EPRA International Journal of Socio-Economic and Environmental Outlook (SEEO) ISSN: 2348-4101
Volume: 11 | Issue: 5 | May 2024 | SJIF Impact Factor (2024): 8.284 | Journal DOI: 10.36713/epra0314 | Peer-Reviewed Journal

WATER MANAGEMENT PRACTICES IN ANCIENT INDIA

Mrs. Rashmi P. Ranade[1], Dr. Jaydeep D. Nikam[2]
[1]*Academic Co-Ordinator, School of Health Science, Yashwantrao Chavan Maharashtra Open University, Nashik, Maharashtra, India*
[2]*Director, School of Health Science, Yashwantrao Chavan Maharashtra Open University, Nashik, Maharashtra, India*

ABSTRACT
Currently, we rely on a multitude of machines, methodologies, and projections to locate groundwater in relation to both present and future geographical advancements, as well as for rainfall prediction and groundwater identification. The global community is confronted with numerous challenges, including the depletion of natural resources, escalating pollution levels, and the disruption of the delicate equilibrium within the natural world. In India, conferences are being held to address and deliberate upon these global developments. The Rig Veda and Atharva Veda encompass a multitude of suktas that delineate their attributes and medicinal advantages. Historical records indicate meticulous groundwater assessments were conducted to locate water sources. The ancient manuscript Brihat Samhita by VarahaMihir offers significant insights in this regard. This paper evaluates the insights presented in ancient scriptures and deliberates on their relevance in contemporary society.
KEY WORDS: *Environment, Vedas, Brihat Samhita, water,*

INTRODUCTION

Water plays a crucial role in human existence, serving as the foundation for societal and cultural progress, traditions, rituals, and religious beliefs. Approximately 10,000 years ago, humans transitioned to an agrarian lifestyle, leading to the establishment of permanent settlements and the development of various sociocultural societies that heavily relied on water. This evolution fostered a unique bond between humans and water.

The Vedas, Ayurvedic texts such as Charak Samhita, and ancient texts like Brihat Samhita by Varah Mihir and Arthashastra by Kotilya, are replete with numerous references to environmental conservation, ecological equilibrium, weather patterns, rainfall occurrences, hydrological cycles, and related topics, showcasing the profound awareness of our ancient saints and people. The extensive knowledge passed down through generations demonstrates a deep understanding of the detrimental impacts of environmental degradation, whether stemming from natural causes or human actions. It was widely recognized that safeguarding the environment was intricately connected to preserving the heavens and earth.

The paper is structured in accordance with the sequence of processes or technologies. The review delves into the insights provided by evidence from ancient water history, shedding light on the hydrological knowledge developed by Indians over 3000 years ago. This research paper thoroughly examines various aspects of ancient Indian knowledge pertaining to hydrology and water resources. It specifically focuses on hydrological processes, precipitation measurement, water management and technology. These topics are explored through an analysis of Indian scriptures.

AIMS AND OBJECTIVES

1. To ascertain the solution to global environmental changes through ancient texts.
2. Exploring the environmental concerns elucidated in the ancient scriptures.
3. Emphasizing the noteworthy environmental principles derived from the Vedic texts that hold relevance in the contemporary world.

EPRA International Journal of Socio-Economic and Environmental Outlook (SEEO) ISSN: 2348-4101
Volume: 11 | Issue: 5 | May 2024 | SJIF Impact Factor (2024): 8.284 | Journal DOI: 10.36713/epra0314 | Peer-Reviewed Journal

References

***Vedic texts**

(Goswami, 2021) Environmental consciousness as reflected in the vedas

समुद्रज्येष्ठाः सलिलस्य मध्यात्पुनाना यन्त्यनिविशमानाः।
इन्द्रो या वज्री वृषभो रराद ता आपो देवीरिह मामवन्तु ॥1॥
या आपो दिव्या उत वा स्रवन्ति खनित्रिमा उत वा याः स्वयंजाः।
समुद्रार्था याः शुचयः पावकास्ता आपो देवीरिह मामवन्तु ॥2॥

The Ṛigveda discloses that there exist five origins of natural water, namely *Divyaḥ* (rainwater), *Sravanti* (natural streams), *Shanitrimāḥ* (wells and canals), *Svayamjaḥ* (lakes), and *Samudrarthaḥ* (rivers).

