

Rainwater Harvesting – The Success Story of Chennai

Dr. Sekhar Raghavan

(Ashoka Fellow)

Director, Rain Centre

4, 3rd Trust Link Street

Mandavelipakkam, Chennai 600028

Email: sekar1479@yahoo.co.in

ABSTRACT

The story of Chennai, a coastal city in South India is a very interesting one. This city has depended largely on its groundwater source, whose exploitable quantity and quality used to be very good till a few years back. Urbanization had not only deprived this city of open space for any natural recharge to occur but also its groundwater due to overexploitation. Chennai was never a rain starved city but was water starved one from 1998 to 2003. There was a complete lack of awareness among both the society and the state about the need to sustain the groundwater source through rainwater harvesting and artificial recharge.

The role played by individuals, non-governmental organizations (NGOs) and the state to promote and popularize RWH not only in Chennai but in the entire state of Tamil Nadu is discussed in detail in this paper. Finally, the successes obtained thereafter and the need to replicate the Chennai success to other major towns within India and outside is also highlighted in this paper.

I. INTRODUCTION

Water is perhaps the most precious asset on earth. Indians have traditionally considered it as one of the five basic elements of nature, the others being air, soil, fire and space. Fresh water is essential for human survival and rainfall is its single largest source. The part of rainfall that is trapped in surface and groundwater sources is all that is available for human consumption. This is what has come to be known as Rainwater Harvesting (RWH).

RWH can be broadly divided into a) RWH relevant in rural areas and b) RWH relevant in urban areas. The two important aspects of RWH are collection of rainwater for immediate use and the other being recharge into the soil, either naturally or artificially for sustaining and improving the groundwater source. Due to availability of large amounts of open space in rural areas RWH is essentially collection of rainwater in surface water bodies such as ponds, lakes etc. and simultaneous natural recharge also takes place. On the contrary, due to shrinking of open spaces in urban areas, RWH is predominantly artificial recharge to sustain the over exploited groundwater source in cities.

Most of the RWH found in rural areas is traditional and practiced only at the macro level.

The plan of the paper is as follows. We go on to a discussion of RWH in urban areas in section II. Section III is devoted to a discussion of the different methods of RWH in individual premises. The activities carried out by both the society and the state during the last thirteen years to promote and popularize RWH and the successes achieved as a result of RWH is explained in section IV. Concluding remarks are made in the last section (V).

II. RAINWATER HARVESTING IN URBAN AREAS

Urban areas, which consist of large and medium sized cities, almost all of them face the twin problems of floods during monsoon and shortage of fresh water during non-monsoon months. Both these problems are of a more recent origin and are caused primarily due to lack of harvesting the rainwater that falls in such areas. The solution to both these problems lies in understanding the scenario and making sincere attempts to harvest every drop of rainwater either as collection for immediate use or aquifer recharge or both.

If one analyses the reasons for these, one would realize that flooding is caused essentially because of shrinking of open spaces and very minimal area remaining unpaved. On the other hand, water scarcity is due to over exploitation of fresh water sources, apathetic attitude of people living in cities leading to water being taken for granted and a lack of awareness among them about the need to sustain the sources through RWH (Sekhar Raghavan, 2004).

In urban areas, unlike rural areas both the aspects of RWH have to be carried out at the macro and micro levels. While it is the responsibility of the state to carry it out at the macro level, the responsibility of implementing it at the micro level lies

with the society, namely the residents. Collection for immediate use at the macro level involves reviving the lakes and ponds and temple tanks still present within cities and towns, from encroachments and renovating/repairing them in order to impound the urban runoff water in them. These renovated water bodies could then serve as decentralized fresh water sources for the immediate neighborhood and also facilitate natural recharge. For example, Chennai still meets 40% of its fresh water needs from 4 such water bodies located in its suburbs.

The other activity namely, artificial recharge at the macro level to be carried out by the state involves, besides such impoundment, diverting the urban runoff into properly designed recharge structures. This runoff is presently being removed by the network of storm water drains constructed almost all over the city and dumped into the sea.

At the micro level, both these aspects will have to be done by the residents in their respective premises. Collection of rooftop water, after proper filtration in plastic/masonry tanks constructed above and below the ground respectively will be relevant only in such places which do not get enough municipal water even during and immediately after the monsoon months.

