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Preserving the Past: Stepwell as a Cultural Landscape and Sustainable Water Source

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Abstract

Water is an essential element of nature and a fundamental resource for all life on Earth. Since ancient times, human civilizations have flourished around water sources, and rivers are revered as sacred, across diverse cultures. In India, traditional water conservation systems like stepwells played a crucial role in ensuring the availability of water throughout the year. Stepwells, known for its unique architectural and cultural significance, have been an integral part of water management in India. This paper offers a detailed examination of the stepwell (Hatti Barav) in Ahmednagar district, focusing on its architectural features. The paper analyzes the structural design of the stepwell, including its depth along with its morphological characteristics. The decline in the number of step wells is leading to loss of social interaction diminishing the cultural landscape of that place. The study aims to showcase the aesthetic and practical significance of these historical wells. Adaptive design offers a solution by revitalizing these structures within modern water management strategies. Restored stepwells can function as community spaces while preserving their historical purpose. Integrating stepwells into eco-sensitive urban planning aligns with nature-based solutions for sustainability. This study highlights their dual role as heritage sites and potential tourist attractions, reinforcing their relevance within the UN's sustainable development goals. It emphasizes the urgent need to preserve these architectural masterpieces, ensuring their continued contribution to water conservation and resilient urban landscapes. By adopting sustainable restoration methods, we can address water scarcity while safeguarding cultural heritage for future generations.

Keywords: Conservation, cultural landscape, stepwell, water, water management

INTRODUCTION

Water is one of the most vital elements on Earth, sustaining life and supporting ecosystems, agriculture, industry, and human settlements. It plays a central role in the survival and development of civilizations, with access to reliable water sources historically determining where communities flourish. Beyond its biological necessity, water is also tied to cultural and spiritual traditions in many parts of the world, including India, where rivers and water bodies are often revered as sacred. For future generations to live healthy lives, water management must be sustainable. With growing concerns over water scarcity due to climate change, population growth, and unsustainable consumption, it has become increasingly important to adopt innovative conservation strategies, drawing from both modern technologies and traditional systems like stepwells. These structures, historically significant in India, served not only as water storage systems but also as vital community and cultural centers, showcasing the deep connection between water and social well-being [1].

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Water management is one of the most essential environmental practices for ensuring healthy living and well-being. It involves both conserving water and reusing wastewater, which are interconnected

strategies aimed at sustainable water use (Figures 1 & 2). While water conservation focuses on reducing demand, wastewater reuse works to close the water loop, promoting a circular flow of water from the built environment back into nature. Historically, efficient systems for capturing and storing water have been vital to human civilization. Early societies, including those in India, developed sophisticated water management techniques, such as qanats, aqueducts, cisterns, and stepwells, to address water scarcity [2].

Figure 1. Independence Day at Hatti Barav.

Figure 2. Music festival celebration.

In ancient India, extreme droughts led to the construction of stepwells, which became critical to the survival of communities by providing reliable water storage. These traditional systems, developed long before modern infrastructure, served as resilient, hydro-supportive forms of water management that helped societies thrive in harsh conditions. As the world faces worsening water crises, these age-old practices offer valuable lessons in sustainable water management, demonstrating how historical methods can contribute to a more sustainable organization of modern society [3].

Stepwells, also known as Vavs or Baolis, are ancient architectural structures built for water conservation, primarily found in arid and semi-arid regions of India. They were first constructed as early as the 3rd century CE and gained prominence between the 11th and 16th centuries, particularly in western India, including Gujarat, Rajasthan, and parts of Maharashtra. These structures were designed to access groundwater and store rainwater during monsoon seasons, ensuring a reliable water supply throughout the year. Stepwells are usually designed with a set of descending steps leading to the water at the bottom [4].

This allowed communities to access water at various depths, depending on seasonal fluctuations in the water table. As water levels dropped during dry seasons, the steps provided easy access to the remaining water. (Put a typical section – highlighting the water going down and access of steps – also show socio-cultural fabric) [5].

A vital part of the sociocultural fabric of the areas they served was played by stepwells. Apart from being functional water sources, they were important centers of social interaction, religious rituals, and cultural gatherings [6]. Many stepwells were intricately carved and decorated with sculptures of deities, animals, and geometric patterns, reflecting the spiritual significance of water in Indian culture. These wells often doubled as temples or shrines, where people gathered not only to collect water but also to participate in festivals, religious ceremonies, and community events (put sketches) – add a section of how step-well is reaching / adding to ground water maintaining the ground water table [7].

This research paper aims to delve into the architectural, cultural, and environmental aspects of stepwells, emphasizing their historical importance and their potential role in modern-day water management and conservation efforts, by exploring the case of Hatti Barav; a stepwell in district of Ahmednagar. The paper analyzes its structural design and morphological characteristics. It aims to emphasize the importance of preserving stepwells not just as water conservation tools but also as vital pieces of cultural heritage [8].