शं त आपो हैमवतीः शमु ते सन्तूत्स्याः । शं ते सनिष्यदा आपः शमु ते सन्तु वर्ष्याः ॥ अ.वे.19/2/1 ॥

शं त आपो धन्वन्याः शते सन्त्वनूप्याः । शं ते खनित्रिमा आपः शं याः कुम्भेभिराभृताः ॥ अ.वे.19/2/2 ॥

According to the Atharvaveda, there exist eight distinct classifications of water. These include haimavatī, which refers to river water originating from the Himalayas, utsyāḥ, representing water in the form of waves, *Saniṣyadā*, denoting water that is continuously flowing, *Varṣyā*, which signifies rainwater, *Dhanvanyā*, referring to water found in deserts, *Anupyāḥ*, representing water obtained from holes, *Khanitramā*, which includes water from wells and canals, and finally *Kumbheyiḥ*, which pertains to water stored in vessels.

(https://www.swadeshionline.in/news/vedic-perspective-of-environment, n.d.) Prithvisukta from the Atharvaveda, holds significant importance as a valuable resource derived from the Vedas. The Earth is symbolically represented as encompassing all that grows upon it. It encompasses both the tangible and intangible aspects of nature, highlighting not only the physical forms but also the emotional connection with them. This depiction not only personifies nature but also provides insight into a way of life. Additionally, the *Prithvisukta*, as expressed in Vedic philosophy, enumerates the three spheres of the universe: the solid earth, the intermediary space, and the celestial realm. The Vedic teachings advocate for the practical application of rituals, such as planting trees and nurturing specific plants, as a means of honouring nature. Ultimately, these practices aim to contribute to the collective well-being.

***Charak Samhita**

(Kale, 2021) The precipitation descending from the atmosphere may be uniform in its composition, yet it takes on the characteristics of the terrain upon which it descends. This concept is elucidated in the positional context of the Charaka Samhita.

श्वेते कषायं भवति पाण्डुरे स्यात्तु तिक्तकम् । कपिले क्षारसंसृष्टमूषरे लवणान्वितम् ॥च.सं सू.स्थान 199॥

कटु पर्वतविस्तारे मधुरं कृष्णमृत्तिके । एतत् षाड्गुण्यमाख्यातं महीस्थस्य जलस्य हि ॥ तथाऽव्यक्तरसं विद्यादैन्द्रं कारं हिमं च तत् ॥ च.सं सू.स्थान 200॥

The characteristics of water influenced by the land - Water that descends from the atmosphere can be likened to a reservoir, as it absorbs the qualities of the terrain upon which it lands. Consequently, the composition of the land determines the attributes of the water. For instance, if it precipitates onto soil with a white hue, the water acquires a bitter taste. Similarly, if it falls onto ground with a pale-yellow color, it retains a bitter flavor. When it lands on salty terrain, it becomes saline, and if it descends onto hot, saline ground, it retains a salty taste. Water that falls upon mountains carries a bitter essence, while water that permeates black soil possesses a sweet quality. The water that descends from the sky, whether in the form of rain, dew, or ice, all contains latent properties.

Furthermore, the precipitation that occurs throughout different seasons yields rainwater with diverse characteristics. During the rainy season, the water is abundant and possesses a calm and soothing nature, while also exhibiting a pleasant sweetness. Conversely, in the spring season, the water becomes thicker and weightier, and its taste transforms into a combination of bitterness and sweetness, accompanied by a slightly coarse texture.

It is important to note that the qualities of water can differ depending on the specific location of the river. Rivers that originate from the Himalayas, for instance, are particularly esteemed due to the water's interaction with the majestic mountains. This interaction imparts a sacredness to the water, hence earning it the designation of holy water.

EPRA International Journal of Socio-Economic and Environmental Outlook (SEEO) ISSN: 2348-4101
Volume: 11 | Issue: 5 | May 2024 | SJIF Impact Factor (2024): 8.284 | Journal DOI: 10.36713/epra0314 | Peer-Reviewed Journal

***Brihat Samhita by Varahmihir**

Upon examining the Vedas, the venerable scientist Varah Mihir of antiquity differentiated the research conducted by these wise individuals, who can be likened to scientists, by emphasizing that the content within the Vedas is not merely regarded as supernatural, but rather as a reservoir of knowledge. This approach involves scrutinizing the context, validating the evidence, and articulating it appropriately within its contextual framework.

