

Study of impact on implementation of Rainwater Harvesting Projects in Arsenic prone areas by Swasthya Bhabna Welfare Society

Dr. Pradip Kumar Das,
MBBS, DTM&H, Ph.D, D.Lit, MBA;

Dr. Eshita Das,
MBBS, MD (Paediatrics);

Dr. Suhas Bhattacharyya,
M.Sc, Ph.D, D.Sc

Ms. Mekhola Sen,
M.Sc (Food and Nutrition)

Mr. Drishtanto Nath
(MBA Pursuing, NMIMS Mumbai)

Abstract: The plan and implementation of installing Rainwater Harvesting Plant in arsenic prone areas by Swasthya Bhabna Welfare Society is one of the main aims among all social works like health, child and maternal care, women's empowerment, awareness etc. Three arsenic prone areas, i.e., Haringhata and Gobardanga and Contai have been projected by installing Rainwater Harvesting Plant. Rain water is stored from roof, clear surface, rock catchment and transport to this plant for purification. This plan is to reduce the dependence of people of arsenic prone areas to ground water. Prabhat Kumar College is situated in coastal area and predominance of salty water is seen there. Rainwater Harvesting Plant has also been installed there. This college associated with the non-government and non-profitable social organization Swasthya Bhabna Welfare Society have been rendering social services for awareness programs of education, arsenic detection, child and woman health, women's empowerment and so on. Here the study shows the dedication, tireless effort and achievements where this team aims to continue the effort.

Keywords: Arsenic, Predominant, Rainfall, Non-profitable, Education, Salty water

Introduction:

Swasthya Bhabna Welfare Society is a registered non-governmental, non-profitable civil society organization. It is currently registered under W.B. Societies Registration Act XXVI of 1961; Regd. No.: S/95275 of 1999-2000. Their registered office is at 15/C, Raja K.L. Goswami Street, P.O: Serampore, Dist: Hooghly, Pin : 712 201. Swasthya Bhabna Welfare Society started its journey since the year 1999 & has completed its glorious 24 years towards their destination. As an NGO, they operate in many different fields, but particularly prioritise health, awareness, education, and women's empowerment. They publish a health magazine called *Swasthya Bhabna Masik* where they aim to address health related questions and articles and inform people about new health conditions and their symptoms as well as precautions since, as they say, "Precaution is better than Cure."

The NGO is working extensively in the field of arsenic detection in water with an aim to provide, clear water to the mass. They conduct multiple awareness programs in villages spread across the State of West Bengal. Going beyond detecting arsenic, *Swasthya Bhabna Welfare Society* has gone ahead with installing rainwater harvesting plants in arsenic prone areas.

To begin with, Rainwater harvesting (RWH) is a process that involves collecting, transporting, and storing rainwater from clean surfaces, such as roofs, land surfaces, or rock catchments, for later use. The water is collected from the roof and filtered before being stored for future usage. The rainwater harvesting technique is straightforward, involving the capture and storage of rainwater where it falls. The water can either be stored in tanks for later use or used to recharge groundwater, depending on the specific situation. The rainwater harvesting system provides a source of soft, high-quality water by reducing dependence on wells and other

sources, and is also cost-effective in many contexts. It is also cheaper to construct compared to other sources such as wells, canals, dams, and diversions.

Background:

In terms of its geology and geomorphology, Kolkata is a part of the Ganga-Padma River system's lower deltaic plain. There is clay and clay loam on the surface. Most places have this clay down to a depth of 10 to 25 metres below ground level (bgl): A fine sand bed can be discovered up to a depth of 30 to 35 metres below this clay deposit. Up to 60 to 100 metres below this level, there is another clay layer that is dark brown to greyish brown in colour. From this depth, a second sand zone with fine, medium, and coarse sand begins and goes down 120 to 180 metres below ground level. A gravel bed is located beneath this sand zone. The base of the sand and gravel zone is where you can find tertiary black and sticky clay.

