Stepwell – The Water Architecture of India

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Abstract

A unique Indian architecture, for preservation of water is the stepwell. In hot and semi-arid region, where rainfall is unusual, stepwells are found, mainly in northwestern India. These are known in different names such as 'baoli', 'bawdi', 'vavdi', 'vav', 'vai', 'kalyani', 'pushkarni' etc. There were a number of various types of stepwells situated on the trade routes to serve thirsty and tiered people. These were also places for ritual observances and meeting places. Though constructed mainly for utilitarian purpose, these stepwells often comprise embellishments of architectural significance. Stepwells are an example of the manmade chasms created for water conservation as well as of an amazing artistic works.

Keywords: *Stepwell, Bowdi, Baoli, Vav, Jhalara*

Introduction

Some architectural works in India, which are not found anywhere else in the world, are the steps to water or the stepwells or rather "stepped wells". They are unique yet minor elements of the Indian architecture, particularly the beautifully engraved walls of these underground water bodies. The climate of Western India is hot, semi-arid and rain is infrequent. Consequently, it is always necessary to save the water of the monsoon rains and keep it available for the arid season of the year. Accordingly, it was felt necessary to build the stepwells. Primarily deep excavated ditches, rock-cut wells, or ponds filled in with water accessed by a circular flight of stairs or steps are called stepwells. These are known in different names such as *'baoli', 'bawdi', 'vavdi', 'vav', 'vai', 'kalyani', 'pushkarni'* etc. In the Sanskrit *Silpa-Shastras* and ancient inscriptions, those are referred to as '*Vapi'* or '*Vapika'*. The stepwells were constructed mainly for utilitarian purpose, though they often comprise embellishments of architectural significance.

It is thought that to ensure water during dry season the stepwells were constructed. In

Hindu mythology, water is a very significant element, considered a boundary between heaven and earth, thus known as *tirtha*. As artificial *tirtha*, the stepwells became not only sources of drinking water, but calm places for bathing, prayer, and meditation. In *Arthashashtra* of Kautilya, mention was made of irrigation by water-harvesting systems.

Since Puranic times, building up a water body or providing support to one who have constructed it has been considered an act of *punya*, a good deed. The rock edict of Rudradaman at Junagadh in Western India, inscribed in 150 CE, narrates about the Sudarshan lake of Junagadh, which was built initially by the great Mauryan emperors. This edict, written in Sanskrit, is the oldest such edict extant in India. The edict of Skand Gupta, which is three hundred years later than Rudradaman's inscription, also speaks about the reparations conducted by the Gupta king in 455-456 CE. It is showing how important was the matter of water, both for the people and the king who ruled them.

Hindu mythology is satiated with accounts of lakes, ponds and kunds. According to one such story, Lord Vishnu with his own hands dug the Manikarnika kund of Varanasi. This kund is thought so sacred that it is believed that during afternoons, all other sacred kunds of India come here to take a holy bath. There are similar stories about the Mandakini lake of Mount Abu.

Archaeological evidence reveals that the practice of water conservation is as old as the science of ancient India. Excavations prove that the cities of the Indus Valley Civilization had great systems of water harvesting and drainage. The settlement of Dholavira, laid out on a slope between two storm water channels, is a great example of water engineering (Takezawa). These may be the precursor of the stepwell. The rock-cut stepwells in India, for centuries, remained a vital part of the lives of the communities of Western India as sources of water for drinking, cleaning, and bathing, for festivals and ceremonies as well. These stepwells were always constructed on the trade routes. They served as breezy resting places for pilgrims, caravans, and common voyagers during the high temperature of the day or for the night sojourn. However, these outstanding constructions were much more than functional tanks.

An advanced water harvesting system that used the natural slope of the land to store the floodwaters of the river Ganga have been reported at Sringaverapura near Allahabad.

Chola King Karikala made the Grand Anicut or Kallanai across the river Cauvery to redirect water for irrigation (it is still working) while King Bhoja of Bhopal built the largest artificial lake in India.

Drawing upon centuries of knowledge, Indians continued to build structures to fetch, hold and deposit monsoon rainwater for the dry seasons. A goddess called "Varudi Mata" is believed to dwell in the stepwells. She is believed to be the goddess of fecundity and is worshipped for granting good crops. In India, the earliest rock-cut stepwells were constructed during the second to fourth centuries CE (Livingston & Beach: 2002). Subsequently, wells at Dhank, near Rajkot, Gujarat (550-625 CE) and the stepped ponds at Bhinmal, Jalore district of Rajasthan (850-950 CE) were constructed. After that, we may notice rapid construction of stepwells in a widespread area covering from the southwestern Gujarat to the north of Rajasthan, down the western border of the country. A thousand of stepwells were reported from that area during that period. From the eleventh to sixteenth century, majority of the stepwells were built in India. Most of the stepwells existing now were constructed eight hundred years ago.

