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A Brief History of Water Conservation and Management System of Harappan Civilization: Challenges of the Water conservation and Water Management System of Harappa Civilization

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ABSTRACT

This article examines the evolution of water conservation and management practices in early human civilization with special reference to the Harappan Civilization. From the earliest times, water has been central to human survival, settlement, and sustainable development, particularly in river valley regions. The Harappans developed highly advanced and scientific systems of water management, as evidenced by archaeological findings from sites such as Mohenjo-Daro and Harappa. These included wells, reservoirs, rainwater harvesting techniques, canals, and sophisticated drainage systems, reflecting a strong understanding of environmental balance, sanitation, and efficient resource utilization. The study also highlights the adverse effects of water pollution on human health and ecosystems, emphasizing its role as a major barrier to sustainable development. Furthermore, it analyzes the challenges faced by the Harappan water management system, including climate change, irregular monsoon patterns, deforestation, floods, salinity, and population pressure, as discussed by scholars like Mortimer Wheeler and Upinder Singh. These factors ultimately contributed to the decline of the civilization. The Harappan experience provides important lessons for modern India, underscoring the need for sustainable water management, environmental conservation, and long-term planning to address contemporary water crises.

Introduction:

From the outset of the civilization human being was very conscious regarding the bad effects of the contaminated water bodies and so that they tried to follow a scientific water management and protection policy and the sustainable use of water body. Water Management and water preservation system have been maintained thousands of years, along with continuous development and emergence of new techniques over time. Due to the lack of drinking water, people have to drink contaminated water and it has an adverse affects in the lives of them, even local ecosystem becomes badly affected. The water pollution is one of the main obstacles of the sustainable development of concern zone. Water pollution affects not only the human life but also the aquatic fauna and the flora of the concern environment area. As a result of drinking contaminated water, many types of diseases spread around the region. Like other countries our country India had an ancient tradition of water management system from the earliest time. The Harappa civilization, which flourished around 4000-1500 BCE in the Indus Valley region, was renowned for its sophisticated water conservation and management systems.

From the dawn of the civilization there has been a deep relation between the human existence and the water body. The natural resources of the drinking water and irrigation water played an important role to the stable and sustainable development in the initial stage of human civilization. Indeed, it is seen that all the great ancient civilization arose in the river valley zone. In the very initial stage of the rising of the human civilization natural water bodies supplied water for all kind of daily necessities such as drinking, irrigation water. But after the extension of the human settlement into the far zone from the natural resources of the water body, they compelled to search new kind of water bodies. Perhaps, due to urbanization, to cope up with population growth and outbreak of disease, the civil society and the ruling class had to take initiative to adopt a specific plan of water conservation and sustainable water distribution management action. Hydrologic knowledge in India has a historical footprint extending over several millenniums through the Harappa civilization and through the Vedic Period this knowledge went to outside of India.

Water Conservation Methods and Management System in Harappa Civilization:

The Harappa civilization, which flourished around 4000-1500 BCE in the Indus Valley region, was renowned for its sophisticated water conservation and management systems. Archaeologists have discovered a lot of archaeological sources from the several archeological sides of the Harappa civilization regarding the existence of the hydrological knowledge and the water conservation system of the people of the Harappa civilization. Harappans followed a scientific sustainable water management and water

conservation system. Actually Harappa civilization is well known for its advanced water management system developed an efficient water supply and drainage system. Archeologist founded a large number of constructed well, tank, bathroom, drainages and burn earthen drain pipes, burnt clay pitchers and big earthen jugs from the different archaeological sides of the Indus valley civilization. The ruins of the Great Birth discovered in Mohenjodaro bear witness to the advanced water management and water conservation system and the development of technical knowledge of construction the water reservoirs. In this regard, great archaeologist Sir Marc Aurel Stein opined that the Harappans had developed a unique system of urban planning, which incorporated advanced water management techniques to support their cities. The water management systems the Harappans were closely tried to their urban planning, with cities designed to optimize water collection, storage and distribution

(a) Main Water Resources of Harappa Civilization:

The main water resources of the Harappan civilization were natural water bodies such as rivers, rain water and the ground water. The most of the urban settlements of Harappan Civilization located along side the bank of rivers. Maehjodaro and Chanhudaro were situated along the bank of Indus, Harapa situated on the bank of Ravi, Ruper situated along the bank of Satlaj, Kalibangan situated along the bank of Ghaggar, Lothal situated along the bank of Bhogava, Banwali situated along the bank of Saraswati. The Harappans built a network of canals, dams, and reservoirs to supply water to their cities and agricultural fields. These water resources played a crucial role in supporting the growth and development of the Harappa civilization. The water conservation system of Harappa demonstrates a profound understanding of the environment and the need for sustainable water management practices. By harmonizing their water usage with the natural cycles and adopting innovative techniques, the civilization minimized its ecological footprint and ensured the sustainability of its urban centers. This environmental awareness and commitment to sustainability are particularly remarkable given the era in which they lived.

