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Research Article

STUDY OF ANCIENT WATER STORAGE SYSTEM ON FORTS IN KRISHNAGIRI DISTRICT OF TAMILNADU

Alaguraj M* and S.Lalitha

Department of Civil Engineering, Er. Perumal Manimekalai College of Engineering, Hosur

A R T I C L E I N F O

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A B S T R A C T

India has a rich heritage of water conservation. Wells and *Kunda*in Rajasthan, *Bandharas* and lakes in Maharashtra, *Bandhis* in M.P, *Kuhal* in Himachal, *Eiris*in Tamilnadu, and the most spectacular, *Aahar* and *Piain* in Bihar…..all this add to the techniques of ancient time which were used for irrigation and water supply. Many of them are in working today also, with full proficiency. These traditional systems are the gift of the knowledge, ambience and society of a particular location. These systems are not only supplying water but also holding perfect balance between environment and human beings. All these systems works on the principle of experience, which is their power and essence of fruitfulness!

An interesting feature of the peninsular plateau is the large number of isolated granito-gneissic rocks which were in former days used as hill fortresses. How in this zone, rather precarious climatically, could a garrison of several hundred men live at the top of these rock outcrops throughout the year, without sufficient supply of drinking water? This phenomenon has been examined.

Keeping above points in mind, a study of water storage system on the forts in Krishnagiri district of Tamil Nadu State was carried out. To explore the facts and their technical details one exploration campaign was arranged, during which, a large number of remains pertaining to the water supply schemes were studied. These includes open channels, remains of small bunds, water tanks, wells, number of small and big cisterns and reservoirs, and remains of artificial lakes at different contours, etc. Various details were observed regarding the water storage system and distribution of the same. The details include collection system, conservation system and distribution system regarding the water supply.

INTRODUCTION

Water being the most essential element, has important place in human life and thus its resource and management have been major concerns of the human societies from ancient times. The Krishnagiri district has prehistoric importance of habitats of mankind during Paleolithic, Neolithic and Mesolithic ages. Various rock paintings and rock carvings of Indus valley civilization and iron ages seen in this district support the historical significance of this district. Krishnagiri was once ruled by Adhiyaman and hence also known as 'Adhiyaman Nadu'. This region was ruled by Pallavas, Gangas, Nulambas, Cholas, Hoysalas, Vijaya Nagar Emperors, Bijapur Sultans, Wadayars of Mysore and Nayakas of Madurai. This region of Krishnagiri served as gateway of Tamilnadu and the protective barriers for southern region defending on slaughts from barriers with motives of imperialism and exploitation. Twelve forts in this region were popularly known as 'Bara Mahal' forts.

Corresponding author:* **Alaguraj M
Department of Civil Engineering, Er. Perumal Manimekalai College of Engineering, Hosur

These forts have brone the funs of many affects by Mysore and Andhra rulers.

These forts served their kings loyally and nobly with their strong arms and coats, at the same time, they conserved springs of sweet water at their heart! These springs gave essence of life for those who battled hard for their state and kingdom. Not only life, but also a touch of heal for their lives and soul when the great worriers lost their lives for the Motherland and Culture!

When you climb these hill slopes, you are surprised to find springs, in all seasons and at different places, even at the top, and also natural cavities, which occur on the upper surface of rocks with gentle inclination, or in cavernous forms below the boulders, all usually full of water from Novemberto March. In some places you see that water is collected in excavations made in the form of reservoirs with flights of steps.

After a preliminary survey of the forts in Krishnagiri district Krishnagiri Fort, Rayakottai Fort and Rathnagiri Fort were selected for the study. The presented paper is an attempt to explore these springs and water bodies along with their technical facts. Our culture, tradition and a rich heritage teach

us lot many new techniques of water conservation and harvesting of rainwater.

Objective

Studying the topic of water storage system on forts is a nice experience though living in the 21st century. The challenges laid down by the new era are much difficult. At the same time our heritage and tradition possess right power to face these challenges and to overcome the same. It is said that without firm foundation, one can't even walk. In the same way, neglecting our tradition and heritage, would certainly demoralize our efforts of water conservation in the modern world. When one comes across the sincere and smart efforts done by our forefathers, for the storage and distribution of water, admiringly bows down his head at feet of this supreme intelligence. The hidden potential within these systems is to be explored.

