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www.indianinstituteofarchitects.com

Editor Ar. Vinit Ramkrishna Mirkar

601, Ratnagar Chs, Jaiprakash Road, Four Bungalow,
Andheri West, Mumbai Suburban,
Maharashtra - 400053.

vmirkar@gmail.com

Advisors : **Ar. Mukul Goyal**

Printer's Email

design.quickprint1@gmail.com

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Dear IIA Members,

The months ahead are significant for the Indian Institute of Architects as we continue to strengthen the Institute and respond to the evolving needs of the architectural profession.

At a time when technology, sustainability and changing approaches to design and practice are reshaping our profession, IIA remains committed to promoting professional excellence, knowledge sharing and meaningful engagement among architects.

The devastating floods in Upper Assam and the recent tragic events in Nepal have deeply affected communities and families. These difficult circumstances remind us of our responsibility not only as professionals, but also as members of society. I appeal to our members to extend their support and solidarity to those affected and to contribute, wherever possible, towards relief and recovery efforts.

As architects, we understand the importance of homes, communities and places that provide people with dignity and security. Standing with those who have lost their homes and livelihoods is therefore not only an act of compassion, but also a reflection of our shared humanity.

The strength of IIA has always rested on the collective efforts of its members, Chapters, Centres, Committees and Office Bearers. I encourage everyone to remain actively involved and contribute towards the continued growth of our profession and the wider community.

As my tenure as President approaches its conclusion, I express my sincere gratitude to all our members and colleagues for their trust, support and cooperation. It has been a privilege to serve the Institute and the architectural fraternity.

With unity, compassion and collective commitment, I am confident that IIA will continue to move forward with strength and purpose, building upon its rich legacy and contributing meaningfully to the future of architecture and society.

With warm regards,

Ar. Vilas Avachat

President

The Indian Institute of Architects

A Reflection, A Handover, and The Road Ahead
Greetings to all my IIA fellow members,

As August 2026 comes to a close, the Indian Institute of Architects stands at a pivotal junction. The election process across our National Council, Chapters, Centres and Sub-Centres marks the conclusion of the 2023-'25 tenure. While every election brings a period of transition, it primarily signals the beginning of a fresh chapter, unfolding new opportunities, fresh perspectives and vibrant possibilities for our fraternity. To all the contesting candidates taking up the mantle to lead and serve, I extend my heartfelt best wishes.

For me, this issue holds a deeply personal significance. It marks the final editorial of my term as Editor of the Journal of the Indian Institute of Architects (JIIA). Looking back over these past years, our guiding vision has been simple yet ambitious: to elevate the quality of the Journal and foster an inclusive platform that truly reflects the diverse, multi-faceted nature of architecture of India.

We strove to ensure that JIIA mirrored the achievements of the entire fraternity. From showcasing ground-breaking design projects, insightful articles and rigorous research papers to amplifying vibrant student works, we worked to celebrate every tier of our community. Beyond academic and professional practice, we opened our pages to individual creative expressions, giving space to poetry, paintings and artistic endeavours that remind us of the human spirit at the core of space-making.

This journey would have been impossible without the steadfast backing of many. My deepest gratitude goes to the National Office Bearers and Council Members for their unwavering trust, guidance and support throughout this tenure. I extend my sincere thanks to our readers for their constant engagement, feedback and encouragement, as well as to the authors, researchers and content creators who placed their faith in JIIA to present their work to the world. Most importantly, I owe an immense debt of gratitude to my dedicated Editorial Team: their tireless efforts behind the scenes made this entire journey possible. I hand over the reins with immense pride and complete confidence that the incoming team will build upon these foundations, bringing new energy and taking JIIA to even greater heights.

Looking immediately ahead, the global architectural spotlight turns toward us as the ARCASIA event commences on 8 September 2026. On behalf of JIIA and the entire fraternity, we extend a warm and enthusiastic welcome to all delegates, architects and distinguished speakers arriving from across Asia and the world. We wish this grand gathering resounding success as it brings together the finest minds to deliberate on the future of the built environment.

As we move forward into a rapidly shifting world, our profession faces unprecedented challenges, from the pressing reality of climate change and rapid technological shifts like AI, to complex geopolitical shifts. Yet, architecture has always been a discipline of resilience and visionary problem-solving. By leaning into collaboration, ethical practice, and innovation, our fraternity will undoubtedly rise above these complexities to create meaningful impact and serve humanity.

Let us continue the good work together.

Jai Hind!

Ar. Vinit Mirkar

Editor

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Vastu Spandana: Abstract Geometric Echoes of Ancient Indian Urbanism

By Ar. Lavanya B



The theme reinterprets the architectural and mathematical intelligence of Indian Knowledge Systems through an abstract geometric composition. The abstract geometry within the graphic draws a direct conceptual parallel to the sophisticated, rock-cut masonry and water-conservation layouts of the Harappan civilisation, most notably seen at the UNESCO World Heritage site of Dholavira in Gujarat. Dholavira stands as a pinnacle of ancient civil engineering, celebrated for its massive, interconnected stone reservoirs, deep stepwells, and a rigid, proportional grid system carved right into the natural bedrock.

Presented as an intricate relief across weathered sandstone, the graphic translates ancient systems into a contemporary language of intersecting circles, semicircular channels, orthogonal grids, planar projections, and precise cylindrical cuts. Concentric channels and recessed forms evoke the reservoirs, catchments, and stepped water systems that transformed scarce resources into organised networks, while the underlying rectilinear framework recalls the disciplined divisions of streets, fortifications, and urban sectors. In classical Indian architecture (*Vastu Vidya*), space is never merely an empty void; it is a living, organised entity structured around cosmic harmony, known as *Rta* (universal order). The graphic captures this philosophy by abstracting the principles of the *Vastu Purusha Mandala*—the metaphysical square grid used to balance spatial energies. The meticulous stippling technique creates a dynamic rhythm of light and shadow, illustrating how individual, fragmented elements (the dots) seamlessly coalesce into a highly structured, unified cosmic machine. It visualises the ancient view that the micro-structures built by human hands are intrinsically connected to the broader macro-cosmic order.

Earth-toned sandstone, tactile relief, and geometric precision bring together the material permanence of ancient architecture with a contemporary sensibility, creating a visual expression of India's enduring contributions to mathematics, spatial science, engineering, and urbanism.



Ar. Lavanya B is an Assistant Professor at Dayananda Sagar College of Architecture, Bengaluru (IIA-IM-109). She specialises in Urban Design and has a keen interest in Basic Design education, visual thinking, and gender-sensitive urbanism, integrating creative pedagogy with research and architectural practice.
Email: lab.dsarch@gmail.com



JIIA Call for Papers, Articles, Projects

AUGUST 2026

The Journal of the Indian Institute of Architects invites original and unpublished contributions from members **ONLY** (academicians, practitioners and students) under the following FOUR categories. Submission in each category is strictly only through the respective google forms.

In order to be accepted for publication, all material sent in these categories should have the following components:

1. MS Word document file with text only. Please do not format it in anyway. The numbered captions for all the images will also be in this document.
2. Folder with all images (minimum 300 dpi), numbered according to the captions given in your text file
3. Photograph of the author/s (minimum 300 dpi).
4. Author biodata – Maximum 50 words.
5. PDF (optional)– showing the intended layout. This pdf should include text and all images, with numbered captions.

Category 1 : Articles

google form link: <https://forms.gle/pJ2d4MVYqyPzWiVc9>

Essays, interviews, articles (1500- 2500 words), book reviews (600 and 750 words), travelogues, sketches and photo-essays in the areas of architecture, planning, urbanism, pedagogy, heritage, technology, ecology, theory and criticism, visual design, practice or any other relevant subject pertaining to the built environment. (Details of the format will be available on the JIIA website).

- For a design project, please include the 'Fact File' with the following details : Project Name, Location, Plot area, Total built up, Structural consultants, Project completion. Also please give the photo captions and credits. Please ensure that the image is referred to within the text. For eg, "As seen in Figure 1...". This is essential for the layout.
- For design projects, plans and sections of the project are desirable along with the photographs.
- Book reviews should be only of books by Indian authors. please include the "Fact File" with the following details: book title, author name, publisher, year of publication, ISBN, language the book is written in, genre (technical/ fiction/ etc.), no of pages, dimensions (in cm), type (Kindle / paperback/ hardback), available at (amazon.in/ flipkart. com/ others).
- Please send a write-up of about 200-300 words along with sketches and photo-essays.