Artificial recharge at the micro level will have to be implemented by injecting the rooftop water (after using it for collection wherever it is relevant) and driveway runoff water into properly designed recharge structures as explained in detail in the next section (Sekhar Raghavan 2006). This will be relevant in places where groundwater is reasonably good, pre-monsoon water table low and soil porous and permeable.

III. METHODS OF RAINWATER HARVESTING

In every premise, whether it be a house, multistoried residential and/or commercial complex, office, factory etc., rainwater falls only on two places: 1) rooftop 2) all around the built-up area, which could be a driveway, garden etc.

ROOFTOP HARVESTING

Rooftop rainwater is of a good quality as it falls on clean terraces (except in factories) and is brought down by the drainpipes called rooftop pipes.

I) Direct at least one or more of these pipes located close to the existing below- ground- level masonry tank into it either through a first-flush arrangement or a sand filter (Fig.1).

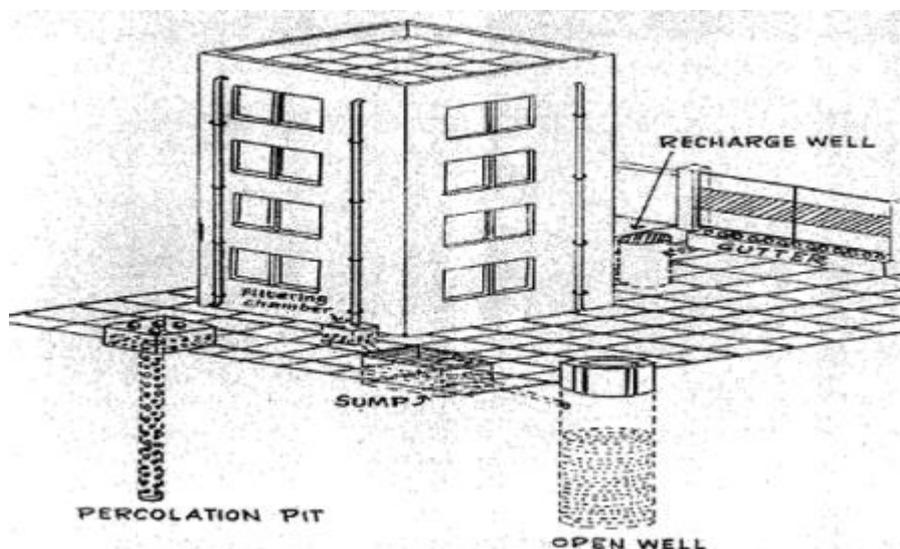
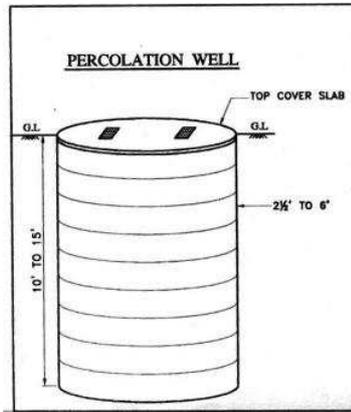


Fig.1

II) Any overflow from the sump can be led into an open/dug well, if any, within the premises for recharge purposes. Pipes not directed to the sump can also be led into the well (fig.1)

III) In the absence of an open well, a percolation/recharge (RC) well could be dug within the premises (fig.2) to inject rooftop water into it.



These are constructed using cement rings readily available in the market. The diameter of these rings range from 2.5 ft. to 6 ft. The depth to which these wells are dug depends on the nature of the soil and the diameter on the volume of water that is likely to be ingested in each one of them. They are left unfilled and are covered with RCC slabs of suitable thickness to facilitate vehicular movement on them.

Fig. 2 Percolation / recharge well

DRIVEWAY RUNOFF HARVESTING

In a large number of houses/flat complexes and office complexes, the driveway area (all around the built up area) will be as much or even more than the rooftop area. Rainwater falling on this area will be quite large and in addition a sizeable quantity of rooftop water will also contribute to this, which eventually runs off to the street through the gate(s). Hence harvesting driveway runoff in such places becomes very important. This should be harvested by intercepting it with the help of a shallow gutter (covered with a reasonably thick perforated reinforced cement concrete slab) or a bump (which is a cheaper alternative to the gutter) near the gate(s) and directed to a recharge well(s) (fig.1 and 2). Such driveway runoff should not be led into a source well since the runoff will contain large amounts of silt. These and other drawings are also available in a booklet titled “RWH in Urban Areas”, which can be downloaded from our website www.raincentre.net.