Water Supply on Forts

Every fort was an independent town. It was a place where all the needed things were kept ready. Large amount of grocery, armors, goods of day-to-day wants etc. were kept handy. The reason behind doing all was that at any time enemy can have a cruel attack. At and on attack, the fort in charge used to close all the gates and means of communications. On this front, the fort is a small town surrounded by the enemy. So the inside storage of food, water arms etc. has to be sufficient for the peoples fighting and living for and on the same. For this purpose, they need to have good storage of drinking water also. Water (with good quality and quantity) being the basic need, and has to be fulfilled at any cost. The storage should be sufficient at emergency. (It is known that forts were battled for the period of 8 to 10 months also. So it is obvious that, a good storage is essential). It is true that it is impossible to carry water from bottom of a peak to top by man power or any mechanism. Hence the total demand water must be fulfilled on the fort itself.

The means used for satisfying the total water demand were underground water tanks, reservoirs, cisterns, and some artificial lakes. Generally it is found that the stone quarries for the construction of the fort were converted in to the lake. Here, after the stone demand being fulfilled for the construction of the fort and walls, the excavated ground portion was blasted at greater depth. The blasting is so arranged that it would generate crakes which will allow the flow of water. By providing sufficient amounts of underground cracks and channels it was possible to bring groundwater in the lake. Another resource was the storage of rainwater which is available in the rainy season. The arrangement of the cisterns is done in such a way that the surface runoff would automatically be diverted to the cistern and it will recharge the same. But this technique is useful where good rainfall is assured and constructions of such cisterns are economical.

Geological Aspects

Movement of ground water takes place under gravity through rocks which have textures and structures favorable for its movement. Rocks in which water can flow easily are called pervious rocks. These are porous sediments with large pores such as sandstone and conglomerates and nonporous igneous and metamorphic rocks with open interconnected joints along which water can easily flow. Rocks through which water cannot easily flow are called impervious. These are nonporous rocks which are massive i.e. free from joints or jointed nonporous rocks in which joints are not open and interconnected and also fine grained porous rocks like shale which are impervious because their pores are too small to allow free movement of water through it. For making a rock pervious, the mere presence of openings is not enough. Their size and arrangement must be such that continuous through channels are available for the passage of water. The condition most suitable for the storage of ground water is the occurrence of a pervious layer enclosed between two impervious layers, one above and one below. By the folding and faulting of such a set of beds various structures are produced in which water is kept confined in the pervious layer by impervious layers. The commonest of such structures and the most suitable for the formation of a groundwater reservoir is a syncline.

Groundwater often finds a natural outlet under favorable structural conditions and flows out from the ground. If water flows out at a single point it is called as spring, and called as seepage if there is a general oozing out of water along a line. The commonest of the springs are the contact springs, which issue where the contact of a pervious water bearing layer with an underlying impervious layer is intercepted by a slope. Water percolating in the pervious rock cannot sink further when it meets the impervious rock below, and flows under gravity along the watertight top of the impervious layer until it issues at the surface a contact spring. In the Deccan Trap are contact springs issue on hillsides where laterite or compact jointed basalt is underlain by amygdaloidal basalt. As the streams in the Deccan Trap area are rejuvenated they flow in rocky channels with alluvial terraces at higher levels. Water seeping in to the alluvial flows over the basalt, and appears as a contact spring where the contact between alluvium and basalt is intercepted by the valley slope. The fair weather flow of perennial streams is provided largely by such contact springs. Springs also issue at the contact of weathered sheet jointed basalt with the underlying fresh amygdaloidal basalt.

Technical Aspects

Fort of Krishnagiri

Krishnagiri fort is one of the strongest forts in Krishnagiri district and is now one of the monuments protected by Archaeological Survey of India. The fort was built by king Krishnadevaraya of the Vijayanagar Empire. For this reason, the town and the fort got the name Krishnagiri (''Krishna'' from the kings name ''giri'' meaning hill). It witnessed many battles. There is a flight steps leading from the foothills to the top of the mountain. There is also a dargah on top of hills and cave. The view from the top is one of the finest in the region. Among the standing buildings and architectural debris of the hill, four rainwater collection tanks are let into the solid rock of the hill itself. The tanks are essentially natural features, but masonry and rubble barricades have been added to increase their storage capacity. The tanks are located on the northern side of the hill. The tanks edged with brick walls and provided with staircases.

In functional terms, the catchment tanks located on the hills are insufficient. Water losses by evaporation from shallow, open basins are severe.

