

## WATER MANAGEMENT IN ANCIENT INDIA

### Introduction

An introduction to major water management systems in ancient India water management, water harvesting, reservoir, step-well With its monsoon-driven regime of rainfall, India soon understood the importance of water harvesting and management—very soon, in fact, judging from the 4,500-year-old Harappan city of Dholavira, in Gujarat’s forbiddingly arid Rann of Kachchh, which dedicated some 20 to 30 per cent of its fortified area (48 ha) to a vast network of interconnected reservoirs, some of them cut in sheer rock; the whole system was fed by carefully harvested rainfall as well as water diverted from two seasonal streams bracketing the city, whose waters were slowed down through series of checkdams. The largest reservoir, to the east of the Castle (the city’s highest and most fortified enclosure), measured 73 x 29 m and would have contained over 20,000 m<sup>3</sup> of water when full. In addition, a small but neatly constructed stepwell dug at the bottom provided for extended access to water, should the reservoir fall empty. As a result, the city was occupied for at least seven centuries without a break.

### 1. Early Historical Era

Monumental waterworks continued into the early historical era. If the Mahabharata promised the builder of a tank a hundred times more *punya* than would get the digger of a well, it is simply because a tank restores water to the earth, while a well draws from it—simple, but even today we are far from such basic awareness, despite the severe water crisis staring in our face. *Arthashastra*, again, shows prescience by paying minute attention to water management and irrigation techniques. Interestingly, and unlike today, access to water through public or private waterworks was not free; it was taxed at various rates, the highest being if irrigated water were supplied by the state. Penalties were prescribed for obstructing or diverting a watercourse, causing fields to be flooded, building a well or a dam on someone else’s land, not maintaining waterworks, or for failing to cooperate in the building of an irrigation tank. Kautilya systematically deals with different situations; for instance, he declares, ‘No one irrigating his field from a reservoir or tank shall cause danger to the ploughed or sown field of another. The water from a lower tank shall not submerge a field fed from a higher tank built earlier. A higher tank shall not prevent the filling up of a lower tank, except when the latter has not been in use for three years....’ (3.9)

Almost echoing Kautilya, Strabo, a first-century BCE Greek geographer, noted: ‘Among [the officials], the first keep the rivers improved and the land re-measured, as in Egypt, and inspect the closed canals from which the water is distributed into the conduits, in order that all may have an equal use of it.’

Such state management of water resources finds confirmation in hundreds of inscriptions recording the constructions of dams, tanks (*tataka*) and ponds (*vapi*), also their maintenance: desilting, repair of embankments, sluices, irrigation channels.... Water diviners were not left out, and were mandated to pay taxes!

At Sringaverapura in Uttar Pradesh, a simple but effective series of interconnected reservoirs, some of them with a well dug at the bottom, was fed by a channel from the Ganges some 2,000 years ago. Later, we find across India a bewildering variety of reservoirs, stepwells, dams, water-diverting devices, canals, all the way down to the humble village pond.

## 2. More Water Structures

Wells came in many shapes—circular, square, vertical or horizontal—and sizes, built with bricks, stone or terracotta rings. There is a long way from Dholavira's modest stepwell to those of classical times, especially in Gujarat and Rajasthan, which are not only engineering marvels but works of sacred art. Mention must be made here of Rani Ki Vav near Patan in Gujarat, with its pillared halls, magnificently sculpted side panels depicting Hinduism's major gods (often accompanied by *apsaras* or water nymphs), and the well's inner cylinder completely covered with hundreds of sculpted stone panels—whose perfect curvature is in itself a technological feat.

Indians experimented with various kinds of dams, the simplest being the earthen embankment designed to create a reservoir or divert a stream. Downstream of the Srirangam island on the Kaveri (Cauvery) river, some 1,800 years ago King Karikala Chola built a more ambitious structure, the *Kallanai* or Grand Anicut, which finds a mention in the Tamil epic *Shilappadikaram*. Still visible today (in restored form), at 320 m long and 20 m wide, it is an ingenious device which stops the Kaveri from emptying itself into its own northern tributary, the faster and steeper Kollidam (or Coleroon), preserving much of the river's water for irrigation in the Kaveri's lower delta.

Near Delhi, the Anangpur Dam, built with quartzite stones during the reign of King Anangpal in the 8th century), intercepts a stream flowing from the Aravalli Hills and stores rainwater during the monsoon season, most of which is used by the city. Over 100 metres long, it is a testimony to the excellence of construction techniques thirteen centuries ago.

In medieval times, more complex water harvesting and distribution systems were elaborated, such as those collecting runoff waters from hillsides and channelling them

through underground tunnels towards storage ponds or lakes. Burhampur (M.P) and Jodhpur (Rajasthan) are typical examples of such integrated systems, which gradually fell into disuse owing to uncleared sedimentation, disappearance of tree cover on the hillsides, contamination of groundwater by industries, etc. Reservoirs were of varied types, including beautiful *pushkarinis* that combined utilitarianism with religion and aesthetics.

Several techniques were also involved, such as desilting through multiple tanks or transporting water to a distance through aqueducts.

The humblest but perhaps most important water structure was the village pond or reservoir. What made it important was not just its ability to recharge ground water, but also its interconnectedness with many neighbouring ponds—sometimes in networks extending over hundreds of kilometres, as in Karnataka and Tamil Nadu. Such networks, which enabled water-rich areas to contribute to less favoured ones, were maintained by village committees, which disappeared when the colonial administration took over—and so did most of the reservoirs and channels in their care. While government schemes to revive them have met with mixed success, numerous individuals and organizations have joined such efforts, often struggling against land sharks or plain apathy.

India's ancient water management systems were adapted to the local geology, environment, climate and requirements. They were effective in the sense that except in cases of severe and prolonged drought, they generally managed to solve local problems with local solutions. This is something we are no longer able to do because of excessive centralization, unsustainable mega-projects and overpopulation. From that perspective, there is much to learn from traditional water management techniques.