Architecture

A Stepwell is a construction, of which the major parts are underground, similar to subterranean temples. A stepwell consists of three architectural parts, (i) the straight down well with a large top and graduated sides meeting at a relatively shallow depth, sheltered from direct sunlight by a complete or partial cover, (ii) the stepped passage leading down several storeys, and (iii) many intermediary pavilions. Generally, stepwells are richly decorated with ornamental relief work and sculptures. In their heyday, many of them were painted in bright colors of lime-based paint, and now traces of ancient colors adhere to dark corners.

According to classical texts, there are four types of stepwells but actually, there are numerous variations of this fundamental classification:

- Nanda – the simplest and common type with one flight of steps leading to the well.

- Bhadra – two flights of steps aligned in accordance with the well in the center.
- Jaya – three flights of steps perpendicular to the flanking ones and arranged in three directions around the central shaft.
- Vijaya – resembling Jaya but in four directions.

We may classify stepwells by their size, plan, materials, and structure. They are of various structures like rectangular, circular, or L-shaped; their building materials vary from masonry, or to rubble, or to brick; and they can have from one to four individual entries. Every stepwell has a unique character. Over the years, the architects also tried out with different designs.

Construction of stepwells involved not merely the plummeting of a typical deep cylinder from which water could be hauled. An adjoining, stone-lined "trench" was carefully positioned. A long staircase and side ledges were set in, which allowed approach to the ever-changeable water level; it run through an opening in the well cylinder. In dry seasons, over a hundred steps had to be crossed to arrive at the water level. However, during rainy seasons, the trench changed into a large reservoir, filled in, and the steps went under water, sometimes water reached the surface. This nifty system for water preservation continued for thousand years.

As stated earlier, the wells are called by many names. In Hindi, they are baori, baoli, baudi, bawdi, or bavadi. In Gujarati, they are commonly called vav.

Baoris are special stepwells that were formerly a part of the early system of water storage in the cities of Rajasthan. The insignificant rainwater in that region was diverted to artificial tanks through canals built on the undulating environs of cities. The water would then permeate into the ground and caused raising the water table and revitalizing a deep and intricate network of aquifers. A series of layered steps were built around the reservoirs to narrow and deepen the wells so that the water loss through evaporation could be reduced.

Jhalaras are characteristically rectangular-shaped stepwells that comprise tiered steps on three or four sides. Water from the subterranean seepage of an upstream reservoir or a

lake was stored in these stepwells. Jhalaras were built to secure easy and normal supply of water for religious rites, royal ceremonies and community use. There are eight jhalaras in the city of Jodhpur, the oldest being the Mahamandir Jhalara that dates back to 1660 CE.

Frequently, in many wells in Gujarat, covered "pavilions" were introduced in each successive level, which were accessed by narrow ledges as the water level rose. Those pavilions provided essential shade as well as strengthened walls against the intense pressure. For this reason, most stepwells are progressively narrowed from the surface to the lowest tier underground, where the temperature is refreshingly cool. By building down into the ground rather than the likely "upright", it was a kind of reverse architecture. Since many stepwells have diminutive construction above the surface other than a low masonry wall, a sudden encounter with one of these vertiginous, constructed gaps creates a sense of sheer wonder.

Besides, art became an element of stepwells. Reliefs and sculptures are noticed on walls, cornices, pilasters, pillars and niches. There are chambers and steps through which the well could be accessed. The lattice work on walls, beautifully carved pillars, ornamented pillars in adjacent area have made the chambers and steps remarkably ornate monuments of Indian architecture.

Stepwells are intricate engineering achievements and spectacular examples of the Indian architecture. Those were commissioned by royal, affluent, or influential patrons. Impact of patronage is discernible on the stepwells, in their architectural ornamentation as well as in their structural plan. In the twelfth century, constructions of stepwells under the Muslim power clearly mark this change. There were marked differences between the Hindu and the Muslim architecture. The post-and-lintel construction with corbel domes are the characteristic features of the Hindu architecture. The arch and the "true" dome were from the Muslims. Sculptures and friezes of deities, humans, and animals bear the Hindu influence. The Muslim architecture is entirely devoid of portrayal of any human figure. It is very interesting to mention here two stepwells in Gujarat — the Adalaj Vav and the Dada Harir Vav. Both of those were constructed around 1500 CE when the Hindu and the Muslim traditions mixed for a short period. Their patrons were female,

whereas those were built in the Islamic reign but by the Hindu artists. All are richly ornamented but deities and human figures are obviously absent.

