



## INDIGENOUS KNOWLEDGE FOR WATER HARVESTING AND MANAGEMENT IN HOT ARID ZONE OF INDIA

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### ABSTRACT

*The Thar desert located in the north-western part of India is a large arid region . It covers around 6% of the country's total geographical area and forms a natural boundary between India and Pakistan. Scarcity of Water (annual rainfall 100-400 mm yr<sup>-1</sup>), extremes of temperature (highest of 47-49°C), and high population density of humans and livestock make this region the most vulnerable desert of the world. Droughts are widespread in this region. However, with centuries of experience, local dwellers have evolved to deal with surrounding environments. Communities have aligned their livelihood in harmony with local resources. Very sound, time-tested water harvesting structures like tanka, khadin, nadis, kund, jhalaras, kui etc. were developed to meet water requirements.*

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### INTRODUCTION

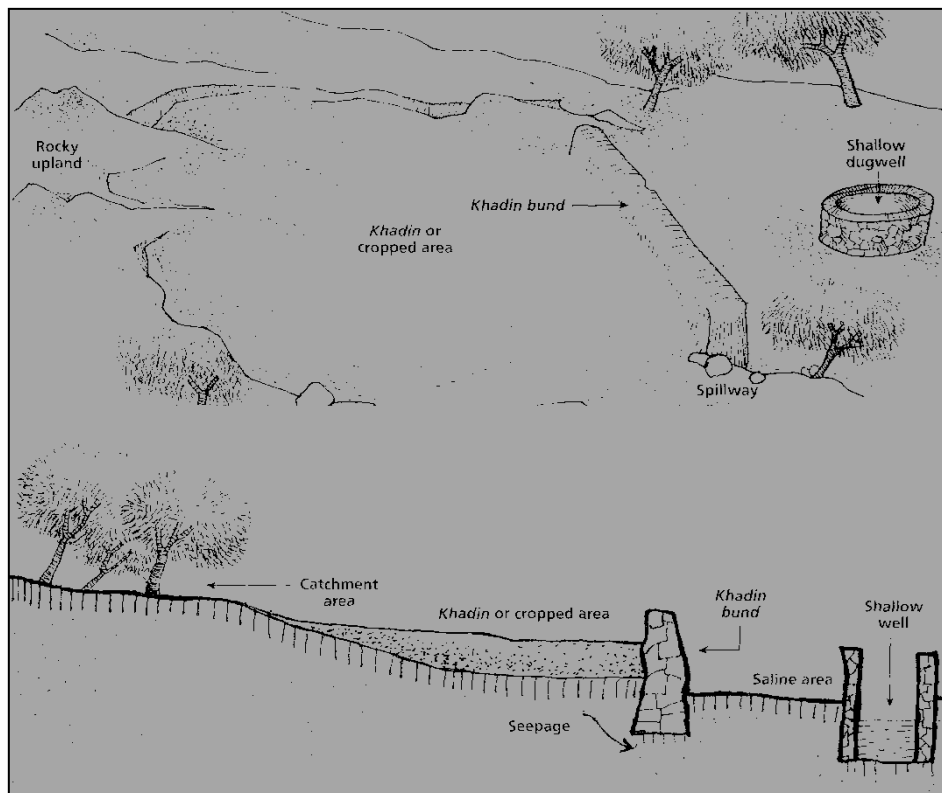
Throughout the arid and semi-arid regions, there are wide ranges of indigenous rainwater harvesting and conservation technologies. It is true for the Indian hot arid zone also. Typical characteristics of the Thar Desert include low (100-400 mm yr<sup>-1</sup>) and highly variable rainfall (CV 35-65%), high-temperature regime, low humidity during the summer season, causing very high evapotranspiration (Goyal and Gaur, 2020). Even in average years, the weather condition for most of the year remains too dry and inhospitable for the successful growth of crops. The people of rural arid areas live in scattered settlements called *dhani's* distributed over sand dunes, interdunal plains and undulating landforms where organized water supply is neither feasible nor adequate water is available to fully meet the demand of thirsty land, humans and livestock (Gaur and Gaur, 2004). Under such circumstances, every drop of water become very precious. People of this region have developed indigenous technologies for rainwater harvesting and conservation. These technologies are site-specific, time-tested, and proven for soundness in extreme conditions. People are conversant with these conservation technologies that require minimum maintenance costs. There is a need to revive these technologies, modify them if needed and extensively propagate in the field. Some of the important indigenous technologies of Indian hot arid for water management are described here:

The common terms for different kinds of water in arid zone

- ✓ Palar water: Rainwater
- ✓ Patal water: Groundwater extracted through wells and tube wells
- ✓ Rajani/Rejani water: Potable Water between transition zone of ground and surface water

## KHADIN

*Khadin* is an exceptional practice of runoff harvesting for crop production in hyper-arid region of Rajasthan developed on the principle of rain water harvesting. These are built across the lower hill slopes below the gravelly uplands around 100-300-meter-long earthen embankment. In this system excess water drains off through sluices and spillways. The khadin has great promise to enhance crop production in hyper-arid regions like Jaisalmer (Goyal *et al.*, 2018).