However, the number of functioning stepwells has significantly declined due to neglect and urban development, leading to the loss of cultural landscapes and traditional social spaces. By safeguarding

these architectural masterpieces, we protect an integral part of our history while addressing modern challenges like water scarcity aligning with the Sustainable development goals (SDGs).

PURPOSE OF THE RESEARCH

The study aims to explore how the historical structures of stepwells functioned as vital water management systems and played a crucial role in conserving water (Figure 3).

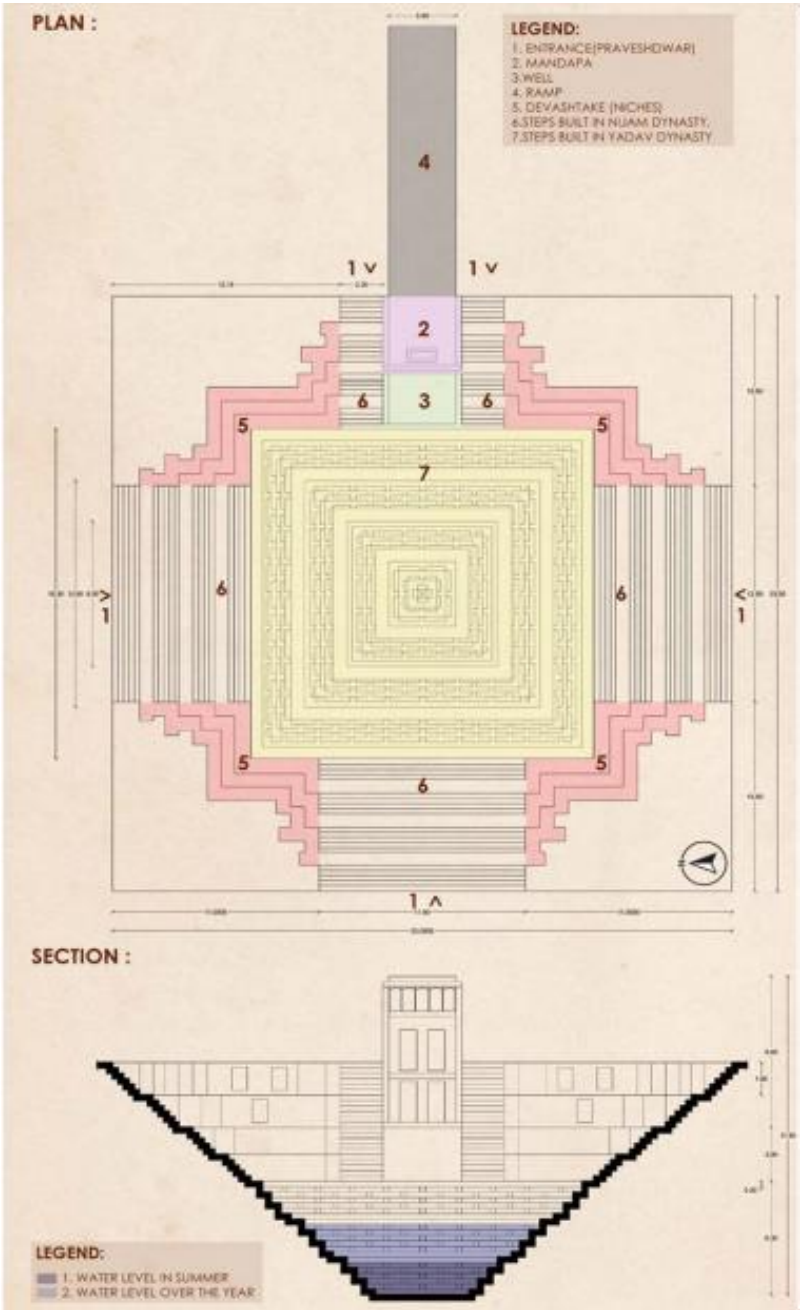

Figure 3. Plan & section of Hatti Barav.

Additionally, the research seeks to highlight the importance of preserving stepwells not only as practical solutions for modern water scarcity but also as cultural heritage sites that reflect the ingenuity of ancient water conservation techniques (Figure 4). By emphasizing their relevance to sustainable water management, the research intends to advocate for the restoration and adaptive reuse of stepwells in contemporary society [9].

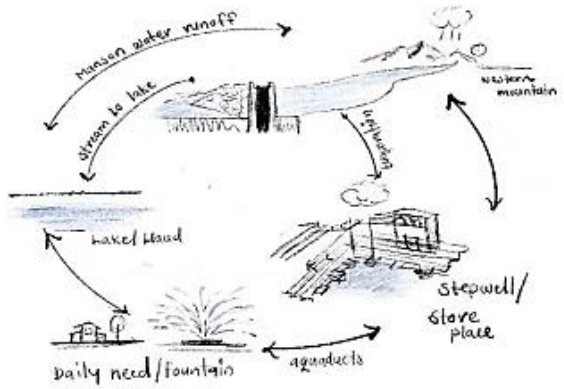

Figure 4. Evolution mapping of traditional water cycle system.