Owing to its unique geological setting, Kolkata's rainfall does not drain downwards to recharge the groundwater regime. Rainwater is completely wasted and hence it poses a significant threat like water-logging and sewage overload. To fight against all such issues with water supply and demand, and issues caused by excessive groundwater depletion, scientists advise the use of rainwater in metropolitan areas.

Swasthya Bhabna Welfare Society has actively taken measures in this aspect by supporting rural arsenic-prone areas to install rainwater harvesting plants. The organisation also aims at contributing towards other locations in a similar fashion. This research would provide them with information about the current projects which can be utilised for the future ventures.

Objectives:

The main objectives of this research are as follows-

- i. To understand the impact of the projects which have been set up in different geographies
- ii. To identify the potential problems faced by the authorities to maintain the RWH plants
- iii. To find out the roadmap for the organisations which have collaborated with Swasthya Bhabna Welfare Society for RWH
- iv. To effectively guide Swasthya Bhabna Welfare Society for their future plans in the domain of rainwater harvesting

Findings:

Swasthya Bhabna Welfare Society has initiated 3 rainwater harvesting projects in different parts of West Bengal, namely, Contai, Haringhata & Gobardanga. All these places are very widely spread apart to ensure that there's equal distribution of access to healthy water. When those areas are visited for study works to find out the condition of the projects now, there were multiple discoveries. Despite being far-off from each other, **the objectives** of all the projects were quite similar –

- To reduce reliance on ground water and address the region's lack of surface water capacity to fulfill demand.
- To increase groundwater accessibility and use rainfall for sustainable development
- To increase rainwater infiltration into the subsoil.
- To enhance the quality of ground water by dilution
- To improve the area's ecology by increasing the amount of vegetation
- To make the area more environmentally friendly overall.

Location 1 – Contai:

Prabhat Kumar College, Contai is one of the places for the RWH projects. It's located 1600 km away from Kolkata and about 31 km from Digha. It receives heavy rainfall in the monsoon season. The winter isn't severe here and summers are also average and comparatively cooler than North-India.

Purba Medinipur district is a part of the lower Indo-Gangetic Plain and the Eastern Coastal Plains. The district can be topographically broken down into two distinct regions: (a) nearly flat plains on the west, east, and north; and (b) coastal plains on the south. Younger and coastal alluvial make up the huge area of land, which is made of alluvium. The district is approximately 10 metres above mean sea level. The district's southern and south-eastern borders are bordered by a 65.5 km long shoreline. Cyclones and tornadoes can occasionally strike five coastal CD Blocks, namely Khejuri II, Contai II (Deshapran), Contai I, and Ramnagar I and II. A significant source of irrigation water is river water. 0.02% of the district's land area, or 899 hectares, is covered in forests.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average rainfall mm (inches)	11.7 0.46	25.5 1	39.3 1.55	47.7 1.88	124.9 4.92	275.4 10.84	305.6 12.03	314.7 12.39	319.1 12.56	150.3 5.92	42.3 1.67	3.9 0.15	1,660.40 65.37
Average rainy days	1	1.6	2.1	3.2	5.9	10.9	14.7	15.2	12.3	5.1	1.4	0.5	73.8

Rainfall in Contai

Rainwater harvesting is an important practice in Contai and its adoption can go a long way in conserving water and promoting sustainable water management practices in the city. The local government has come up with several schemes for this purpose. NGOs have also been showing up at this time of need to start rainwater harvesting in schools, colleges and houses. Swasthya Bhabna Welfare Society is one of them.



Prabhat Kumar College had a long-term relationship with Swasthya Bhabna Welfare Society as they had done multiple programs together with respect to arsenic detection, child health, educational awareness, etc. On the basis of this relationship, this said project for rainwater harvesting went ahead.

Since the college is situated in a coastal area, salty water is predominant in the region. Although the ground water level is not very deep, the quality of that water comes as an obstruction for consumption. This motivates the institution to turn towards surface water via Rainwater Harvesting.

In 2020, a rainwater harvesting project was implemented in Prabhat Kumar College. It was done following the technique of rooftop harvesting. So, the rooftop of one of the buildings of the college is used as the catchment and rainwater is collected there. It is then transported through pipes to a tank. The collected rainwater is then filtered and processed before it is made available for final consumption.

