



A Study On Rain Water Harvesting In Urban Areas Of Kaithal District Of Haryana

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Abstract

Although, 70% of the globe is covered with water, unfortunately only 1% of this water is suitable for human use. Only a small part is freshwater; most are found in the seas. Much of the fresh water is trapped in ice caps and glaciers, making it inaccessible. 22% of freshwater withdrawals worldwide are used for industry, with 70% going to agriculture, mostly for irrigation. Water for domestic use and a safe and sufficient supply for drinking are still top priorities. In 2000, the globe had 6.2 billion inhabitants. According to UN forecasts, there will be an additional 3.5 billion people by 2050, with most of this development taking place in poorer countries that currently suffer from water scarcity. Therefore, if there are no corresponding benefits in water conservation and recycling of this essential resource, the demand for water will increase. This essay provides a brief overview of the necessity of rainwater harvesting, when it is necessary and how it should be done. In addition, it attempts to examine several well-executed cases and legislative measures that essentially support them. The approach used is based on the analysis and results of case studies. The objective of the study is to identify the rainwater harvesting techniques used in Kaithal city as well as any problems associated with their use so that recommendations for implementation can be developed. The likely outcome of the study offers a potential solution to current rainwater harvesting problems in urban areas.

Keywords — Fresh water, drinking water, water stress, rainwater harvesting, water demand, recycling, water conservation.

INTRODUCTION

A. Indian Scenario -

Indian rainfall shows great temporal and regional variability. For 80% of India, it only rains more than 80% of the year in the four monsoon months. The 4000 billion cubic meters (BCM) of rainfall that India receives on average every year is not evenly distributed. Most is lost through seepage and evaporation. Only about 630 BCM is used. India's physiographic, meteorological, soil, environmental and socio-economic characteristics vary greatly. The water collection technique is therefore very site-specific.

B. Analysis of urban water demand profiles

The main causes of increasing water demand include urbanization, population expansion, rapid development, changes in lifestyles, changes in the demographic composition of the population, and the potential consequences of climate change. The country's urban water supply and sanitation sector is plagued by poor service levels, a widening supply-demand mismatch, unsanitary conditions and declining technical and financial performance. There are two ways to respond to this increasing demand for limited available resources: either the "supply side", which involves creating new resources to meet the need, or the "demand side", which involves controlling consumption demand to delay or eliminate the need to create new resources. Urban areas of India currently face an ironic water-related situation. Acute water shortages coexist with frequent street flooding during the monsoon season, requiring urban local authorities to skilfully manage excess water from the rainy season to make up for shortages in other seasons. Groundwater extraction has reached extremely high levels in many cities, leading to problems such as declining groundwater levels, well/tube well failures, and deterioration of groundwater quantity and quality. Rainwater harvesting can help in this particular case by providing a solution.

II. RAINWATER HARVESTING

Since it is not possible to get water from the soil alone in India, water harvesting refers to using rainwater where it falls as much as possible, collecting the excess water and reusing it in the same area. In its broadest definition, rainwater harvesting (RWH) is a technique used to collect and store rainwater for human consumption from roofs, soil surfaces, or rock basins. It has been used for over 4000 years due to the temporal and geographical unpredictability of rainfall. The parts of RWH consist of: Catchment: the area of the roof where the rain is collected Conveyance: pipes or channels that connect the storage area to the collection area Filtration and ozone/UV radiation are two purification methods used to make the collected rainwater suitable for human use. Storage: cisterns for safe storage of collected rainwater and Distribution: Rainwater delivery system; typically consists of a small pump and pressure vessel.

A. The need for rainwater harvesting

The fact that water is a finite, renewable natural resource that is mobile is increasingly recognized. In addition, the amount that is available can vary greatly from year to year, from place to region, and even within a single year. We depend on subsurface water because surface water cannot meet our needs. The natural rate of freshwater replenishment in the ecosystem is outpaced by the amount of freshwater withdrawn. Groundwater recharge has decreased and rainfall infiltration into the subsoil has decreased substantially due to increasing urbanization. However, rainwater, which is clean and of high quality, is lost to the drain. There is a desperate need to find methods to conserve reuse and recycle water.

B. Methods of rainwater harvesting-RWH

There are following three techniques of rainwater harvesting.

- a) Rooftop- storing rain water for direct use.
- b) Recharging ground water aquifers, from roof top run off.
- c) Recharging ground water aquifers with runoff from ground area.

C. Viability

For the reasons below, it is the most suitable in the current setting.