Rainwater from mountain catchments flows as monsoon runoff and is first slowed and stored in traditional bandh (check dams), allowing initial groundwater recharge. Excess water is then directed into lakes and stepwells (barav), ensuring year-round storage and accessibility. From here, it is distributed through channels and aqueducts for daily use and irrigation. The system completes a sustainable loop as water percolates back into the ground and returns to the natural cycle through evaporation.

TYPOLOGY OF STEPWELL

- *Location:* The design of stepwells varies based on the regional climate and geology. For instance, stepwells in arid regions like Gujarat and Rajasthan are deeper and more elaborate to access lower water tables, while those in semi-arid regions like Maharashtra might be shallower. (add a section showing depths) (Figure 5).
- *Purpose:* The primary function of the stepwell (water storage, irrigation, drinking water, or as a resting place) influenced its form. Some stepwells were purely functional, while others were more ornate and served as places for social and religious gatherings. (add a section showing activity) [10].
- *Architectural Style:* The cultural and architectural styles of the time and place influenced stepwell designs. For example, stepwells built during the medieval period were often intricately carved with religious and mythological symbols, blending functionality with aesthetics.
- *Depth and Size:* The depth of the stepwell often correlates with local water levels, with deeper wells found in drier regions. Larger stepwells sometimes include multiple levels, galleries, and chambers for larger storage and social functions.
- *Cultural and Religious Importance:* Many stepwells doubled as temples or spiritual spaces. Their design often included intricate carvings, shrines, and sculptures reflecting religious beliefs, with steps leading down to the water symbolizing a sacred journey

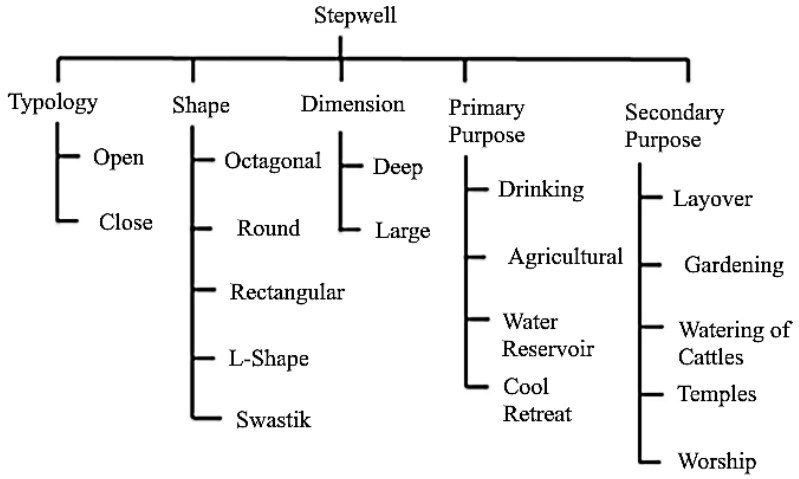

Figure 5. Stepwell typology and functional classification diagram.

These factors shaped the diversity of stepwells across India, ranging from simple, utilitarian structures to grand architectural masterpieces.

LITERATURE REVIEW

The Indian subcontinent encompasses a gamut of variegated landscapes and environments ranging from floodplains to harsh deserts. The hot and dry areas in the western part of the country were prone to frequent droughts due to an acute shortage of water. Hence, intelligent water-based collection and harvesting systems have been an integral part of the sustainable and vernacular urban fabric of these regions. Stepwells were the most prominent form of traditional water systems that did not just function as a source of water for communities but demonstrated strong social, religious, and aesthetic values, thereby contributing significantly to India's rich heritage (Figures 6 & 7). Contrastingly, today, when we have adopted modern water systems, the traditional water-based architecture suffers decay and damage due to lack of maintenance and public awareness [11].

Figure 6. Rajastan Chand Bhoari stepwell.

Figure 7. Bansilalpet stepwell.

The study analyzes the structural intricacies of these stepwells, including their organization, orientation, dimensions, ratios of length, width, and depth, along with morphological characteristics. The author aims to highlight the aesthetic and functional appeal of these wells. The paper proposes a methodical approach to emphasize the importance of preserving these architectural marvels. It concerns their dual significance as tourist attractions or cultural assets, as well as their vital involvement in water conservation initiatives as outlined in the UN Sustainable Development Goals. In order to guarantee that future generations will value and enjoy these cultural assets, the study highlights the urgent need to promote their protection in modern contexts while acknowledging the heritage significance of traditional stepwells [12].