The rainwater collected is usually sufficient for 8-9 months of water consumption in the campus. Given the fact that Prabhat Kumar College has a roll strength of about 7000 students, it is safe to say that the project has been doing a wonderful job. Upon interviewing the principal of the college, Dr. Amit Kumar De, and other professors, the impression is that the teachers, staffs and students consume water derived from this project with no hesitation. Furthermore, there has not been any cases of medical illness due to this water reported till date.

Some of the challenges faced by the institution while they wanted to start RWH were financial and technological support. Swasthya Bhabna Welfare Society came to the rescue providing as much aid as possible in terms of development of the entire plan. They had allocated funds for installation as well as for maintenance and repairs of the plant in the future, if necessary.

With this project, awareness has been spread among the households, educational institutions and workplaces about the importance of water conservation to a great extent. Nearby schools and colleges have also started RWH to meet their water demands. All the stakeholders of Prabhat Kumar College take pride in spreading the word which is in line with Swasthya Bhabna Welfare Society’s vision for this project.

In the future, the goal is to be able to maintain the RWH plant in a sustainable manner. The college and the NGO might also be working hand-in-hand to spread further awareness in the region. Adding on, there’s also a scope for utilizing the entire rooftop of the college. There’s a huge financial constraint on this, but it can cater to water needs of the campus for more than 5 years with only 1 year of rainfall. This is an opportunity to be considered later on only if the current project runs smooth enough and funds are available to the institution and our organisation.

Location 2 – Gobardanga:

Gobardanga is a town located in the North 24 Parganas district of West Bengal, India. The town is situated about 50 kilometres from Kolkata, the capital of West Bengal. It is an important commercial center and a hub for transportation and communication in the region. The town also has a thriving retail sector, with several markets and shopping centers that cater to the needs of local residents and visitors.

Gobardanga receives an average annual rainfall of about 1,500 millimetres. The town experiences monsoonal rainfall from June to September, with the heaviest precipitation occurring in the months of July and August. Despite the abundance of rainfall, the town often faces water scarcity issues, especially during the dry months. Rainwater harvesting is a practice that can help address the water scarcity issue in Gobardanga.

In Gobardanga, Swasthya Bhabna Welfare Society collaborated with Madhusudankati Samabay Krishi Unnayan Samiti to inaugurate a rainwater harvesting project. The latter is an organisation aimed at benefitting the farmers of the village. The farmers form a considerable chunk of the population in the region as the economy of Gobardanga is primarily driven by agriculture and small-scale industries. The town is known for its production of jute and other cash crops.

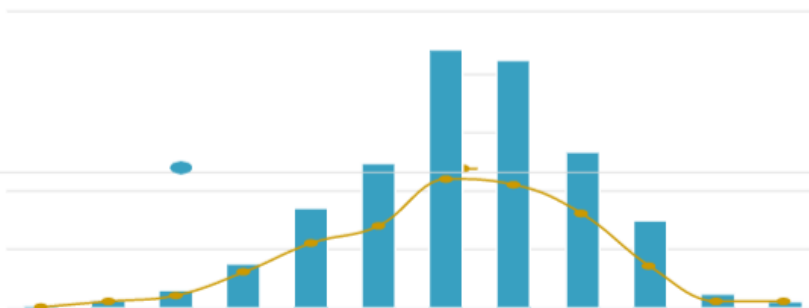


Rainwater is collected at two different percolation ponds from which the water is transported with a pipe. Using a simple sand filter, the water is filtered with the help of coarse sand, gravels and boulders. Then, using a motor, the purified water is relocated to a tank. Finally, the water out of a tap connected to the tank is available for healthy consumption.

With the RWH system, Madhusudankati Samabay Krishi Unnayan Samiti manages to provide water to a lot of people. The organisation takes a minimal charge from the consumers so that maintenance of the plant can be done. The chairman of this project claimed that they provide this service to more than 400 families in the village, on a regular basis.

