Urban Water System Under Adilshahis of Bijapur

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ABSTRACT

The Adil Shahi rulers made an elaborate arrangement of pure and wholesome water for the people of Bijapur and its suburbs. The water works, bearing ample testimony to the sophistication of the engineers of that period, are the most fascinating aspect of Bijapur. The main sources of water were reservoirs, lakes, tanks, ponds and wells. The tanks during the Adil Shahi period can be classified as those which supplied drinking water to Bijapur, its suburbs, and tanks meant for irrigation, and for maintaining water works. The city of Bijapur is located in the dry Deccan region of India, yet ensured 24x7 water supply to its citizens be it for agricultural or domestic use during the 14th to 18th centuries under the Bahmani and Adil-Shahi Dynasty.

Two unique urban water systems, the Kharejari and Muhammed Nada, accompanied by several cisterns made it possible to populate and develop a city in the semi-arid region of India. Watershed management techniques were applied to ensure the sustainability of these water systems. Though in ruins, it provides water for irrigation and domestic use even today. Extensive ground surveys were carried out to record every segment using a mobile-based mapping application and handheld navigation device. Satellite data, topographical maps, historic maps and literature reviews aided in linking up all segments to prepare the first complete map of the Kharejari and Muhammed Nada water systems. Bijapur, a

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heritage city of Karnataka State, has undergone unplanned organic urban growth coupled with a lack of awareness, understanding, conservation practices, and appropriate implementation of existing policies, which have resulted in an unsustainable geophysical alteration of the fragile hydraulic landscape affecting these unique water systems. This paper discusses the intricate details of the historic water systems of Bijapur and discusses the challenges in conserving them as national heritage.

KEYWORDS: *Irrigation, Accompanied, Conservation, Navigation.*

Introduction:

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.

Providing clean drinking water is one of the primary and priority functions of a city administration. One such attempt was done about 530 years ago at Bijapur city by the Adil Shahi kings (1490-1686) through three means: the Kharejari or Surang-Bhawi (tunnel-well in Kannada) (Nazim, 1836), Ganj Pipeline network (network of water towers and terracotta pipelines) and Public Bawdis (Cisterns). The spatial arrangement was such that the rich and the poor had easy access to potable water. The defence perspective was probably overlooked considering the availability of water while selecting the site for Bijapur city; this was totally against the convention of Medieval period dynasties in India (Sohoni P., 2017). The city sits in a sink with a highly dissected and undulating topography of the Deccan Plateau. The plateau soils are shallow along the slopes and uplands while the valleys with thicker layers are extensively cultivated. Below the fine clayey soil on the surface is the weathered

basaltic layer (vesicular basalt) and further below the harder Deccan Trap as bedrock. The vesicular basalt layer forms a fairly good aquifer. Tree crops like tamarind and mangoes dominated the landscape along the slopes and valleys, which are now giving way to unprecedented unplanned urbanization. The surface streams are non-perennial in nature and drought is becoming a common phenomenon annually. Most villages are located along with surface water sources and open wells are the direct source of groundwater during challenging times. The vesicular basaltic aquifer is supported by several recharging structures referred to as Talabs and Sarovars (reservoirs). Surface and groundwater resources were developed in an ingenious way providing 24x7 potable water to its citizens. All the three urban water supply schemes developed served not just the fort city but the immediate surroundings as well. The Kharejari is the local name for Karez or Qanat water systems in Bijapur, but the system is much more complex than seen anywhere else. Muhammed Nada is a unique network of Ganj (water towers) and terracotta pipelines from Begam Talab and Bawdis are the large cisterns that dot the city area.

Historical Background of the Urban Water System of Bijapur:

The water-related infrastructure is inseparable from the cultural identity of Bijapur. This is indelibly linked to the emotional, social, political and cultural pride of the ruler and the people. Elaborate hydro infrastructure construction was taken up by appointing Persian engineers under the supervision of royal court Amirs (nobles) (Mate, 1998). There are folklore and stories associated with such projects which make them immortal forever though not physically. One such folk story is depicted in the painting on the walls of Torwi Lakshmi Temple describes Ibrahim Adil Shah II as a hermit who having convinced the goddess Ganga to bless his kingdom. The goddess obliges under one condition that Ibrahim will show the way and won't look back at Ganga. The doubtful Shah looked back and Ganga disappeared saying you can dig to find me. The place of arrival of Ganga is considered to be the place where the headworks of Kharejari starts. This story depicts cultural harmony, the integration of local beliefs and faiths by rulers. Thus, ensuring cooperation and allegiance to the kingdom. Being a drought-prone region, the significance of water supply need not be emphasized hence the water

