



Indian historic water structures: graphic studies and analyses to understand the significance of transition in a traditional stepwell

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Abstract

The study aims at analysing an historic water structure built in Ahmedabad (Gujarat state, northwest India), a pretty desert region where water is scarce and the concept of a well with steps leading to the water was crucial for the survival of cities. The so called "stepwells" were primarily built solely for practical purposes, but over time, architectural elements such as decoration, niches and multifunctional pavilions were added to celebrate the water. Among these structures, for the urgent need of maintenance and its bad state of conservation this research wanted to take into consideration and analyse the whole composition of the Bhavani Mata stepwell (Ahmedabad) identifying architectural characteristics related to local cultures. Tangible and intangible aspects were recognized and correlated with the built structures as well as the transition between the interior spaces along the step path. The conclusion stresses that the stepwell has a fundamental role in disconnecting from the environment. It creates a substantial shift in the ambiance and the transition types via linear spaces establish the character of the place through the difference in light to dark, warm to cold, arid to humid atmosphere, open to enclosed. A place that should be studied, documented, and protected to be passed to future generation as an extraordinary example of humankind answer to hard environment constrains and amazing case studies transitional spaces design.

Keywords

India, stepwells, transition, representation and analyses, traditional architecture

Topic

Examining



Mata Bhavani temple
stepwell (images by the
authors).

Introduction

The cooperation between the CEPT University Ahmedabad and the Architecture Department of the University of Ferrara, started in 2013. This joint project began with the identification of all the crucial features for a possible approach on Global South Countries cultural heritage [Jain 2019]. The main goal was to reach an effective cultural exchange between international educational experiences able to enhance the development of best practices for cultural heritage protection. The role that heritage documentation and representation can play in emerging countries such as India is very often undervalued and erroneously connected to mere survey activities [Bjønness 1994]. The idea conceived by the two academic institutions was to offer several on-field approaches concerning heritage documentation for preservation and enhancement by the means of educational workshop experiences and other joint activities. This approach empowered the academic cooperation and allowed Indian and Italian professors to get in touch with topics, sometimes, very far from their own background [Borin et al. 2018]. Nowadays a strong need of compromise between development and conservation is seen as a crucial factor for the preservation of Cultural Heritage in global south countries such as in India [Jain 2017]. This contribution analyses traditional stepwell and is divided into several areas of investigation. The first section wants to explore the origin of stepwell in western India as water structure and places of social meeting among the residents. Then the study describes the selected case study, located in Ahmedabad (Gujarat State), the Mata Bhavani stepwell. The structure was chosen due to its need of urgent conservation strategies and for its peculiar architectural features [Jain-Neubauer 1999]. The following part highlight some research questions that after the on-site analyses started to grow as part of the approach based on the transitional aspect of architectural spaces. The core section of the essay analyses the stepwell under investigation in terms of movement, change of scale, sense of enclosure and openings. The identification of a high level of hybridization due to surrounding objects placed on site by the residents is resulting in a loss of historic identity. Concluding, the several aspects analysed led the authors to a possible methodology for stepwell analyses in order to better preserve the original spirit of these structures.

The stepwells in Gujarat

Step wells were once integral to the semi-arid regions of Gujarat, as they provided water for drinking, washing, and bathing [Livingston, Beach 2002]. These wells were also venues for colourful festivals and sacred rituals. Stepwells, also called stepped ponds, built between the 5th and 19th centuries, are common in Western India; over 120 such wells are reported in the semi-arid region of Gujarat [ENVIS Centre 2019].

Among these structures, the Ruda Bai stepwell in Adalaj area, in Ahmedabad, (built at the end of the XV century) is probably the most valuable example in terms of heritage significance (fig 01). Stepwells are also found in more arid regions of the Indian subcontinent, extending into Pakistan to collect rainwater during seasonal monsoons [Shokoohy 2004]. While many such structures are utilitarian in construction, they sometimes include significant architectural embellishments, which attracts many tourists. In the past, these stepwells were frequented by travellers and caravans as stopovers along trade routes. India's first rock-cut stepwells are dated from 200-400 AD. Subsequently, the wells at Dhank (550-625) and construction of stepped ponds at Bhinmal (850-950) took place.

