

**STUDY OF RAIN WATER HARVESTING STRUCTURE  
(TANKAS) IN BHARUCH TOWN, GUJARAT, INDIA**

*Submitted to*

**Dr. Shernaz Cama  
M. Phil, PhD  
Consultant  
C-53, Anand Niketan  
New Delhi – 110 021**

*by*



**Development Alternatives  
B-32, TARA Crescent  
Qutab Institutional Area  
New Delhi – 110 016**

## A REPORT ON FEASIBILITY STUDY OF RAIN WATER HARVESTING STRUCTURE (TANKAS) IN BHARUCH TOWN, GUJARAT, INDIA.

### Background :

A Delhi based NGO has been working on "Preservation and Promotion of the Parsi-Zoroastrian Culture and Heritage" supported by UNESCO. The project mainly reflects on The Living Heritage, Religion and the Priesthood of Zoroastrian community, Parsi-Zoroastrians in Public Life and their contribution to different sectors, surveying and recording of Oral traditions like customs and ceremonies, legends, myths and stories, classification and protection of tangible Heritage sites in India, Iran and China, preservation and collation of Archival material on the Parsi-Zoroastrians, etc. The Parsi community in India had migrated from Iran in 936 AD. They settled in different parts of India and their contribution in the fields of trade, industry and commercial enterprise is noteworthy.

While documenting the Heritage and dying wisdom of Zoroastrian community, the NGO came across traditional water harvesting structures called Tankas which the community has been using for over two centuries in Bharuch district of Gujarat.

**Purpose of visit :** To study the socio-technical feasibility of the Roof Top Rain Water Harvesting (Tanka) structures in Bharuch town, Gujarat, India.

### Methodology for the study :

- Physical validation of the existing Tankas
- Interaction with different stake holders
- Collection of water samples for quality check

### Evolution of the Tanka system:

Rain Water Harvesting is an age-old practice and involves the collection of runoff rain water for productive use. The technology of water harvesting for better utilisation is being practiced from time immemorial. The technique of rooftop harvesting involves collecting rain water that falls on sloping house roofs through a pipe into an underground tank built in the courtyard.

Due to the population pressure, recurring droughts, there is a great demand for drinking water everywhere. Besides, there are other reasons for scarcity of drinking water, it includes the in situ geological and other geomorphological set up of the region. During good olden days, people used to fetch drinking water through traditional water harvesting structures like dug wells, Jhods, Tankas, etc at community as well as household level.

Descending from the ancient hydraulic civilization, one could observe the Wisdom of Traditional Rainwater Harvesting System called Tankas adopted by the Parsi Community for domestic use in some parts of Gujarat especially in Bharuch.

The Parsi community of South Gujarat have been using traditional rain water harvesting structures called Tankas for over two hundred years which are prominently visible in Parsi community settlements in Bharuch.

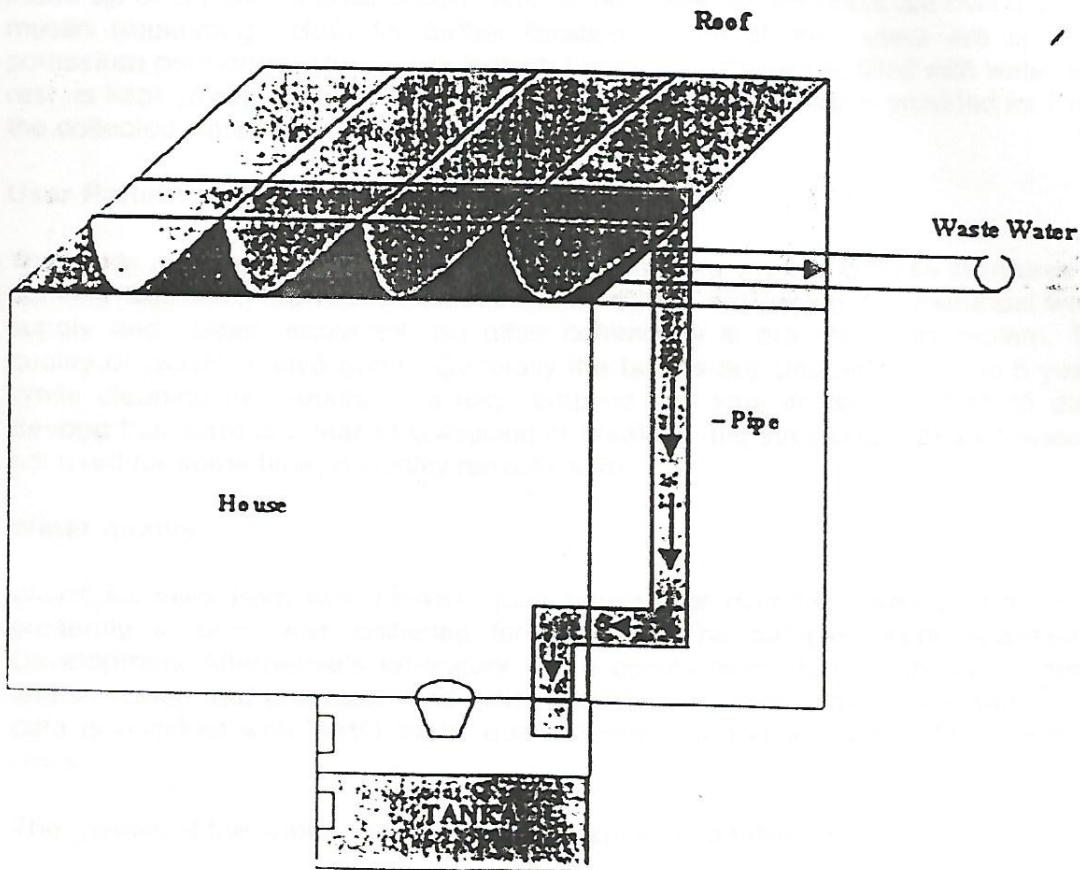


The study focused on analysing the design of the tankas components, water quality issues, user pattern and advantages and disadvantages of the Tanka system.

