WATER RESOURCE CENTRE

JAL BHAGIRATHI FOUNDATION

WATER HABITAT RETREAT

WATER RESOURCE CENTRE

An Oasis Created With Rainwater Harvesting

MARWAR
The Legend lives on

The Marwar region of the Thar Desert is characterized by dry sandy terrain with sparse vegetation, much in contrast to the acolourful image of its people, dance, music and culture. The *paniharan* (women carrying headloads of water), oft seen in the desert, is an image portraying the search for water and the endless drudgery of desert women. Local poetry and romance are inspired by this lifeline in the desert, the long water walk by the *paniharans* under the scorching sun. Folk lore is replete with stories of the *paniharan* gaily walking to the *panghat* (bank of the water body), delicately swaying with the wind, their toil lost in the cheerful songs.

The story of Jodhpur and Marwar begins with Cheeria Nathji, who lived at the top of Bhakurcheeria, a hill one hundred and twenty meters high, known locally as Cheeriatunk or Mountain of Birds. This, quite, inaccessible and isolated spot was perfect for the reclusive hermit. However, his meditative isolation was shattered when the Rathore ruler Rao Jodha decided to build the famous and impregnable Mehrangarh Fort on the same hill. When Jodha's masons began work while disrupting the serene environment, Cheeria Nathji cursed the Rathore, *'Jodha! May your kingdom always suffer a scarcity of water!'*

Today, in the villages of the erstwhile kingdom, as old men gather and lament over droughts, casting their gaze to the sky, smelling the air for monsoon rain, the curse of Cheeria Nathji lives on. Five centuries later, the Jal Bhagirathi Foundation, an NGO headed by HH Maharaja Gaj Singh, a descendant of Rao Jodha, has been successful in bringing water security in 300 villages in the very same land by reviving the culture of rainwater harvesting. The Water Resource Centre (WRC) of the Foundation in Jodhpur stands as a testimony to the efficacy of rainwater harvesting as a sustainable water source.

Traditional wisdom of Rainwater Harvesting

Rain water harvesting is simple; it has two major parts, first is developing mechanisms to capture rain from a catchment area, and second storing the captured water for prolonged use. Water harvesting structures can be further classified into impounding and recharge systems.

Impounding Structures- store rainwater externally in surface structures, to be used during the year, or to be kept as a reserve for drought periods. Lakes, ponds and underground tanks are examples of impounding structures. Such structures are prevalent in the Marwar, since ground water is saline.

Recharge Structures- facilitate recharging of ground water for future usage. Recharge structures store and percolate rain water to recharge the groundwater aquifers. This method does not require elaborate surface infrastructure and can be successfully employed through recharge wells or water bodies in areas with good groundwater quality.

The Marwar is known for its traditional rainwater harvesting systems, which helped communities to survive in this rather inhospitable region for hundreds of years. Since rainfall is sparse, local people developed techniques to harvest rain through their collective wisdom. Water harvesting structures such as *tankas, beris, anicuts, nadis* and *talabs* deserve special mention.

Tankas or kunds are underground tanks, constructed for collecting and storing runoff water from natural or artificial catchments, or from a roof top. This is the major source of drinking water in many villages in the region. Normally, its capacity ranges from 10,000 litres to 100,000 litres.

Nadis or Talabs are ponds, dug at a natural depression in the land to collect water from large catchment areas at a village level. Its storage capacity ranges from 15,000 m^3 to 250,000 m^3. People frequently transfer water from the ponds to *tankas* for optimal storage and to reduce evaporation and seepage loss.

Anicuts are small *bunds* made to slow down and store water in natural channels of runoff. This is an effective way not only to save water but also to recharge ground water.

Beris are shallow percolation wells, often located near ponds, *anicuts* or sand dunes so that seepage of water from these structures can be harvested and stored.

Bawaris are step wells, in which the water can be reached by descending a series of steps. *Bawaris* have spectacular architecture with spaces around the water-body below the ground for people to find relief during the hot summer days.

ABOUT JBF

Jal Bhagirathi Foundation was established as a Trust on January 15, 2002. The Organisation serves to regenerate community leadership and institutional support to strike a balance between environmental capacities and people's needs, especially in the access of safe drinking water. The Foundation positions its work and learning at the national level for further replication, thus contributing towards the ongoing debate on pro-poor policies.