While early stepwells were made of stone, later stepwells were made of mortar, stucco, rubble, and laminar stones [Voudouris et al. 2019]. The well cylinder was the basic form used to deepen the wells. It is also inferred that the stepwells in Gujarat have survived so long because of the builder's knowledge of the soil conditions and the earthquake proneness of the region. The well size recommended, based on considerations of stability, was of four to thirteen *hasta* (*hasta* is a Sanskrit word, which means "forearm" of size varying from 30-61 cm), a size of eight *hasta* was considered ideal, and a 13 *hasta* well was considered dangerous. However, the well thickness from top to bottom remained generally uniform.



Fig. 01. Internal spaces of the Ruda Bai stepwell in Adalaj area, in Ahmedabad, possibly the most known stepwell in Gujarat region (images by the authors).

By the 11th century, the stepwell planning and design acquired architectural excellence and the Hindu Stepwells were standardized [Bhatt 2014]. Around 45 stepwells structures are built-in and around Ahmedabad with its own unique identity and associated culture. From that, only seven stepwell structures are protected by archaeological survey of India or state archaeological department, many stepwell structures are partly or completely altered and inhabited by the people living around them while the rest of the structures are left in ruins. The level of a temporary and permanent change in the existing structure defines the identity of a place [Joshi 2001], and currently association of religious beliefs and activities are overpowering the current abandoned situation of stepwells, leading to the addition of temple structures in the stepwell as they become an extension for religious activities. With the implementation of the new water system due to technological advancements and the decreasing water level, the stepwell structures became dysfunctional. The purpose of valuing and celebrating the water is transformed into a place for worship [Kumar 2009], so the nature of change and the level of alteration in and around the structure affects the first impression of a space.

Mata Bhavani stepwell, Asarwa, Ahmedabad

The Mata Bhavani temple stepwell is the oldest underground structure in Ahmedabad. Built in the 11th century under the rule of the Solanki dynasty. The unique feature of the stepwell is the pavilion above the ground making a mark of the underground structure and become a place of shelter in the hot and arid climate of Ahmedabad (fig. 02). The purpose of the stepwell structure has always been associated with women but the religious connection to the stepwell led it to become a religious place for community gatherings. The association of religious activities in the well structure combined with the surrounding community places, makes the whole atmosphere of the place perceive it as a 'living well'. The structure of a well was designed in a way that the pavilion structure gets used as a gathering space by people living around it [Chakrabarti 2017]. The families who live near the stepwell and the houses along the stepwell edge have developed as a community space and the stepwell structure has become a part of their daily activities.

Research design

The study aims at comprehending Ahmedabad's stepwells considering the significance of the building as a subterranean structure for water collection and highlighting the transition of space as key factor for a better understanding of these sites.