IV. ACTIVITIES CARRIED OUT IN CHENNAI TO PROMOTE RWH

Promoting rainwater harvesting in urban areas warrants a three-fold thrust: 1. Creating awareness among various sections of the society regarding the importance of rainwater harvesting, to not only augment the existing sources but also to raise ground water levels and sustain the water table 2. Helping the citizens to implement rainwater harvesting in their respective premises in an efficient and cost-effective manner 3. Carrying out studies on i) the nature of the sub-soil in different parts of the city and their capacity to absorb large quantities of water ingested into it, ii) the effectiveness and adequacy of various structures put up for rainwater harvesting and iii) the post-monsoon impact on the quality and exploitable quantity of ground water in places where rainwater harvesting has been implemented.

IV.1. BY INDIVIDUALS AND NGOs (SOCIETY)

In order to carry out these three objectives and to bring succor to the water-starved citizens of Chennai, the author decided to involve himself in a door to door campaign in 1995 in a few coastal suburbs of Chennai city called Besant Nagar and Valmiki Nagar. By virtue of its close proximity to the sea, the quality and the exploitable quantity of ground water in these localities were good till about ten years back. But, as construction in these localities proliferated, the quantity of ground water tapped increased steadily even as the soil available for direct absorption of rainwater shrank substantially. As a result, the ground water table in these areas steadily went down.

During the campaign it was made clear to the residents that implementing rainwater harvesting in these areas, where the soil is sandy, is very simple and cost-effective and failure to do so would lead to saline intrusion, resulting in a permanent damage to the aquifer.



In order to accelerate the activities, a few like-minded people formed the Akash Ganga Trust in January 2001. Our trust derives its name from Akash meaning the sky and Ganga denoting the perennial river Ganges of North India, believed to have descended from the sky - together the name stands for the water received from the sky, viz., rainwater. Our trust launched the Rain Centre in Chennai, which was inaugurated by our Hon'ble (late) Chief Minister of the state of Tamil Nadu on August 21, 2002.

This centre is a one-stop information and assistance centre for rainwater harvesting and is the first in the country. The initial seed money for starting this centre came from a few non-resident Indians living in the U.S. The state government is also one of the co-sponsors of the rain centre.

Rain Centre, has been involved since 2002 in not only creating the much needed awareness among the urban residents, but has also helped them to put up well designed artificial recharge structures in their respective homes. The centre was also instrumental in legislating RWH in 2002, according to which RWH was made mandatory in every house/flat complex in the entire state of Tamil Nadu, the first state in India to do so.

IV.2 BY THE GOVERNMENT (STATE)

The AIADMK government, which came to power in June 2001 and ruled the state of Tamil Nadu till May 2006 showed keen interest in promoting and popularizing RWH at the micro level in the entire state. This was to enable the residents to augment the little or no piped water supply as well as to sustain the groundwater source in their respective premises. For this purpose, a high-level advisory committee was formed with senior government officials as members. Our organization was the only NGO to serve in the committee.

On the advice of the committee several awareness raising activities were carried out for almost a year and a half in the entire state. This included preparation of resource material like brochures, booklets, posters and video films on the importance of RWH in both English and vernacular language and setting up several rain centres in the state. A propaganda van was designed and made to be taken to various localities of Chennai. The government organized workshops on the correct RWH methodology to plumbers and masons besides residents, almost every week for one full year. Finally, the government enacted a law in October 2002 and followed it up with an ordinance in June 2003, making RWH compulsory in all existing buildings in the entire state of Tamil Nadu and to be completed within one year viz. on or before October 11, 2003. Tamil Nadu is the first state in the entire country to enact such a law for both old and new buildings.