The first rock-cut stepwells in India appeared between 2nd and 4th centuries A.D., born out of necessity in an erratic monsoon climatic zone that is bone-dry for most of the year but drenched by torrential rains for many weeks. It was essential to guarantee a year-round water supply, particularly in the arid regions of India where the water table could be inconveniently buried 10 stories below (Figures 8 & 9). Over time, design and planning of stepwells evolved into astoundingly complex structures. The next stage of evolution witnessed the construction of wells at Dhank, near Rajkot, Gujarat (550–625 A.D.) and of the stepped ponds at Bhinmal, in the Jalore district of Rajasthan (850–950 A.D.)10 Continuing the legacy, around thousands of other stepwells, varying in proportion began to be constructed in various parts of western India. Stepwell construction saw its peak from the 11th to 16th century. But studies show that the construction of such structures might have originated much earlier than that. Following the reported discovery of as many as 700 wells in just one section of the city of Mohenjo Daro, the scholars are led to believe that these "cylindrical brick-lined wells" might have been invented by the people of the Indus Valley civilization and may be the predecessors of the stepwell [13].

Figure 8. Dholavira stepwell.

Figure 9. Mehruli Stepwell – 1211AD.

STEPWELLS CONSIST OF SEVERAL ARCHITECTURAL AND STRUCTURAL FEATURES, OFTEN INCLUDING

- *Toda:* These are a pair of decorated pillars at the entrance of the stepwell, marking its location. The design can range from elaborate to simple, depending on the stepwell's style. Typically, they contain a small space to hold an oil lamp.
- *Kuta:* These are landings between sets of steps where people can stand and rest. They are usually covered by pavilions that are stacked in levels, each corresponding to earlier Kutas. The number of Kutas often determines the stepwell type.
- *Ardhakuta:* Similar to Kutas but without a landing or pavilion, these are arch-like structures that provide support.
- *Well shaft:* This is a circular shaft at the end of the stepwell, allowing access to underground water.

CONCEPT OF STEPWELLS

Stepwells originated in India and are renowned for their precise architecture and water management. They were initially built as reservoirs and water storage systems, and some also served as temples, with intricate stone carvings adorning their columns and pavilions. Travelers, caravans, and locals used them as a place to rest, especially in the heat (Figure 10).

Functions and Uses of Stepwells:

- *Main Function:* Stepwells were designed to supply water, especially in hot, dry regions where water is scarce most of the year. As they draw water from underground springs, stepwells offer a continuous flow of fresh, naturally filtered water.
- *Daily Uses:* Stepwells provided water for household tasks like bathing, washing clothes, watering animals, and irrigation.
- *Community Space:* Located within villages, stepwells also acted as a cool retreat during the summer, offering relief from the heat.
- *Additional Features:* Stepwells often had platforms, galleries, stone benches, spiral staircases, and passages around the well. They were also beautifully decorated with carvings, sculptures, and niches.
- *Water Quality:* The minerals and salts in the soil mixed with the water, adding beneficial substances to it.

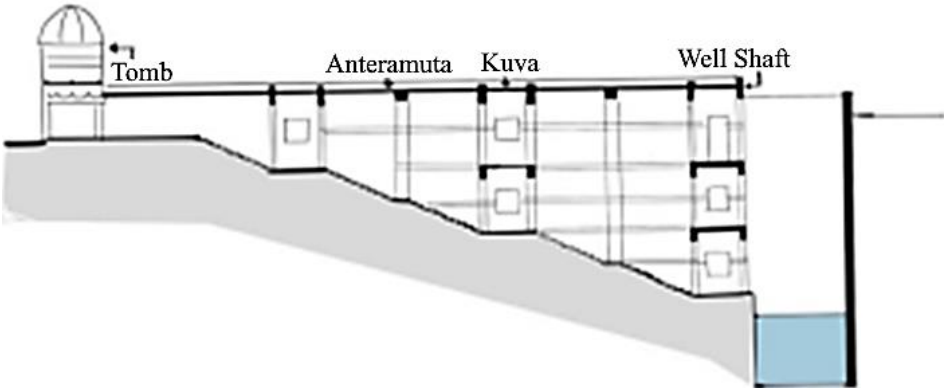

Figure 10. Terminology of stepwell.

These elements showcase stepwells as a vital part of water conservation and community life in India. Study of Ancient Stepwells in India. International Journal of Research in Engineering, Science and Management.

Stepwells were not only crucial water sources but also important social and religious hubs. These underground structures often functioned as temples, filled with carved images of deities, primarily Vishnu and Shiva, depicted in various forms such as Sridhar (Vishnu as the bearer of wealth), Jalasayin (Vishnu reclining on Anant Nag), and Varaha (Vishnu's boar incarnation). These carvings created a sacred atmosphere for ritual activities like bathing, prayer, and offerings. Even today, some stepwells, such as the 11th-century Mata Bhavani Vav in Ahmedabad, continue to serve as active temples, despite lacking groundwater.

