

Conventional Water Conservation Structure: Case Study of Nagpura Bhairaw Bawli at Durg (Chhattisgarh)

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Abstract

Water is a lifeline of any civilization. Urban development adds impervious surface, which increase surface runoff appreciably and decreases infiltrations and evaporation to maintain the urban water balance. The 80% potable water flow as sewer (goes into the drain). The demand of water is increased 20 times within last 20 years. The global water Use has grown almost three times faster than the population growth rate. The ancient water management systems show that the traditional knowledge of water management was efficient as well as eco-friendly. There were minimum disturbance to natural system like hydrological cycle, soil, vegetation, etc. The conservation of the natural source of ground water recharging and conventional water conservation system is a good option for management of water.

Keywords: rains, stepwell, water conservation

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INTRODUCTION

India being one of the most populated countries has more chances of water crises in the coming years and will have more water demand in agricultural sector, industrial and domestic sector. Change in overall scenario of water management in urban areas and also in most of rural area is either to manage water in pipes or to carry from distant sources. Decline of ground water at alarming rates is an intimation to recall our ancestral water management techniques.

The demand and supply has to be considered on priority basis so as to create proper balance i.e. recharge of ground water aquifers, recharge of surface water due to natural flow of rain water as gravity flow and finally to plan structures with due consideration of chocking/blocking of rain water creating flood situation during rains. The storm generated at the area should be

utilized for recharging by diverting it to suitably designed recharge pits or to the nallah by means of drain and finally to surface water collection reservoir, pond or lake.^[1]

The ancient water management systems show that the traditional knowledge of water management was efficient as well as eco-friendly. There were minimum disturbance to natural system like hydrological cycle, soil, vegetation, etc.

HISTORY

1. One of the oldest water harvesting system is found about 130 km from Pune along Naneghat in the Western Ghats.^[2]
2. From more than 5000 years Rain water harvesting has formed part of Indian traditions and over centuries they develop a ranges of techniques to harvest rain water to the last drop.

3. As early as 3000 BC, the Indus valley civilization had several reservoirs, to collect monsoon runoff and every third house has a well.
4. Kautilya Arthashastra written in third century BC, indicates that Indians had constructed dam and lakes and had sound knowledge of Rain water harvesting techniques. There was a regular class of officers to superintend the rivers, to measure the land and to inspect the sluices by which water was let out from the main canals.
5. In south India, the first dam being constructed by king Karikata chola, as early as 2nd century AD and it is functioning even today
6. The traditional Rainwater harvesting system of south India, called 'Eris' were designed and developed 1000 year ago.
7. The Veeranam tank in Tamil Nadu, which has a bund of 16 km. Length, was built from 1011 AD.
8. Tamil Nadu accounts for 39,202 Eris are formed a very scientifically knitted chains in 18th century for about 2000 villages.
9. Another example of about 400 year old underground tunnels with air shafts to maintain the flow of water and to carry water to distant places are still functional at a small town Burhanpur near Maharashtra–Madhya Pradesh border.
10. There were 300 Ponds in Raipur (Chhattisgarh) during Kalchuri Period (14th century). The whole Raipur city was surrounded by Ponds. The Ponds were developed by Kalchuri and Maratha emperor as the natural ground water recharger. Paithu and Dabari are also constructed also to interconnect the Pond.

A few traditional Rain water harvesting, Water conservation and water harvesting systems used in different parts of India are following.

Rainwater Harvesting

Rainwater harvesting is basically accumulation and storage of rainwater for use and for recharging ground water sources.^[1] The various RWH system used are as follow.

Kund

Kunds (Kundis), in Rajasthan are constructed by rich people or by community to provide rain water for all.

Bawalis

Bawalis (Stepwell) in Gujrat and Rajasthan region was constructed to provide water for travelers and the structure also provide space for gathering as well as resting place.

Phads and Bhandaras

Phads and Bhandaras were constructed in Maharashtra region for rain water harvesting.

Haveli System

Haveli system was constructed in Madhya Pradesh region for rain water harvesting.

Kare System

Kare system was constructed in Karnataka region for rain water harvesting.

Water Conservation

Zings

Ladakh have Zings for collecting melted glacier. As the glacier melts the flowing water accumulates in the tanks.^[3]

Guhel

Jammu Kashmir has Zings for collecting melted glacier. As the glacier melts the flowing water accumulates in the tanks.^[3]

Water Harvesting

Jobo

The Jobo system of Nagaland for water harvesting includes forestry, agriculture and water for livestock. In hilly terrain the rain water harvesting system constructed

to capture water in ponds at different levels without disturbances to natural topography. Water is used for multi purposes.^[4]

Ahar-Pyne System

Bihar has its Ahar-Pyne System, unique water harvesting system made by peoples' participation. The storage tank with channels used to hold water and divert overflow of rain water used to irrigate fields.^[4]

Bawli (Step Well)

Bawli or Stepwells are wells or ponds in which the water may be reached by descending a set of steps.^[5] Step well also called Kalyani, Pushkarni, Bawadi or Bawli or Barav or Vaav or Step ponds. They may be covered and protected and are often of architectural significance.