Category 2 : Student Work

google form link: <https://forms.gle/8wDCYFusLb7hWcpa6>

Summaries of dissertations (2000-3000 words) at the level of B.Arch. & M.Arch., and theses at the Ph.D. level. The Guide for that work will be mentioned as the Co-author. (Format will be available on the JIIA website).

Category 3 : Contributions from Chapter Correspondents

google form link: <https://forms.gle/kdVvqQUmWDMRhjGi8>

- (a) Chapter News: This includes various interesting activities from the Centres of your Chapters (maxm. 500 words for the news from the entire Chapter).
- (b) News of conferences by the academic institutes in your respective Chapters.
- (c) Obituaries : Obituaries of IIA members should consist of the photograph of the departed soul, the dates of birth and death and a short 50-word note.

Category 4 : Research Papers

google form link: <https://forms.gle/4CmCsXQJdrBiSrSD8>

Research papers (2000-5000 words) in the prescribed format. The research may be based on their ongoing or completed research. (Format is available on the JIIA website). All contributions in this category will be double blind peer-reviewed before being accepted for publication by academic experts of repute.

Category 5 : JIIA Cover + Theme Note

google form link: <https://forms.gle/En69gXSps2j72Hrf7>

Students from affiliated colleges are invited to design the cover page theme. This should be a graphic based on some aspect of Indian Knowledge Systems. The submission will include the graphic file (jpeg or corel draw); a theme note (with a title) of about 500 words explaining the concept of the graphic. Please note that the image you send should be within a SQUARE of 15 x 15 cm. It will be adjusted as per the layout requirements of the JIIA Cover. It should NOT contain any text / slogan/ etc.

Please note:

1. All submissions will be accepted only through google forms.
2. Submissions will **NOT** be accepted through email.
3. Any queries to be addressed to : jiieditorial@gmail.com.
4. When you correspond with us, please give your email id (that you regularly use) and your cell no. (preferably with WhatsApp).
5. It is compulsory to mention your IIA regn. No. Submissions will **NOT** be accepted from non-members.
6. The review process takes anywhere between 4-6 weeks. Since it may not be possible to respond to all authors who send in their work, we will definitely revert if and when your work is accepted.
7. JIIA does not charge any fees for publication of any professional or academic work.
8. It is understood that submission from an author is an original work, unpublished anywhere else, and that IIA and JIIA are in no way responsible for any matter or dispute arising out of the publication of the same.
9. All authors are requested to refer to further detailed information available on the JIIA website.

Designing Living Heritage

A narrative-based approach to Commemorative Architecture

By Kashish Jain and Ar. Priya Arora

1. Introduction

"The design of space is the design of experience." — Bernard Tschumi

'Commemorative Architecture' has existed since ancient civilisations from Egyptian pyramids and Greek victory monuments to modern-day memorials like the Holocaust Museum and the Statue of Unity. Traditionally, commemorative structures were object-centric, emphasising monumentality, grandeur and permanence. In contemporary contexts, however, commemoration has evolved beyond static representation, it now focuses on spatial storytelling (Lu, 2017), user experience, participation and emotional engagement.

This shift aligns with the concept of 'Living Heritage' - heritage that continues to evolve through interaction and experience rather than remaining frozen in time. It transforms architecture into a living narrative, sustaining memory and cultural meaning for future generations. The research aims to study commemorative architecture and the role of architectural narrative in designing spaces and enhancing user-experience. Architecture has the potential to narrate stories. Stories are the easiest media through which people understand things and values (Tharammal, 2019). Adopting a narrative-based approach to commemorative architecture helps in emphasising how space can communicate stories, evoke emotion and nurture collective memory.

1.1 Methodology

The methodology conducted for this research is divided into following steps:

Step 1: Exploration of architectural narrative and its relevance within commemorative architecture with a focus on user experience and emotional values. Primary data for this study was drawn from literature reviews, research papers, articles and case examples.

Step 2: Analysis of the role of spatial qualities in shaping architectural narratives and examines how these qualities evoke emotional responses through national and international commemorative projects supported by public surveys.

Step 3: Evaluation of the impact of narrative elements on user experience through public survey analysis.

Step 4: Recommending design strategies that integrate narrative elements to enhance user experience in commemorative architecture.

2. Literature Review

2.1 Narrative expressed through architecture

Prior to providing an overview of narrative through architecture, let us first talk about why narrative is important in architecture? Psarra (2009) states that "...narrative is often considered as something quite different - a story, a sequence of successive actions and events". Storytelling is an intrinsic part of the human experience. We are, as Atwood puts it, "creative storytelling beings" (Siddiquee, 2024).

Stories serve many purposes, they preserve history, culture and communicate complex ideas in an entertaining and effortless manner that inspire us. Just as stories narrate ideas, so does architecture. Narrative in architecture is even more powerful because all of the senses are engaged as one is moved and guided through space (Maze, 2006). It is a language, it is not just about buildings being useful or functional - it is also about meaning, symbolism and storytelling. Just as literature uses words to tell stories, architecture uses space, forms and arrangements to create narratives and convey values (Kang, 2021).

In simple words, architectural narrative is the depiction of stories and events through the formation of space. As we understand ideas and values better through stories, the intention of commemorative architecture could be better communicated through the architectural narrative (Tharammal, 2019). The role of the architecture of commemoration is to keep in memory and constantly recall events from the past of significant historical, cultural and ethical value (Tarczyński), this memory is called prosthetic memory. The purpose of an architectural narrative is to build and nourish this prosthetic memory so that the visitors have a better understanding of the past (Tharammal, 2019). Architecture is connected with wholistic, complex spatiotemporal dimensions of experience (Terzoglou, 2018). Spatial dimension relates to the physical and perceptual qualities of space - how architecture communicates through form, signs and movement while temporal dimension relates to time and sequence - how spaces unfold as experiences and how they connect to history and give them a sacred status (Wojtkiewicz, 2017).

2.2 Architectural Components of Narrative Construction

“Narrative enters architecture in many ways, from the conceptual ‘messages’ it is made to stand for ... This aspect of architectural expression, what the design speaks of, is relevant to narrative as representation. It concerns the semantic meanings of buildings and places and the contribution of architecture to the expression of social and cultural messages. But architecture does not only express meaning. It also participates in the construction of meaning through the ordering of spaces and social relationships.” (Psarra, 2009)

But construction of meaning is a process, using a series of interconnected elements as shown in Figure 1, we can shape how users experience and interpret architecture. It begins with messaging, expressed through semiotics and symbolism - where



Figure 1: Inter-relations between the elements of architectural narrative

Source: Author

signs, spatial cues and symbolic forms communicate cultural, emotional and conceptual ideas beyond the physical structure (Bellentani, 2016). But as Whitley (2018) questioned, “Are we not concerned with the journey from point A to point B?”

These messaging parts should be placed in a storyline and the story should unfold as the user navigates the space through geometry, configuration of a space, movement of a user, changing perspectives, emotional transitions through light and sound and material expression. Together, these elements of storytelling strengthen the emotional narrative and elevate user experience.

Psarra (2009) emphasises that geometry and configuration are inter-related. The meaning of a space comes from how these two interact. For example, a geometrically ordered, symmetrical layout (like axial symmetry) may limit perceptual variety, while a less ordered geometry combined with a flexible configuration may enrich exploration and emotional experience. Similarly, Whitley argues that while architecture has the opportunity to be discoverable, symmetric ordering systems have limited the potential of spatial arrangements. Their strict adherence to axuality diminished surprise and excitement through excessive control and predictable outcomes. The modern movement’s break from symmetrical space gave rise to the unexpected, foregrounding the movement of the eye, mind and body as critical components of architectural experience - an approach that may be understood as ‘movement architecture’. As Tschumi asserts, “meaning is derived from the order of experiences rather than the order of composition” (Whitley, 2018).

While spatial configuration and movement structure the physical journey, experiential depth is intensified through the manipulation of light, sound and materiality in the built environment shaping users' psychological responses. Lightness and darkness operate as complementary narrative forces (Lu, 2017) - light often signifies hope, divinity and enlightenment, while darkness evokes mystery, loss and remembrance. Their dialogue allows a space to communicate emotions that words or forms alone cannot convey. Materiality further grounds these experiences (Lu, 2017), as materials are more than mere building elements. Each carries distinct textures, temperatures, colours and symbolic meanings (Bellentani, 2016) that shape how users perceive, feel and remember a space. Extending this narrative beyond the visual realm, sound functions as an invisible yet powerful architectural element which makes the space more immersive - visitors don't just see, they feel and hear it (Tarczyński).