WATER CULTURE
A way of life in The Desert

Communities in Marwar never mourned the scarcity of rainfall but faced it with élan, developing a rich water culture which perpetuated in folk tales, songs by bards and the personification of water structures, giving them names of gods, goddesses and local heroes. Often a temple adorns the embankment of *talabs* or *nadis* (ponds), signifying that they are venerable. This reverence for water helped in its conservation, use and protection in an optimal and sustainable way. Communities in the region constructed and maintained rain water harvesting structures, considered it a moral duty, undertaken with great pride and collective responsibility.

The month of *Jeth* (May-June), though bellowing fire with scorching sandstorms is cursed by none. Instead, walking about totally covered except for the face, the cattle herds sing songs to praise the Lord: *"The month of Jeth has come, the wind is blowing from the south, the pebbles are rattling in our ears, may the Lord be praised."* From time immemorial, their traditional wisdom recognizes that if *Jeth* does not burn in fury, as it should, if the sandstorms are not swept up, then the rains will

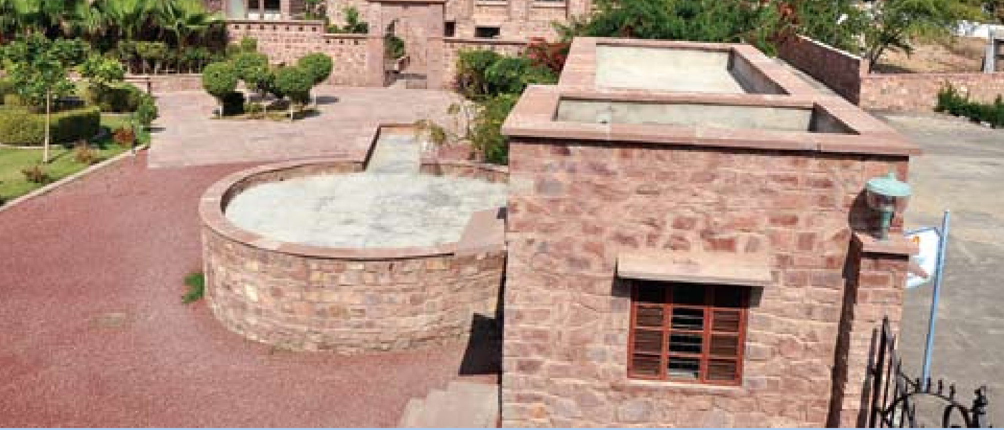
not come. Desert men knew much before scientific explanations that monsoon clouds are attracted towards high temperature regions.

Water in all its various forms is considered divine and its conservation is deeply embedded in the socio-cultural milieu; it is an integral part of celebrations and religious ceremonies. All rituals from birth to death revolve around *talabs*, a new born is given water for the first time from the *talab* while mortal remains are cremated on the embankment of *talabs.*

A newlywed bride is taken to the village *talab,* to pay obeisance, this also marks the beginning of a deep bond she develops with the *talab*, her friend for life. Brothers take good care to marry sisters in villages that have water security by means of rain water harvesting structures close to the village. Every year after her wedding the happy sister invites her brother to celebrate *"Samband Hillona"* (churning of relationships) commemorating their love and affection. The sister thanks her brother for marrying her into the water rich village and proudly takes him to the village *talab,* where they offer a drink to each other. This privilege is lost to those, whose sisters are married in villages without the village *talab.*

The worship of water is a deterrent against pollution, *talab* water is believed to be pure and pristine; fit for the Gods to bathe in. On *Dev Jhulni Gyaras,* the village deity travels in procession to the village *talab* with much festivity; dipped in the *talab* amid chanting of *vedic mantras.* Catchment areas of water bodies are protected through social fencing and community norms like prohibition of defecation. Traditionally harvested water was kept clean by earmarking separate water bodies for animal and human consumption; prohibition of washing and bathing in the water body.

In Marwar each drop of water is valued; from the moment rain falls till it stops, every village, every person does their part to collect the precious drops falling on roof tops, in courtyards, in the fields, at crossroads and even in uninhabited places. This is why, rain in the Desert is not measured in centimeters or inches, but in drops.