Examples

There are numerous stepwells in northwestern India as well as some sporadically found in other parts of the country. Some are mentioned below.

The earliest example of a bath-like pool accessed by steps is found at Uperkot caves in Junagadh. The stepwell called Navghan kuvo is hewn partly out of the soft rock (Plate 1). The well is named after Ra Navghon (1025-44 CE). It was constructed in the year 1026 CE. It is an example of the early rock cut stepwell architecture. A spiral flight of steps leads down 52 meters to the water. The well itself is square shaped (Plate 2). Light is admitted through the openings in the sidewall. The well is enclosed with a large courtyard. The well itself is much older than the courtyard (Jutta: 1981).

In Udaygiri in Odisha, there was also a stepwell leading down to the water body (Plate 3). This stepwell served a long time ago as the source of water for the Buddhist monks. However, it is now not in use and filled in with polluted water (Plate 4). It is believed that the water in this well never dries up. The well dates back to tenth century CE.

The Rani ki Vav, otherwise known as the Ranki stepwell, located in Patan in the north of Gujarat is an unparalleled example of the Solanki architecture (Plate 5). It was made by Udaymati (1022-1063 CE) the wife of the Solanki King Bhimdev in 1063 CE. This massive stepwell is 64-metre long, 20- metre wide and 27-metre deep. The stepwell is multi-storied, encompassing walkways and walls that connect the stepped reservoir to a circular well. Columns, brackets and beams are decorated with scrollwork and wall recesses (Plate 6). Those are richly carved with depiction of *dasavataras* of Vishnu, alternating with female figures flanked on the walls encircling the staircase.

The last step of the well leads to a small opening. It was the way in to a 30-kilometer long channel, which is now blocked by stones and mud. This tunnel was probably used as an escaping way by the kings during war. The UNESCO included the Rani-ki-Vaav in the list of world heritage sites in 2014.

A superb instance of the synthesis of the Hindu artistry and floral and geometric patterns of the Islamic architecture is the stepwell of Adalaj, situated on the main caravan way of Ahmedabad and Patan (Gujarat). It was made by Rudabai, the widow of a Rajput noble Veer Sinh Vaghela in 1499 CE. It is five-storied structure, using cross beams all along their lengths (Plate 7). This stepwell belongs to the category of three-faced 'Jaya' stepwell. It contains Arabesque designs, ornamented pillars, decorative verandas with fine carvings, carved walls and niches with shrines of Hindu gods and goddesses, elephants, flowers, birds and *chhatris* all through its five floors underground. The space inside the stepwell is octagonal (Plate 8) but the well is circular. There is a three-dimensional trellis with stone floor slabs running transversely (Plate 9). This creates a rhythm of light and shade. The temperature within the well is lower than the outside ambient temperature.

The Champaner city in Rajasthan is otherwise known as "the city of a thousand wells". Amongst those, the Gebanshah's Vaav at Champaner has been built in the sixteenth century CE by a fakir named Gebanshah (Plate 10). This stepwell comes under the category of the 'Nanda' type. There are steps and covered landings alternatively, which are known as 'kutas'. The well is completely open to the sky admitting light and revealing a wonderful view of the beams and pillars crossing one another at angles. There are 'kumbhas' or pitchers that can be seen below the beams lining the walls of the stepwell. These are not much ornamented. The well is 20 meters deep with the circular shaft having a diameter of 6 meters. The length of the well at ground level is about 50 meters. There is still water in this well.

There is a unique Helical Stepwell situated in a short distance from Champaner, towards Vadodara. It consists of a 1.2-meter wide staircase which spirals down along the wall of the good shaft (Plate 11).

Modhera is a town in Mehsana district of Gujarat. The town is well known for its Sun Temple of Chalukya era. The temple has an adjacent stepwell, which is of the 'Nanda' type (Plate 12). It is from the eleventh century CE. It has three tiers. Ornamentation is insignificant. There is a square pavilion without a dome at the shaft end of the well. It looks rather like a temple sanctum.