Finally, cinematic choreography integrates space and time, creating a sequence of revelations. As described by Gordon Cullen in his seminal work 'Townscape', where unfolding vistas, surprises, sudden contrasts, transitioning between spaces, scales and atmospheres guide the emotional and psychological journey of the user. He also coined the term 'serial vision' which refers to the changing perspectives and sequential views as you move through space. Serial vision lets us envision how a space will look from different angles, viewpoints and times of day, fostering the creation of designs that deliver a sense of discovery and delight that keeps the visual journey engaging. By creating a sequence of engaging spaces, serial vision can reinforce the unique sense of place with a deeper emotional connection (Guy, 2024).

In commemorative architecture, all the experiences must be arranged in sequential events of time (Pallasmaa, 2018). Given its engagement with history, the messaging and storytelling elements need to follow a deliberate historical sequence. This sequence is the hidden layer in the architectural narrative which deals only with the temporal dimension of architecture as it recounts events and characters from the history in respective sequence, usually in chronological order. This makes visitors flow through time, like a time-lapse through space - from past to present or present to past (Tharammal, 2019). Combined, these elements transform architecture from a static form into an immersive storytelling medium.

Set within a sparse agricultural landscape, Peter Zumthor's Bruder Klaus Field Chapel exemplifies

how architecture can transcend form to become an experiential narrative. Shaped by movement, materiality and atmosphere, the chapel reveals itself gradually, guiding the visitor from a distant sculptural presence (Figure 2) into an introspective interior (Figure 3) where horizontal movement shifts toward a vertical focus on light and sky. This shift in proportion guides the visitor's eye, body and mind (Figure 4) demonstrating how built form can impact and heighten the human experience by evoking emotion and communicating meaning over time, allowing design to tell a story rather than remain a static structure (Moody, 2019).



Figure 2: Bruder Klaus Field Chapel exterior

Source: Samuel Ludwig



Figure 3: Bruder Klaus Field Chapel interior

Source: David Schönen

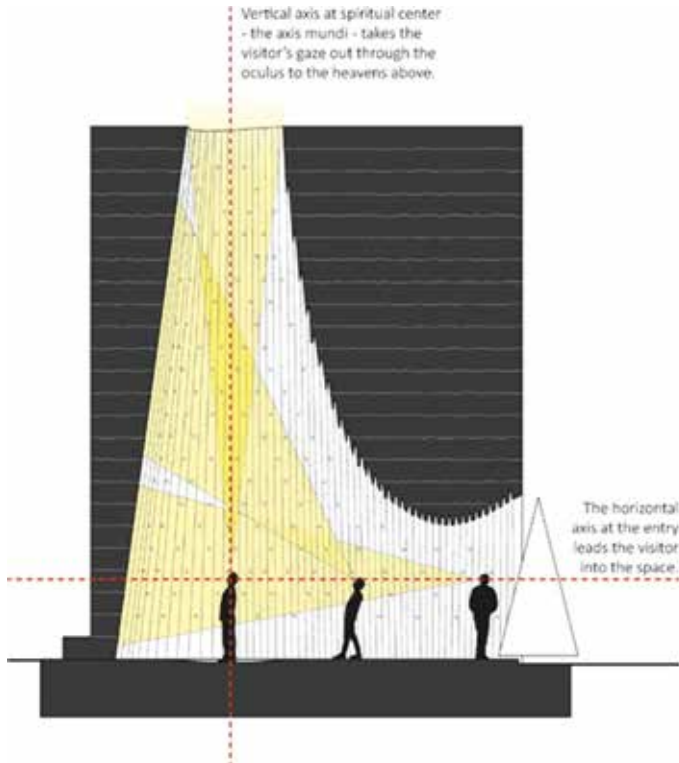


Figure 4: Section of Bruder Klaus Field Chapel
Source: Schwartz and Ford, 2016

3. Methods of Analysis

3.1 Case Studies

Commemorative architecture spans a wide range of spatial and cultural expressions. For this research, two distinct narrative-driven projects were selected to ensure a diverse yet balanced understanding of how architecture can communicate stories and emotions. Their selection enables the study to examine how different quality of space induces different emotions. The chosen case studies offer contrasting cultural and spatial approaches while remaining relevant to this research focus. The case studies selected are as follows:

3.1.1 Jewish Museum, Berlin, Germany, by Daniel Libeskind

Daniel Libeskind's extension to the Jewish Museum, Berlin (Figure 5) was an attempt to reclaim a lost cultural identity erased during WWII. The design expresses the feelings of absence, emptiness and invisibility by using architecture as a narrative medium to evoke the emotional and historical impact of the Holocaust on both the Jewish culture and the city of Berlin (Pavka, 2026).

The building's form is derived from a fragmented Star of David, symbolises the ruptured continuity of Jewish life in Germany. Lacking a direct external entrance, access is deliberately mediated through the original Baroque museum via an underground corridor (Figure 6, start point-1), creating a disorienting



Figure 5: Exterior of Jewish Museum, Berlin
Source: <https://www.berlin.de/en/museums/3108776-3104050-jewish-museum-berlin.en.html>

transition that reflects the fear, uncertainty and hidden existence experienced by Jews during the Holocaust. This path leads to a junction of three axes representing distinct historical trajectories: the 'Axis of Continuity' leading to exhibition spaces; the 'Axis of Emigration', terminating in the disorienting 'Garden of Exile'; and the Axis of Holocaust leads to a blind alley at the end of which there is the Holocaust Tower, a space of isolation and trauma (Figure 6).

Libeskind further introduces vertical voids that slice through the building symbolising the physical and emotional absence left by the victims. Narrow dark corridors and the spatial configuration from light to darkness and openness to confinement evoke instability and loss. Materiality reinforces this emotional atmosphere - cold, exposed concrete absorbs warmth from the body and expresses depressing emotions (Zumthor, 2006). Installation of iron faces that produce unsettling sounds underfoot, symbolising silenced suffering (Tarczyński).

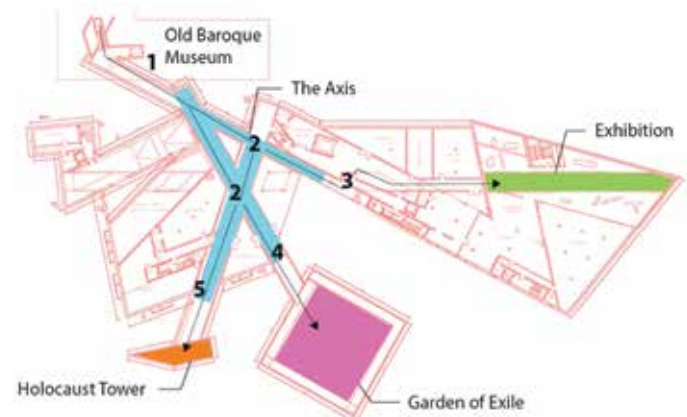


Figure 6: Plan of the Jewish Museum, Berlin
Source: Zhang, 2024

The museum's circulation unfolds as a cinematic journey, guiding visitors from pre-Holocaust history (Old Baroque Museum) into a fragmented and oppressive spatial experience. Dead ends, confined passages and occasional light create a tension between despair and hope. Ultimately, this spatial quality transforms the museum into an emotional journey of Jewish history, one that is felt before it is intellectually understood.

3.1.2 Virasat-e-Khalsa Museum, Anandpur Sahib, Punjab, India, 2011, by Moshe Safdie

Clad with local sandstone, the Khalsa Heritage Centre acknowledges the Sikhs' history as celebrated warriors. Its stainless steel, upward curving roofs contrast with traditional gold-domed Sikh structures like the Golden Temple in Amritsar (Safdie Architects, 2011). The petal-like galleries arranged in groups of five, symbolise core Sikh values, while the monumental entrance establishes a sense of reverence and power (Figure 7).



Figure 7: Entrance of Virasat-e-Khalsa Museum
Source: Ram Rahman

Inside, the museum uses controlled lighting, vibrant colours and immersive soundscapes to create a spiritual and celebratory experience (Figure 8). Multimedia displays and locally crafted artifacts enhance narrative engagement and cultural pride. Spatial transitions from monumental volumes to intimate, reflects Sikh history from struggle to resilience.

3.2 Public Surveys

This research employs a non-intrusive approach of data collection to analyse architectural narrative and user experience, integrating qualitative field survey within the historic urban fabric of Jaipur, Rajasthan (India) with questionnaire-based analysis. From the literature review, certain parameters of spatial qualities have been identified - form, scale and proportion, transitional spaces, play of light and sound, material, levels, ascending and descending space. The emotional responses of users were collected in these spatial environments.