The architectural design and decoration of stepwells reflect the influence of their patrons. A significant shift occurred around the 12th century under Muslim rule. While Hindu builders used post and-lintel construction with corbel domes, Muslims introduced arches and true domes. Hindu artisans carved intricate sculptures featuring deities, humans, and animals, but Islamic tradition, which forbids depictions of human (Figures 11), led to changes in stepwell decoration. Notably, two prominent stepwells – the Rudabai Vav and Dada Harir Vav – were built in Gujarat around 1500 AD. These structures, commissioned by female patrons and built by Hindu artisans under Islamic authority, are lavishly adorned but lack depictions of deities and human Figures 12. (Steps to Water: Stepwells in India. (n.d.). www.chitrolekha.com/V5/n2/04_Stepwells_in_India).

Figure 11. Interior Geometry of stepwell.

Figure 12. Adalaj ni vav.

The stepwells of Nagpur exhibit several architectural and decorative features that are characteristic of both Indo-Islamic and Indian traditions. Chhatris, dome-shaped pavilions, are prominent features in these stepwells. Originally designed to adorn tombs, chhatris became decorative elements in various structures. They are common in Mughal architecture and are widely used in Rajasthan. The simple Shekhawati Chhatris feature a single dome supported by four pillars, sometimes adorned with interior paintings.

Jharokhas, seen in the Hariweda stepwell, are stone windows projecting from a building's facade, typically from the upper floors. These windows, supported by brackets or corbels, allow inhabitants to observe the surroundings. Often partially enclosed with intricate jali work, jharokhas are known for their formal elegance and decorative detailing.

Multifoil arches, also called polyfoil arches, are another typical feature in Nagpur's architecture. These arches consist of multiple leaf-shaped segments created by overlapping circular forms. Depending on the number of segments, they are referred to as trifoil (three segments), quatrefoil (four segments), and so on, with multifoil typically having more than eight segments.

Ogee arches, seen in some stepwells, are decorative arches made up of two curves – one concave and one convex – forming an S-shaped appearance. This elegant design is both structurally sound and aesthetically appealing.

Pulleys and parapets are practical features in stepwells. The parapet walls, which line the stepwell periphery, are slightly raised above ground level and serve as protective barriers to prevent falls. They also provide defensive cover in some cases.

Brackets in Nagpur's stepwells are elaborately carved with designs of plants, fruits, or animals. These brackets, made from stone or wood, offer structural support and are used to hold elements like beams or statues. They are crafted in various forms, such as corbels or consoles, and add ornamental appeal to the architecture.

Toranas, ceremonial gateways, are featured in some stepwells like Hariweda and Rajabaksha. These structures, consisting of a horizontal cross-piece supported by two vertical posts, are richly adorned with sculptural motifs, reflecting cultural and spiritual symbolism. Toranas are common in Buddhist, Jain, and Hindu architecture and often feature floral or leaf motifs and guardians, symbolizing protection and auspiciousness.

Stone carvings, found in stepwells made from yellow sandstone, are a traditional art form used to embellish the architecture. These carvings, including floral motifs and statues, enhance the visual appeal and represent timeless craftsmanship. In terms of material and structural details, the stepwells in Nagpur are built using composite masonry. This method combines ashlar masonry for the outer, aesthetically pleasing facade, and rubble masonry as a cost-effective backing for the walls.

METHODOLOGY

The methodology for this research paper on the Hatti Barav stepwell in Ahmednagar encompasses a combination of qualitative and quantitative approaches aimed at exploring its architectural, cultural, and environmental significance (Figure 13).

Firstly, literature review serves as the foundational step, involving the examination of existing scholarly works, historical texts, and documents related to stepwells, particularly focusing on Hatti Barav. This will provide a contextual background and help identify gaps in current research. Field visits will be conducted to Hatti Barav, allowing for direct observation and documentation of its architectural features and current condition. During these visits, photographic documentation will be carried out to capture the structural details, carvings, and surrounding environment. This visual data will be instrumental in analyzing the stepwell's design and its relationship with the cultural landscape. To gain a deeper understanding of the community's relationship with Hatti Barav, semi-structured interviews have been conducted with local residents, historians. This qualitative data will provide insights into the historical significance, social functions, and current challenges faced by the stepwell. Additionally, surveys may be distributed to gather quantitative data on public awareness, perceptions, and attitudes towards the conservation of Hatti Barav. More, an analysis of water management practices has been included, evaluating the stepwell's role in water conservation and its integration with local water management systems such as the Khapari Nal Yojana. This analysis has drawn from historical records and contemporary observations.