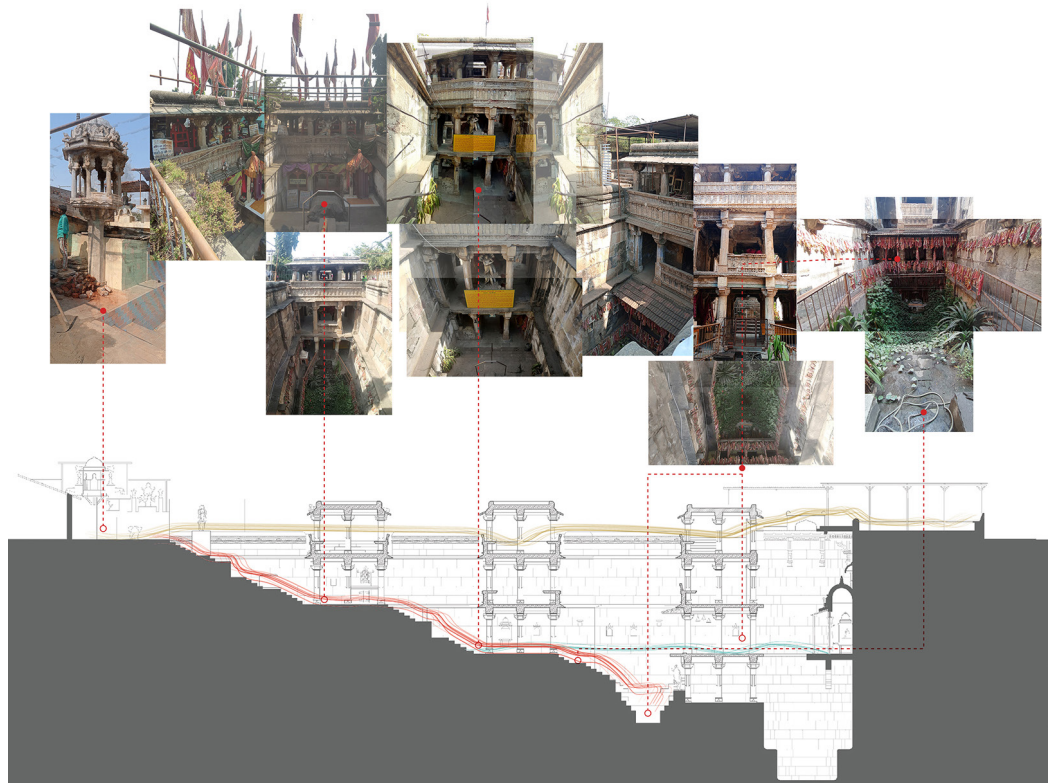


Fig. 02. Section and images of Mata Bhavani temple stepwell the oldest underground structure in Ahmedabad built in the 11th century (images by the authors).

The use of integrated representation techniques (fig. 03) allows to describe the overall atmosphere of the stepwells, which is affected by its context, spatial organization, human association, orientation, and relation with people and traditions. Because the intangible component of this cultural heritage site is so important to its effective preservation, a strategy based on decolonization principles should be one of the first stages in protecting it in India. This is especially true in the context of a country as culturally varied, lively, and complicated as India. It should not be confused with full isolation from international norms, but rather with measures that are in line with them while remaining local [Benjwal 2021].

With these assumptions, and by an international cooperation based on cultural and expertise exchange, the authors developed a research approach based on some key questions evaluated by the study that can be summarised as follows:

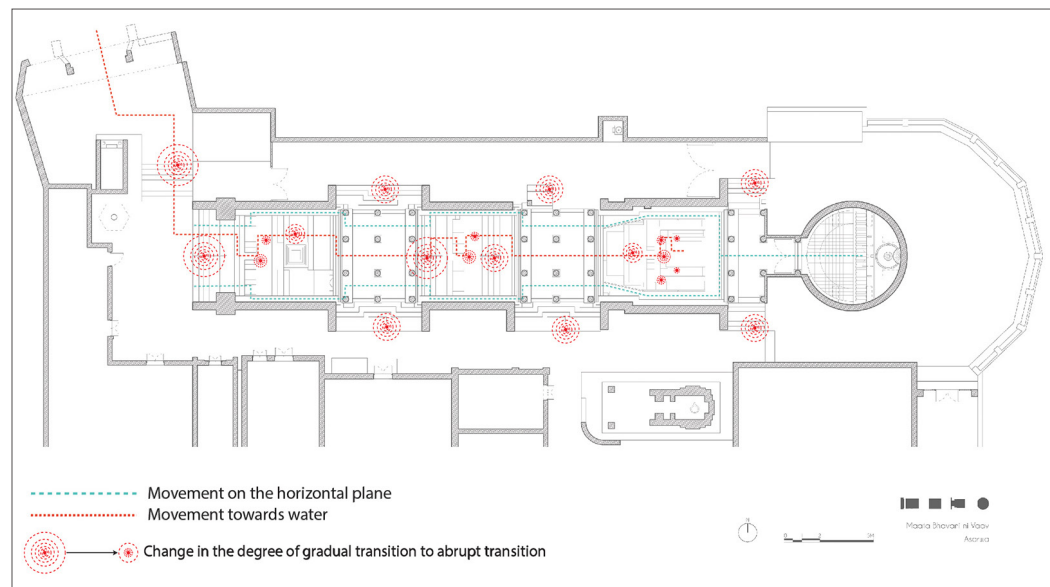
- Is the linear descending experience affected by the architectural changes of the space?
- Are there any changes in terms of architectural scale that can be perceived by the visitors?
- Is the sense of enclosure prominent inside the structure?
- What's the role of openings?
- What's the level of cultural heritage hybridization of this structure due to contemporary ways of life?