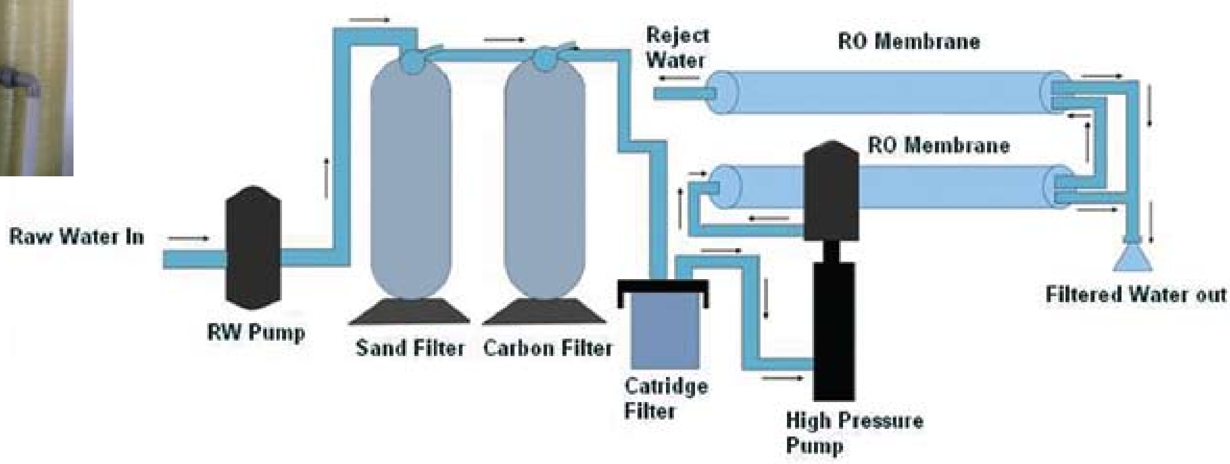
Percolation Well

A percolation well adorns the courtyard of the Centre. This is the drinking water source for the entire staff and visitors throughout the year. Naturally filtered water percolates into the well from the *talab* on the one side and the *nadi* from the other side of the Centre through the sand beds and rock fissures.

Diameter: 5 Meters
Depth: 7 meters
Capacity: 137,000 litres
Water Availability: 12 months, even in drought years

Safe Water Station

The Centre is equipped with a safe water station, a water treatment plant consisting of pressure filter and Reverse Osmosis (RO) plant. Water from the percolation well is treated using pressure filter for use in washrooms; whereas RO treated water is used for drinking. Pressure filters are effective in removing turbidity and making water clean, whereas the RO plant removes dissolved minerals and ensures water is safe for drinking. The water testing laboratory of the Centre monitors the chemical and biological parameters by regularly testing the quality of water produced by the Safe Water Station.
The plant has an installed capacity of treating 12,000 litres of drinking water per day.