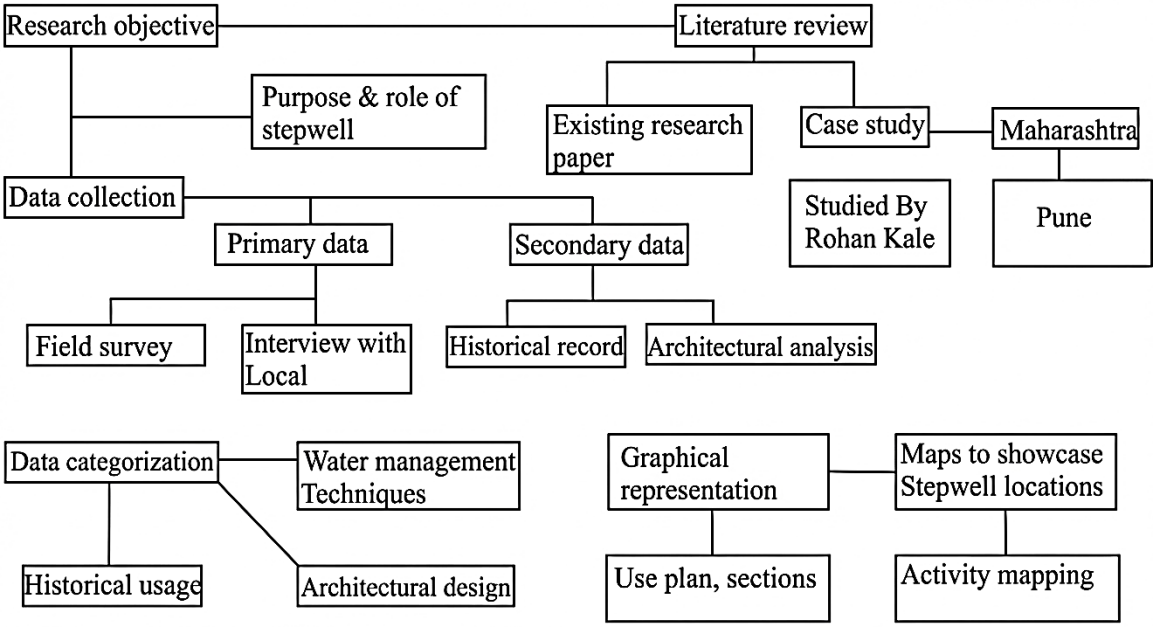

Figure 13. Methodology chart.

Finally, the findings from both qualitative and quantitative analyses have been synthesized to develop recommendations for the conservation of Hatti Barav, highlighting its potential as a cultural heritage site and its role in promoting sustainable water management practices. This comprehensive approach will ensure a holistic understanding of Hatti Barav and inform future conservation efforts.

DATA COLLECTION AND DATA ANALYSIS

CASE STUDY (Hatti Barav)

Stepwells, known as Baravs in the region, have long been a vital part of India's architectural heritage, combining utility with intricate design to address water scarcity in arid regions. These stepwells were engineered not only to collect and store water but also to serve as gathering places and community hubs. One such example is the Hatti Barav of Ahmednagar, a significant stepwell built during the Nizam Shahi period.

The engineers and architects of the time focused on rainwater harvesting and water collection systems from the nearby Garbhagiri mountain, part of the Sahyadri range. Recognizing the potential of the mountain's natural water resources, they utilized the principles of slope and gravity to direct rainwater and mountain runoff into a network of reservoirs. The water was channelled down the mountain slopes and collected in fifteen large ponds constructed at the base. These ponds became the core of the city's water storage system, ensuring a sustainable supply of water during dry periods. Founded in 1490, Nagar City arose in a region facing significant water scarcity challenges. During the Nizam Shahi period, innovative solutions for water management became essential, especially considering the lack of year-round water flow from the Sina River. Though the Sina River flowed through the region, its seasonal nature demanded alternative methods for water storage and distribution.

To transport water from the ponds to key locations in the city, the Nizam Shahi engineers employed several advanced techniques (Figure 14). The Hatti Barav, a stepwell with a depth of 70 feet, played a crucial role in water distribution. The name Hatti Barav (Hatti meaning elephant) was derived from the use of elephants to lift water from the well. Bulls and elephants were employed to raise the water to a central distribution chamber, from which it was then transported throughout the city using underground channels. The Ahmednagar city area falls within a mid to slightly elevated contour range, indicating relatively stable terrain with gentle slopes. In contrast, the Hatti Barav region is situated in a lower contour zone, facilitating natural water accumulation and making it a suitable location for a stepwell.