(b)Water Conservation and Management System:

The water conservation and management systems the Harappa civilization was truly remarkable, considering the technological limitations of their time. Their innovative approaches to water management enabled them to thrive in the Indus Valley region, which was prone to floods and droughts. Harappans demonstrated a remarkable understanding of sustainable water management policies, which allowed them to thrive in a region with limited water resources. The people of Harappa followed the following kind of water conservation methods.

(i) Rain Water Harvesting:

One of the most important water conservation method followed by the people Harappa civilization was Rain Water Harvesting. Rain water harvesting was a important resource of the water of the Harappa civilization. Harappans designed their buildings with sloping roofs to collect and store rainwater in tanks and cisterns. This kind of rain water harvesting system is known as Roof-top rainwater conservation. They also constructed large, sophisticated reservoirs to collect and store rainwater. These reservoirs were often lined with bricks and had a sophisticated system of canals and channels to distribute the water. The people of Harappa also developed innovative water harvesting and storage techniques to cope with the varying seasonal flow of the Indus River. They constructed check dams and embankments to capture rainwater during the monsoon season and stored it in reservoirs for use throughout the year. This not only mitigated the risk of drought but also reduced the impact of floods by regulating the flow of water. Historian Upinder Singh has observed that the Harappans practiced rainwater harvesting, collecting and storing rainwater for non-potable purposes.

(ii) Wells:

Archeological evident dating back to 3000 B.C reveals the presence of a lot of reservoirs like wells to collect monsoon with approximately every third houses having a well.Harappas constructed numerous wells to store and distribute water for various purposes, including domestic use, agriculture, and livestock. Wells were dug deep into the ground to access groundwater sources, providing a reliable supply of water even during dry seasons.Many Harappan cities, such as Mohenjo-Daro and Dholavira, featured elaborate well systems and reservoirs that helped store water for non-agricultural purposes. The Harappans also built step wells, also known as "baolis" or "vavs," which were unique structures that allowed people to access water at different levels. These step wells were often decorated with intricate carvings and sculptures. There discovered the existence of over seven hundred open wall in Mohenjodaro. Almost every house had a private well, and public baths were also common, indicating a high level of water management.

(iii) Tanks and reservoirs: Many ruinous reservoirs have been discovered from the cities of Harappan civilization . Harappas constructed numerous reservoirs to store and distribute water for various purposes, including domestic use, agriculture, and livestock.

(iv) Burnt Earthen Pottery: Excavations at Harappan sites, such as Mohenjo-Daro and Harappa, have uncovered numerous examples of burnt earthenware pottery used as water reservoirs. burnt earthen

pitcher and jar were used to store water, which was collected from rainfall, wells, or other sources.This kind of earthen pots helped conserve water by reducing evaporation and preventing contamination.

(v) cannals: The Harappans built extensive networks of canals, embankments, and sluice gates to divert water for the agricultural purpose.The Harappans developed an extensive network of canals that connected the cities to the surrounding countryside.

(vii) Drainage system: The Harappans built a well-planned drainage system, including covered drains and sewage systems, The cities of the Harappa, such as Mohenjo-Daro and Harappa were meticulously planned with well-laid-out streets, brick-lined drainage channels, and sophisticated sewage systems. These drainage systems were designed to efficiently collect and channel rainwater and wastewater away from residential areas, ensuring cleanliness and sanitation within the cities. The advanced urban planning and drainage systems reflect the civilization's understanding of the importance of water management in maintaining public health and hygiene.

The drainage system, including covered drains and sewage systems, helped to conserve water and maintain cleanliness. The system included covered drains, manholes, and a network of sewage pipes that ensured efficient waste management.