The largest, and perhaps the greatest stepwell, named Chand Baori (c. 800 – 825 CE) is situated in Abhaneri/Abaneri, Dausa in Rajasthan. This is a four-sided structure with a huge temple on one side (Plate 13). Terraced steps, 3500 in number, march down the other three sides. It has thirteen storeys with a depth of 100 feet. The stepwell was constructed in the tenth century, and it is dedicated to Harshat Mata, goddess of joy and happiness.

Rani Ji Ki Baori or "Queen's Stepwell" situated in Bundi, is the most famous in Rajasthan. It was built in 1699. It is 40 feet wide at the top, 200 steps go down to the water (Plate 14).

In the lost city of Vijayanagara there is a large pond-style stepwell near the ruins of Hampi. It is similar to Chand Boari, but with four even sides (Plate 15).

The Agrasen Ki Baoli is situated in New Delhi. This stepwell was discovered in 2002. It indicates late Tughlaq (1321-1414 CE) or Lodi (1451-1526 CE) architectural style. Agrasen Ki Baoli measures 58.52 metres by 13.71 meters at ground level. It has been constructed by putting 'rubble masonry.'

The monument has four tiers with a flight of 108 steps going down to the well some of which are submerged. The well is rectangular. The steps are flanked by thick walls on both sides. There are two rows of arched niches at each of the tiers. Each series of niches are divided into two levels — the top level is a shallow 'false niche' that was probably meant for the purpose of design. However, the lower niche is deep and can easily have room for two people; it served as a meeting place and provided relief from the warmth. There are passages and rooms inside the baoli, which are now locked away.

There is a circular well measuring 7.8 meters in diameter at the northern end of the baoli. It is protected by iron grills at the top and is linked to the baoli through a duct. In the past, as the water level rose in the well, it would fill the baoli from the bottom to the top level (Plate 16).

Another notable stepwell in Delhi is the Red Fort Baoli, which is a unique stepwell in Delhi having two sets of staircases, leading down to the well. The date of building of this

baoli is uncertain. Perhaps it was constructed before building of the Red Fort in 1648 CE.

The two sets of staircases imitate each other and come across at a right angle, giving the baoli an 'L' shape (Plate 17). Unlike other baolis, the stairs are not very steep, so that one can easily climb down to the source of water. There is an octagonal tank measuring 6.5 meter in diameter and 14.27 meter deep at the bottom end where the stairs meet. It is covered and attached to the adjacent tank measuring 6.1 m x 6.1 m at the southern end.

In Red Fort baoli, equal shaped stones have been carefully piled in rows to build up its walls, resulting in a proportioned design of the monument.

There are vaulted chambers on both sides of the staircases, which can accommodate a number of people. This is again a distinctive element of this baoli. After the revolt of 1857, the baoli was concealed and its cubicles were used as prison.

In Gwalior Fort, there is the Assi Khamba ki Baori (Plate 18). This ancient stepwell is located in front of the Man Mandir Palace. It was made by Maharaja Man Singh Tomar (1486 – 1516) for his queens to bathe. It consists of eighty pillars and therefore it is known as Assi (80) Khamba ki baori.

Social aspects

Over the centuries, stepwell making improved so that by the eleventh century those became superb achievements of engineering, architecture, and art.

Stepwells were not only a source of water but also meeting places of people and for religious observances (Tadgell: 1990). They run almost as underground temples, rich in engraved images of the divinities. These sculptures created a holy environment for ritual dip, prayers, and offerings. Even at present, a number of stepwells continue as functional temples although there is dearth of groundwater, for instance, the Mata Bhavani Vav in Ahmedabad, built in the eleventh century CE. The stepwell architecture is rich in the icons from the Hindu pantheon as well as worldly similes like that of *mithuna* (erotic lovers), horses and elephants, butter churning, fighting or acrobatics, or decorative

friezes and panels with flower-patterned motifs. Besides, there are sculptures such as Tirthankara congregation found in the stepwell architecture created under Jain influence.

A millennium ago, stepwells were essential to daily lives of the people. It was the act of benevolence of the rulers of the regions to build stepwells for the common people. Through the ages, a number of stepwells were built all over northwestern India. However, most of those at present have been abandoned; many are dilapidated and dried out, as groundwater has been sidetracked for industrial use and the wells no longer access the water table. Recently, major restoration works have been undertaken in some important sites in Gujarat. There is a collaborative endeavor to boost understanding to protect stepwells as fine work of architecture and engineering.

