

# Rainwater Harvesting System for Sustainable Water Management

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**Abstract:** Rainwater harvesting as a effective method to conserve water resources by collecting and storing rainwater for vsious uses. This project aims to design and implement a cost-effective rainwater harvesting system suitable for residential, institutional, or community applications. The system involves the collection of rainwater from rooftop surfaces, conveyance through a network of gutters and downpipes, filtration to remove impurities, and storage in an undergroo-find or overhead tank. The stored wat-er can be used for domestic non-pota-ble purposes such as gardening, washing, tollet fiushing, and groundwater recharge. The expected outcome of the project is a functional rainwater harvesting model supported by cost estimation, efficiency analysis, and environmental impact assessment.

**Keywords:** *Rainwater Harvesting, Water Conservation, Sustainable Development, Groundwater Recharge, Civil Engineering*

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## I. INTRODUCTION:

India is one of the developing countries. Due to faster industrialization and urbanization and increase in population water demand is increasing day by day. Rainfall in India is highly irregular. Most of it is concentrated during a few months of the year and maximum amount flows away resulting in poor recharge of ground water. There is significant spatial imbalance in water resource available and water demand. Therefore, it is becoming necessary to bring water from distant places increasing the cost of conveyance. It is also a common observation that underground water table is depleting due to uncontrolled extraction of water. The state of Tamilnadu covers an area of 130,058 square km and supports a population of 72 million. Over half of this population is in rural area which faces problems related to water. Conventional sources like open well, bore well and piped water supplies have failed due to depleting water tables, poor water quality and high cost involved in operation and maintenance. Every year a great amount of water is being lost that falls on terraces, all of which finds its way to the storm water drains. Rain Water Harvesting (RWH) can play important role for solving the water problems. Water Conservation Water Conservation has three broad connotations; maximum storage of rainwater, economical and optimal use including prevention of wastage/ leakage and multiple use – reuse and recycling. In urban water supply almost 30 to 40% of the water is wasted through the distribution system. In Industrial sector also, there is a scope of economy in use of water. Public awareness should be generated through a massive campaign of communication through all available media and by the utility management itself setting an example for conservation.

### Water Scarcity in Tamilnadu

Water is a becoming a scarce commodity and it is considered as a liquid gold in this part of the country especially in Tamilnadu. The demand of water is also increasing day by day not only for agriculture, but also for household and industrial purposes. The perennial rivers are becoming dry and ground water table is depleting in most of the areas. Country is facing

floods and drought in the same year in many states. This is because, no concrete action was taken to conserve, harvest and manage the rain water efficiently. If the availability of water is 1700 M3/p/y, there will be occasional water stress, and if it is less than 1000 M3/p/y, it is under water scarcity condition. Though India is not under water stress conditions but Tamilnadu state is already under water scarcity condition, but there is no need for panic since it is possible to manage this condition as in the case of Israel where the availability is only about 450 M3/p/ y, by means of water harvesting, water conservation and water management. Through an ordinance titled Tamilnadu Municipal Laws ordinance, 2003, dated July 19, 2003, the government of Tamilnadu has made rainwater harvesting mandatory for all the buildings, both public and private, in the state. The deadline to construct rainwater harvesting structures is August 31, 2003. The ordinance cautions, “Where the rain water harvesting structure is not provided as required, the Commissioner or any person authorized by him in this behalf may, after giving notice to the owner or occupier of the building, cause rain water harvesting structure to be provided in such building and recover the cost of such provision along with the incidental expense thereof in the same manner as property tax”. It also warns the citizens on disconnection of water supply connection provided rainwater harvesting structures are not provided.

### The Principle of Rain Water Harvesting

Rainwater falling on the ground is absorbed by the earth and it constitutes the groundwater. This water is stored amidst the loose soil and hard rocks beneath the earth’s surface just as sponge stores water. Just as the water can be sucked out of a sponge, so can groundwater be sucked out from beneath the earth through bore wells.

All this can happen only if the rainwater is allowed to touch the loose earth. Extreme urbanisation in a city like Mumbai has meant that at least three-fourths of the city’s surface area has been developed, that is, covered in hard concrete by way of buildings and roads.

### Need for Rain Water Harvesting

Rain Water Harvesting means the activity of direct collection of rain water which can be recharged in to the ground water to prevent fall of ground water level or storing in surface or underground water tank. It is most suited in today's context due to following reasons.

1. It is the most scientific and cost effective way of recharging the ground water and reviving the water table.
2. It offers advantage in water quality for both irrigation and domestic use.
3. It provides naturally soft water and contains almost no dissolved minerals or salts, arsenic and other heavy metals.
4. It can be done at individual as well as in a community level. This way we can be self-sufficient in terms of domestic water requirements and not just dependent on the actions initiated by government or any other local body.

### Benefits of Rain Water Harvesting

1. Rise in ground water levels in water
2. Increased availability of water from wells
3. Prevent decline in water levels
4. Reduction in the use of energy for pumping water and consequently the costs.
5. Reduction in flood hazard and soil erosion
6. Benefiting in the water quality
7. Arresting sea water ingress
8. Assuring sustainability of the ground water abstraction sources and consequently the village and town water supply system
9. Mitigating the effect of droughts and achieving drought proofing
10. Reviving the dying traditional water harvesting structures and their rehabilitation as recharge structures.

### Suggestions

1. Watersheds, Check dams, Roof water harvesting should be made compulsory and mandatory.
2. Efficient irrigation systems like Sprinkler, drip, trickle, macro and micro irrigation should be practised in agriculture.
3. Sequential water use: Reuse, recovery and recycling of waste waters.
4. Switching to less water-dependent crops.
5. Water conservation and higher efficiencies for water-conveyance, water-application and water-use.
6. Scientific management of water by making use of electronics and IT based aids like soil-

8. moisture measurements.
9. Participation of women in conservation of water.
10. Competent, knowledgeable and experienced personnel to be involved in management of water.

### II.CONCLUSION

Water is most valuable resource. There are no serious efforts to gain water by practices like rainwater harvesting, watersheds and mini-ponds. Rain Water Harvesting should be made mandatory. Sequential water use (reuse, recovery and recycling of waste waters) should be planned wherever possible so that the load on fresh water can be reduced. Water's presence in agro-eco systems should be treated on a holistic approach, and by employing scientific management tools it should be judiciously used. For agriculture, an integrated water management practice consisting of three main components – Rain Water Harvesting, water-saving micro-irrigation, and highly efficient crop production – should be adopted. Conservation of water should be taken as a way of life and widely adopted. "WATER SCARCITY DIVIDE PEOPLE.....

..... RAINWATER HARVESTING UNITES THEM."

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