Chapter 27 Wind Cycle

ऐशानो यदि शीतलोऽमरगणैः संसेव्यमानो भवेत् पुन्नागागरुपारिजातसुरभिर्वायुः प्रचण्डध्वनिः ।
आपूर्णोदकयौवना वसुमती सम्पन्नसस्याकुला धर्मिष्ठाः प्रणतारयो नृपतयो रक्षन्ति वर्णास्तदा ॥27.9॥

Sloka 9. If the north-easterly breeze be cool, scented by the flowers of Punnaga, Agaru and Parijata, be sonorous and be enjoyed by groups of Gods, the earth restored to youthful vigour will be full of water and crops, and kings will curb their enemies, will protect all class of people and with the utmost justice.

विरसमुदकं गोनेत्राभं वियद्विमला दिशो लवणविकृतिः काकाण्डाभं यदा च भवेन्नभः ।
पवनविगमः पोष्ठयन्ते झषाः स्थलगामिनो रसनमसकृन्मण्डूकानां जलागमहेतवः ॥28.4॥ Immediate Rain

Sloka 4. The following are the symptoms of ra - tasteless water, the sky of the colour of cow's eye or crow's eggs, uncontaminated directions, moisture salt, calm wind, much tumbling of fishes ashore and the repeated croaking's of frogs.

यदा स्थिता गृहपटलेषु कुकरा रुदन्ति वा यदि विततं वियन्मुखाः ।
दिवा तडिद्यदि च पिनाकिदिग्भवा तदा क्षमा भवति समैव वारिणा ।28.10॥ Immediate Rain

Sloka 10. When dogs stand on the roofs of houses, or bark continuously looking up towards the heavens, or when lightning is seen flashing from the north-east at day-time, then the earth will be completely filled with water.

यदि वित्तिरपत्रनिभं गगनं सुदिताः प्रवदन्ति च पक्षिगणाः ।
उद्द्यास्तमये सवितुर्युनिशं विसृजन्ति घना नचिरेण जलम् ॥28.17॥ (Immediate Rain)

Sloka 17. If the sky bears the tinge of the wings of the Tittira bird, and groups of birds twitter merrily at sunrise and sunset, then the clouds will pour down rain soon by day and night respectively.

प्रविशति यदि खद्योतो जलदसमीपेषु रजनीषु । केदारपूरमधिकं वर्षति देवस्तदा नचिरात् ॥28.23॥
वर्षत्वपि रटति यदा गोमायुश्च प्रदोषवेलायाम् । सप्ताहं दुर्दिनमपि तदा पयो नात्र सन्देहः ॥28.24॥(Immediate Rain)

Slokas 23-24. If there be glow-worms at night near the clouds, before long there will be rain filling all the fields. In spite of rain-fall, if jackals howl in the evening, there will not be a drop of water, though the sky be overcast for seven days at a stretch. This need not be doubted.

चत्वार्यार्यम्णाद्यान्यादित्यं मृगशिरोऽश्वयुक् चेति । मण्डलमेतद्वायव्यमस्य रूपाणि सप्ताहात् ।।32.8।। (signs of earthquake)
धूमाकुलीकृताशे नभसि नमस्वान् रजः क्षिपन् भौमम् ।विरुजन्द्रुमांश्च विचरति रविरपटुकरावभासी च ॥9॥ वायव्ये भूकम्पे
सस्याम्पुवनौषधीक्षयोऽभिहितः । श्रयथश्वासोन्मादज्वरकासभवो वणिकपीडा ॥10॥
रूपायुघसूरैद्याखीकविगात्रखपण्यश्चिस्पिजनाः । पीब्धन्ते सौराष्ट्रकहरुमगधदशार्णमत्स्याञ्च ॥11॥

Slokas 8-11.-The circle presided over by the Wind- God consists of the seven asterisms, viz., Uttara, Hasta, Chittra, Swati, Punarvasu, Mrigasiras and Aswini, (that is, whenever an earthquake occurs in any one of these stars, it has to be construed that it is due to the Wind Circle). The following symptoms of this circle will be revealed a week in advance: the quarters are covered with smoke; a wind blows lashing with the dust of the earth and breaking trees; and the Sun does not cast bright rays. During an earthquake of the Wind Circle the decay of crops, water, forest and herbs, the out- break of swellings, asthma, madness, fever, phlegmatic affections and trouble to the trading community will ensue. So also, concubines, warriors, physicians, women, poets, singers, traders, artisans, the Saurashtras, Kurus, Magadhas, Dasarnas and Mathsyas will suffer.