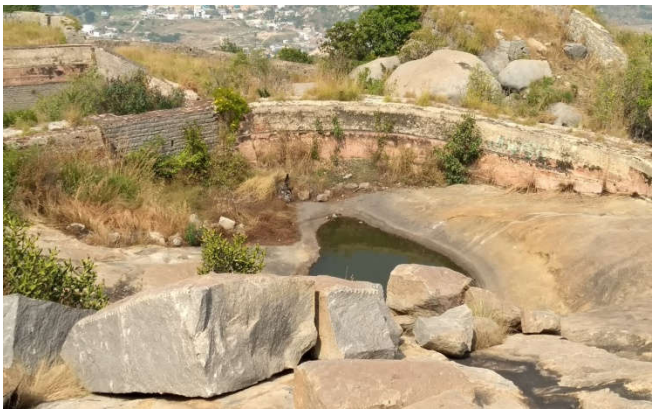

Fig 1 Rainwater Harvesting Tank 1

Fig 2 Rainwater Harvesting Tank 1

Fig 3 Stone Barricades

Rayakottai Fort

The fort is situated within the town of Rayakottai which is one of the ancient fortress in the Krishnagiri district.it is now one of the protected monument by the Archaeological Survey of India.in the 18th century Hyder Ali and Tipu Sultan ruled this fort. Rayakottai Fort was one of the important outposts used by Tipu Sultan's forces on their military campaigns. The fort is 31kms from Krishnagiri.The fort was built on a granite rock and consisted of two forts connected by a rampart: one at the foot of the rock and the other on top of the rock. The entrance wall has a classic look and the view is magnificent.

Fig 4 Rainwater Collection Tank

Rathnagiri Fort

Ratnagiri is one of the ancient and historical Capital City of Kingdom "Sri Penukonda Jagadevaray" who ruled this area in the 15th Century. According to the British writers in the Book of "Madras Gazetteer", Ratnagiri was second capital city of Vijayanagara Empires. The king Penukonda Jagadeva Raya who married the daughter of Sri Rangadeva Raya of Vijayanagar Empier was ruled this Rathnagiri. This king was ruled the places currently named Krishnagiri, Dharmapuri, Denkanikotta are now in Tamil Nadu and Kanakapura, till Chennapattna in Karnataka. Vijayanagar near Humpy in Karnataka is the First Capital of Vijayanagar Kindom is in the Banks of Thungabadra, this Ratnagiri second capital is in the Banks of Sanath Kumari river. Ratnagiri is in the height of 2805fts to sea level, hence the climate was excellent with cool breeze of thick forest. The Hill Fort, Caves, Sculptors and Sri Ramar Temple were shows the past history of Ratnagiri Hills.

Fig 5 The Tank Edged With Brick Wall

CONCLUSION

The fact that many such systems are still in use speaks volumes about the care the rulers had taken in proper and continuous maintenance of the systems, their farsightedness to make them useful for centuries. An extensive network of cisterns, rainwater collection tank, natural reservoirs edged with brick masonry walls built in the entire hill and the lessons learnt by them will continue to inspire the generations to come. Water is a great power of development. If we want equal, society oriented and sensible development, we have to

recharge these traditional systems and must strengthen the same.

Some of the important points can be summed up as follows:

Rainwater harvesting: It as felt that, rainwater harvesting is the Mantra for the new millennium. There is no pollution, no transportation cost, less storage cast etc. has made this technique essential one. Rainwater harvesting provides an independent water supply during regional water restrictions, and in developed countries, is often used to supplement the main supply. It provides water when a drought occurs, can help mitigate flooding of low-lying areas, and reduces demand on wells which may enable groundwater levels to be sustained. It also helps in the availability of potable water, as rainwater is substantially free of salinity and other salts. Application of rainwater harvesting in urban water system provides a substantial benefit for both water supply and wastewater subsystems by reducing the need for clean water in water distribution system, less generated storm water in sewer system,[2] and a reduction in storm water runoff polluting freshwater bodies.

Water reuse: Water shortage has become an increasingly difficult problem to manage. More than 40% of the world's populations live in a region where the demand for water exceeds its supply. The imbalance between supply and demand, along with persisting issues such as climate change and exponential population growth, has made water reuse a necessary method for conserving water.

Importance of Water conservation: Fresh, clean water is a limited resource. While most of the planet is covered in water, it is salt water that can only be consumed by humans and other species after undergoing desalination, which is an expensive process. Occurrences such as droughts further limit access to clean and fresh water, meaning people need to take steps to reduce water use and save as much water as possible. In some areas of the world, access to water is limited due to contamination. People who have access to fresh water can take steps to limit their use of water to avoid waste.

Educational resources for water conservation: Teachers who wish to teach students about the importance of water conservation can find plenty of lesson plans and activities online. The lessons teach students the importance of saving water and provide tips for saving water at home or school.

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