Figure 8: Interior of Virasat-e-Khalsa Museum
Source: Safdie Architects

The walled city of Jaipur designed by Vidyadhar Bhattacharya has a strong sense of character and identity comprises several distinctive spaces that reflects its history and culture and engages visitors emotionally. Inspired by Zimmermann's work on mood detection through mouse movement patterns, this study similarly interprets architectural experience through observational behaviours such as walking pace, lingering, movement patterns, facial expressions and their mood during interaction (Zimmermann, 2008). This approach prioritises spontaneous emotional responses, thereby preserving natural behaviour within the environment. The most prominent area of the city was selected and the data were gathered from users of various age groups and professions and their responses were recorded with their consent.

As shown in Figure 9, the architectural spaces were documented inspired by the serial vision of Gordon Cullen, a pedestrian walking down a street from one point to another, at a uniform pace and the movement of the pedestrian is providing a sequence of revelations, shown in the serial drawings just below the map and at each point, the emotional response of different users were collected.

Complementing the field survey, a structured questionnaire survey was undertaken to document users' perceptions and experiences across different spatial typologies. Together, these methods enable comprehensive understanding of how architecture can become a medium of shaping psychological responses.

4. Results and discussion

This study evaluated a comprehensive analysis of emotional responses to the architectural spaces as

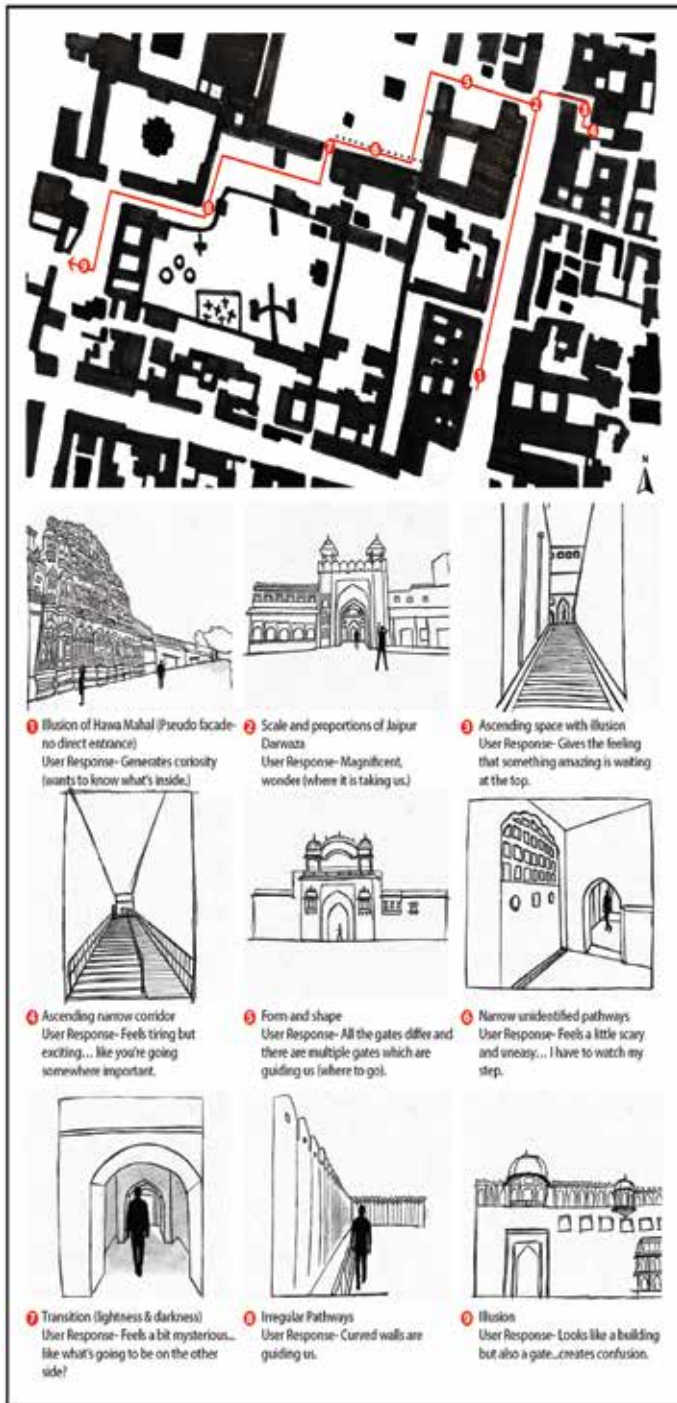


Figure 9: Survey area of Jaipur along with serial drawings
Source: Author

shown in Figure 10. Diagram A and B illustrate the respondent demographics, indicating a majority of participants in the 18-30 year-old age group and a higher representation of female respondents. Diagram C highlights perceived discomfort across spatial conditions, with narrow enclosed spaces identified as the most uncomfortable. Diagram D correlates spatial typologies with emotional responses, demonstrating how different configurations evoke varied emotional intensities where level of emotion 0 indicates no emotion (or

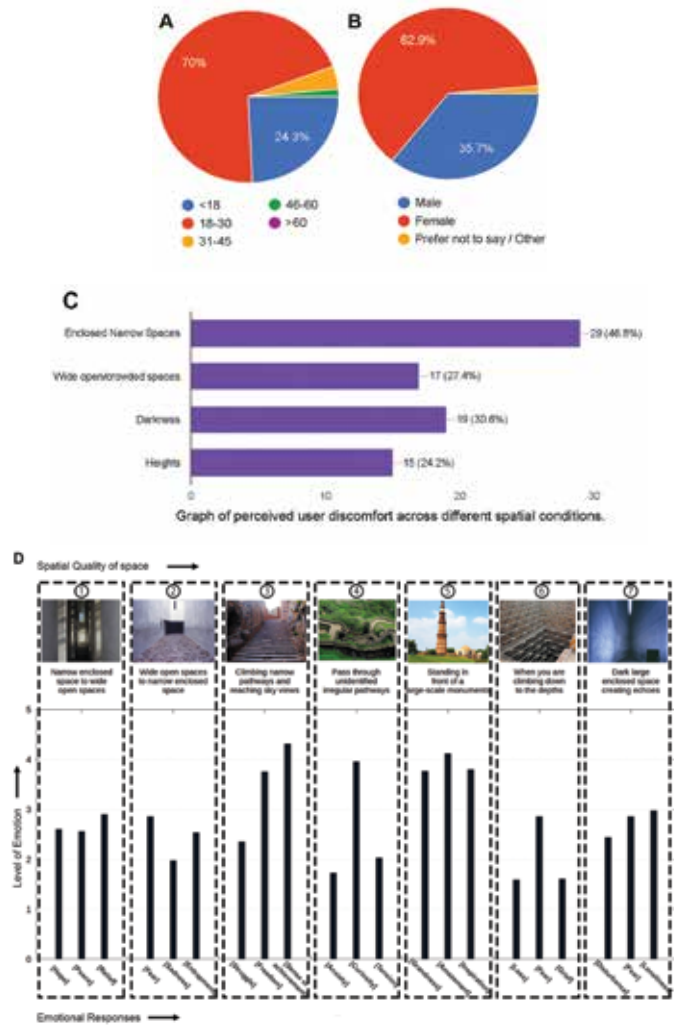


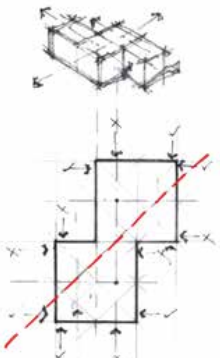
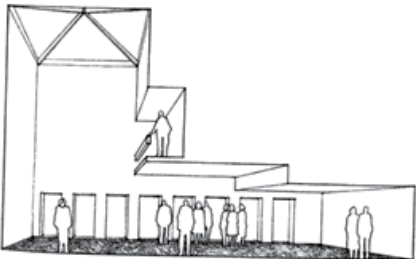
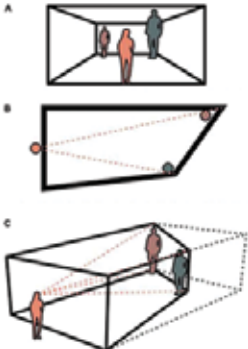
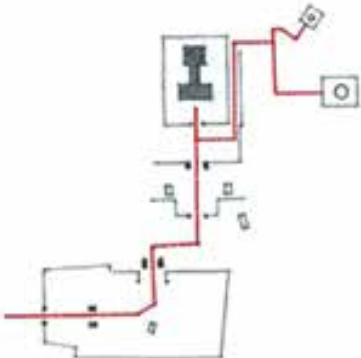
Figure 10: Results of public survey showing different emotions in different spatial conditions
Source: Author

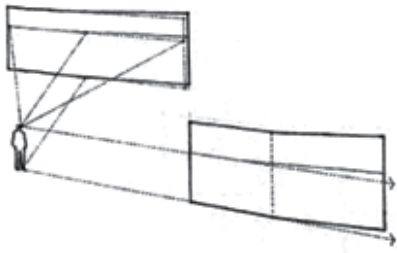
unsure) while level of emotion 5 indicates high/strong emotions. Spaces with visual continuity and openness tend to generate positive responses like curiosity and excitement whereas confined, dark, or vertically disorienting environments induce anxiety, fear and discomfort. Overall, the figure establishes a direct relationship between the spatial qualities and user emotions.