यदि वेतसोऽम्बुरहिते देशे इस्तैखिभिस्ततः पश्चात् । सार्थे पुरुषे तोयं वहति शिरा पश्चिमाः तत्रः ॥54.6॥ दकार्गलम् ॥54॥
(Exploration of water wings)
चिह्नमपि चार्धपुरुषे मण्डूकः पाण्डुरोऽथ मृत् पीता । पुटभेदकश्च तस्मिन् पाषाणो भवति तोयमधः ॥7॥

Slokas 6-7. If rotting (tree) is seen flourishing in waterless tract, there will be water at a depth of 7 cubits at a distance of 3 cubits to the west of the tree. There will be found a westerly vein flowing underneath. At a depth of 2 1/2 cubits, the symptoms would be a pale white frog; thereafter, yellow cray, and further, a very hard stone (which will break only by the application of great heat) and underneath that there will be water. (Man's height 120 digits of 5 cubits.)

उदगर्जुनस्य दृश्यो बल्मीको यदि ततोऽर्जुनाद्धस्तैः । त्रिभिरम्बु भवति पुरुषैखिभिरर्धसमन्वितैः पश्चात् ॥12॥
श्वेता गोधार्धनरे पुरुषे मृद्धूसरा ततः कृष्णा । पीता सिता ससिकता ततो जलं निर्दिशेदमितम् ॥13॥

EPRA International Journal of Socio-Economic and Environmental Outlook (SEEO) ISSN: 2348-4101
Volume: 11 | Issue: 5 | May 2024 | SJIF Impact Factor (2024): 8.284 | Journal DOI: 10.36713/epra0314 | Peer-Reviewed Journal

Slokas 12-13. If there be an ant-hill to the north of an Arjuna tree, there would be water at a depth of 17 cubits, at a distance of three cubits to its west. When the earth is dug 2 cubits deep, there will be a white lizard; then at a depth of five cubits, grey clay; then dark, then yellow, then white, and then sandy earth. Beneath that, abundant water is to be predicted.

वल्मीकसंवृत्तो यदि तालो वा भवति नालिकेरो वा।पश्चात् षड्विर्डस्तैनैरैश्चतुर्भिः शिर। याम्या ॥54.40॥

Sloku 40. - If a palm tree or a cocoanut tree is found covered with ant-hills, there will be a southerly water-vein at a depth of 20 cubits at a distance of 6 cubits to the west of the tree.

अजातश्चाखान् शिशिरे जातशाखान् हिमागमे । वर्षागमे च सुस्कन्धान् यथादिस्थान् प्ररोपयेत् ॥55.6॥(Vrukshayurveda)

Sloka 6.-The grafting should be done in *Shishira*, season for those that have not yet got branches; in *Hemanta* for those that have grown branches; in the beginning of monsoon for those that have large branches. The particular direction of the cut off tree should be maintained in grafting also.

***Arthashastra of Koutilya**

(Encyclopaedia Britannica, n.d.) The Arthashastra, ascribed to Kautilya, who is believed to have served as the chief minister to Emperor Chandragupta in 300 BCE, the illustrious founder of the Mauryan dynasty, encompasses a wide range of governance matters, encompassing the intricate subject of water governance. During the reign of the Mauryan Empire, the Arthashastra provides a comprehensive record of the various hydraulic structures that were constructed for the purpose of irrigation and other functions.

Different Methods Employed in Antiquity

(Singh, 2020) The water sciences in ancient India reached an advanced stage of development during the Harappan civilization. This civilization showcased remarkable achievements in the construction of intricate hydraulic structures, as well as the implementation of both centralized and decentralized wastewater disposal systems. Additionally, they possessed knowledge and techniques for wastewater treatment.

Moving forward in time, the Mauryan Empire, which existed from approximately 322 to 185 BCE, is recognized as the first 'Hydraulic Civilization.' This empire is characterized by its construction of dams that featured spillways, reservoirs, and channels equipped with spillways known as Pynes and Ahars. Furthermore, the Mauryans demonstrated an understanding of water balance, developed systems for water pricing, measured rainfall, and possessed knowledge about various hydrological processes.

(Danino)Water management systems in ancient India were highly sophisticated and played a crucial role in ensuring the availability and distribution of water resources. These systems encompassed various techniques such as water harvesting, reservoirs, and step-wells. The unique monsoon-driven regime of rainfall in India greatly influenced the design and functioning of these systems.