Fig. 03. On site analyses, trying to capture the ambience of the space through charcoal sketches (images by the authors).

The movement: just a linear descent?

The identity of the underground structure is observed by its complex patterns of movements. The linearity of structure gives a sense of what types of movement will be, but the arrangement of steps in the journey plays an important role in the experience of a place.



The gradual linear movement towards the water with sudden change and surprises gets enhanced by the various quality of space and volumes. The following features can be highlighted in relation to the linear movement:

1. Approach: The diagonal approach (No visual connection from the entrance gate)
2. Entrance: Big entrance to the stepwell complex
3. Path: Perpendicular shift in the previous movement path
4. Nodes (Pause points): Change of movement pattern at every pause point at pavilions.
5. Sequence: Sudden change in vision with changing sequence.

The journey from outside to inside is relatable to the journey of the temple complex; as one reaches towards the end, the purest form of elements is experienced in darkness and silence. As one moves towards the goal, the relation with the outside is getting departed at every level of pause (fig. 04).

The change in scale

The unique feature of Matabhavani stepwell is the highlighting pavilions above the ground level. The pavilion level is sunken down to the surrounding ground level, the higher level of the surrounding is giving a sense of pavilion coming out of the ground. The scale and proportion of the pavilion structure and the columns' arrangement is giving a human scale to the structure (fig. 05). The smooth transition from ground to pavilion structure is experienced because of the wide steps inviting to pavilion. The changing riser in size with a sudden change in the steps' orientation creates a movement pattern evident for this journey. The transformation of columns from the square base to offset square profile to the octagonal shaft to rounded edges columns shaft near the capital helps to relate the pavilion's height to human scale. The inaccessible first ledge coming out of the retaining wall and the accessible broken platform of the second pavilion is further breaking down the open volumes.