The water conservation system of Harappan Civilization was integral to its development and longevity as one of the world's earliest urban civilizations. Through sophisticated urban planning, the construction of wells and reservoirs, the development of irrigation networks, and innovative water harvesting techniques, the civilization showcased an advanced understanding of water management. These projects not only supported the civilization's agricultural and urban needs but also reflected a deep respect for the environment.

Challenges of Water conservation and management system of Harappa civilization:

The water conservation and management system of Harappa civilization had to face several challenges which caused the downfall of the water conservation and management system and as well as for the cause of the decline of this civilization. These systems had to face several challenges over time. 21st century India has been facing such king of challenges also.

Some of the historians have emphasized on climate change and the natural imbalances as the causes of decline as well as the causes of the decline of the water management and conservation system of the Harappan civilization. Archaeologists like Mortimer Wheeler, Gregory L.Possehl and A. L. Basham

emphasized on Climate change issue regarding the decline of the Harappan civilization. According to the historians such as G. L. Possehl, changes in the monsoon pattern and rain fall may have destroyed the agrarian based economy and the ecological system of the Harappan civilization. Mortimer Wheeler opined that the climatic changes and shortage of rainfall may have affected the Harappan civilization's agriculture and water supply system. Due to the lack of rainfall the saline content of the soil had gradually increased and land became barren. Desertification tendency of the soil increased and ground water level had downfall. Increase aridity and reduced river flow may have led to the soil degradation which reduced the land fertility and effected the agricultural productivity.

According to A. L. Basham the climate change had significant effects on water scarcity and degradation of Agricultural system of the Harappan civilization. Decreased rainfall and increased evaporation due to aridity may have reduced the water resources and management system, affecting the civilization's ability to sustain its cities. Modern historian and archaeologist Dr. Upinder Singh also opine that a shift in the climate, leading to reduced rainfall and increased aridity may have badly affected the agricultural productivity and the water supply of the Harappan cities.

One of the main reasons for the rainfall's unpredictability was the extreme deforestation and the loss of trees caused by the burning of charcoal in brick-baking kilns. . For about five hundred years Harappans had been cut down trees recklessly to burnt clay bricks and clay pots.Harappans unconsciously destroyed the flora and the fauna of their surrounding area for the development of their urban life. As a result Ecological and Hydrological imbalance occurred in the Harappan civilization and the total system collapsed.

Frequent floods were another important challenge faced by the Harappans. Archaeologist like S. R. Sahani, Sir Arnest Makey, S.R. Rao, Raikes and Dales believe that floods played a important role to destroyed the Harappan civilization. M. R sahani said that flood may have swept the Indus culture. Climatic changes, particularly the weakening of monsoon rains led to devastating floods and droughts that ultimately driven the civilization to collapse. Some researchers also argue that changes in sea levels may have also affected the Harappan civilization. A rise in sea levels could have led to coastal flooding and saltwater intrusion into freshwater sources. Perhaps in this situation the drink water bodies were contaminated.

The Harappan civilization also had to face the challenges of population growth, which put pressure on their water resources and the water management system. The Harappans' sophisticated water

management systems required regular maintenance. But due to the weakness of the civic authority and the mental barrenness of the systems were neglected, and reached to the collapsed.

Conclusion:

The study of water conservation and management in the Harappan Civilization reveals a highly advanced and scientifically organized system that played a crucial role in sustaining one of the earliest urban societies in human history. Through efficient urban planning, the use of wells, reservoirs, canals, and sophisticated drainage systems, the Harappans demonstrated a deep understanding of hydrology, environmental balance, and public health. Archaeological remains from sites such as Mohenjo-Daro and Harappa stand as enduring evidence of their technological innovation and sustainable practices.

However, the eventual decline of this system underscores the vulnerability of even the most advanced civilizations to environmental and human-induced challenges. Climate change, irregular monsoons, deforestation, floods, and increasing population pressure, as highlighted by scholars like Mortimer Wheeler and Upinder Singh, disrupted the ecological balance and weakened the sustainability of the civilization. The neglect of maintenance and administrative inefficiencies further accelerated its collapse.

Thus, the Harappan experience offers a significant lesson for the modern world, especially for 21st-century India; Sustainable water management, ecological awareness, and responsible use of natural resources are essential for long-term survival and development. The history of water conservation and management systems in our glorious Harappan Civilization, along with the challenges it faced, can be regarded as an important warning for 21st-century India.

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