provider becomes supreme. Bijapur is dotted with a variety of water structures. Some are ingenious works of that time. The Bijapur's historic urban water system is a combination of Kharejari / Surang-Bhawi (tunnel-well in Kannada) (Govindankutty, 2016), terracotta / earthen pipeline network, Ganj (water towers), manmade reservoirs (using mud/stone embankments) and Bawdis (Cisterns). This multi-source water management system was undertaken and completed during the reign of the Bahmani and Adil Shahi kings (Mate, 1998). It also showcases the deep understanding of engineers on rainfall patterns, local terrain, geology, slope and aquifer properties. The spatial arrangement of urban water supply systems is a reflection of good planning and management of city services. These urban water systems also contributed to watering royal gardens and irrigating agricultural lands. A fourth system, which could not be completely traced starts from the Chalukya period reservoir called Ramling Talab (Nazim, 1836). A network of Ganj-pipeline runs from here towards the city but only a few are existing today. The medieval cities in Deccan, namely Bidar, Aurangabad, Ahmednagar, Hukeri and Burhanpur (Govindankutty, 2018) have remnants of such water systems, some functioning, others in ruins. People have moved on with new technologies aiding in reaching deeper into Earth to harness groundwater and fill their overhead tanks at the click of a button. The ever-expanding urban area, especially when it is organic and unplanned is not mindful of such heritage structures even for the sake of learning or as a live water museum showcasing the ingenious constructions of the period. The earliest work on such a great water system was initiated at Bidar during the early 15th Century (Govindankutty, 2013), which is simple groundwater drawing Karez system similar to those in Iran but the systems at Bijapur is a much-improved version with additional use of surface water and complex controlling mechanisms. Similarly, the Ganj-Pipeline network is also unique to Bijapur.

Importance of the Study:

It is interesting to note that the community of Bijapur city may have enjoyed an unhindered good drinking water supply through the summer months. Though not a household level system but everyone in the community had access to public water fountains or cisterns. The palaces of kings, nobles, rich merchants and other

important citizens had household level pipeline water connections. The physical setting of Bijapur city is at a lower elevation than the surroundings. Thus, gravity and natural slope ensured the flow of water to the citadel. Bijapur is a city with a large number of palaces and gardens, spread over undulating topography. Their spatial distribution, increasing urban population and higher water demand resulted in the development of small decentralized to the large public water system to suffice the needs. The best example of a small decentralized system is at Afsal Khan palace, while two large public systems are the Kharejari and Ganj-Pipeline network from Begam Talab. The cisterns are an example of a small community-level water system, of which some of them are connected with Kharejari or the Ganj Pipeline network. These were huge labour-intensive projects sanctioned by the rulers, supervised by nobles and some even appointed expert Persian engineers. The Kharejari was part of an expansion scheme of Bijapur to Navraspura and tap the floodwaters of Torwi stream.

Objective of the Study:

- To study the Historical background of water system of Adilshahi periods. To study the urban water system of Adilshahis of Bijapur.

Research Methodology:

This study is based on secondary sources of data such as articles, books, journals, research papers, websites and other sources.

Discussion on Difference Pattern Water System in Bijapur Adilshahis:

Kharejari Unique Water System: The Bijapur Kharejari utilizes both groundwater and surface water. The Kharejari system includes manmade reservoirs using mud/stone embankments, terracotta pipelines, shallow aqueducts (with lime mortar stone masonry work), and a deeper gallery tunnelled through the compact basaltic geology. To understand the Bijapur Kharejari, it needs to be split into smaller sections which have been detailed in the next few sections. The Torwi headworks is the catchment of Kharejari which includes elaborate arrangements to harvest surface water. The waters from Torwi headworks are carried by terracotta pipeline to Surang Bawdi (Well) and further through the shallow and deep tunnel to the

city. A branch tunnel also joins the main system from Ibrahim Talab enhancing the supply of water.

The Torwi Headworks: The source of Bijapur Kharejari is at Torwi / Torwah about 6 km west of the city. Elaborate catchment arrangements based on the principles of watershed management has been made to tap both surface and Groundwater. The catchment headworks include a series of embankments along streams, and Bawdis. The streamflow and surface run-off are diverted to embankments creating small to big reservoirs. An embankment was built across the Torwi stream forming a small reservoir, ensuring infiltration of water and recharging of the groundwater table. This ensured water level in Mother well located alongside remained above the Karez gallery. It reflects that the Karez engineers had a very good understanding of seasonal water fluctuations and addressed it using a simple solution. This is the starting point of Bijapur Kharejari.

The Torwi Terracotta Pipes: The Torwi pipeline is one of the lengthiest terracotta pipelines laid to carry water in India during the medieval period. The pipeline stretches for 3.45kms from Jami Masjid premises to Surang Bawdi. At appropriate intervals, pressure valves with a desilting mechanism have been created to ensure the smooth flow of water. It is interesting to note that the Torwi pipelines were constructed to circum-navigate the terrain undulations between Torwi Sarovar and Surang Bawdi. The pipelines from Jami Masjid run 2.3km towards North-East direction and make a right angle turn towards South-East direction, proceeds another 1 km to join other pipelines from Sat Khabar bawdi and Afsal Khan Sarovar about 100m south of Surang Bawdi (Cousens, 1889; Mate, 1998).