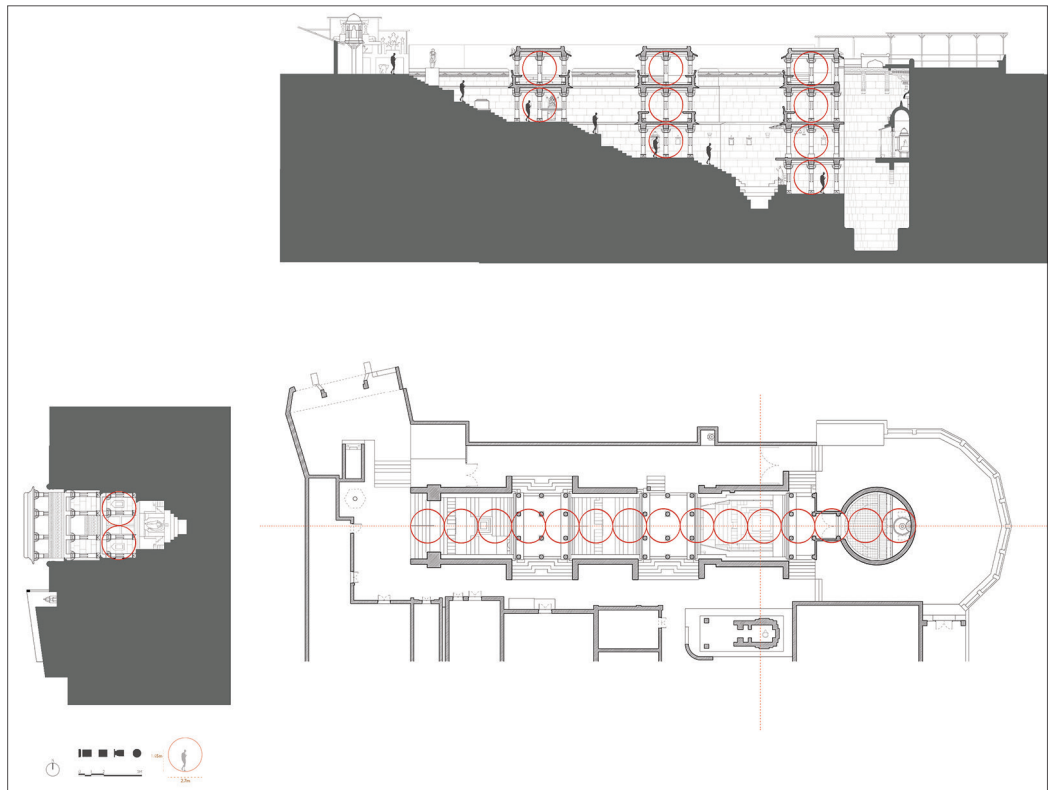


Fig. 05. Understanding the scale and proportion of space by having one relational factor with a human scale (images by the authors recreated from base drawings by Aashini Seth).

The sense of enclosure

While entering stepwell through steps leading to water or temple structure the open space between the first and second pavilion structure is perceived as an enclosed space by the massive retaining wall on either side and relatively porous pavilion structure on the other side. The confusing movement makes one aware of the fact being in the open space because of changing light and orientation. The pavilion structure is perceived in complete contrast with the outside as a dark and enclosed space with few traces of light from the opening on the central bay. The sudden transition from relatively lit up and open space to dark and closed space is defining a space's character.

A similar pattern has been followed in the transition from the second pavilion to the well structure. The feeling of being in a big open underground space is prominent as the whole movement is under the big opening on top (fig. 06). The confusing movement towards reaching water surrounded by the natural vegetation gives a sense of getting enclosed by the natural elements like water, sky, earth. The pavilion's lower storey was perceived as a more functional and enclosed space, as it has been used as a temple structure. The degree of transformation was that every space is altered with all religious activity and ritual materials. The whole space becomes alive as many people come to visit the temple and the activity around the structure also makes it feel more enclosed.

Nature of openings

The Mata Bhavani stepwell has a different proportion of the openings, the placement of the pavilions is such that the overall three open spaces have divided the structure into three different portions. The unusual opening sizes and the East-west orientation of the structure making the open space lit throughout the day. The transition from one open space to another has a different experience with changing light intensity, changing the proportion of the opening, and increasing volumes of space.