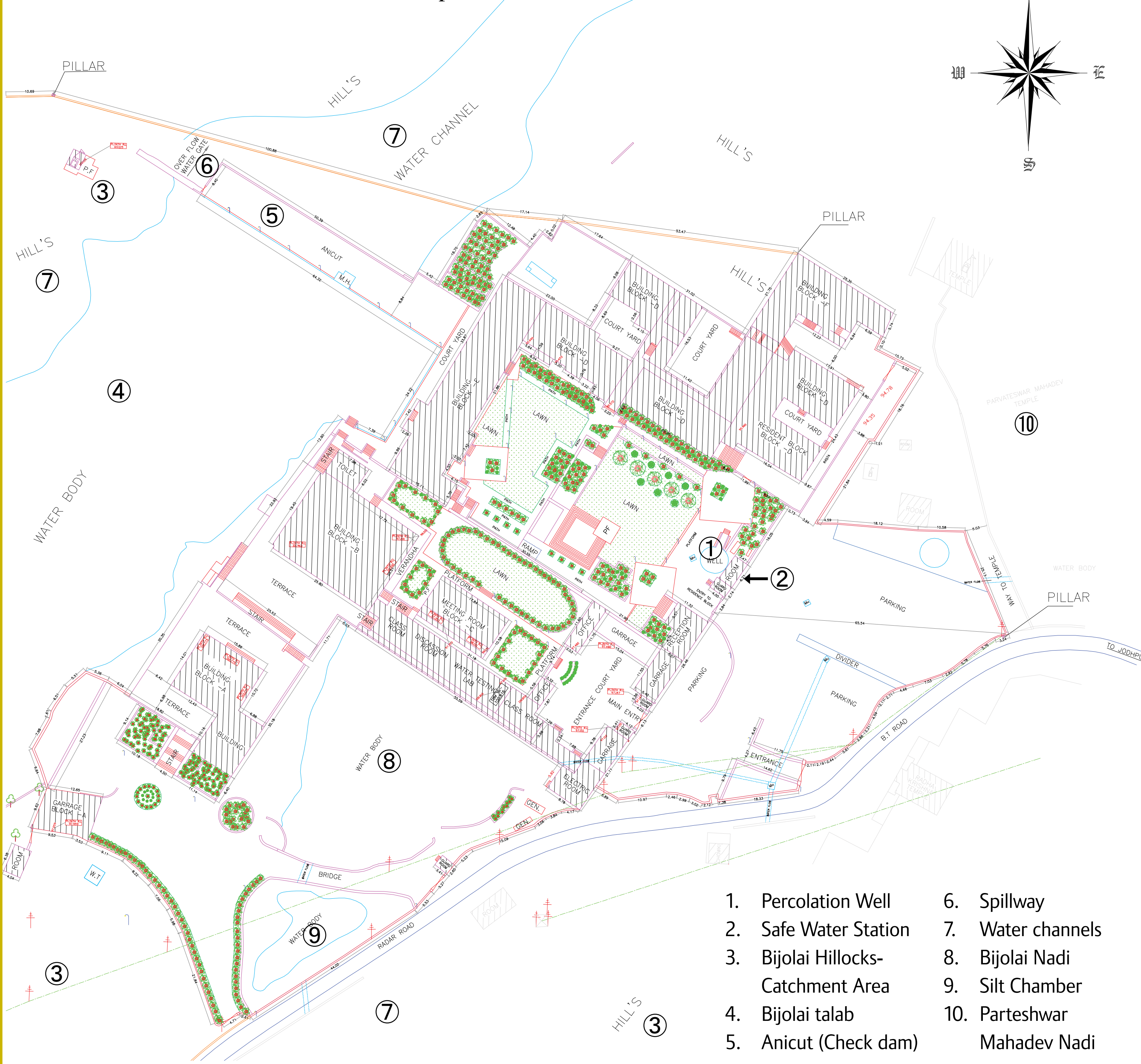
The Water Walk

The 'water walk' through the Water Resource Centre (WRC) is a unique learning experience designed to provide first hand information about traditional water harvesting techniques. The WRC was established at the historic Bijolai Palace nestled between the Aravalli hills - built by Maharaja Takhat Singh (1843-1873). The terrain is distinguished by massive rock formations and flat hilltops covered by thorny shrubs, cacti and dry deciduous forest.

A sprawling lake known as the Bijolai Lake - a traditional rainwater harvesting structure - lies adjacent to the palace. Rainwater from the surroundings hills flows into this lake to be collected with the help of a check dam. In the courtyard, there is a perennial well recharged by water from this lake. The well, in yester years, had a pulley system to draw water and a Persian wheel was installed to lift water from the lake. The overflow from the Bijolai Lake goes into the Kayalana Lake, a vast water body about one kilometre away, supplying water to Jodhpur city.

The Bijolai Palace, spread across an area of 790,000 square feet, was donated by HH Maharaja Gaj Singh to the Jal Bhagirathi Foundation to establish it as a Centre for development initiatives in the Marwar. The Centre itself has a range of interconnected water harvesting structures offering a rewarding water walk to understand traditional water harvesting techniques that make the Centre completely water self-sufficient with no external supply of water.

Map of the Water Resource Centre



TRADITIONAL Rainwater Harvesting

Bijolai Hillocks- the Catchment Area

The efficiency of rain water harvesting depends on the size and nature of the catchment area as well as the kind of surface structure used to store water. The catchment area is the place where the rain water is harvested and then flows into or is channelled to the water storage structure. The Water Resource Centre is ideally located in the Aravalli hills characterised by rock formations and flat hilltops partially covered by thorny shrubs. The natural slopes of the rocky land is a very good catchment area for harvesting most of the rainwater within a few hours from around one square kilometres of the surrounding land. As the impervious rocky formations reduce percolation, the efficiency of rainwater harvesting is very high. In addition to the surrounding hills, rooftops of the Center's buildings as well as the gardens in the campus add to the total catchment area, thanks to the functionally planned architecture.

