



## Traditional Wisdom of Rainwater Harvesting With The Use of Modern Technology: A Case Study of Delhi

Vineeta Bhatt

House No. 40, Sector 56, Jawahar Apartments, Near HUDA Market, Gurugram, Haryana – 122002, INDIA.

ABSTRACT

In July 2015 Delhi received 147.8 mm rainfall and the roads were flooded and commuters were left to wade in knee-deep water in most parts of the city. The aim of the paper is to find the reasons behind why rainwater harvesting is still not widely accepted in Delhi. The paper can be grounded into following categories: What are the best possible strategies which a government can use to attract people to adopt and implement the idea of rainwater harvesting in their community? How can Delhi revive its traditional wisdom with the use of modern technology? Accordingly, the key research questions of the paper are: Can such systems be revived today? Is viable management alternatives and community participation is possible in Delhi? This paper attempts to spread message to the people about depletion level of ground in Delhi and to motivate people to accept their responsibilities towards society as a whole.

KEYWORDS

Rainwater Harvesting, Waterlogging, National Green Tribunal, Water Tanks.

### Background

It is difficult to predict the nature of Delhi's rainfall. People face both kinds of problems in Delhi: first delayed monsoon which leads to further problems such as water scarcity and secondly, waterlogging which happens due to heavy monsoon. But is there is any common remedy for these problems? Indeed, it is rainwater harvesting. In has been seen that during water scarcity crisis there is an increased demand for the power to access and use of groundwater. Monsoons brings rains and rains ought to bring joy but always comes along with problems such as traffic jams and waterlogging which ultimately brings water-borne diseases. Hence, it is correct to say that heavy rain and its subsequent pain follow closely. Major areas in Delhi where repeated water logging noticed due to rain are: Wazirabad road to Loni road, under Defence colony flyover, under Laxmi Nagar metro station on Vikas Marg, Vikas Marg chungu under pass, ISBT Kashmere Gate, Minto Road, AIIMS flyover, Lajpat Nagar, Jangpura, Bhogal and Gautam Nagar. Water-logging was also reported from areas such as Jawaharlal Nehru Marg, Ambedkar Stadium, Tilak Bridge, Mathura Road to Bhagwan Das Road, IP flyover, Minto Road to Minto Bridge, MCD Community Center Kashmere Gate, Azad Market, Subzi Mandi Chowk Kamla Nagar, Kashmere Gate Metro Station to I.P. College, ISBT to Ritz Cinema, Karol Bagh and East Park Road, Dhaula Kuan, Ashram, Nehru Place, Panchsheel, Mahipalpur near the Indira Gandhi International airport and at ITO junction, Rana Pratap Bagh, Paharganj, Rohini, Pitampura, Mayur Vihar, Geeta Colony, Raja Garden flyover, Ber Sarai Market, IIT Flyover, Mahipal Pur Chowk upto Masood Pur, Mahipal Pur-Mehrauli Road, Ashram Chowk and upto Moolchand, Shahdara Railway Bridge, Rampura-Zakhi- ra to Punjabi Bagh , Ranjit Singh Flyover , Rithala Metro Station , Round About Kamla Market , Round About Pusa Road , Roundabout Idgah , Roundabout Panchkuian Road near Shamsan Ghat, Saket Court , Saket Metro Station, Lado Sarai , Sanjay Gandhi Transport Nagar parking, Sanjay T-Point etc.

### The National Green Tribunal: Significant Steps

The National Green Tribunal (NGT) is established in India for the effective and speedy disposal of cases related to the protection of Environment. The NGT has taken a significant step and passed an order on 20th August 2015 and directed the Delhi government, all public authorities and the Government of India to ensure that rainwater harvesting systems are installed in every project without default. It was also mentioned that no government project including flyovers and bridges will be approved until it's stipulated in their tender documents that a rainwater harvesting system will also be developed on it. It

was also stated in the order that each department as well as the corporation would notify an officer who shall be responsible for ensuring that the already installed rainwater harvesting systems and/or that are installed in future, work efficient and are maintained properly. Emphasis was also made to submit a quarterly report to a committee which will be responsible and perform all supervisory functions and will be constituted by the chief secretary and the ministry of environment and forest and climate change. [1]. On 27th March 2016, the NGT has directed Central Ground Water Authority and Delhi Jal Board to fix a uniform procedure for installation of rainwater harvesting systems in hotels, hospitals and malls in Delhi. [2]. Table 1 shows that in 2015, the NGT has imposed fine on several hospitals and malls and hotels for not installing rainwater harvesting systems within their premises.