They generally accompany temples or sometimes Mosque.

The basic difference between stepwell and well or tanks are to make it easier for people to reach the ground water and to maintain and manage the well.

Stepwells are common in Gujrat and Rajasthan. Ground water was an important source in this arid region but there are stepwells in other parts of India like Orissa, Maharashtra, Madhya-Pradesh, and Karnataka.

HISTORY OF STEP WELL

1. Stepwell construction is known to have gone on from at least 600 AD. In the south western region of Gujrat.
2. The practical idea even spread north to the state of Rajasthan along the western border of India where several thousands of these wells were built.
3. Most existing stepwells hit its peak from last 800 years.

4. Stepwells are certainly one of India's most unique but little known contribution to architecture.

Chand Baori at Rajasthan

1. Chand baori is situated at a distance of 95 km from Jaipur on Jaipur Agra road in the village Abhaneri in the Dausa District.
2. It was constructed in 800 AD
3. It consists of 3500 steps arranged in perfect symmetry over 13 stories.
4. It extends approximately 100 feet into ground.
5. It is one of the deepest, longest in India and considered to be biggest in the word.

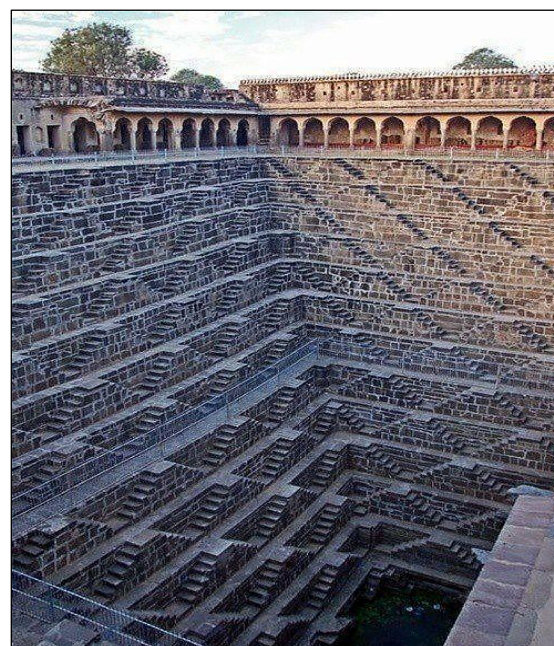


Fig. 1. Chand Baori at Rajasthan.

Water scarcity now a day is not limited to arid regions and over exploitation of water leads to scarcity in almost all cities. People have to save water by any type of storage or method adopted. The purpose is to capture water for future and sustainable use.

NAGPURA BHAIRAW BAWLI

In Nagpura Durg (Chhattisgarh) when not gain a drop of water up to a depth of

100 m. in bore well the owner of land Mr. Ashok Modi decided to construct the traditional Bawli and named it *Nagpura Bhairaw Bawli*. Nagpura Bhairaw Bawli is situated at a distance of 54 km from Raipur and 15 km from Durg (C.G.) on Durg-Khairagarh road in the village Nagpura near Shri Uvasaggaharam Parshwa Tirth. Its construction was completed in 2010. It consists of 20 steps for tank and 18 steps for well over 02 stories. It extends approximately 10 m into ground.

Structure Detail of the Bawli

The construction area is approximately 30 m length and 20 m width (600 sq m). It has entrance by downwards steps from west side and rest three sides contains 600 mm thick parallel stone masonry walls with the 1.5 m gap up to depth of 5 m. From existing ground level, the entrance stair has approach for the God Bhairaw Temple from its mid landing and rest steps approach towards the tank of size 23 m × 23 m.

The masonry has small holes of diameter 75 mm. The gap is filled with chips of lime stone, granite stone and sands for filtrations the water flow towards tank from various levels. The tank has water tight floor to collect the water in the well size 7 m × 7 m and depth 5 m. Constructed in north-east corner of the tank. With the slope maintain towards well.

In this Bawli, the owner Mr. Ashok Modi use the water harvesting by the construction of parallel walls with small holes @75 mm diameter. The gap of @1.5 m between the parallel walls fills with sand and granite chips for filtrations of water coming from outer sides of the well.

The storage water in Bawli is being used continuously including the summer season by irrigation and other purposes.

Minimum Rating of Water Discharge in Summer

1. During the hottest season in May June the discharge capacity of the Bawli is 480 L per hour for 12 hours in a day.
2. Total water discharge=4800 L × 12 hours =57,600 L/day
3. The water is being used by the villagers living near the Bawli and uses for their various purpose including drinking and cooking too. They collect the water as per their convenient as the Bawli has a submersible pump to discharge the water continuously from 35 mm dia. Pipe.
4. This quantity of water is enough for a population of $57,600/135=426$ people=@100 families. (Assuming Water required @ 135 L/capita/day and Size of Family=@4 members).