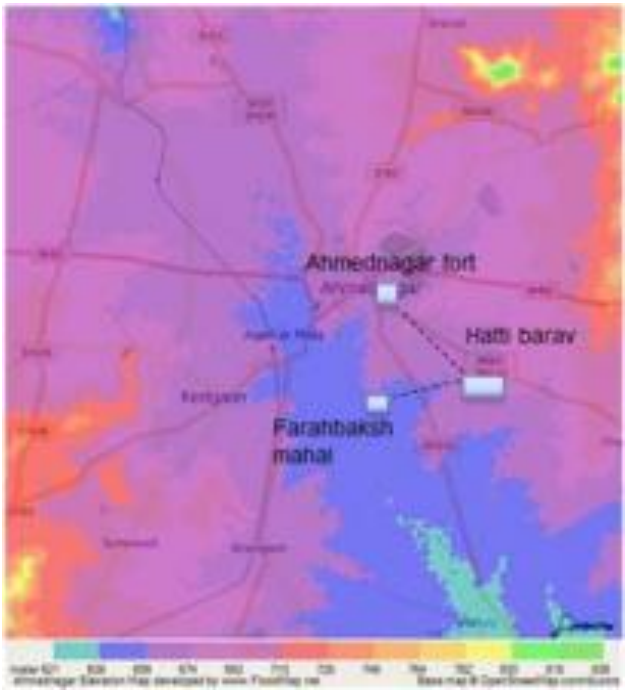

Figure 14. Contour map of Ahmednagar.

The construction of the Bhapri Naal Yojana, a system of underground terracotta pipes, exemplified the use of gravity and slope for efficient water movement across long distances. This system ensured the consistent flow of water from the ponds and reservoirs into the stepwell and eventually throughout the city (Figure 15). Additionally, the Bhandara Naal acted as a critical juncture in the water transportation network, supplying water to various parts of the city.

One of the most notable recipients of this water system were the Farah Baksh Mahal, also known as the "Pleasure Palace." Known for its elaborate fountains and its role as a venue for music, dance, and cultural performances, the palace relied heavily on water supplied from the Hatti Barav (Figure 16). The intricate waterworks here served not only functional purposes but also added to the Aesthetic appeal of the palace.

Figure 15. Perspective View of Haatti Barav.

Figure 16. Built Form Integrated with Edge.

Hatti Barav is a stepwell with a series of descending steps leading to the water reservoir at the bottom. This design allowed for easy access to water, regardless of the water level. Even during low-water seasons, people could still reach the water by walking down the steps. The well was designed with a rectangular plan, which provided a larger surface area for rainwater collection (Figure 17). The depth of the stepwell was designed to tap into the groundwater table, providing water even in dry seasons. The capacity was large enough to hold a substantial amount of water during the monsoon.

In addition to supplying water to the city and its architectural landmarks, the water infrastructure also supported travellers passing through the region (Figure 18). The Hatti Barav was strategically located on the Jamkhed-Beed Road, an important route that connected Marathwada and north-western Maharashtra. The water from this stepwell provided vital resources to traders and pilgrims.

The construction of the Hatti Barav and its surrounding structures was overseen by Saka Salabat Khan, a notable Figure 18 in the history of Nagar, who contributed significantly to the city's architectural and water management advancements. This historical water management system, anchored by the Hatti Barav, not only sustained the city but also serves as a testament to the ingenuity of Nizam Shahi engineers. Their use of natural principles like gravity and slope to channel water effectively offers valuable lessons for sustainable water use and landscape preservation in modern times. This version incorporates the role of stepwells, specifically the Hatti Barav of Ahmednagar, while explaining the use of slope and gravity for water collection from the mountains into ponds, emphasizing their sustainable design.

Figure 17. Views from model of Hatti Barav.

Figure 18. Views from model of Hatti Bara.

STRATEGIES FOR ADAPTIVE REUSE

By incorporating any of these adaptive reuse strategies, Hatti Barav stepwell could regain its former importance while simultaneously becoming a symbol of how historical structures can be effectively integrated into contemporary urban life. These initiatives would also highlight the stepwell's dual importance as both a cultural heritage site and a potential solution to current water management issues. Hatti Barav can be restored and repurposed as a key attraction within Ahmednagar's heritage circuit (Figure 19). Interpretive displays, guided tours, and digital storytelling can educate visitors about the well's history, its role in medieval water management, and its architectural importance. The area surrounding Hatti Barav can be landscaped into an urban green space with native vegetation, walking paths, and seating areas (Figure 20). This would enhance the environmental value of the site and provide a peaceful retreat within the city.

With careful planning, parts of the stepwell or its surrounding space could be repurposed for cafés, artisan markets, or bookstores that celebrate Ahmednagar's local crafts and history (Figure 21). This would generate revenue for its upkeep while keeping its cultural essence alive.

Figure 19. Interaction spaces.

Figure 20. Music programs.

Figure 21. Public garden.