Recently on 5th June, a bench headed by NGT Chairperson Justice Swatanter Kumar also issued notices to Ministry of Environment and Forests, Ministry of Urban Development, Delhi government, Central Ground Water Authority (CGWA), Delhi Development Authority, Delhi Jal Board (DJB) to clean, maintain and restore all the bodies, natural wells and other water bodies which are in existence in NCT of Delhi and also directed them to make sure that for the coming rainy seasons these water bodies can receive rainwater in good quantity.[3]

**Table 1: The NGT Has Imposed Fines on Major Hospitals, Malls and Five-Star Hotels [4]**

	Hotels	Fine	Hospitals	Fine	Malls	Fine
1	Jaypee Sid-dharth	7.5 Lakhs	B M Gupta Hospital Private Limited	5 Lakhs	Laxmi Build-tech Private Limited	5 Lakhs
2	The Piccadily	7.5 Lakhs	Indraprastha Medical Corporation Limited (Apollo Hospital) Santom Hospital	5 Lakhs	Life-style Builders Private Limited	5 Lakhs

3	Tirupati Infraprojects Private Limited (Indus Hotels and Spa)	5 Lakhs	Jaipur Golden Hospital	5 Lakhs	Upaj Build-con Private Limited	3 Lakhs
4	Aman Hospitality (Kempinski Ambience) and Hotel Ibis	NGT issues bailable warrants for its non-appearance despite notices being served to it.	Holy Family Hospital	3 Lakhs	-	-

**Issues and Problems of the City People**

Delhi High Court set up a bench for mandatory installation of rainwater harvesting systems. On 30th May 2016, a bench of Justice Manmohan upheld Rule 50 of Delhi Water and sewer (Tariff and Meeting) Regulations of 2012, which makes rainwater harvesting systems compulsory in residential or commercial premises on plots of 500 square metre or more. It was also declared that buildings on plots of such sizes will attract 1.5 times higher water bills, if found not installing a rainwater harvesting systems within their premises. The rule received lot of agitation from public and people started filing petitions to Delhi Jal Board (DJB). On it court clearly mentioned its argument that a city cannot live without rainwater harvesting.

A petitioner from South Delhi’s Anand Lok area had filed a petition against DJB’s water bills. According to the petitioner the water bills that came to the family with “rain harvesting penalty” added is absolutely unjust. Petitioner filed in his statement that the house built in 1988 and government should consider the case sympathetically and should not impose retrospective charges on citizens. Other issues were also been addressed by the people in their petitions such as “no space” to add a rainwater harvesting systems, as the plot had been made into “builder flats” and “retrofitting” of the building which requires “renovation of the roof” etc. [5]. Delhi High Court encouraged people to adopt “modern technology” to install rainwater harvesting systems within their premises.

Rather than shifting responsibilities from one authority to another it is better to prepare a plan for common good and for all. Community-led participation can be a viable management alternative. It is found water crisis problems in Kusumpur Pahari, next to Vasant Vihar and near to R. K Puram’s Ravi Dass Camp. Senior citizens found fetching 80 litre water in bicycles after covering 04-05 kilometre from Kusumpur Pahari to R. K. Puram . Community people had put forward their concern to respective MLA, Mr. Naresh Yadav but their efforts were gone in vain because nothing came out. According to them DJB is not helping them out and shifting responsibilities to Delhi Development Authority (DDA). People blamed MLA for increasing tanker mafia in the area. Girls’s school dropout and low attendance have also seen increasing in Kusumpur Pahari area because of water collection. Paid Tanker comes once in a week and local people call that day as water day. Women wait for several hours in the scorching heat, heavy rains etc. but in vain. After standing for long hours they still don’t get enough water. Even the children cannot be spared. They cannot afford to go to school especially on water day. Water collection along with their mothers has become their main job.

**What Delhi Government is doing?**

In an exclusive interview with IANS, Delhi Water Minister and Chairman of DJB Kapil Mishra stated very clearly that the city government is going to make water harvesting mandatory from July. He stated that Aam Aadmi Party (AAP) plans to reduce any water crisis affecting the city in the future. He further announced that his government has plans to provide modern technology in each colony, slum areas which did not have the facility earlier. [6]. He mentioned modern technology is available to install rainwater harvesting systems like piped water supply and made commitment that his government will provide piped water supply network to slums, colonies and Jhuggi-Jhopdi (JJ) Clusters by December 2017. He specified that the work has already been started and within a one year the city government is able to laid water pipelines in 217 colonies and soon going to lay pipelines in 238 colonies including Bijwasan, Badarpur and Rajokri by the end of 2016.