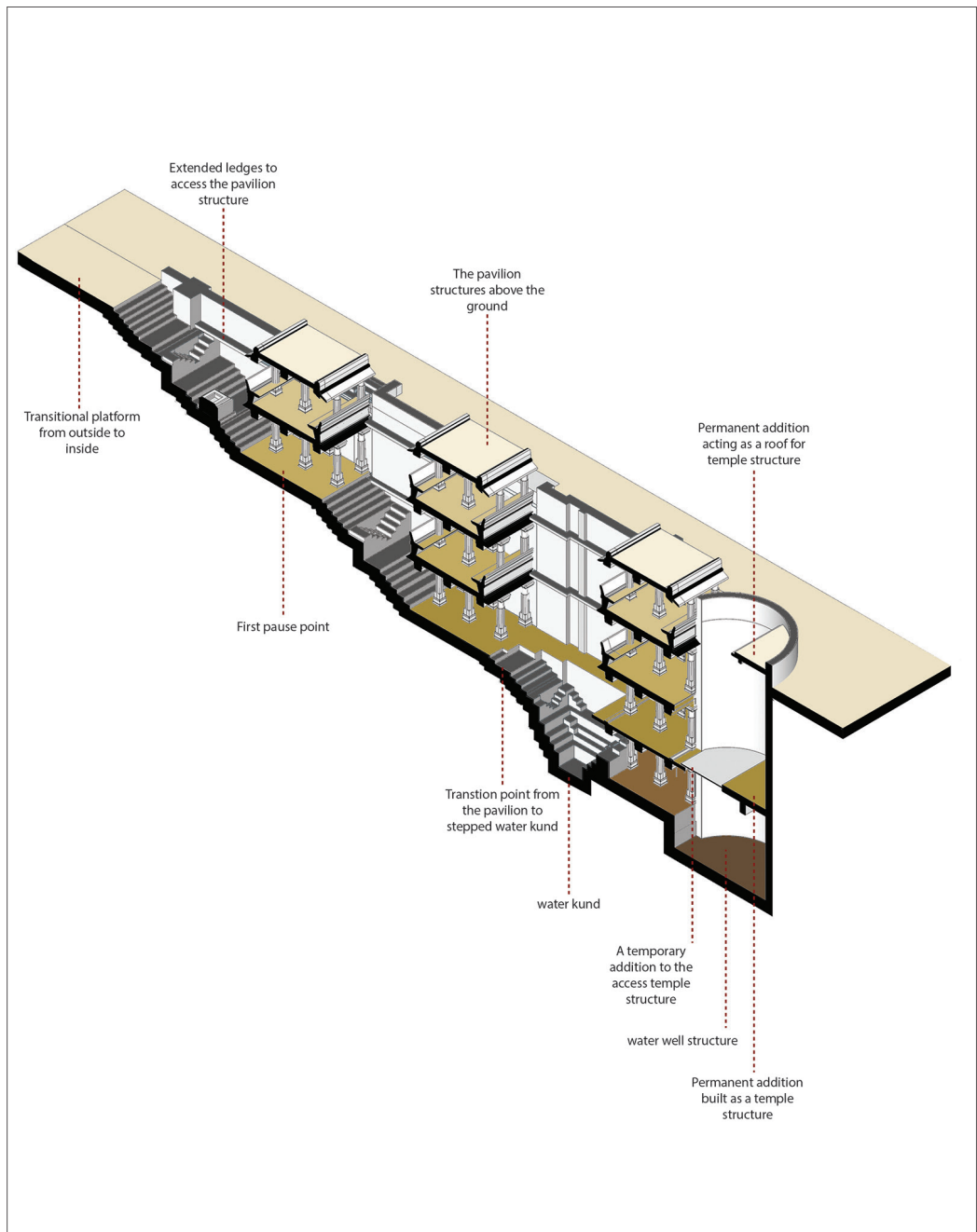


Fig. 06. Isometric views of stepwell structures in the planes, where horizontal planes act as a pause point and the inclined planes direct the movements (image by the authors).

The first stories of the pavilion above the ground were perceived as more open and porous in comparison to the lower stories of the pavilion.

The central bay is acting as a connector between two open spaces. The sudden change in the natural light from open space to dark pavilion space to open space becomes a pattern that is experienced in the journey from outside to inside. The intensity of natural light brings liveliness to the static symmetric structure. Changing the intensity of light on the simple geometrical structure is perceived differently with changing light condition from every pause point at the pavilion (fig. 07).

The transition through light dark light is more impactful through space; the intensity of the change in light is not evident enough to notice because of the large open volumes, changing movement patterns (fig. 08).



Fig. 07. The changing opening sizes and the types of natural light because of the north-south orientation throughout the day (images by the authors).