5. Conclusions and recommendations

Based on this study, the spatial qualities that are recommended for an immersive experience are presented in Table 1. Different spaces induce different emotions. This research proves that architectural narrative when applied in commemorative architecture can transform static monuments into an immersive storytelling experience and commemorative architecture becomes truly impactful when it acts as a living narrative, enabling collective memory, cultural identity and emotional resonance to endure for future generations.

Table 1: Recommended narrative approach to Commemorative Architecture for immersive experience
Source: Figures and data compilation by Author

S. No.	Spatial Quality	Recommended
1.	Ordering Principles Avoid symmetrical arrangements of spaces as it becomes predictable. Asymmetric ordering system creates movement of eyes and mind induce an emotion of excitement; alertness gives rise to the unexpected.	Asymmetrical Order 
2.	Form: Volume, scale and proportions Avoid maintaining a constant spatial volume; instead, create rhythmic variations in scale and proportion to evoke emotions and enhance the narrative experience.	Variations in Volume 
3.	Illusion It evokes curiosity and engagement; it lets you control perception. (A) Displays what the perceiver encounters from a given point. (B) Displays a conceptual plan drawing of an Ames Room. The red dashed lines represent the field of view of the perceiver. (C) Reveals the actual conditions under which an Ames room functions.	
4.	Movement Linear movements diminish possibilities and become boring. Despite irregular pathways create tension, uncertainty, curiosity and alertness.	Uneven Movement 

5.	Eyes on the path Direct visual access along the path should be avoided. Instead, a sense of mystery and gradual revelation should be maintained to engage visitors in a narrative spatial journey.	No direct visual access 
6.	Display Typology Rather than limiting displays to rectangular frames, the entire space, including its walls, ceiling and surfaces, should become the exhibit itself, creating an advanced and immersive experience that evokes a sense of belonging.	All the surfaces including walls, ceilings 

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Kashish Jain is a final year Bachelor of Architecture student at Aayojan School of Architecture, Jaipur. She has developed a keen interest in the quality of space, architectural narrative and commemorative architecture. During her internship at INI Design Studio, Ahmedabad, she gained hands on experience in healthcare planning, design and execution.
Email: kashishpjain03@gmail.com



Ar. Priya Arora (A29983) is an Associate Professor at Aayojan School of Architecture, Jaipur. She holds a Bachelor degree in Architecture from NIT Hamirpur and Master degree in Urban Planning from MNIT, Jaipur. Her area of interest is in urban infrastructure, water management and universal accessibility.
Email: pra@aayojan.edu.in

Representation of Mental Health in Architecture

Through Contemporary Media or Films

By Roshini M and Ar. Mohesh Babu Radhakrishnan

1. Introduction

In the contemporary period, people are challenged by the consumption of life represented by the media. This further influences the perception of spaces shown as a part of narrative cohesion. But, how far do these virtual realities limit potential reality? The critical analysis of the characters about a space influences viewers' perspective. Instead of mere spatial quality's establishment, the focus sets the standard of emotions triggered by a 'set studio'. These media could be more careful in the way they narrate a space. This article briefs on the existing threats and potential of spaces represented in films for children.

The media and films are on the side of providing information to people with a strong sense of reality. But whether they actually represent the actions happening in real life is a deep doubt. Once there came a flip of pure entertainment purpose to showcasing 'based on true narrative', it blurred the difference in varied groups. Perhaps the ways for promoting minor or unfair opinions as a new normal became a true challenge for people to accept.

Nowadays, films target a certain age group of audience, to uplift their box office collection as a strategy. In such cases, the adults who are

expected to have better rationality, at times fail to step out as a 'mature enough' person from illogical representations. Likewise, what could be expected from a child who goes in with all excitement to watch a film which has all 'new normal' tags for unhealthy actions. How can a child be taught to wear 'glasses of reality' to make sure they inhale right and good visuals?

2. Media Strategies

To make a scene more sensible in a dramatic visual representation, an ordinary feeling of a space is being exaggerated. For example, the Gen-z (generation) prefer to have their room with aesthetic decors and wallpapers to show themselves as a 'cool' or 'chill guy'. Whereas a room with good quality of light and ventilation is being barged to let in the ideologies of LED colorful lights strips and air conditioners.

Imagine a child, from a family with lower economic background, happen to see this set design stating as a 'normal teenager room', it both consciously and unconsciously triggers the child to want that template without secondary thinking for the need of it. With the similar category, a child's individual identity is being questioned by showcasing only limited parameters as a choice.

3. Media's Mind Games

Have you ever noticed for every emotion/ person, a certain color is put up to represent it? To be more keen, the conventional stigma 'pink is for girls, blue is for boys' is not taught in schools, but exactly in cartoons and children's media. These thoughts are sown in younger minds which later on stereo-type gender based colors and activities.

The spreading of insecurities in children thickens, as it slowly creates discomfort in their own personal choices. Every time a child watches a cartoon, the spatial representations leave a mark on them that makes them judge the person who belongs in that space. For example, 'happy guy lives in a brick house, sad guy lives in a hut' – certainly the thought does not come from reality, but merely from twisted-opinions. To make a scene more sensible in a dramatic visual representation, an ordinary feeling of a space is exaggerated, which children find hard to differentiate reality.

At a young age, we would have simply wanted a play area where we hangout with our friends, then there's a transition to 'I want a room for myself'. From where exactly that decisive tone arrives? How does a child figure out the need and the want for privacy?

4. Incoming Challenges

In the past, children were primarily exposed to cartoons, storybooks and animated films, which were generally produced and distributed through relatively structured platforms operating within established norms and regulations. Today, however, the media environment has become far more complex and dynamic. Artificial intelligence and social media now play a significant role in rapidly influencing children's perceptions, behaviour and understanding of the world. Children are often drawn to visually engaging content and may continuously scroll through material that captures their attention without fully understanding its context or implications. Such exposure can potentially influence their thoughts and emotions and, in some cases, contribute to psychological distress. Children also have a strong tendency to imitate the words, actions and behaviours they observe, often without comprehending the deeper ideas or consequences behind them. Over time, repeated exposure to inappropriate or misleading content may affect their emotional development, perception of reality and overall mental well-being.

For instance, darkness in a space is represented as a quality to induce fear in most of the media. But, studies say at early stages of a child, they don't

actually experience any emotion until triggered by external factors like visual representations, words, expressions. So when a child is left alone in dark space, it naturally moves with excitement of the unknown rather than screaming from sacredness.

5. Responsibilities Carried by Media

Apart from the physical environment, visual surroundings are prevailing and easily accessible in the contemporary world. In some cases, an imbalance between the virtual world and reality can lead to mental health issues among young minds. As a parasite it continues to grow within the child, leading to physical health impairments too.

It is important to establish certain norms and limitations in the visual representation of content in media and films, particularly when it may influence young and developing minds. Factors that make it difficult for children to distinguish between reality and fantasy should be carefully addressed to support their mental well-being. At the same time, children should be encouraged to engage in positive and healthy environments that promote emotional growth. Normalising differences in individual choices, preferences and perspectives can help create a more accepting and balanced environment for their development.

In a rapid bend to a highly media dependent time zone, children are growing watching the delusional screens of media. Especially children at the edge of stepping into the teen and the early ages of teens tend to lookout for new trends in the media, to make themselves feel validated among their peers. This is exactly where the media and films find their importance. The industry indeed has to take responsibility for their role in representing a space or a person with a strong narrative background.

6. Conclusion

There is a need for taking responsibilities by the media platforms which encounter a younger audience. There could be a boundary set to differentiate between the real time narration and fantastical narration. Alexandra Lang says that 'children look to super heroes to transcend their own limitations and those of the world around them' emphasising the manipulation that superman would have saved people from fire whom the firefighters couldn't. Only by creating a familiar spatial environment, every child could possibly imagine understanding the thoughts rather than being forced into their trends. Rather than overwhelming with un-natural representations, the metaphorical emphasis on simple children objects works as a better media consumption.