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Figures

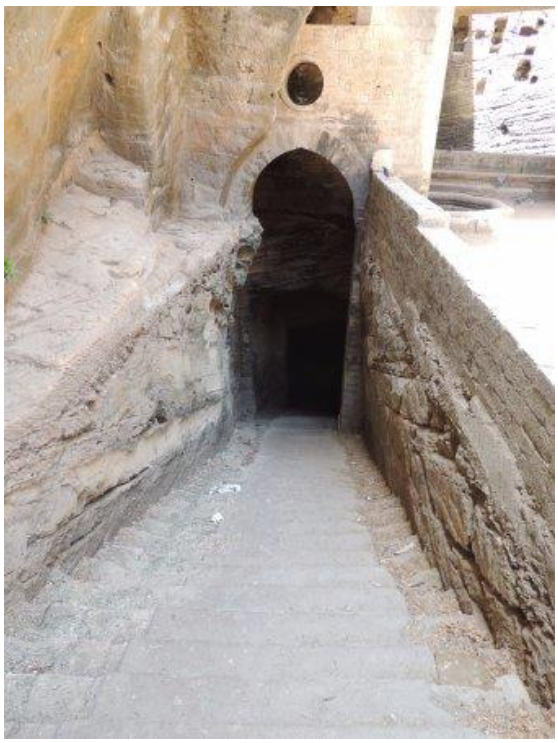

Plate 1. Steps in Navghan Kuvo (Photo courtesy Wikimedia)

Plate 2. Navghan Kuvo – inside view (Photo courtesy Wikimedia)

Plate 3. Stepwell at Udaygiri (Photograph by author)

Plate 4. Well, Udaygiri (Photograph by author)

Plate 5. Rani ki vav (Photo courtesy Wikimedia)

Plate 6. Sculptures in the Rani ki vav (Photo courtesy Wikimedia)

Plate 7. Adalaj stepwell (Photo courtesy Wikimedia)

Plate 8. Inside view of Adalaj stepwell (Photo courtesy Wikimedia)

Plate 9. Trellis and stone slabs in Adalaj stepwell (Photo courtesy Wikimedia)

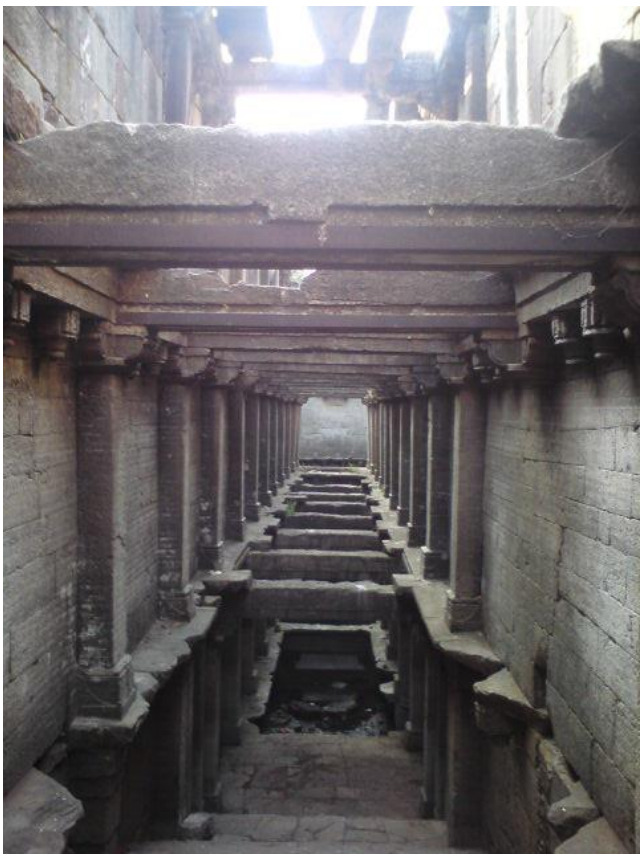

Plate 10. Gebanshah's vav (Photo courtesy Wikimedia)

Plate 11. Helical stepwell (Photo courtesy Victoria Lautman)