Water harvesting was a prominent practice in ancient India, where rainwater was collected and stored for future use. This involved the construction of intricate networks of canals, tanks, and ponds to capture and retain rainwater. These systems not only helped in replenishing groundwater levels but also provided a reliable source of water during dry seasons.

Reservoirs were another integral component of water management systems in ancient India. These large artificial lakes were strategically built to store excess water during the monsoon season. The stored water could then be utilized for irrigation, drinking purposes and sustaining ecosystems during periods of low rainfall. Reservoirs were often constructed near rivers or in hilly regions to maximize water storage capacity.

Step-wells, also known as baolis or vavs, were innovative structures that played a vital role in water management. These architectural marvels consisted of a series of steps leading down to a well, allowing easy access to water sources even during droughts. Step-wells not only served as a means of water storage but also provided a cool and shaded environment, making them popular gathering places for communities.

EPRA International Journal of Socio-Economic and Environmental Outlook (SEEO) ISSN: 2348-4101
Volume: 11 | Issue: 5 | May 2024 | SJIF Impact Factor (2024): 8.284 | Journal DOI: 10.36713/epra0314 | Peer-Reviewed Journal

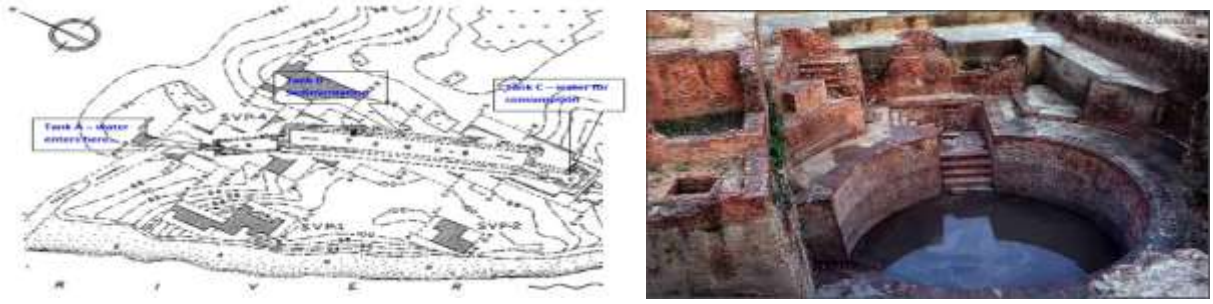
The monsoon-driven regime of rainfall in ancient India greatly influenced the design and functioning of these water management systems. The timing and intensity of monsoons determined the amount of water available for collection and storage. Therefore, these systems were designed to efficiently capture and utilize the seasonal rainfall, ensuring a sustainable water supply throughout the year.

The ancient city of Dholavira, located in the arid Rann of Kachchh in Gujarat, is renowned for its remarkable water management system. This 4,500-year-old Harappan city allocated a significant portion, approximately 20 to 30 percent of its fortified area spanning 48 hectares to an extensive network of interconnected reservoirs. These reservoirs, some of which were carved into sheer rock, were supplied with water through a meticulous combination of harvested rainfall and diverted water from two seasonal streams that bordered the city. To regulate the flow of water, a series of checkdams were strategically constructed.

Source: https://www.ahmedabadmirror.com/dholavira-pride-of-gujarat-now-unesco-world-heritage-site/81804058.html#google_vignette

Among the reservoirs, the largest one was situated to the east of the Castle, which served as the city's highest and most fortified enclosure. This reservoir, measuring 73 by 29 meters, had a capacity of over 20,000 cubic meters when filled to its maximum capacity. Additionally, a well-designed stepwell was excavated at the bottom of the reservoir, providing an alternative source of water in case the reservoir ran dry. This comprehensive water management system enabled the city to sustain its population for a remarkable span of at least seven centuries without interruption.

In Uttar Pradesh, specifically at Sringaverapura, an ingenious network of reservoirs was established around 2,000 years ago. These reservoirs, interconnected and strategically equipped with wells at their base, were ingeniously supplied with water from the Ganges through a channel.