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Roshini M is currently pursuing a final year in B.Arch at CARE School of Architecture, Trichy.

She has a keen interest in critical thinking of spatial qualities that could influence human behavioral patterns. She strongly believes that the design of a habitat shapes and influences the behaviour, experiences and identity of its inhabitants.

Email: roshinimanickam@gmail.com



Ar. Mohesh Babu Radhakrishnan (A25666) is an Assistant Professor at the CARE School of Architecture, Trichy. His work examines the relationship between architecture, human behaviour and well-being. Informed by his research at Victoria University of Wellington, New Zealand, his academic practice explores phenomenological approaches to the built environment and their influence on human experience. He was invited as a TEDx Speaker at NIT Trichy in 2022, where he spoke on architecture and students' mental health. His contributions to socially responsive design education were recognised with the Design Educator Award (2024–25) by the Ethos Foundation.

Email: moheshbabu123@gmail.com

Architecture for Millet Revival

An Integrated Millet Research, Innovation and Outreach Centre at Shirwal, Maharashtra

By Ar. Isha Chiplunkar and Dr. Abhijit Natu

1. Introduction

Agricultural practises across the Indian subcontinent have long been shaped by diverse climates, soils and cultural landscapes, evolving into cultivation systems guided by monsoon rhythms, soil fertility cycles and a close, generational relationship with native crops. That relationship endured for centuries until the Green Revolution's shift towards high-yielding, input-intensive cereals reshaped what Indian farmers grew and households consumed. Wheat and rice moved to the centre of the plate, while millets, once staple grains across the country's arid and semi-arid belts, moved to its edges, taking with them a nutrient-dense, climate-resilient food source that had sustained land and diet for generations.

Today, as climate change and lifestyle-related health concerns intensify, millets are once again recognised for their ecological and nutritional value. Requiring little water, withstanding extreme weather and offering nutrient-rich grain in place of more input-intensive staples, they have re-emerged as a key component of climate-resilient agriculture. This recognition has extended beyond research into policy, in 2023, the United Nations declared the International Year of Millets, following a proposal by India supported by 72 countries. The Food and Agriculture Organisation and the Indian Institute of Millets Research have likewise positioned millets at the centre of climate-resilient, nutritionally secure food systems.

1.1. Significance of the project

This attention has translated into concrete policy support, national missions, revised minimum support prices and targeted funding for production and value chain development, aimed at reversing decades of decline in crops long overshadowed by wheat and rice. Yet policy and funding alone have not closed the distance between laboratory, field and plate. Millets remain a crop known through headlines rather than habit for most consumers, and through necessity rather than encouragement for many farmers. What is missing is not evidence of millets' value, but the infrastructure to carry that evidence from research into practise, and from practise into everyday life.

The design brief of the project therefore responds to that need by proposing a built environment to study millets, their ecological and cultural context and to reintegrate them into contemporary agricultural practise, returning them first to farms and, in time, to plates.

1.2. Intent of the project

The intent of this thesis is to design a Millets Research and Outreach Centre that directly addresses this infrastructural gap through an integrated programme of research, training and public outreach.

Conceived as a regional hub, the centre is organised around five stakeholder groups whose combined participation can ensure that millets return to cultivation and everyday diet. Researchers generate

knowledge, students carry it forward, farmers sustain cultivation, industry expands innovation and manufacturing, and consumers, engaged through outreach, sustain demand. The centre's intent is to make these relationships structurally and spatially legible, addressing the disconnect between research, cultivation and consumption that has forced millets to recede from farms and diets.

1.3. Aim

To design a Millets Research and Outreach Centre that brings academic research, farmer training, industry-linked innovation, and public outreach into a single campus, advancing sustainable millet cultivation and sustaining public engagement with millets' nutritional and cultural significance.

1.4. Objectives

- To understand the ecological, nutritional and cultural role of millets in India, establishing the rationale for a dedicated research and outreach facility.
- To analyse existing institutional models, such as IIMR and BAIF, and derive a relevant operational framework for the centre.
- To identify a suitable site based on agro-ecological zoning, accessibility for stakeholders, and proximity to millet-growing regions.
- To formulate a comprehensive architectural programme accommodating research, farmer training, industry-linked innovation and value addition, and public outreach, ensuring functional clarity and spatial coherence across departments and shared community spaces.

1.5. Methodology

- Background Research: Reviewing literature on millets' dietary and cultural relevance, agronomic and policy context in India, and institutional frameworks for research, cultivation and outreach.
- Primary Data Collection: Visiting institutions such as IIMR, Hyderabad and BAIF, Pune as case studies, with documentation and expert discussions on the spatial and functional requirements of such a centre.
- Secondary Data Collection: Studying precedents through books and online sources to inform programme development.
- Formulating a design programme from primary and secondary data.

- Selecting a suitable site based on agro-ecological zoning, stakeholder accessibility, and proximity to millet-growing regions.
- Analysing site compatibility with the proposed programme.
- Revising the programme to align with site conditions, stakeholder needs and objectives.
- Studying building byelaws and technical guidelines governing the selected site.
- Evolving a design concept and the design proposal.

1.6. Scope and limitations

The project includes detailed site planning, architectural design of built and unbuilt spaces, and a conceptual approach to structure and services. It excludes detailed structural, services and interior design.

2. Review of Literature

2.1. What are Millets?

Millets are a diverse group of small-seeded grasses belonging to the family Poaceae, adapted to semi-arid regions and tolerant of drought and high temperatures. Based on husk structure, they are classified as naked varieties, including Finger millet, Pearl millet and Sorghum, and husked varieties, such as Kodo and Foxtail millet, which require dehulling before consumption.

2.2. Agronomic Requirements for Millet Cultivation

Cultivation follows two seasons, Kharif during the monsoon and Rabi in the drier months for irrigated varieties, with different species adapted to varying rainfall, temperature and soil conditions, from Sorghum's higher water requirement to minor millets surviving on a fraction of that. Most varieties prefer slightly acidic to neutral soils. This adaptability to marginal and variable conditions sustains yields where other staples fail while requiring minimal chemical inputs, making millets a genuinely low-risk crop.

2.3. Cultural Significance of Millets

Millets carry cultural significance still visible in Indian rural life, offered in harvest festivals and ancestral rites, prepared as festive sweets, and processed collectively in ways that foster community bonding and oral knowledge exchange, particularly among women.

2.4. Millet-Based Food Systems

Staples such as Jowar and Bajra Bhakri (flat-bread)

remain daily fare in agrarian households, while modern processing techniques, popping, flaking, extrusion and baking, are increasingly adapting millets into ready-to-eat products suited to contemporary consumption.

2.5. Lifestyle Diseases and Millet Nutrition

Millet's low glycemic index has been associated with improved glucose regulation (Anitha et al., 2020), their fibre content with reduced BMI (Devi et al., 2011), and their magnesium and soluble fibre with improved cardiovascular markers (Singh & Raghuvanshi, 2012), positioning them as a preventive rather than curative dietary component.

2.6. Government Initiatives and Policies

Schemes such as PMFME and NABARD-backed farmer producer organisations have extended targeted support to millet entrepreneurs and rural producer groups alongside broader national missions.

2.7. Entrepreneurship in Millets

This convergence of nutritional and economic potential has fostered a growing entrepreneurial ecosystem around millet processing, value addition and export, one increasingly drawing in small farmers, women's self-help groups and rural youth as direct participants rather than end suppliers.

3. Case studies

3.1. Secondary case studies (books/ internet)

Secondary case studies included the Galbabbhai Farmers' Training Institute, Palanpur (Ar. Anant Raje), and the Krishi Vigyan Kendra for BAIF, Chaswad (Ar. Narendra Dengle), both examining rural training institutions in agricultural contexts. Landscape precedents, including Lawrence Halprin's Greenwood Common and University of California, Santa Cruz, alongside Ghirardelli Square, San Francisco, informed the treatment of outdoor spaces and circulation.

From these studies, several principles were derived:

- Research, training and allied functions woven around shared courtyards, creating a campus where learning extends beyond formal teaching spaces.
- Climate-responsive planning using courtyards, verandahs, shaded transitions to moderate the microclimate and support outdoor activity.
 - Simple, modular construction using local materials, balancing economy, durability and adaptability for rural institutional settings.

- Landscape designed as an active social framework, where planting, seating and water features enrich movement, gathering and campus identity.