**Salient features of the Tanka Water Harvesting Structures:**

Tankas are traditional water storage structures for collecting rain water from roof tops through a piping system to a storage tank constructed below the foundation of the house. The tankas are structural and engineering marvels developed almost two centuries ago that were carefully developed, maintained and sustained over the ages.

**Sketch of a Tanka : ( Not to Scale)**



### Construction details and Collection of water :

The reliability of the Tanka system is a combination of catchment area, frequency and intensity of rainfall, storage capacity and domestic consumption. While designing/ constructing the Tanka, catchment area (size of the roof), total rainfall in that area/intensity of rain fall; and the size and shape of the structure or the storage capacity, domestic consumption and income have been considered. The shape of the Tanka looks like a rectangular closed dug well and these underground storage structures are made with lime, sand and talc (local name - Khadi). The water is mainly used for drinking and other domestic purposes.

During monsoon season, the rainwater collected from the rooftop is allowed to drain out two to three times to make the water free of residue and other impurities. Before allowing the water into the Tanka, the users taste the water as well as test the water with a glass to check the water quality and purity. The roof water is collected through a piping system with intermittent filtration processes. The filtration is at intake pipe as well as at the vent of the Tanka. The filter used at the Tanka is made up of copper, of bowl shape with small holes. All the filters are overlaid by a muslin (mukhmul) cloth for further filtration. Some of the users are applying potassium permanganate as disinfectant. One third of tanka is filled with water and rest is kept empty. The Tanka is fully covered, and a small hole is provided for lifting the collected water through a bucket.

### User Pattern and Durability

The study revealed that some of the Parsi community are using these structures for drinking and other domestic purposes while others are relying on municipal water supply and other resources. No other community is practicing this system. The quality of water is also good. Generally the tankas are cleaned after 4 to 5 years. While cleaning the tankas, it is fully emptied and kept empty for 10 to 15 days. Beyond that there is a fear of collapsing or breaking the structure. Although water is not used for some time, its quality remains same.

### Water quality

Water samples from two Tankas (one unused for over two years and the other presently in use) was collected for analysis. The samples were analysed in Development Alternative's laboratory for a comparative study of the water quality and indicated that chemical and biological quality of both samples are similar. The data is checked with WHO Water quality standards and are within the permissible limits

The details of the water analysis are summarised in a table below:

Parameter	Unused Tanka	Used Tanka	WHO Standards
pH	7.0	7.5	6 - 8
Conductivity Micromhos/cm	138	129	
Hardness (ppm)	120	100	75 - 150
Chloride (ppm)	53	18	250
Fluoride (ppm)	0.6	0.6	0.6 - 1.5
Nitrate (ppm)	10	0	40 - 80

### Advantages of Tanka water harvesting structures:

- ◊ Water is available for the household throughout the year and is particularly significant during times of water scarcity and drought. It also helps in saving time and energy in fetching water.
- ◊ Simple technology and is easy to maintain
- ◊ System is independent and can be managed at household level.
- ◊ Local material and skills can be used for construction of the structure.
- ◊ Water collected can be kept in good quality and is safe with simple precautions.
- ◊ Good quality water for consumption.

### Disadvantages :

- ⇒ The user has to learn rationing the usage of water during dry season.
- ⇒ Inadequate management and maintenance can lead to contamination.
- ⇒ Rusting of tin sheets when not maintained properly.

### Observations :

- The Tankas are used only by Parsi community especially in Gujarat state
- The structures are more than two centuries old
- The Tankas are constructed on river terraces, hence the stability of the structures seems to be strong. But there may be other geological reasons for sustainability of these structures. For instance, an earthquake occurred in 1970s in which only buildings cracked but not the tankas.
- While collecting rain water, some of them used KMNO<sub>4</sub> for purification as well as disinfectant.
- The quality of water remains good even if the water is not used for a couple of years ( as indicated by the water analysis)
- Initially women were primarily responsible for collecting water for the tankas but now it is being used by both men and women.
- The cleaning of tankas is done once in every 4 to 5 years and while cleaning, the Tankas should not be kept empty for more than 15 days, as there is fear of their collapse.
- Although water is stored in the tankas for a long time, as it is a closed structure, there is no scope for mosquitoes to breed.
- It has improved the water security of the beneficiary community, lessened the drudgery of women carrying water, gave reliable supply of water at homestead, and convenience of collecting water at homestead at any time by anybody irrespective of age and sex.
- The rainfall data of Bharuch district of past decade indicates that it was very erratic, and scanty. However, the limitation of the tankas is that it is dependent on rains and hence the water has to be used judiciously to avoid shortage during water scarcity.
- Tankas systems functioned in a social milieu that valued the sustainability of its resource base and it clearly emerges as a practice related to a particular religion needs and sensitive to local ecological demands.

## Conclusion

Rain water-harvesting structures (Tankas) remains neglected due to lack of awareness and recognition by the other community on the technology and its durability. Initial cost of the tanka is still a little bit high for most of the house holders. Therefore a government subsidiary or a credit facility scheme should be developed to encourage these harvesting systems or some other mechanisms has to be explored from external funding agencies.

There is a need for further study in view of cultural and heritage of Zoarastrians with respect to these Tanka structures and also the technical feasibility of the Tanka structures (design, cleaning, foundation depth, repair and maintenance, sanitation). The most crucial aspect would be to study the construction material and the geological structures where the tankas are dug, for which it would be the answer to the water remaining potable for such long duration.