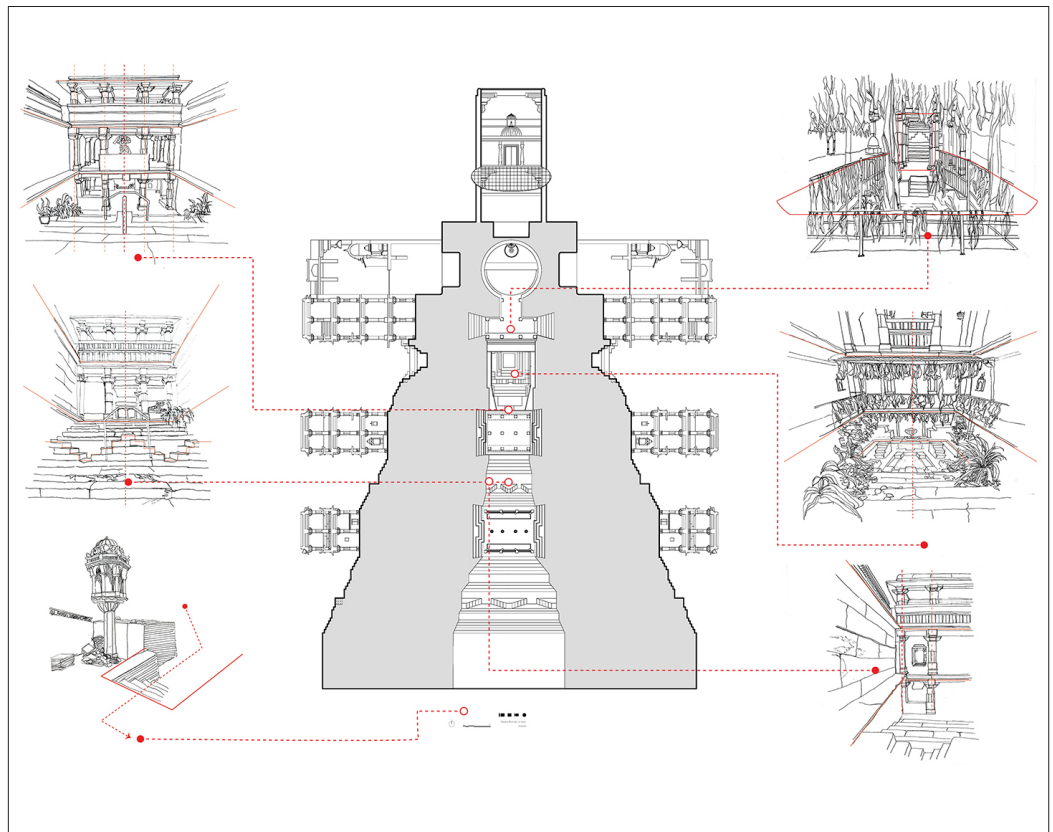


Fig. 08. The changing frames with every step of movement. The change in geometrical frames is set at every pause point of the pavilion, where the pavilion's simple, symmetrical and geometry adds depth and direct vision. At the same time, moving through steps, the changing frames with changing the orientation of movement with adjusting vision with changing opening, light condition, and volumes (images by the authors).

Surrounding objects

The usage of the pavilion above the ground has completely changed from a place for shelter or gathering space to storage site of the materials of the temple. The addition of red flags over the pavilion structure and the sculptures are disturbing the visual connection through the porosity of the pavilions. The broken edge of sandstone on the corner and the changing surface of the sandstone with the dampness and the layer of moss and algae taking over it, affecting the overall atmosphere of the space. The well structure is completely altered because the green vegetation has taken over the place, and because of the natural plants and the presence of water the humidity level increases a lot such that the whole space becomes cold. People keep knotting the red *chundri* (multicoloured scarf) to the railing as a part of the offering, and the series of red *chundri* is making a panorama around the entrance. Also the smaller offering elements in the temple structure, the glazed tiles over the rough sandstone, the photographs of gods and goddesses, change the overall atmosphere of a place (fig. 09).

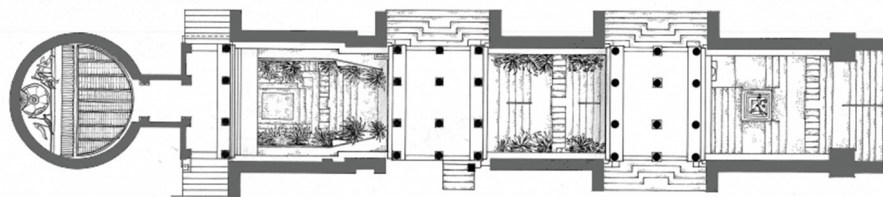


Fig. 09. The alteration of space by the addition of temporary things in and around the stepwell affecting the atmosphere of the place (images by the authors).