Bijolai Talab

This sprawling *talab* (pond) is a man-made water harvesting structure which is almost 200 years old. This is the perennial water source of the Centre and is reliable even during years of acute drought. It is also a source of drinking water for wild animals living in the surrounding protected forest area. On the eastern side of the *talab* are the remnants of a Persian wheel which was once used for pulling drinking water by royal attendants of the Maharaja when in residence. The water recharge level by the *talab* is so high that all the plants in the gardens survive with the percolated water in the subsoil.

Area: 7200 square meters

Average depth: 10 meters

Capacity: 72 million litres

Water Availability: 12 months even in drought years

Anicut (Check dam)

The Bijolai Talab was constructed by building a traditional check dam known as *anicut,* which also connects the Centre to the hillocks across the *talab.* The structure holds a large quantity of water locked between the hills and the Centre. During the rainy season once the *talab* is filled, its water overflows through a small spillway located at the end of the check dam. The overflow water feeds into the Kayalana Lake, a major drinking water source of Jodhpur city. The check dam has a sluice located in the centre, which was used to flush out water before the rains, ensuring that harvested water is clean.

Length of the Check Dam: 80 Meters
Length of the Spill way: 16 Meters
Width of the Check Dam: 8.4 Meters

Bijolai Nadi

This pond is the second rain water harvesting structure in the campus. In the past this was maintained as a separate water body for livestock to keep the water clean in the Bijolai Talab for human consumption.

Area of pond: 1900 square meters
Average depth of the pond: 3 meters
Capacity of the pond: 6 million litres
Water Availability: 12 months in normal years;
8 to 10 months in drought years

Silt Chamber

A unique feature of this water body is that water from the water channel first collects in the silt chamber, where all the clay and sand particles settle. Clean water then flows over into the *nadi.* The silt chamber keeps the water in the *nadi* clean and also reduces the need for de-silting.

Area of silt chamber: 260 square meters

Parvateswar Mahadev Nadi

The overflow of water from the Bijolai Nadi goes to Parvateswar Mahadev Nadi outside the Centre, through an underground channel below the parking area. This *nadi* has been made by constructing a small check dam and the water is used by adjoining temples and their livestock.

Area of pond: 400 square meters
Average depth of the pond: 2.5 meters
Capacity of the pond: 1 million litres

Water Channels

The source of water in all the structures in the Water Resource Centre is the rainwater harvested from the buildings of the Centre as well as from the neighbouring hills. While the rain water from the buildings flows directly into the *talab* and *nadi,* the rainfall in the hills is harvested through water channels. Rich with fertile soil that settles during monsoon runoff, these water channels are full of vegetation and are cleaned before monsoon to ensure smooth flow of water to the *talab/nadi.*

Number of channels: 3 (2 for Bijolai Talab & 1 for Bijolai Nadi)