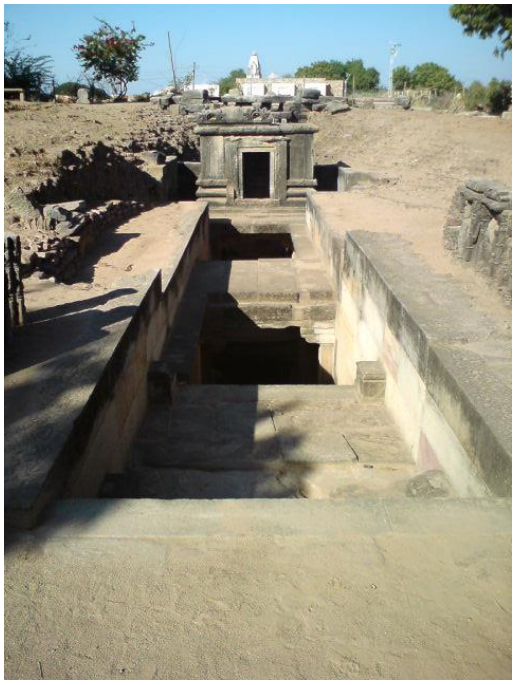

Plate 12. Modhera stepwell (Photo courtesy Wikimedia)

Plate 13. Chand baori (Photo courtesy Victoria Lautman)

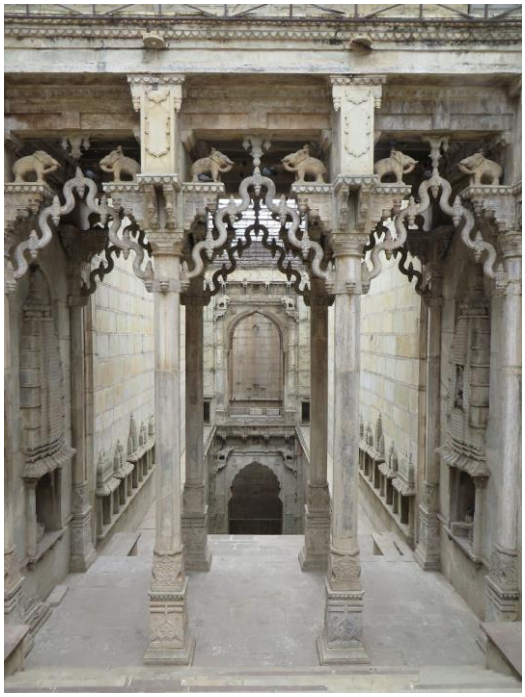

Plate 14. Rani ji ki baori (Photo courtesy Victoria Lautman)

Plate 15. Hampi stepwell (Photo courtesy Wikimedia)

Plate 16. Agrasen ki baoli (Photo courtesy Wikimedia)

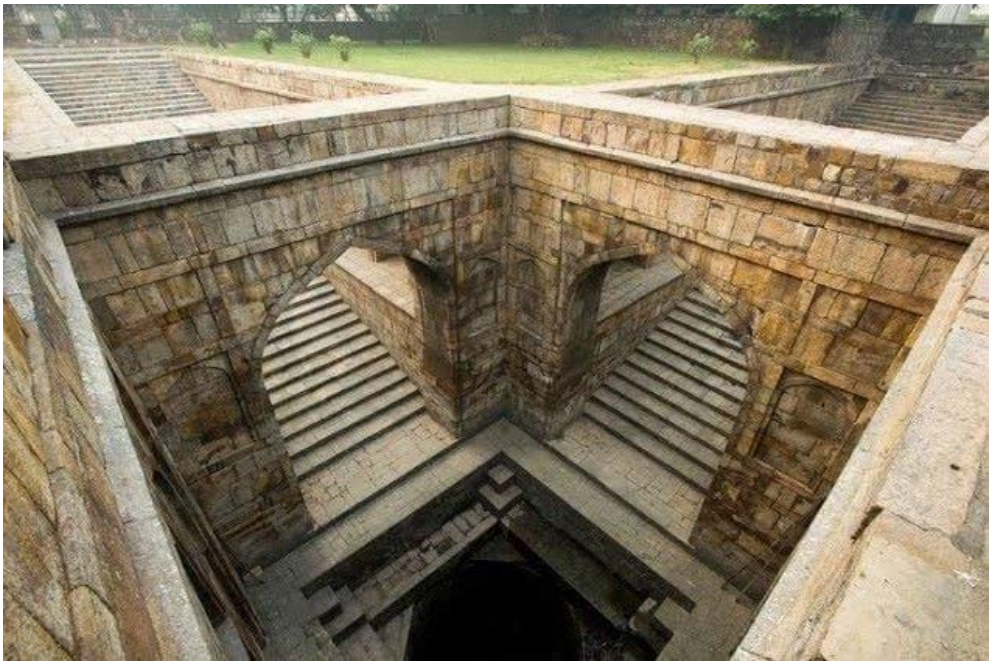

Plate 17. Red Fort stepwell (Photo courtesy Wikimedia)

Plate 18. Assi Khamba ki Baori, Gwalior Fort. (Photograph by author)