Conclusions

The stepwell itself is a place in Transition; it is continuous with basic linear movement destined to the endpoint, detaching with the surroundings. The transition types through a linear space define the character of spaces, as every stepwell provides a significant change in the atmosphere - as a part of the experience. Through the design of the research and the produced graphic analyses, it was possible to understand the emotional side of this architecture. The first sense of enclosure that gets prominent as one enters the stepwell complex through the main gate is probably related to the surrounding by the community house. In the case of the stepwell, the change in representation techniques is necessary to connect with the change in the atmospheric parameter like scales of pavilion frames, openings, degree of enclosures, change in sensory experience, change in light and materiality, changing ground

levels, the form, proportion, and the placement of pavilions, changing ornamentation, and the strong atmosphere impacts the experience while transitioning through spaces. The stark relation with light is experienced in the temple structure (third pavilion), as the only semi-circular opening in the well structure is lighting the volume. The transition from the wide-open space to temple structure is impactful, as the sudden change in terms of the space, light, function, and human adaptation of the space define the character of Mata Bhavani stepwell. The adaptation of the existing underground water structure by the community living around has impacted the atmosphere of the place: the experience of visiting a stepwell and the temple structure is in a struggle with the same structure. Unfortunately, the purpose of the structure is completely altered to different programs where the identity of it gets lost in the transformation with unnecessary change and the addition of the material in the linear inclined movement. Which question that, is it a place for water or place for worship?

References

- Benjwal, H. (2021). Safeguarding intangible heritage of Prayagraj: agenda for policymakers and stakeholders. In *International Journal of History* 2021; 3(1): 41-43.
- Bhatt, P. M. (2014). *Her space, her story: exploring the stepwells of Gujarat*. New Delhi: Zubaan.
- Bhattacharyya, A. (2019). *From Repository of Reminiscence. Between History and Memory, the Blue Jodhpur: Experiences of integrated documentation on and survey techniques*, 123-132. Santarcangelo di Romagna: Maggioli Publisher.
- Bjønness, H.C. (1994). *A cultural heritage conservation strategy in the context of urban de-velopment - the case of Kathmandu, Nepal*. ICOMOS publishing.
- Borin, E., Maietti, F., Rossato, L. (2018). *Education to cultural heritage survey and representation for preservation: the case study of Jodhpur, the blue city, India*. Proceedings of Heritage 2018 - 6th International Conference on Heritage and Sustainable Development, Green Lines Institute.
- Chakrabarti, M. (2017). *Stepwell—The Water Architecture of India*. Pakistan Heritage, 9(1).
- Dallen, J.T. (2009). *Cultural Heritage and Tourism in the Developing World: A Regional Perspective*. London: Routledge.
- ENVIS Centre (2019). *The Stepwells of Gujarat. Ecological Traditions of India Volume – XI Edition*. United Kingdom: CPR publisher.
- Jain, K. (2017). *Conserving architecture*. India: AADI Centre.
- Jain, M. (2019). *The best for both the worlds: documentation on of blue Jodhpur and the education of architecture students*. Between History and Memory, the Blue Jodhpur: Experiences of integrated documentation on and survey techniques. 27-36. Santarcangelo di Romagna: Maggioli Publisher.
- Jain-Neubauer, J. (1999). *The stepwells of Gujarat*. India International Centre Quarterly, 26(2), 75-80.
- Joshi, A. M. (2001). *Integrating spatial and monument conservation with development demand of a living heritage*. Master thesis in urban planning, tutored by prof. Tiwari, S. R., Lilipur: Ttribhuvan University.
- Kumar, M. (2009). *Envisioning a cultural landscape: Mansagar Lake Project, Jaipur, India*. Thesis Submitted to the Graduate Faculty of the University of Georgia, Master of Landscape Architecture.
- Livingston, M., Beach, M. (2002). *Steps to water: the ancient stepwells of India*. Princeton Architectural Press.
- Shokoohy, N. H. (2004). *Waterworks of mediaeval Bayana, Rajasthan*. Bulletin of the Asia Institute, 18, 19-42.
- Voudouris, K., et al. (2019). *Evolution of water wells focusing on Balkan and Asian civilizations*. Water Supply, 19(2), 347-364.

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