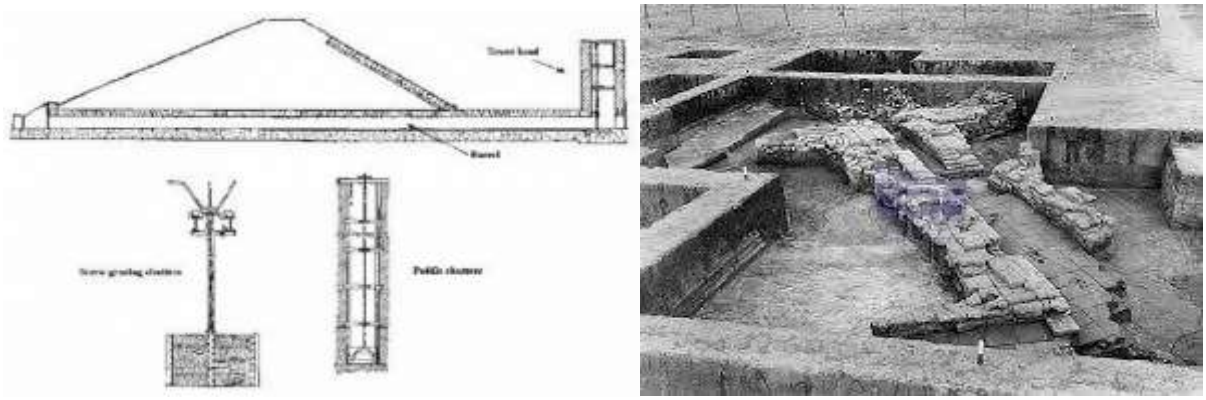
Source: https://threadreaderapp.com/thread/1239248045235027969.html#google_vignette

As time progressed, India witnessed the emergence of a remarkable assortment of water storage systems, ranging from reservoirs and stepwells to dams, water diversion mechanisms, and canals. Even the humble village pond played a significant role in this diverse landscape of water management across the country.

Approximately 1,800 years ago, King Karikala Chola constructed a more ambitious edifice known as the Kallanai or Grand Anicut, which is referenced in the Tamil epic Shilappadikaram. This structure, still visible today in its restored

EPRA International Journal of Socio-Economic and Environmental Outlook (SEEO) ISSN: 2348-4101
Volume: 11 | Issue: 5 | May 2024 | SJIF Impact Factor (2024): 8.284 | Journal DOI: 10.36713/epra0314 | Peer-Reviewed Journal

form, measures 320 meters in length and 20 meters in width. It serves as a clever mechanism that prevents the Kaveri River from flowing into its own northern distributary, the faster and steeper Kollidam (or Coleroon), thereby conserving a significant amount of the river's water for irrigation in the lower delta of the Kaveri.



Source: https://books.openedition.org/ifp/10050

In the vicinity of Delhi, the Anangpur Dam, built using quartzite stones during the reign of King Anangpal in the 8th century, intercepts a stream originating from the Aravalli Hills and collects rainwater during the monsoon season. The majority of this stored water is utilized by the city. Measuring over 100 meters in length, this dam stands as a testament to the advanced construction techniques employed over thirteen centuries ago.

FEATURES OF THE SYSTEM

During the medieval era, advanced water collection and distribution methods were developed, including systems that gathered rainwater from slopes and directed it through subterranean passages to reservoirs or lakes. Burhampur (M.P) and Jodhpur (Rajasthan) serve as prime illustrations of these sophisticated systems, which eventually became obsolete due to sediment buildup, deforestation on the slopes, pollution of groundwater from industrial activities, and other factors. Reservoirs came in diverse forms, with some being ornate *Pushkarinis* that blended practicality with religious and aesthetic purposes.

The most modest yet arguably the most crucial water feature was the village pond or reservoir. Its significance lay not only in its capacity to replenish groundwater, but also in its links to numerous adjacent ponds—often forming extensive networks spanning hundreds of kilometers, such as those found in Karnataka and Tamil Nadu. These networks allowed water-abundant regions to support those with less favorable conditions, overseen by village committees. However, with the advent of colonial rule, these committees vanished along with the majority of the reservoirs and channels under their supervision. During ancient eras, the Indians possessed extensive knowledge and expertise in the realm of sanitation and wastewater management technology. These advanced concepts were well-established and reached their pinnacle during the civilization and subsequent periods. The residences were all linked to the sewer system, where the conduits were shielded by bricks and precisely cut stones. Initially, the domestic sewage flowed through conical terracotta pipes into compact reservoirs for the purpose of settling and eliminating bigger impurities (initial sewage treatment). Subsequently, the wastewater was directed into the street's drainage channels.