CONCLUSIONS

In conclusion, the Hatti Barav stepwell in Ahmednagar stands as a testament to the ingenious water management systems of ancient India. This architectural marvel not only served as a vital source of water for the community but also played a significant role in shaping the social and cultural landscape of the region. To ensure the preservation of Hatti Barav, a comprehensive conservation strategy is essential. This could involve regular maintenance to clean and restore the stepwell, as well as community engagement initiatives to raise awareness about its historical and cultural significance. Collaborating with local authorities, heritage organizations, and community members can create a sense of ownership and responsibility towards preserving this invaluable resource. Additionally, integrating sustainable practices and modern conservation techniques can help protect the stepwell from further deterioration while maintaining its historical integrity also mention some local authorities – events groups, ngos, schools and institutes who can come here as an event's spot/ picnic/ heritage activity.

The conservation of Hatti Barav will not only safeguard an important piece of architectural heritage but also contribute to the revitalization of the cultural landscape in Ahmednagar. By preserving such sites, we can foster social interaction and community bonding, as stepwells have traditionally served as gathering places for various events and rituals. Moreover, promoting Hatti Barav as a cultural heritage site can attract tourism, creating economic opportunities for the local community while educating visitors about the region's rich history. The conservation of Hatti Barav is crucial for maintaining cultural identity and enhancing community resilience, ensuring that future generations can appreciate and learn from this significant part of our heritage.

A Walk-through video of the structure, exploring
the intricate layers of history, culture, and architecture.

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REFERENCES

1. Piplani M. Stepwells: Reviving India's cultural and traditional water storage systems. In: Progress Towards the Resource Revolution. Conference paper; 2019 Dec. Available from: https://www.researchgate.net/publication/343127225_Stepwells_Reviving_India's_Cultur_al_and_Traditional_Water_Storage_Systems.
2. Li Y, Matsumoto K, Sawaki M. Potential of traditional domestic rainwater harvesting systems: Current trends and future directions. J Clean Prod. 2024 [cited 2024 Feb 11];434:140075. Available from: https://www.sciencedirect.com/science/article/pii/S209526352400075X.
3. Panicker AS, Dubey DD. Transformative Watershed Management in Villages in Maharashtra. In International Conference on Sustainable Built Environment 2024 Mar 15 (pp. 335-351). Singapore: Springer Nature Singapore.
4. Malaviya NS. Lessons in conservation from ancient stepwells. Deccan Herald. 2024 Jun 15 [cited 2024 Feb 11]. Available from: https://www.deccanherald.com/features/art-and-culture/lessons-in-conservation-from-ancient-stepwells-306689.
5. Sreekanth A. Dissertation - Final: Stepwells of India. Issuu. 2020 [cited 2024 Feb 11]. Available from: https://issuu.com/aisysree/docs/aishwarya_sreekanth_-dissertation-_final.
6. Sudarshan S. Stepwells. SlideShare. 2015 Nov 19 [cited 2024 Feb 11]. Available from: https://www.slideshare.net/slideshow/stepwells/55383964.
7. Sheikha A. A study on the stepwells: The traditional water harvesting system of India. Scribd. 2021 [cited 2024 Feb 11]. Available from: https://www.scribd.com/document/530704381/A-Study-on-the-Stepwells-The-Traditional-Water-Harvesting-System-of-India.
8. Yashashree G. Stepwells: India's water conservation heritage. Scribd. 2023 [cited 2024 Feb 11]. Available from: https://www.scribd.com/presentation/638210847/Untitled.
9. Sriparvathy U, Salahsha TN. Adalaj Stepwell: A magical resonance of architectural ingenuity [Internet]. 2021 [cited 2026 Apr 2]. Available from: https://www.researchgate.net/publication/349739843_Adalaj_Stepwell_A_Magical_Resonance_of_Architectural_Ingenuity
10. Selvaraj T, Devadas P, Perumal JL, Zabaniotou A, Ganesapillai M. A comprehensive review of the potential of stepwells as sustainable water management structures. Water. 2022 [cited 2024 Feb 11];14(17):2665. Available from: https://www.researchgate.net/publication/363140283_A_Comprehensive_Review_of_the_Potential_of_Stepwells_as_Sustainable_Water_Management_Structures.
11. Dutta A. Steps to water: Stepwells in India. Chitrolekha J Art Des. 2015 [cited 2024 Feb 11];5(2). Available from: https://chitrolekha.com/V5/n2/04_Stepwells_in_India.pdf.
12. Dutta A. Steps to water: stepwells in India. Chitrolekha J Art Des [Internet]. 2015 [cited 2024 Feb 11];5(2). Available from: https://chitrolekha.com/V5/n2/04_Stepwells_in_India.pdf.
13. National Research Council; Division on Earth and Life Studies; Board on Earth Sciences; Committee on Floodplain Mapping Technologies. Elevation data for floodplain mapping. Washington (DC): National Academies Press; 2007 Sep 16.