**Challenges in the Way of Installation of Rainwater Harvesting Systems in Houses**

It has been found that only few Resident Welfare Associations (RWA) in South Delhi have made good use of the modern technology of rainwater harvesting systems within their premises. This shows their sense of responsibility towards society as a whole. Does it not indicate still most citizens are unaware of the reality of depleting surface water resource? Main challenge is to spread the awareness regarding significance of installing rainwater harvesting techniques in rural areas, planned colonies, unauthorized regularized colonies, resettlement colonies, urban villages, JJ clusters etc. Incentive-giving approach can work better in such cases where people are not willing to adopt the process due to lack of awareness, absence of funds etc. Government of Delhi should launch some policies/schemes/programs/actions for making Delhi a city of happy people. For instance, a rebate can be given ranges from 10-15 percent on water bills or electricity, rebate in their children school fees, free family health check-ups etc. Best rainwater harvester individual award, best rainwater harvesting community award and best rainwater harvesting institution award can be given to the individuals, group of people, institutions and community as a whole. People should be encouraged to get their rainwater harvesting system tested regularly and maintain the system properly. Timely workshops can be arranged for the people to make them ensure that rainwater cannot enter pipes containing safe drinking water.

**Rainwater Harvesting Techniques in Some Countries of Asia**

In China people uses technology which stores rainwater and stormwater runoff in ponds of various sizes. A thin layer of red clay is generally laid on the bottom of the ponds to minimize seepage losses. Trees, planted at the edges of the ponds, help to minimize evaporative losses from the ponds. [7] The average annual rainfall in Gansu Province of Central China is about 300 mm. A task force of the Gansu Research Institute launched and developed the rainwater harvesting projects for water conservancy supported by provisional government to provide essential rural infrastructure to poorer areas of Gansu Province. Families were encouraged to maintain rainwater harvesting system in their houses and provided with one clay tiled roof catchments area with two upgraded cement water cellars, known as shuijiao in Chinese along with plastic sheets for concentrating rainwater runoff on one field. Traditional clay lined shuijiao (water cellars) were upgraded by lining them with cement or concrete and small metal pumps were attached to them. A trench dug around this was used to collect any rainwater for watering the vegetables being produced. People find this system affordable and easy-to-use. Trend analysis shows that families really benefitted from the system not only in terms of sufficient water but also with good crop. People adopted the idea very seriously and more than 2,000,000 lakhs rainwater tanks had been built since 2000. [8] In the Capiz Province of Philippines people store rainwater in high capacity wire framed ferrocement tanks varied from 2 to 10 m3. The construction of the tanks involved building a frame of steel reinforcing bars (rebar) and wire mesh on a sturdy re-

inforced concrete foundation. The tanks were then plastered both inside and outside simultaneously, which reduced their susceptibility to corrosion when compared with metal storage tanks. [9]

In Japan, the people often use the roof of their homes to collect water, transporting it downward with copper and ceramic chains and finally diverting the rain water into underground water tanks and sometimes large barrels for household water storage. Rain chains (kusari doi) are a stylish way to beautify rainwater harvesting system. Contour trenching technique in Vietnam proved successful not only in favoring plant growth but also increased agricultural productivity. The knock-on effects on shallow groundwater levels are thereby made sustainable since the primary concern for people is an economic one.

### Some Valuable Suggestions

The rainwater harvesting system should be implemented as part of the income generating activities in Delhi.

Money is a motivational factor and government can provide short term loans with easy repayment charges to the poor people to fund the initial capital cost of installation of the tanks and related tasks.

Award, Reward, Relaxation, Rebate are key words. Government should implement some incentive giving policy which makes people to maintain rainwater harvesting tanks.

Best rainwater harvester award to an individual, group of people, community as a whole, colonies, specific institution etc. can be given, 10-15 percent relaxation can be provided in water and electricity bills, rebate can be given to people for free health check-up, school fees etc.

