



Abstract: A preliminary investigation on hydraulic system for revitalization of qanat system and emphasis model study at Bidar, Karnataka in India and in future such studies to be carried out to the other water structures.

Keywords: Qanat System, Hydralic system, Bidar, India

India in general and Karnataka in particular, the first wave of Islamic rule was aggressive and uncompromising. Gradually, however, it adapted to the social and cultural context of the country and assimilated many local customs and traditions. As Islam developed in India, complex interaction emanated at all levels between the Muslim faith and established Hindu culture. Moreover, it practices a two-way cross-fertilization of ideas and beliefs that wrought perceptible changes in both cultures. This process of interaction was slow and obscure, but it had enormous repercussions for the development of religious, cultural and artistic traditions of India.

The profound antithesis of spiritual and aesthetic ideals of polytheist Hinduism and iconoclastic Islam devoid of imagery could hardly induce any sort of fusion. Yet in spite of fundamental differences of outlook and belief, a syncretism did develop in such a way that society was able to make its own contribution to the Deccan Sultanate architecture. A judicious and harmonious blending of such architectural and decorative elements characterize the Deccan Sultanate architectural manifestations in Karnataka irrespective of whether they are forts, palaces, mosques, tombs, madarsas or water works.

The Deccan Sultanates were five Muslim ruler - ruled late medieval kingdoms of Bijapur, Golkonda, Ahmednagar, Bidar and Berar. These kingdoms became independent during the breakup of Bahamani Sultanate: Ahmednagar, Bijapur and Berar in 1490, Golkonda in 1518 and Bidar in 1528 (Figure 1). The Bidar Sultanate was rule by the Barid Shahi dynasty from 1487 to 1619 (Michell and Zebrowski, 1999).

The city of Bidar is located 130 kms from Hyderabad and 669 kms from Bengaluru, India. Bidar is situated at the centre of the Deccan plateau and is located 100 kms northeast of the former capital of the Bahamani dynasty, Gulbarga. The Bidar fort is at the north of the town and extends 1.2 kms to the southeast and 1 km to the north-south. It is spindle-shaped, having six entrances and being surrounded by moats. The palace complex of the dynasty is situated in the south of the fort complex. The town of the Bidar is adjacent to the south wall of the fort and it is surrounded by hexagon shaped walls. In the walled town, Jama Masjid, Mahmud Gawan Madarsa, and a few khangahs and talims remain. The mausoleum of the royal family of the Bahamani dynasty is in Ashtur village, northeast gate of Bidar town and mausoleum of the Barid dynasty extends in the southwest of the town (Yazdani, 1995).

There is a legendary association of the name 'Bidar' with 'Vidarbha'. It also appears to be derived from bidaru (bamboo in English), which seems to have been noted for its chesters in the past and they became known as 'Bidarooru' and then 'Bidare' or 'Bidar'. This is supported by the occurrence of the name 'Bidar' and 'Bidarooru' respectively in Lakkanna Dandeshas 'Shivatatva Chintamani', composed in 15th century and in 'Veerasangayyana Choupada' written by Channamallesha of Umbalige in 1700. Veerasangayya, the hero of the story, is mentioned as the native of 'Bidarooru' and even now, the town has Veerasangayya's tomb. Bidri ware, a delicate metal ware containing silver and gold inlaid on the exterior surface of steel is a very popular art form of Bidar (Yazdani, 1995).

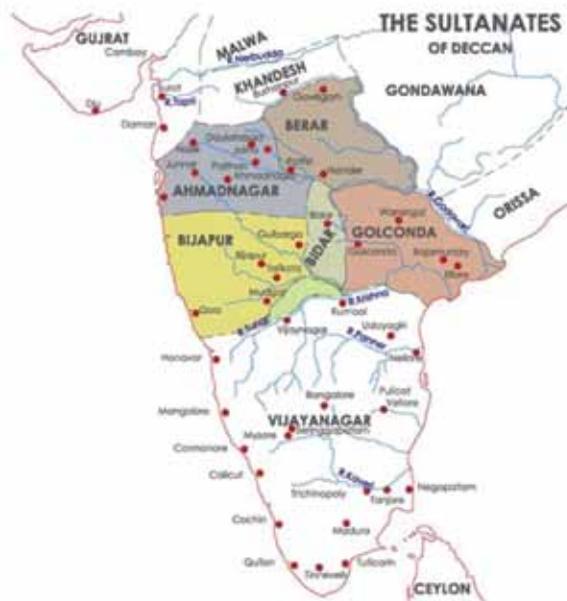


Figure 1: Map of the Sultanates of Deccan

Qanat System

Barid Shahi rulers made an elaborate arrangement of pure and wholesome water for the people of Bidar and its suburbs. The water works, bearing ample testimony to the sophistication of the engineers of that period, are the most fascination aspect of Bidar. The main sources of water were reservoirs, lakes, tanks, ponds and wells (Cousens, 1926).

A Qanat (Karez) is a water management system used to provide a reliable supply of water for human settlement and irrigation in arid and semi-arid

climates. The Qanat technology is known to have been developed by Iranians in the early first millennium BCE and to have spread towards west and eastward. The value of a qanat is directly related to the quality, volume and regularity of the water flow. Qanats are constructed as a series of well-like vertical shafts, connected by gently sloping tunnels. Qanats tap into subterranean water in a manner that efficiently delivers large quantities of water to the surface without need for pumping. The water drains by gravity, with the destination lower than the source, which is typically an upland aquifer. Qanats allow water to be transported over long distances in hot dry climates without loss of much of the water to evaporation.