THE DIMINISHING PROMINENCE OF AN ENVIRONMENTAL RESOURCES

The eventual downfall of the ancient civilization can be attributed to several factors. Firstly, a prolonged period of aridity lasting approximately 900 years resulted from the gradual weakening of the Indian summer monsoon. This lack of rainfall and subsequent drought would have had a significant impact on agricultural productivity and the availability of water resources, ultimately destabilizing the civilization.

Secondly, the social structure of the civilization played a role in its collapse. The society was highly stratified, with distinct classes and hierarchies. This social division, coupled with rapid urbanization, created densely populated areas

where infectious diseases could easily spread. The close proximity of individuals in urban centers would have facilitated the transmission of diseases, leading to widespread outbreaks and a decline in population.

The collapse of the ancient civilization can be attributed to a combination of factors. The prolonged dry epoch, social structure and urbanization, and natural disasters all played a significant role in its downfall. Understanding these factors provides valuable insights into the challenges faced by ancient civilizations and the delicate balance required for their survival. India's historical water management systems were tailored to suit the specific geology, environment, climate, and needs of the region. These systems proved to be efficient as they successfully addressed local challenges through localized solutions, except during severe and prolonged droughts. However, due to excessive centralization, unsustainable mega-projects, and the burden of overpopulation, we have lost the ability to replicate such effective solutions. Therefore, there is a wealth of knowledge to be gained from studying and adopting traditional water management techniques.

Lastly, natural disasters further contributed to the collapse of the ancient civilization. Massive floods and tectonic disturbances, such as earthquakes, would have caused widespread destruction and loss of life. These catastrophic events would have disrupted infrastructure, destroyed settlements and further weakened the already vulnerable society.

CONCLUSION

In conclusion, water management systems in ancient India were a testament to the ingenuity and resourcefulness of its inhabitants. Through practices such as water harvesting, reservoir construction, and the creation of step-wells, ancient Indians were able to effectively manage and utilize water resources, even in the face of a monsoon-driven rainfall regime. These systems not only provided a reliable water supply but also contributed to the overall development and prosperity of ancient Indian civilizations.

The present study has investigated the hydrological advancements in ancient India commencing from the Vedic Period. Various ancient texts including Vedic texts, Charak Samhita, Brihat Samhita, Koutily's Arthashastra, among others, have been examined. During that era, irrigation systems, various types of wells, water storage systems and cost-effective sustainable water-harvesting methods were established across the region. Numerous examples exist of water-harvesting structures being built using locally sourced materials with the involvement of the public.

Knowledge in ancient India was primarily preserved in the shlokas of scriptures, with only a select few individuals being proficient in the languages of these sacred texts. Consequently, knowledge and wisdom were often inaccessible to the majority of later generations.

REFERENCES

1. *(n.d.). Retrieved from https://www.swadeshionline.in/news/vedic-perspective-of-environment: https://www.swadeshionline.in/news/vedic-perspective-of-environment*
2. *A, K. G., & Parne, M. (2020). Gurukul -A Restoration of Heydays. In Akshar Wangmay (pp. 1-4). Pune: Jyotikiran Publication.*
3. *Adhikari, T. N. (2023, March). Inclusiveness in Gurukul Education Systemc. Gyanjyoti 3(1), 99-107.*
4. *Danino, M. (n.d.). Water Management in Ancient India.*
5. *Dr-Swati-Bandi, D. J.-S., & Dr-Neha-Nagori. (2024, February). Imparting Value Based Education Through Gurukul Methodology for Achieving Sustainable Development Goals. European Economics Letters 14(1), 545-551.*
6. *Encyclopaedia Britannica. (n.d.). Retrieved from https://www.britannica.com/topic/.*
7. *Goswami, D. M. (2021). Environmental consciousness as reflected in the vedas. International Journal of Sanskrit Research, 264-266. Retrieved from https://doi.org/10.22271/23947519.2021.v7.i5e.1513*
8. *Kale, V. (2021). Charak Samhita (1st ed.). Delhi: Choukhamba Sanskrit Pratishthan.*
9. *Shastri, S. V. (1946). Retrieved from https://archive.org/details/Brihatsamhita: https://archive.org/details/Brihatsamhita*
10. *Singh, P. K. (2020, October 5). Hydrology and water resources management in ancient India. Hydrol. Earth Syst. Sci, 24(10), 4691–4707. Retrieved from https://doi.org/10.5194/hess-24-4691-2020, 2020.*