1. It is the most cost-effective and scientifically sound method for groundwater recharge and raising the water table.
2. Provides water quality benefits for domestic and agricultural use.
3. Due to the extremely low level of pollution, rainwater is among the cleanest sources of water available. Arsenic and other heavy metals, as well as almost no dissolved minerals or salts, are not present in the naturally soft water it supplies.
4. Both a person and a community can participate. In this sense, we will be able to meet our own domestic water needs without depending solely on the government or other local authority to take action.

D. Benefits of Rainwater Harvesting-RWH

It promotes sustainability, energy conservation, habitat protection and flood and soil erosion prevention. It monitors falling water levels and increases the amount of water available for future generations. It reduces the cost of water supply and eliminates the need to build additional dams and other infrastructure to divert water.

E. Demerits

The main reasons for the shortcomings of rainwater harvesting technology are the unpredictable and limited amount of rainfall. This technology must be adopted from the bottom up, as opposed to the more common top-down strategy used in other water resource development initiatives. Local government and NGO resource mobilization can play a vital role in the development of rainwater-based schemes, as can water resource development agencies in larger, more conventional public water supply schemes. This may make rainwater harvesting less attractive to some government agencies charged with managing water supplies in developing countries.

F. Quality of Stored Water

Rainwater is likely to contain the following types of pollutants: 1. Pollutants in the air 2. Surface contaminants such as dust or mud This can be largely avoided by washing away the first rains. Fragments of paper, plastic bags and leaves transported by water can be stopped by a screen at the outlet of rainwater from the terrace. Filtration and sedimentation can be used to remove additional pollution.

G. Cost Analysis

Economic analysis has the following aspects –

- Installation or construction costs
- Operation and maintenance costs
- Estimate of benefit or rate of return

These costs consist of the price of pit construction, filter material and piping. Mandatory rainwater harvesting is not practical. There are costs and infrastructure involved. The size of the building and a number of other factors are taken into account when calculating costs. Many places lack the geological characteristics necessary for such a system, especially in areas where land forms the base of the country. In these situations, setting up such an infrastructure is costly. Careful planning and design can significantly reduce the cost of a storm water system. The one-time and lower investment of RWH is compared to the price of water in emergencies.

H. Effects on Groundwater Hydrology due to Urbanization

Due to the construction of houses, sidewalks and roadways, urban regions have little exposed dirt for water to seep into. The urbanization trend is gaining speed. Urbanization requires large investments in water infrastructure to supply water to individual users.

- Drastic drop in water level in some areas
- Drying up of wells/bore wells
- Better use of energy
- Deterioration of groundwater quality
- Intrusion of sea water into coastal areas

A. Stakeholders

Public sector

1. Central Government - Several countries have national water regulations. Although, there is a national water policy in India, there is no actual national legislation. A strong and thorough text, the National Water Policy of 2002 creates a framework that can be translated into legislation. In India, water is a state subject under the constitution. According to the 74th Constitutional Amendment, the municipal governments in their respective spheres are responsible for the administration of these regions.

2. State Government – The Haryana State Government has mandated rainwater harvesting for all new construction projects involving plots larger than 1000 square meters. State-supported water supply has both human and financial problems. Water is subsidized by the state. People waste it. The state will quickly run out of funds both for new initiatives to keep up with demand and for maintaining existing ones.

3. Local Government- Buildings with RWH system installed are eligible for % rebate on property tax from Kaithal Municipal Corporation. With technical support from the US Agency for International Development (USAID), PMC was one of the first to start implementing a green housing initiative. However, even with programs and incentives, not many people use the city's water management system. The reason for the hesitation is the lack of water in this place. Implementation of water conservation strategies at the level of supply and consumption is an essential part of an effective water management policy. The current paradigm of centralized water supply appears unsustainable and consumes a disproportionate amount of energy. Water is excessively wasted in several places in the supply and distribution network. Supply savings are achieved by improving the use of water resources that are available, taking steps to increase these resources and improving the efficiency of supply systems through tasks such as replacing and repairing aging pipes, properly managing network pressures, fixing leaks and reducing losses. in water treatment facilities.

Private sector

Just over 600 of Kaithal's 6.5 million houses have RWH. PMC offers property tax rebates to municipalities that use rainwater harvesting. It is not feasible to require older urban property owners to use this method as they lack the space and side margins needed to set up the system. In 2009–10, 8,065 households received tax relief. In Kaithal, where demand and population are growing, small-scale rainwater harvesting by builders and architects plays a significant role. In addition, city builders provide RWH for previous projects.