Total length: 1800 meters

Total catchment: 1 square kilometres

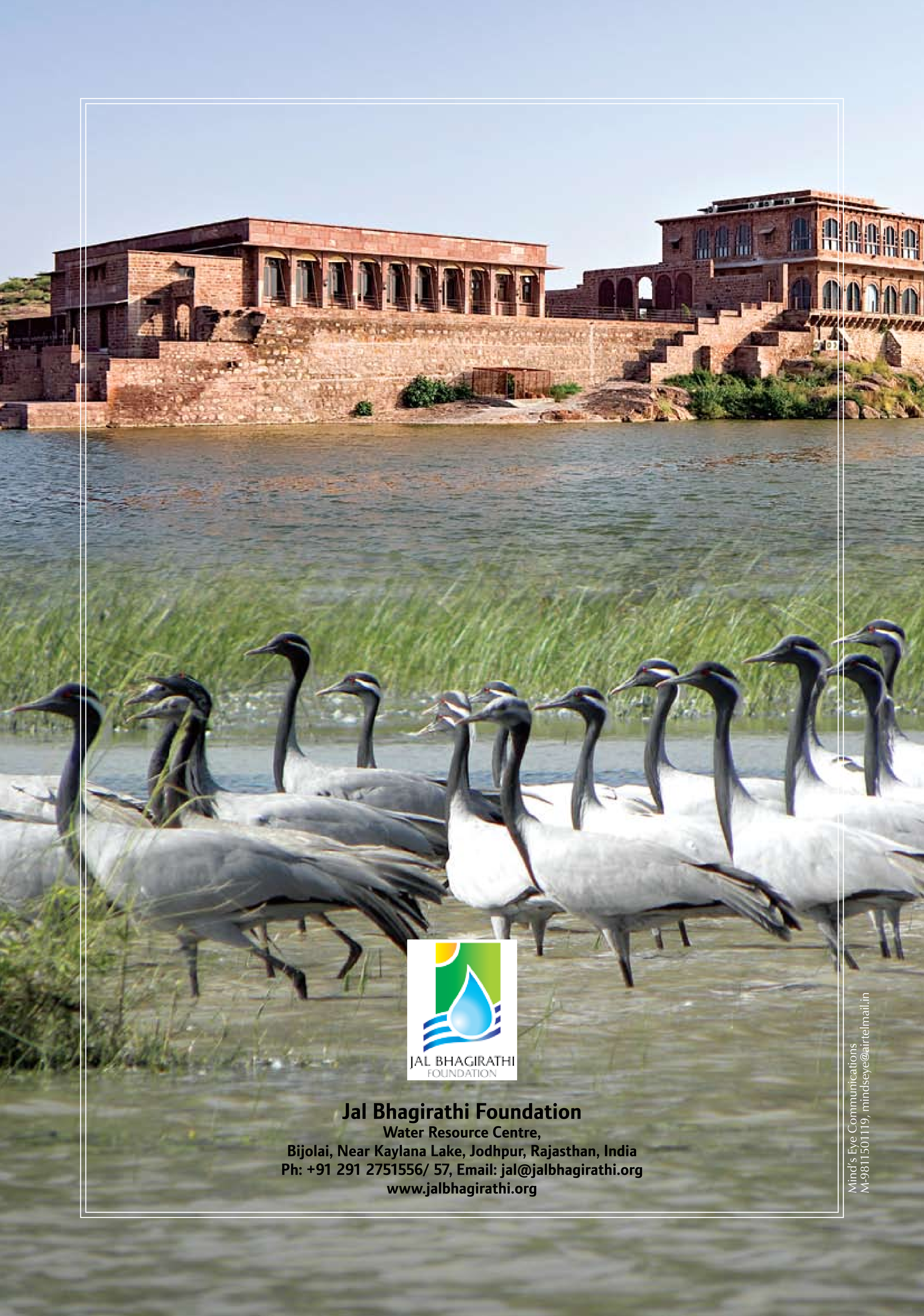
Gardens at the Water Resource Centre

The level of water in the percolation well corresponds to the water level in the Bijolai Talab and Bijolai Nadi. The high water level and its continuous percolation enable the trees and plants with deep roots to survive with the percolated water in the subsoil. During monsoons when the *talab* and *nadi* fill up, the subsoil water level in the garden rises and flows out of the ground showing the efficacy of rain water harvesting. Even during the summer the water level is sufficiently high so that roots of the trees can transpire sufficient water to survive in the scorching sun. The garden also acts as a rain water catchment for reverse percolation of water to the *talabs* and *nadi* during the monsoon. The gardens reflect the efficient water management of the Centre which makes it a rain water oasis in the middle of the desert.

Water Harvesting in Jodhpur

Jodhpur, the capital of Marwar, is the second largest city in Rajasthan after Jaipur. This city was constructed in the year 1495 with well planned water harvesting and storage systems. The water management system that existed in the city demonstrates the superior traditional wisdom. Most of these structures were constructed over time by the rulers of Marwar, philanthropists and communities themselves. More importantly the communities together took the responsibility of the management and upkeep of these systems. According to the survey conducted in 1989 by the Centre for Science and Environment, New Delhi there were 229 water storage structures in Jodhpur city comprising of ponds, tanks, wells and step wells with well knit system of channels ensuring overflow of one structure went to the next. These traditional structures were the only source of drinking water in those days. The Bijolai Talab and Bijolai Nadi were a part of this intricate system; overflow from these structures is even today channelled to Kayalana Lake, the major drinking water source of the city.

The usage of traditional water harvesting system was kept alive till 1960s and after this period there was a steep fall in the usage of such systems and practices. The breakdown began with the introduction of piped water systems and centralised management of water resources. Today, unfortunately, most of the traditional water harvesting systems in the city have been abandoned. The revival of those structures is important for a sustainable water future, especially because the water crisis is escalating globally and particularly in India due to climate change and population growth.



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