**Fig-1. Khadin system of runoff farming**

## TANKAS

Since ancient times the rain water was collected and stored in the underground structures called tankas to meet the home needs. Until today, most of the villages in Rajasthan get drinking water from these structures. These tankas were usually built near religious centres and in villages for community usage due to the belief in the sanctity of water. Besides this, every household used to have underground tanka of varying capacity from 5-15 thousand litres. Prominent families used to have more than one tanka in their homes. Community tanka of 3-5 lakhs capacity was found in the arid region. Smaller tankas are generally connected with rooftops for rainwater harvesting. However, an artificial catchment was constructed for larger/community tanka rainwater harvesting. Construction of tanka on an individual family basis has a psychological impact of pride of ownership to the beneficiaries.

## Kunds/Kundis

The Kunds/Kundis are typical rainwater harvesting structures of the Thar Desert of Rajasthan. The main difference between tanka and kunds is the location and shape of the structure. The Kunds are constructed outside the home, whereas tankas are typically constructed inside the house. The shape of traditional tankas is rectangle depending on the available space within the house, whereas kunds are essentially circular in shape. The catchments of kunds are made with lime and mortar for higher runoff generation (Gaur *et al.*, 2018). The sidewalls of kunds are covered/plastered with lime and ash whereas, kunds have a dome-shaped cover to protect the water. Large public kunds have been in practice for the poor people in the region. The kund system of rainwater collection is very effective even in rainfall as low as 100 mm.

## KUIS/BERIS

Kuis/Beris is a unique water harvesting system in the hyper-arid region of western Rajasthan. A *kuis* is a very small dug well (*kuan*), *kuis* is feminine, and *kuan* is masculine. The *kuis* is small only in width; its depth is quite deep as far as its depth goes. *Kuis* or *beris* usually are 5 meters (m) to 12 m deep with a very narrow opening. The *kuis* differs from the normal well (*kuan*) in another way that *Kuan* is dug to tap the water table, but the *kuis* does not access the water table the same way as the *Kuan* does. The *kuis* collects rainwater in an exceptional way. This system relies on the principle of collection of percolated rainwater deep down from the sandy terrain. To harvest percolated rainwater deep from sandy soils, a narrow and deep pit known as *kuis/beris* in local language used to be constructed in the sandy catchment. *Kuis* are generally found in the Jaisalmer and Barmer districts of Rajasthan, where rainfall is very low, and groundwater is very deep and saline.

**Fig-2. Traditional Kunds**

## BAORI /BAWDI

Baoli/Bawdi are step wells usually found in Rajasthan, Gujarat and some parts of northern India. The main purpose of constructing these stepwells is primarily to provide domestic water safety and ease to the local people without buckets and rope. *Baori* is normally rectangle in shape with steps on three sides. The main source of Water in the Baori is essentially groundwater. Therefore, these are usually more than 50 feet deep. *Baori* is a bigger structure and requires a lot of labour and material; therefore, these are often constructed with community participation and, most of the time with the help of local support. *Baori* also serves the purpose of a common place of gathering for social function and a resting place for outside travellers. Due to indiscriminate groundwater exploitation for various purposes, the water table is declining faster, and most stepwells dried up except a few with tourism attractions. There is a need to encourage groundwater recharge in these areas.

## JHALARAS

*Jhalaras* are human-made water harvesting structures similar to *Baori* found in Rajasthan and Gujarat. *Jhalaria's* water is primarily meant for community use and religious rites. The main difference between *Baori* and *Jhalaras* is an essential source of water. The primary source of water in *Jhalaras* is surface water. The *Jhalaras* collect subsurface seepage of a *talab* or a lake located upstream. Surface runoff from the surrounding catchment is also allowed to collect in *Jhalaras*.

## CONCLUSIONS

Drought-proofing, mitigation and relief strategies are the needs of the hot arid zone of Rajasthan subjected to frequent droughts. Traditional social, cultural, religious, spiritual, and people's science has greater significance for mitigating drought and combating desertification in the great Indian Desert. Indigenous governance of water is needed from social and environmental points of view, and a means to ensure water as a human right. With all their respective aspects, the rediscovery of traditions can restore and create just and sustainable livelihoods in India and globally.

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