Non-governmental organization

According to the paper "Rainwater harvesting to meet Kaithal's water scarcity" written by the NGO Green Energy Foundation, rainwater harvesting can provide 21% of the water required within the Kaithal Municipal Corporation area. According to the report, rainwater can cover approximately 32% of the total water consumption within the city, with surface runoff covering 11% of the need. The research proposed making rainwater harvesting mandatory for all new construction, highlighting a 30% reduction in water in the city and an attitude towards water management. A person can recycle and reuse 60 to 70 percent of the water they use. The primary problem was the use of potable water for everything; analysis indicated that using recycled water for landscaping and vehicle washing would reduce the need for fresh water by 40%. He recommended suitable artificial recharge systems.

End-users

The abundant water supply in the city caused residents to lose interest. Rainwater harvesting is not a popular option, even with a property tax abatement. People don't realize how important water is until PMC opts for a metered water system. People will realize the value of water and the importance of rainwater harvesting if it is given value. It is also clear that people do not take much initiative. As the people of the city in the south endured years of suffering due to the rains failing year after year, some houses freely decided to take this action. Public education campaigns and the creation of laws regulating the specifications of domestic plumbing fixtures, the installation of low-consumption appliances (such as

washing machines, dishwashers, showers and toilets), and the recycling and reuse of wastewater are examples at the user level. water conservation initiatives.

IV. CONCLUSION

1. The absence of legal penalties for failure to construct storm water harvesting structures and the failure of municipal corporations to enforce their authority over engineers and architects to ensure that storm water retention measures are included in design, construction and supervision are two possible explanations for the failure. RWH measures. 2. Public water systems may experience a decrease in revenue if rainwater harvesting devices are used extensively. 3. The public sector has not adopted the use of rainwater as a replacement for the current water supply system.

4. A sustained, broad-based public awareness campaign has not been implemented. 5. Lack of demonstration centres to educate the public about the complexities of building rainwater harvesting facilities. 6. Often there are no building regulations regarding rainwater harvesting systems and there are no explicit rules for users or developers to follow.

The way forward

1. Rainwater harvesting on the roof at building level.

Kaithal experiences moderate rainfall and has a number of wells to recharge the deeper aquifers. In order to recharge groundwater in deep collectors, a practical approach is to collect rainwater on the roof. This would significantly contribute to improving water supply to households throughout the year.

2. RWH at city level

Being present during runoff Urban runoff can be reduced on site through specific design features and strategies such as rain gardens, permeable/porous pavement, swales, filtered catch basins, tree trellises, irrigation of public spaces, storm water mitigation incorporated into street designs, maintenance rain chambers and appropriate drainage of rainwater. In a typical neighbourhood, parking lots and roads make up about 65% of the impervious surface used for traffic. Porous surfaces can be used to retain and recycle runoff from large parking lots, resulting in additional vegetation. The two components of urban water management are storm water drainage and water conservation. Water harvesting techniques will not work without a carefully thought out rainwater drainage infrastructure as the two sectors intersect.

Recharge shafts in old and abandoned quarries

There aren't many old, abandoned quarries in the Kaithal metropolitan area. These quarries are filled with rainwater during the monsoon. Groundwater recharge is minimal because the base of the quarries is often composed of dense and massive basalt. Most of the accumulated precipitation evaporates and is of no use. The yield of adjacent drilled and dug wells would be increased if recharge shafts were built up to the permeable strata, thereby improving groundwater recharge.

Policies

India has been harvesting rainwater since civilization existed. However, the public and the government forget this only when water is scarce. Several actions and constructions should be done or built before the rainy season. This will allow rainwater that drains beyond city limits or sub-catchments to be collected and used immediately or recharged back into the ground. The lack of comprehensive coverage in current policy declarations is the main reason for the necessity of a policy framework for water harvesting systems. Rainfall collection, storage in reservoirs and groundwater recharge can thus be used as a replacement paradigm for a more sustainable water supply. RWH can be part of the building code of the house. Rainwater harvesting can be scaled up to neighbourhood and micro-watershed levels as civil society becomes more aware of its options. The following are some of the elements approved by JNNURM that have a direct impact on water management: Urban renewal or reconstruction of inner (old) urban areas [which includes things like solid waste replacement, sewerage and drainage] ; Water supply, including desalination plants; Sewerage and solid waste management; Storm water and sewerage improvement and construction; and protection of water bodies. So, there is a lot of scope for changing the way cities are created.

3. Public campaign and participation in raising awareness

In order to achieve a sustainable goal in the coming years, people, NGOs and the government should work together and implement rainwater harvesting intensively everywhere. Research into rainwater harvesting (RWH) in urban areas is ongoing and its scope includes identifying the technologies and methods used. Policy formulation measures that promote RWH and ensure efficient use of available water should also be studied.

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