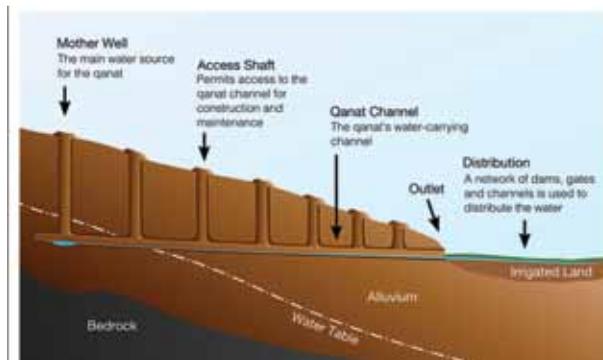


Figure 2: Cross-section of a Qanat

It is very common in the construction of a Qanat for the water source to be found below ground at the foot of a range of foothills of mountains, where the water table is closest to the surface. From this point, the slope of the Qanat is maintained closer to level than the surface above, until the water finally flows out of the Qanat above ground. To reach an aquifer, Qanats must often extend for long distances (Figure 2). Qanats are sometimes split into an underground distribution network of smaller canals called Karez. Like Qanats, these smaller canals were below ground to avoid contamination. In some cases water from a Qanat is stored in a reservoir, typically with night flow stored for daytime use. The Qanat system has the advantage of being resistant to natural disasters such as earthquakes and floods,

and to deliberate destruction in war. Furthermore, it is almost insensitive to the levels of precipitation, delivering a flow with only gradual variations from wet to dry years (Zargar, 2007).

Remarks

Qanat system in Bidar is used to tap underground water. However, these are rarely in use these days. The Qanat system in Bidar with 21 vertical shafts is said to extend for about kilometres (Karnataka State Gazetteer, 1983), of which a few have been closed by city builders and developers, leaving 15 vertical shafts visible today (Figure 3). The vertical shafts are used by the present farmers and neighbouring settlers.

These 15 vertical shafts are dug at regular intervals towards northeast to southwest for about 6 kms from Naubad village (outlet of the qanat system) to Kolar village (where the 15th vertical shafts is visible). All these 15 vertical shafts and outlet of the qanat system have been dug in the laterite formation, which signifies the builders understanding about the geological formation and their engineering aspects (Figure 4 to 18).

Around 1.5 kms east from outlet of the qanat system at Naubad village, there is remnants of Deccan sultanate structure identified as Bagh-e-Hamam (Figure 19). The preliminary investigation at Bagh-e-Hamam appears to be a water structure. The structure has three platform levels approximately 2 m in depth. In orientation, the north-eastern side indicate as an outlet to the structure, which has reveal horizontal and vertical terracotta pipes. The horizontal pipe channelizes the water outward whereas vertical pipe control the flow of the water towards the Hamam. The north-western side has revealed outer edge of the structure along with the stone pillars and rooms whereas south-eastern and south-western side of the structure is intact. The south-western side has revealed seven arches and there are steps behind the arches, which indicate that the arches have storeyed structure? On the southern side there presume to be huge structure related to the water body, which require further investigation in this regard.



Figure 3: Location of Qanats at Bidar



Figure 4: Qanat Outlet



Figure 5: Qanat 1



Figure 6: Qanat 2



Figure 7: Qanat 3



Figure 8: Qanat 4



Figure 9: Qanat 5



Figure 10: Qanat 6



Figure 11: Qanat 7



Figure 12: Qanat 8



Figure 13: Qanat 9



Figure 14: Qanat 10



Figure 15: Qanat 11



Figure 16: Qanat 12



Figure 17: Qanat 13



Figure 18: Qanat 14



Figure 19: Bagh-e Haman at Naubad vilage

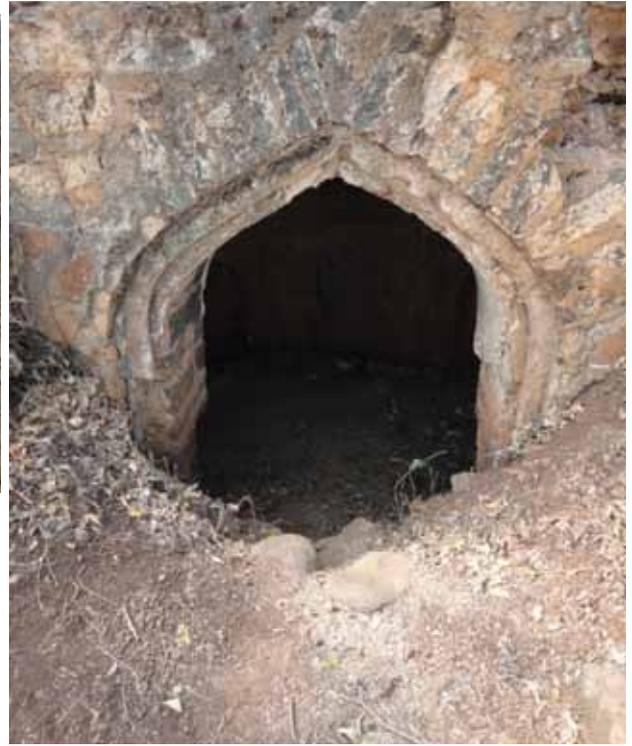


Figure 19: Bagh-e Haman at Naubad vilage

Based on the preliminary investigation at Bidar Qanat system, it is learned that creativity for coping up with diverse circumstances of water engineering and it can be promoted by the great challenges and limited resources. A rich water culture is prerequisite for efficient and sustainable management of limited water resources in arid and semi-arid regions.

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