V. SUCCESSES

A survey conducted by the Rain centre, revealed that the groundwater levels in the entire city had risen by 6 meters in some areas and by 8 meters in some others, thanks to the law, which made RWH mandatory and the good monsoon rains that the city received during 2005 and 2006. The open dug wells in a few apartment complexes, which had gone dry a few years back came back alive and were filled up to two thirds its volume during the 2005 monsoon itself. The groundwater in the bore wells, which had gone brackish improved considerably in quality and are being used even now for drinking and cooking. The improvement in groundwater levels was also noticeable in a few temple tanks (every big Hindu temple will have a huge tank nearby with steps, which can be thought of as an open well at the macro level) within Chennai. The tanks, which had remained waterless for almost thirteen years, got filled up to three feet from the bottom, thus indicating the rise in water table.



Chennai city is no longer water starved and it was never rain starved. The Municipal piped water supply has improved considerably in the entire city and as a result groundwater exploitation has been reduced to a bare minimum leaving the groundwater reserves quite rich. There are more than one reason for all the successes achieved by Chennai city. Some of them are i) The state and the society worked together to promote an environmental cause, which is really necessary ii) There were committed individuals in both the state and the society to work for the cause wholeheartedly iii) Considerable amount of awareness activities were carried out by both the state and society before RWH was made mandatory, which is very important to promote a cause like rainwater harvesting.

VI. CONCLUSIONS

Most of the other metro cities in India are rain rich but water starved. We should not forget the fact that water harvested is water produced and make sincere attempts to harvest every drop of water that falls within every premises, locality, city and country before thinking in terms of mega projects like interlinking of rivers, desalination of sea water etc. Pollution of rivers and other water bodies such as lakes and ponds by dumping of solid waste and industrial and domestic effluents into them and encroachment of them must be stopped and the water bodies will have to be revived for capturing rainwater.

Though rainwater harvesting is important in every major town and city not only in India but the world over, it is much more important in coastal cities, since what is not harvested runs off into the sea before we realize and gets wasted. This is not so in inland towns and cities, where, what is not harvested has a good chance of getting into the nearby river and prove to be useful to people living downstream or get into water bodies within the towns. Since India has a long coastline, implementation of RWH in coastal cities with sandy beaches, which have a good groundwater potential, will have to be taken up on a war footing. Any delay will result in seawater intrusion into its fresh water aquifers and create a permanent and irreversible damage. Our slogan for the future should be HARVEST RAINWATER LEST WE PERISH.

REFERENCES

1. Sekhar Raghavan (2004) *Rainwater Harvesting in Urban Areas - The Chennai Experience*, Arid Lands Newsletter 56, University of Arizona, Tucson.
2. Sekhar Raghavan (2006) *Rainwater Harvesting - Need, Relevance and Importance of Groundwater Recharge in Urban Areas with Particular Reference to Coastal Cities*, Proceedings of the International Workshop on Rainwater Harvesting, Kandy, Ministry of Urban Development and Water Supply, Government of Srilanka.



About the Author: Dr. Sekhar Raghavan is a doctorate in Physics from Madras University. He is currently the Director of RAIN CENTRE (www.raincentre.net) a one-stop information centre for helping the general public to know about Rainwater Harvesting and to implement the same in their respective houses, flats, offices etc. This is the first of its kind and was inaugurated by the TN Chief Minister in August 2002. Working displays of rooftop harvesting, driveway runoff harvesting near the gate have been set up in this centre. The other activities of the centre include conducting, periodically, awareness programmes on rainwater harvesting for school and college students with video presentations and workshops for builders and plumbers. The entire service is provided free of cost.

Since 1995, Dr. Sekhar has been involved in a door to door campaign in Chennai city trying to create awareness, among the residents, regarding the importance of rainwater harvesting to augment their existing sources as well as to sustain the precious ground water resource. He has also helped many residents of Chennai to implement RWH in their respective premises with the help of trained plumbers and masons.

In June 2001, he was included in the high-level committee formed by the Department of Municipal Administration and Water Supply, Government of Tamil Nadu to promote, propagate and popularize Rainwater Harvesting in the entire state. The government on the recommendation of this committee made RWH compulsory in all existing buildings and this law came into effect in October 2002.

In January 2003, he was selected as an Ashoka Fellow by a U.S. based non-profit organization called Ashoka Innovators for the public, appreciating his efforts to promote rainwater harvesting in Chennai city. He was also selected for the Harmony Silver Award 2010, by The Harmony for Silvers Foundation, a non-government organisation founded in 2004 by Tina Anil Ambani. The Government of NCT of Delhi engaged his services as an invitee to offer service and advice on Rainwater Harvesting.

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