Rain Chains systems can be used in temples like Akshadham, Chattarpur, Kalkaji, Birla Mandir at Gole market, Jandewalaan, Marghat Wale Baba Hanuman Mandir at Yamuna Bazar, Iskon Temple at Kalkaji etc and in churches like Kasmiri gate church near Madarsa Road, Jama Masjid Gate No. 1 etc.

People should be encouraged to clean up their rainwater harvesting systems twice in a year i.e. Pre-Monsoon and Post-Monsoon.

Develop groundwater recharge structure.

Under-construction Delhi metro rail stations like Delhi Gate, Red Fort, Kashmiri Gate, Daryaganj, Jama Masjid should maintain rainwater harvesting systems within their premises to avoid traffic and waterlogging problems.

Similarly under-construction flyover like Wazirabad to Mukarba Chowk bypass, GPO underpass Kashmiri Gate and roads like Shastri Park to Kajuri Pusta and Wazirabad to Kajuri flyover road are notified areas where installation of rainwater harvesting systems are required.

Children should be trained for water management and proper water utilization. Schools should introduce water related folk songs so that children can connect themselves to water.

Innovative ideas for rainwater harvesting can be introduced in schools like making a tank using mix of cement, earth and old plastic bottles filled with sand as "bricks".

Independent house owners, restaurants, parks can think of bamboo drip harvesting system.

DDA, DJB, NDMC can come up with timely workshops for the people related with construction, installation, excavation, plastering, maintenance of rainwater harvesting systems. Gender issues, community management issues can be discussed with experts.

Contour Trench helps to reduce heavy rain hazards.

### Traditional Wisdom of Rainwater Harvesting With the Use of Modern Technology

Today, restoration of the traditional methods of water conservation like Baolis, Community-Kundis, Stepwells, Johads, Ponds, Virdas, Lothals, Dighis, and Water Tanks is needed. These conventional methods can complete the local needs and also maintain ground water level.

Below are the notified areas where the traditional methods can be maintained with the use of modern technology:

Johad (artificial pond to hold water): Wazirabad Village, Badli, Burari Park.

Kundis ( a circular underground well) : Rithala, Bahadurgarh, Mundka, Near Nagajgarh Drain, Ramlila Maidan, Okhla Industrial Ara, Tughlakabad Railway Colony, Jasola

Stepwells: Sector 3 Dwarka, Jharora Kalan, area near to Najafgarh to Bahadurgarh Road.

Virdas (shallow wells dug in low depressions called jheels): Rajpur Kurd Village near Chattarpur, Near Madarsa Road Kashmiri Gate.

Dighis (square or circular reservoir fed by canals): Burari Village, Narela-Wazirpur-Saoli, Bawana Industrial Area, Uttamnagar Najafgarh Road, Alawardi, Ramlila Maidan.

Water Tanks: Rukmani Devi Jaipuria Public School-Rajpur Road-Civil Lines, Saint Xavier's School- Raj Niwas Marg-Civil Lines, Park Agoli Raj Ghat, St. Columba's School- Ashok Place-Near Gole Dakhana-Gole Market, Colleges of Delhi University, Kasturba Hospital near Jama Masjid, Teerath Ram Hospital in Rajpur Road, Cross River Mall in Karkarduma and Fun Cinema Motinagar etc.

### Since last 10 years the findings revealed few important points:

People living in government residential houses like Jawaharlal Nehru University Old Campus, Saraswati Puram, NCERT, IIT, R.K. Puram etc. should be encouraged to construct concrete base pits in the verandas of their houses.

The capacity of pits can vary from 10,000-12,000 litre and can be 10-12 feet deep and 5-6 feet wide.

Pits can be connected with the drains that divert the water from the rooftop into them.

Add hay from time to time and keep it covered with net.

This helps in proper filtration of water before it goes into the tank.

Water tanks should be cleaned twice a year: Pre-Monsoon and Post-Monsoon. Estimated cost around Rs. 5,000-6,000 annually.

Efforts should be taken by RWA to channel the water into a dry wells located in their nearby places. Initial cost of construction of drains covers around Rs. 3-4 lakhs.

Farmhouse owners can maintain well-designed and bigger size tanks because of large space like Sainik Farms, Chattarpur Farms etc.

DDA Flats owners can opt for rooftop water tanks rainwater harvesting system such as Munirka, Vasant Kunj, Rohini, Janakpuri and Siddhartha Extension near Ashram etc. Restaurants can also adopt this method like Kake Di Hatti in Chandni Chowk.

