with quality and quantity of groundwater. One of the solutions to the urban water crisis is rainwater harvesting capturing the runoff.

The term rainwater harvesting is used frequently these days, however, the concept of water harvesting is not new for India. Water harvesting techniques had been evolved and developed centuries ago. In India, water harvesting means utilizing the erratic monsoon rain for agriculture and conserve excess runoff for drinking and for recharge purpose.

Ground water resource gets naturally recharged through percolation. But due to indiscriminate development and rapid urbanization, exposed surface of soil has been reduced drastically with resultant reduction in percolation of rainwater, thereby depleting ground water resource. Rainwater harvesting is the process of augmenting the natural filtration of rainwater in to the underground formation by some artificial methods. "Conscious collection and storage of rainwater to

cater to demands of water, for drinking, domestic purpose & irrigation is termed as Rainwater harvesting."

The rainwater harvesting offers ideal solution, in areas where there is inadequate groundwater supply or insufficient surfaces sources. It also reduces urban flooding such as roads, subways etc. Other major benefit of rainwater harvesting is improvement of quality of groundwater by recharging water into the aquifers.

IN URBAN AREAS RAINWATER CAN BE HARVESTED FOR FOLLOWING PURPOSES:

- Storing rainwater for ready use in containers above or below ground
- Charged into the soil for withdrawal later (groundwater recharging)
- To avoid flooding of roads, subways, railway lines

FROM WHERE TO HARVEST RAIN :

In urban areas rainwater can be harvested from the following surfaces,

- **Roof tops :** If buildings with impervious roofs are already in place, the catchment area is effectively available free of charge and they provide a supply at the point of consumption.
- **Paved and unpaved areas :** The landscapes, open fields, parks, stormwater drains, roads and pavements and other open areas can be effectively used to harvest the runoff. The main advantage in using ground as collecting surface is that water can be collected from a larger area. This is particularly advantageous in areas of low rainfall.
- **Storm water drains :** Most of the residential colonies have proper network of storm water drains. If maintained neatly, these offer a simple and cost effective means for harvesting rainwater.

Out of these roof top rainwater harvesting is most suitable in urban areas. In this method rain water collected from the roof of the building is diverted to a storage tank. The storage tank has to be designed according to the water requirements, rainfall and catchment availability. Each drainpipe should have mesh filter at mouth and first flush device followed by filtration system before connecting to the storage tank. It is advisable that each tank should have excess water over flow system.

Excess water could be diverted to recharge system. Water from storage tank can be used for secondary purposes such as washing and gardening etc. This is the most cost effective way of rainwater harvesting. The main advantage of collecting and using the rainwater during rainy season is not only to save water from conventional sources., but also to save energy incurred on transportation and distribution of water at the doorstep. This also conserves the groundwater, if it is being extracted to meet the demand when rains are on.

ROOFTOP RAIN WATER HARVESTING (RTRWH) :

It is a system of catching rainwater where it falls. In rooftop harvesting, the roof becomes the catchments, and the rainwater is collected from the roof of the house/building. It can either be stored in a tank or diverted to artificial recharge system. This method is less expensive and very effective and if implemented properly helps in augmenting the ground water level of the

area.

COMPONENTS OF THE ROOFTOP RAINWATER HARVESTING SYSTEM :

The system mainly constitutes of following sub components :

- Catchment
- Transportation
- First flush
- Filter
- **Catchment**
- The surface that receives rainfall directly is the catchment of rainwater harvesting system. It may be terrace, courtyard, or paved or unpaved open ground. The terrace may be flat RCC/stone roof or sloping roof. Therefore the catchment is the area, which actually contributes rainwater to the harvesting system.
- **Transportation**
- Rainwater from rooftop should be carried through down take water pipes or drains to storage/harvesting system. Water pipes should be UV resistant (ISI HDPE/PVC pipes) of required capacity. Water from sloping roofs could be caught through gutters and down take pipe. At terraces, mouth of the each drain should have wire mesh to restrict floating material.
- **First Flush**
- First flush is a device used to flush off the water received in first shower. The first shower of rain needs to be flushed-off to avoid contaminating storable/rechargeable water by the probable contaminants of the atmosphere and the catchment roof. It will also help in cleaning of silt and other material deposited on roof during dry seasons Provisions of first rain separator should be made at outlet of each drainpipe.
- **Filter**
- There is always some skepticism regarding Roof Top Rainwater Harvesting since doubts are raised that rainwater may contaminate groundwater. There is remote possibility of this fear coming true if are different types of filters in practice, but basic function is to purify water.

BENEFITS OF RAINWATER HARVESTING

Rainwater harvesting in urban areas offers several benefits including provision of supplemental water, increasing the groundwater table via recharge, solving the problem of urban flooding and improving the quality of groundwater. In homes and buildings, collected rainwater can be used for irrigation, toilet flushing and laundry. The major benefits of rainwater harvesting are summarised below:

- rainwater is a relatively clean and free source of water.
- rainwater harvesting provides a source of water at the point where it is needed.
- it is owner-operated and managed with low running costs.
- it is socially acceptable and environmentally responsible.
- it promotes self-sufficiency and conserves water resources.
- it reduces stormwater runoff and thereby flooding.
- it uses simple, flexible technologies that are easy to maintain.
- provides safe water for human consumption after proper treatment.

DISADVANTAGES

The main disadvantages of rainwater harvesting technologies are limited supply and uncertainty of rainfall. The other disadvantages include low storage capacity especially in urban areas whereas, increasing the storage capacity will add to the construction and operating costs making the technology less economically feasible and possible contamination of the rainwater with animal wastes and organic matter which may result in health risks.

SUSTAINABILITY

Rainwater harvesting is one of the most promising alternatives for supplying water in face of increasing water scarcity and escalating demand. Rainwater harvesting presents an opportunity for the augmentation of water supplies allowing at the same time for self-reliance and sustainability and mitigating the problem of flooding in urban areas. Rainwater harvesting should be made compulsory for all urban housing projects by making proper amendment in law so that the burden on the groundwater source will be reduced and the expenditure on maintenance of roads and underground drainage will also be reduced. The urban areas where rainwater harvesting has been practiced have become self sufficient in their need of water.

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