Location 3 – Haringhata:

Haringhata is a small town located in the Nadia district of West Bengal, India. The town is situated around 60 km from Kolkata and is known for its agricultural produce and livestock farming. The region receives moderate to heavy rainfall during the monsoon season, making it an ideal place for rainwater harvesting.



In Haringhata, rainwater harvesting is becoming increasingly popular, as people are recognizing the importance of water conservation and the benefits of using rainwater for various purposes. The primary source of drinking water is groundwater, which is often contaminated with arsenic. High levels of arsenic in the water

can cause several health problems, such as skin lesions, cancer, and neurological disorders.

Several organizations in Haringhata, including the Haringhata Municipality, have taken several initiatives to promote rainwater harvesting. They have encouraged people to install rainwater harvesting systems in their homes, schools, colleges and workplaces.

In December 2020, Swasthya Bhabna Welfare Society had inaugurated a rainwater harvesting plant in Laupala Kalpataru High School, Haringhata. The project aimed at providing clean drinking water to its stakeholders, primarily the students, teachers and non-teaching staff.



The rainwater is collected at the rooftop of one of the buildings of the school. The water is then transported through pipes to a tank using a motor. Then, the water is filtered and supplied to the consumers via a tap.

By interviewing the officials at the school and several parents, there's a clear impact of the project on their lives. Earlier, students could only have access to clean water as long as the water they brought from their home lasts. But, after the implementation of this project, students are able to refill as many times as they require to quench their thirst.

One of the challenges faced while implementing this project was the Lockdown, owing to the pandemic. The restrictions from the Central Government were making it difficult to execute the plan. Teacher-in-charge of the school, Mr. Rajib Chakraborty, always went the extra mile in every step which Swasthya Bhabna Welfare Society took. Another challenge with respect to maintaining the RWH plant is the wandering of animals, primarily monkeys. They possess a threat in contaminating the stored water in the rooftop with germs and viruses. However, Swasthya Bhabna Welfare Society and Laupala Kalpataru High School are considering taking care of this threat in the near future.

Recommendations:

Rooftop catchment tanks need routine management and repair, just like all other water supply systems, to guarantee a consistent and high-quality water supply. The roof catchment system will stop supplying dependable, high-quality water if its various parts are not cleaned on a regular basis, water usage is improperly managed, issues are not found, or essential repairs are not made. The maintenance and management needs listed below can serve as a foundation for monitoring and checking:

The entire system (roof catchment, gutters, pipes, filters, first flush, and overflow) should be checked before and after each rain throughout the rainy season, and it should ideally be cleaned after every dry spell longer than a month.

At the conclusion of the dry season and soon before the first rainstorm is predicted, the storage tank should be cleaned and cleansed of all silt and debris (the tank should be refilled afterwards with a few centimetres of clean water to prevent cracking). Be careful to do prompt maintenance on all tank fixtures, such as replacing any worn screens and maintaining the outlet tap or hand pump, before the first rains are expected.

In metropolitan locations where natural recharge has been significantly reduced, runoff water collected

from roof tops might artificially replenish and supplement the declining ground water resources. Areas with a water table depth of more than 8 metres below ground level and porous strata underneath are suitable for artificial recharge.

Swasthya Bhabna Welfare Society should also be connecting with the project heads of different locations at regular intervals. This would enable the team to gauge the amount of maintenance required for the immediate future. With this, they can save up on high-cost repairs which are usually required when minor problems go unnoticed.

All in all, the success of the current projects portrays the amount of expertise with which they have executed their plan. This should definitely boost their confidence and will to reach out to the vast amount of people in rural India, who are still not able to drink a glass of clean water.

References:

- [1]. <https://www.worldweatheronline.com/haringhata-weather-averages/west-bengal/in.aspx>
- [2]. https://en.wikipedia.org/wiki/Purba_Medinipur_district#Geography
- [3]. <https://en.wikipedia.org/wiki/Contai>
- [4]. <https://en.wikipedia.org/wiki/Haringhata>
- [5]. <http://swasthyabhabna.org/>