### Conclusion

Delhi's main sources of water are from Haryana (Munak Canal, Bhakra storage facility and Yamuna). The rest of the supply is

from Uttar Pradesh (Upper Ganga Canal). Munak Canal had damaged during the recent Jat agitation for job reservations in Haryana which caused a 200 feet breach on the canal near Sonapat. Due to this Delhi had suffered acute water crisis and all schools in the national capital were shut on 22nd February 2016. Since 10th March Delhi is facing unmanageable water crisis. These impacts can be reduced, if residents of Delhi will take serious plea to "save rainwater" and adopt rainwater harvesting.

Moreover, within a week, Haryana's Irrigation Minister Om Prakash Dhankar also refused to supply water to Delhi on 16th March. According to him, Delhi's Chief Minister Arvind Kejriwal's stand regarding opposing the construction of Sutlej Yamuna Link (SYL) canal in Punjab is against the interests of the farmers and people of Haryana. Delhi needs to reduce its dependence on Haryana when it comes to raw water supply.

More reservoirs should be made along with floodplains so that they can be used to store the heavy flows in the Yamuna in the monsoon season.

There is land for reservoirs at Palla and both upstream and downstream of Wazirabad. More reservoirs should be made along with floodplains so that they can be used to store the heavy flows in the Yamuna in the monsoon season.

We have traditional wisdoms with us set up by our ancestors to fulfill our water requirements. Every state could take care of its own water supply. Individual level-community level-state government level participation is the need of the day. Better water management will also help in resolution of inter-state water conflicts.

## References

1. The Times of India, (August 20, 2015), "All flyovers, bridges must install rainwater harvesting systems: NGT", TNN, Delhi.
2. See URL: <http://timesofindia.indiatimes.com/city/delhi/All-flyovers-bridges-must-install-rainwater-harvesting-systems-NGT/articleshow/48561111.cms>
3. The Economic Times (27th March 2016), "Fix norms on rainwater harvesting in hotels, malls: NGT to CGWA", PTI, New Delhi. See URL: [http://articles.economictimes.indiatimes.com/2016-03-27/news/71849993\\_1\\_rainwater-harvesting-system-central-ground-water-authority-vikrant-kumar-tongad](http://articles.economictimes.indiatimes.com/2016-03-27/news/71849993_1_rainwater-harvesting-system-central-ground-water-authority-vikrant-kumar-tongad)
4. The Indian Express, (5th May 2016), "NGT directs Delhi government to clean all natural water bodies within three weeks", PTI, New Delhi.
5. See URL: <http://indianexpress.com/article/india/india-news-india/ngt-directs-delhi-govt-to-clean-all-natural-water-bodies-2835426/>
6. The Indian Express, (12th May 2015), "NGT imposes hefty fines on hospitals, malls without rainwater harvesting systems", Express News Service, New Delhi. See URL: <http://indianexpress.com/article/cities/delhi/ngt-imposes-hefty-fines-on-hospitals-malls-without-rainwater-harvesting-systems/>
7. Mathur, Aneesha, (31st May 2016), The Indian Express, "Delhi HC upholds rule on rainwater harvesting in buildings on plots 500 square or more", New Delhi. See URL: <http://indianexpress.com/article/cities/delhi/delhi-hc-upholds-rule-on-rainwater-harvesting-in-buildings-on-plots-500-sq-m-or-more-2826522/>
8. The Economic Times (9th April 2016), "No water crisis in Delhi, water harvesting to be made mandatory: Delhi water minister – check", IANS, Delhi. See URL: [http://articles.economictimes.indiatimes.com/2016-04-09/news/72186354\\_1\\_upper-ganga-canal-water-crisis-ground-water-level](http://articles.economictimes.indiatimes.com/2016-04-09/news/72186354_1_upper-ganga-canal-water-crisis-ground-water-level)
9. UNEP [United Nations Environment Programme] 1982. Rain and Storm Water Harvesting in Rural Areas, Tycooly International Publishing Ltd., Dublin.
10. CSE Webnet, "Rainwater Harvesting in Gansu Province, China", International Technology Rural. Retrieved on 8th June 2016. See URL: <http://www.rainwaterharvesting.org/international/china.htm>
11. Gould, J.E. 1992. Rainwater Catchment Systems for Household Water Supply, Environmental Sanitation Reviews, No. 32, ENSIC, Asian Institute of Technology, Bangkok.