The Embankment and Reservoirs: Near Surang Bawdi there are three major embankments creating reservoirs namely, Mohammed Sarovar, Afsal Khan Sarovar and Ibrahim Sarovar. All three are on the tributary of the Torwi stream. Muhammed Sarovar with an approx. capacity of 518560m3 is located to North West of Surang Bawdi, the reservoir spreads towards the South with an area of 8.64 hectares. The reservoirs have two purposes, recharging the aquifer and diverting water through pipelines to Kharejari and augmenting the water supply to the city. The area of the reservoir cannot be identified as encroachments that have resulted in land-

use changes, hence an estimated area based on a mobile mapping application survey has been used for calculating the volume of water. Urbanization is also fast approaching these sites. Ibrahim Sarovar embankment stands as an example of this, urban structures have already come upon it. It also showcases a lack of respect for heritage structures as well as poor planning and implementation of existing policies for conservation. Thus, encouraging unplanned organic urban development.

The Ibrahim Talab to Sat Khabar Bawdi – Kharejari Branch Section: The Ibrahim Sarovar is connected via a tunnel to Sat Khabar Bawdi. The tunnel is similar to the Torwi tunnel, shallow and lined using stone and lime mortar. The tunnel passes under the Afsal Khan Sarovar and empties into Sat Khabar bawdi. The tunnel is in a dilapidated condition with many sections collapsed. Few of the air vents are still visible, but land conversion from agriculture to urban has resulted in the filling up of collapsed sections and air vents. At the northern end of the Afsal Khan Sarovar embankment, a Bawdi has been constructed in the Sat Khabar Complex (60 tombs), pipelines from this Bawdi leads to Surang Bawdi. All the pipelines from Towri, Sat Khabar Bawdi and Afsal Khan Sarovar meet 150m southwest of Surang Bawdi.

The Surang Bawdi: Surang Bawdi is the culmination point of all the pipelines. It's a near square well, on the southwest side pipelines from Sat Khabar Bawdi, Afsal Khan Sarovar and Torwi can be seen, while on the north-west side the tunnel towards the city starts. The Bawdi is 12m sq. with a depth of 20ft. The base of the tunnel is at 14ft. The Bawdi was completed filled with debris as part of the land recovery process to convert it into non-agricultural land use. Intervention by the Archaeological Survey of India and local heritage activists lead to its excavation. But the work was abandoned in between and is now lying-in dilapidated condition.

The Surang-Bawdi to Sainik School Kharejari Section: The Tunnels runs in a northeasterly direction for about a few meters and swing south-easterly towards the present-day Sainik school campus. The tunnel is 12ft wide and 7ft high, it's lined with stone and lime mortar. Approximately 3ft space along the length of the tunnel from its foundation has been left unlined to allow the flow

of subsurface water into the tunnel. The basalt layers of the Deccan Trap have been cut and tunnelled, the depth varies from 60 to 90ft. Most of the air vents in this section have been closed but few are still visible over the surface. Air vents had a dome-shaped masonry structure made of basalt stone and lime mortar to protect the water from any kind of pollution. The urban development and land-use change have negatively impacted the air vents, most have been destroyed and those remaining are in dilapidated condition.

The Sainik School to Mecca Gate – Kharejari Rock Cut Tunnel: This is the first supply point of Kharejari. Further the tunnel proceeds toward Ibrahim Roza, the tunnel is 2 to 3ft wide, the width varies due to the rough cutting of basalt stone. The air vents can be detected up to Ibrahim Roza and thereafter the direction of the tunnel cannot be traced from the surface. The Kharejari formed a unique water supply system of Bijapur during the 16th to 18th century AD. These are unique water systems when compared to Persian Qanats, which operate purely on groundwater or subsurface snowmelt water, with most of them running through near desertic conditions. While the Bijapur karez is one of the best examples of watershed management practices. The water system got abandoned with the arrival of modern technology to extract water, as well as the rapid unplanned organic growth of the city.

Conclusion:

The Adil Shahi rulers made an elaborate arrangement of pure and wholesome water for the people of Bijapur and its suburbs. The water works, bearing ample testimony to the sophistication of the engineers of that period, are the most fascinating aspect of Bijapur. The main sources of water were reservoirs, lakes, tanks, ponds and wells. The tanks during the Adil Shahi period can be classified as those, which supplied drinking water to Bijapur, its suburbs and tanks meant for irrigation, and for maintaining water works. When it comes to historic urban water systems the most prominent ones are the overground Roman aqueducts be at Rome or Port du Gard in France and the Persian Qanat systems serving cities like Yazd or Esfahan have been provisioned for many other purposes as well, like running floor mill, windcatchers (Badgir) or cooling towers etc. Similarly, the Indian Karez systems have their uniqueness, like the

use of multiple sources, pipelines, pressure controlling mechanisms and the indigenous 'Mohammed Nada' water system. These increase the value and character of Bijapur's urban heritage.

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