3.2. Live case studies

Live case studies included the Agharkar Research Institute, Pune, whose department-wise laboratory clusters informed the Research department's sequencing; the Indian Institute of Millets Research, Hyderabad, whose integrated seed bank, extension department and Nutri Hub parallel the proposed programme; and the BAIF centre at Jawhar, Palghar, whose seed bank, training hall and residential facilities modelled a smaller, community-oriented approach. Together, these point to three requirements: laboratory-grade research and processing infrastructure, as at Agharkar and IIMR; training that accommodates farmers at varying capacities rather than as visitors, as at BAIF Jawhar; and knowledge exchange built as shared, democratic space rather than a one-directional flow.

A discussion with BAIF Pune's Chief Thematic Programme Executive, offered a practitioner's view: the intent should be "to weave a network around seeds, knowledge and people" rather than build an isolated institution.

The following section translates the project's aims, objectives and requirements into a detailed architectural programme.

4. Design space programme

5. Site selection and analysis

Millets are cultivated across semi-arid to dry sub-humid agro-climatic zones with low rainfall and well-drained soils. Three millet-growing states, Karnataka, Rajasthan and Maharashtra, were studied, with one site shortlisted in each: Nelamangala, Jaisalmer and Shirwal. These were evaluated using a compatibility matrix assessing location, site characteristics, zoning, environmental impact, utilities and future expansion. Nelamangala offered strong accessibility, and Jaisalmer met agro-climatic criteria, but both fell short on-site parameters. Shirwal satisfied all criteria, including a sloping site, road access, zoning compatibility and utility availability, and was selected.

5.1. Why Shirwal?

Shirwal is a semi-urban settlement in Satara district, along the Pune-Bengaluru National Highway, roughly 50 km from Pune and 55 km from Satara. Within Maharashtra's Scarcity Zone, its semi-arid climate and basalt-derived soils have long supported rain-fed

Table 1: Architectural space programme
Source: Author

Sr. No	Space	Objective	Target population
A	Entrance and Administrative Department	Administrative hub housing directorial and institutional oversight functions	General public (consumers), staff, administrators, visiting officials
B	Information Centre	Public-facing space raising awareness of millet cultivation, nutrition and cultural significance through galleries and audio-visual displays	Tourists, local public (consumers), students, visiting farmers
B1	Café (extension of Information Centre)	Serves traditional, seasonal and general millet-based recipes alongside a souvenir shop	Consumers, tourists, visitors
C	Research Department	Discipline-specific labs and workstations for agronomic, nutritional and scientific research on millet varieties	Scientists, researchers, students
C1	Experimental farms	Controlled field, polyhouse, glasshouse extending the research labs, with a farming tower testing future farming methods	Scientists, Researchers, farm staff, students
C2	Seed bank and grain store (within Experimental farms)	Preserves local millet varieties and mutant lines per research protocol, with grain storage for produce awaiting transfer to labs	Researchers, scientists, staff
D	Extensions and value addition department	Farmer-facing consultation and socioeconomic analysis linking research to on-ground practise	Farmers, extension officers, researchers
E	Innovation Centre	Development, testing and training space for value-added, ready-to-eat and ready-to-cook millet products	Entrepreneurs, food technologists, farmers, food enthusiasts
E1	Processing units (extension of Innovation Centre)	Leasable processing infrastructure with machinery for farmers and entrepreneurs to manufacture value-added products; public tours run through the Information Centre	Farmers, entrepreneurs, food technologists
F	Training department	Skill-building and knowledge-sharing space for farmers and farming enthusiasts, with a dedicated library	Farmers, farming enthusiasts, students
G	Multipurpose hall	Flexible congregation space for institutional, cultural and community events	Staff, trainees, local community, visitors
H	Residential areas	Accommodation for staff, scientists and trainees, with a common dining facility	Scientists, staff, trainees, visiting scholars
I	Other spaces	Open-air gathering space for public and community activities	General public (consumers), staff, trainees

millets such as jowar and bajra, and the site remains embedded within an active agrarian landscape. This enables direct knowledge transfer, field trials and community participation with local farmers, rather than research removed from the practise it studies. Its location also ensures regular movement of researchers, students, policymakers and visitors, supporting long-term viability without compromising rural character, while its representative dryland conditions offer potential as a prototype for comparable decentralised research hubs. This convergence of agro-climatic suitability, agricultural continuity and regional accessibility offers the centre both rootedness and reach.

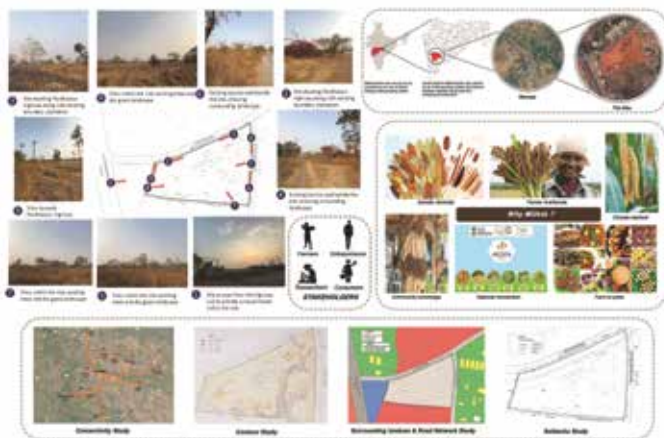


Figure 1: Project significance and site context

5.2. Site features and analysis

At 65,015 sqm and 603m altitude, the site slopes south to north and west, with gradients of 1:10 to 1:20. Shallow, well-drained sandy loam and red lateritic soils over a basaltic Deccan Trap base are moderately fertile but low in organic matter, reflecting the semi-arid conditions millets are adapted to. The tropical climate brings a monsoon from June to September with 1500 to 2000 mm annual rainfall, hot pre-monsoon summers reaching 35 to 38°C, and mild winters between 15 and 28°C.

Surrounding land use is predominantly public and semi-public along one edge, with agricultural fields and pockets of residential and commercial development elsewhere, reflecting Shirwal's shift from rural to semi-urban. The site is accessed via Pandharpur Road and a proposed 18 m road, with NH-48 providing strong regional connectivity. Slope analysis identified gentler gradients as the principal buildable zones. Existing native trees, Vad (Banyan), Amba (Mango), Kadunimb (Neem), Saag (Teak), Kanchan (mountain ebony) and Chinch (Tamarind), are retained under an ecological restoration strategy, shaping the design around preserved vegetation.

Visual analysis informed the orientation of built spaces to the surrounding landscape. Together, these conditions establish the physical and contextual foundation for the design that follows.

6. Conceptual development and design solution

The design responds to the site's sloping terrain and irregular geometry, shaping a contextual and efficient built environment. A restrained architectural language and simple material palette integrate research, innovation and community within a cohesive landscape framework.

6.1. Concept and Spatial Organisation

The campus is organised around the experiential farm, placed at the heart of the site to symbolise that the institution is woven around the essence of the seed. Farmers cultivate this living field directly, its rows changing in colour, height and texture through the seasons, allowing the farm itself to become a dynamic backdrop. Water channels inspired by the traditional paat (furrow) system divide the ground into a working grid, while the experimental farms occupy a dedicated stretch reserved for scientific research.

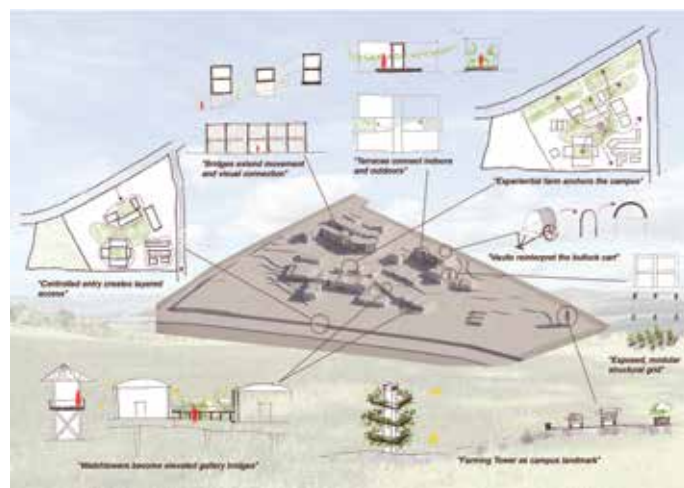


Figure 2: Concept: architecture from agriculture

Even before the campus entry is reached, the Farming Tower marks the site along NH-48, functioning both as a working research structure and the centre's visual identity. A single entry leads into the public zone containing the reception, exhibition galleries, café and experiential farm. Beyond it, the semi-public zone on flatter terrain accommodates training halls, the seed bank, research laboratories and experimental farms, while the steeper, more secluded areas house residences and service functions. Vehicular movement is confined to a peripheral road, leaving the campus core pedestrian, with parking distributed across decentralised nodes.