CONCLUSION

1. The owner of the land Mr. Ashok Modi decided to collect the ground water when the borewell not gain a drop of water upto a depth of 100 m. He uses the traditional Bowli and water harvesting technique by parallel walls filling with chips of Lime stone, granite chips and sand for filtrations of water and submersible pump for discharging the water. As per Mr. Modi Sand is used for screening, Granite dissolves the impurities and Lime stone for catalytic the purification process.
2. The quality of water is good as the villagers are using since last 5 years.
3. In present urban scenario this bawli may be a good option for storage of water to manage the water requirement.

Its every individual's duty to share their responsibilities to conserve water resources, not only the government alone would be held responsible. Stakeholders also include searchers, prominent citizens and citizen groups, NGOs, scientists,

media persons, urban planners, landholders and real estate developers among others. Proper water policy to control and to protect water resources at

micro level is present days demand besides water policy at colony, city, state and national level.^[6]

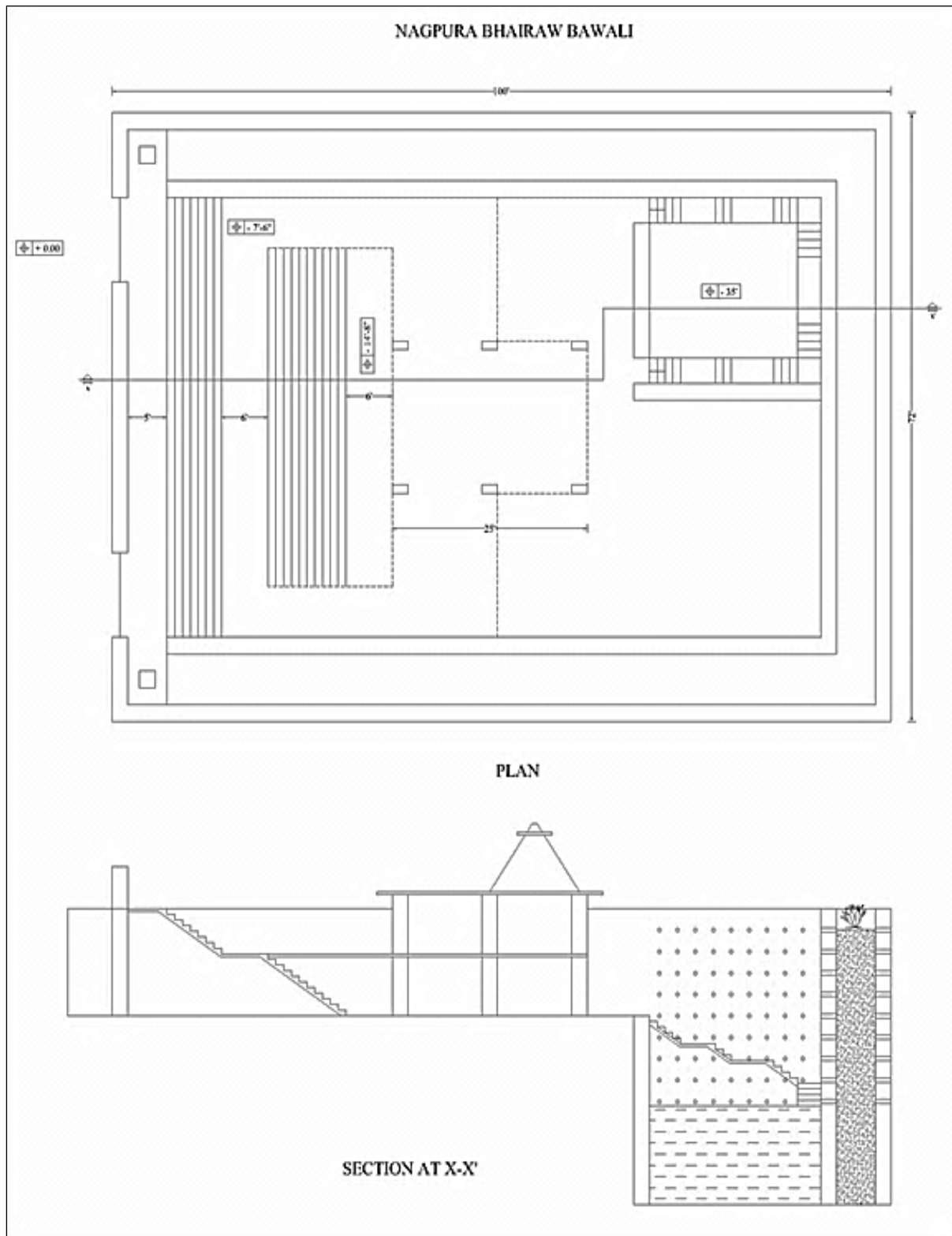




Fig. 2. The Nagpura Bhairaw Bawli.



Fig. 3. The Pipe from Submersible Pump to Discharge Water.



Fig. 4. *The Parallel Walls.*

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