Figure 3: Site plan at +606.4m level



Figure 4: Site plan at +602.5m level

Three courtyards punctuate this sequence. At the entrance, a grid of Corten steel millet kernels, each engraved with information on a different variety, introduces visitors to the centre's purpose.



"Arrival at the entrance plaza, marked by corten steel millet-kernel sculptures"



"View along a campus pathway, bordered by native grassland planting"

Figure 5: Arrival and circulation

Elevated bridges connecting the galleries reinterpret the traditional farm watchtower, offering views across the experiential farm while allowing visitors to descend into it, extending learning beyond the galleries through direct engagement with the landscape.

Further within, the Courtyard of Produce marks the threshold to the training, research, extension and innovation zones, overlooking the processing units and harvest fields. Pebbled paving, inspired by the texture of millet grains, surrounds a water body referencing traditional farm well, grounding innovation in agrarian memory. The Courtyard of Ideas brings together scientists, farmers, entrepreneurs and enthusiasts for dialogue and knowledge exchange. Anchored by a Corten steel sculpture, Seed of a Good Idea, it celebrates the germination of innovation, while informal seating and a landscape of shrubs, grasses and open soil reflect the evolving phases of millet-related activity.

6.2. Structural System and Materials

Walls are built as a 380 mm thick stone and brick composite masonry system, with stone to the exterior and brick to the interior, drawing on regional construction practice for thermal performance and material honesty. A 5m x 5m modular exposed concrete frame establishes a common structural language across the campus, while permitting variations in span to accommodate buildings with different spatial and functional requirements.

At select nodes, courtyards, labs and gathering spaces, ferrocement vaults introduce variation to the roof form, their curved profile drawn from the traditional bullock cart. Foundations are isolated and stepped concrete footings with plinth beams, suited to the site's sloping ground.

6.3. Landscape Design

The landscape design draws inspiration from architecture and elements related to agriculture, treated here as material for spatial and sculptural design rather than mere backdrop. All mature existing trees are retained, with new planting drawing on native species selected for both ecological function and seasonal character. Neem, Buch, Saptaparni and Seeta Ashok form the primary canopy, selected for drought tolerance and low maintenance while Kanchan, with its rose-pink bloom, marks the entry of key buildings across the campus. Sloping areas are stabilised with native Durva grass, selected for minimal irrigation, drought tolerance and foot traffic resistance.



Figure 6: Site sections

Along the site's eastern edge, the buffer reserved for future road widening is planted with native grasses rather than permanent tree cover, acknowledging its eventual reclamation while recreating the region's original grassland character and attracting birdlife to an otherwise ornamental margin. A bamboo pergola, inspired by the traditional method of drying millet, shades the path between the residential block and the main courtyard, serving as both a practical

walkway and a subtle thread of cultural memory. At intervals along the pathways, imprints of millet are cast directly into the concrete paving, small, recurring reminders of the site's core idea underfoot.

Landscape is therefore not merely a setting for the architecture, but an integral part of the visitor experience, shaping the campus as profoundly as the built form itself.

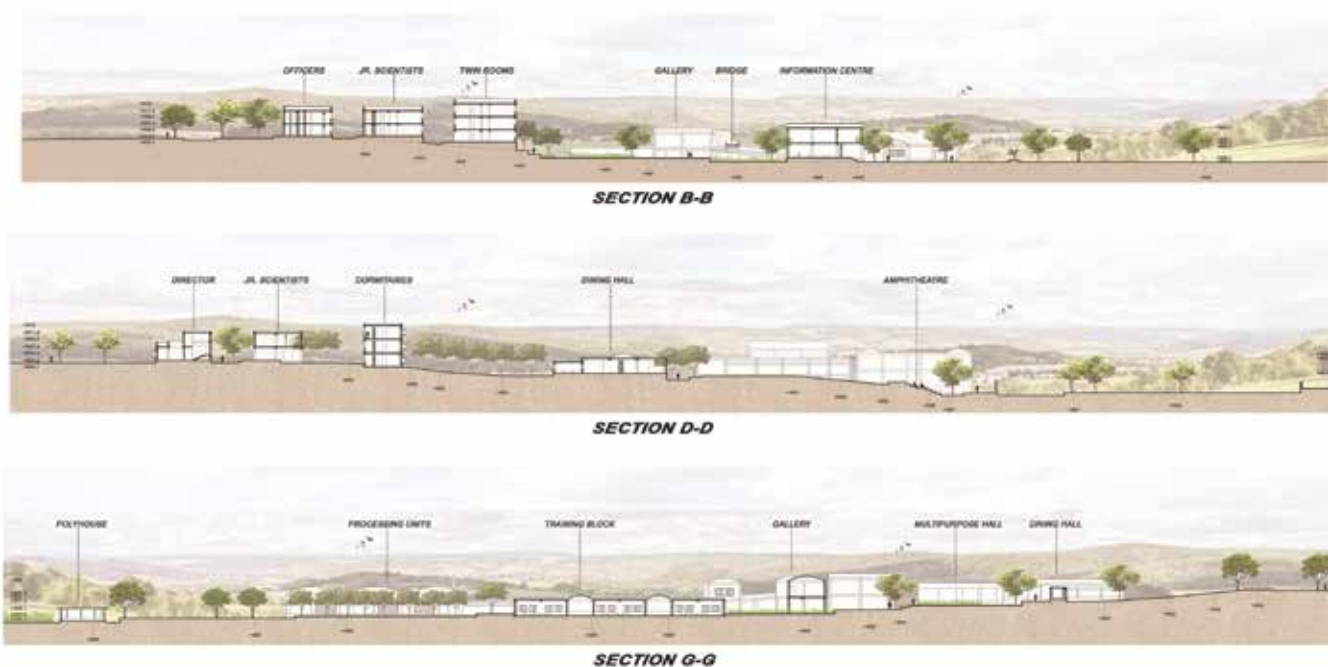


Figure 7: Site sections

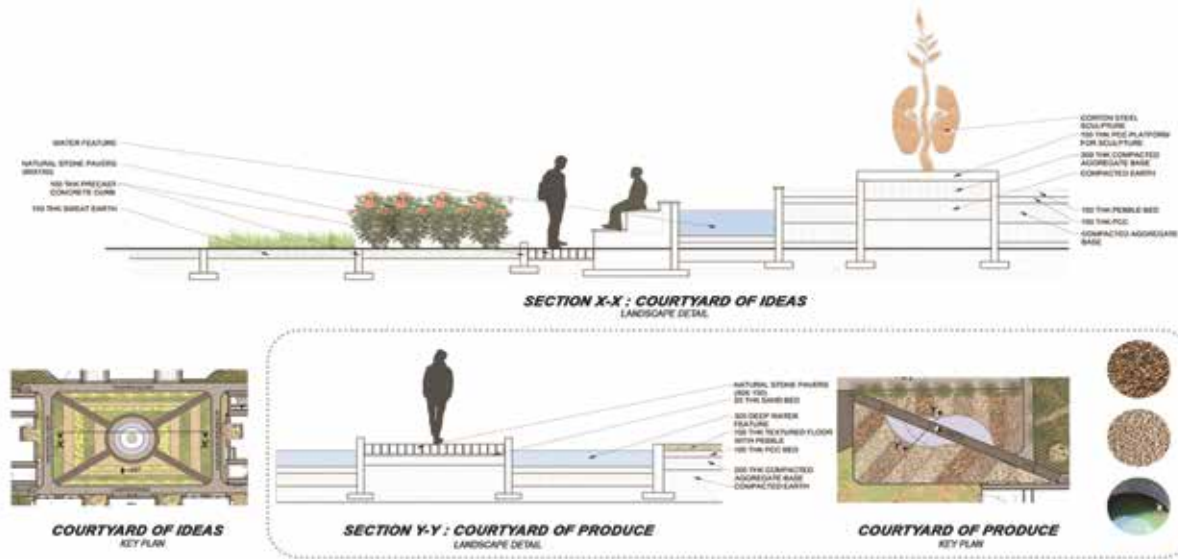


Figure 8: Landscape details: Courtyard of Ideas and Courtyard of Produce

7. Summary of the design Project

Agriculturally, the design restores resilient millet systems through research, conservation and demonstration. For farmers and entrepreneurs, it provides seed resources, training and the processing infrastructure to build their own value chains rather than depend on others to build one for them. It

engages the public through the Information Centre, the café and the courtyards that carry millets' rituals and recipes into daily use, while positioning Shirwal, sited within Maharashtra's own Scarcity Zone, as a prototype for comparable centres across India's other millet-growing belts.

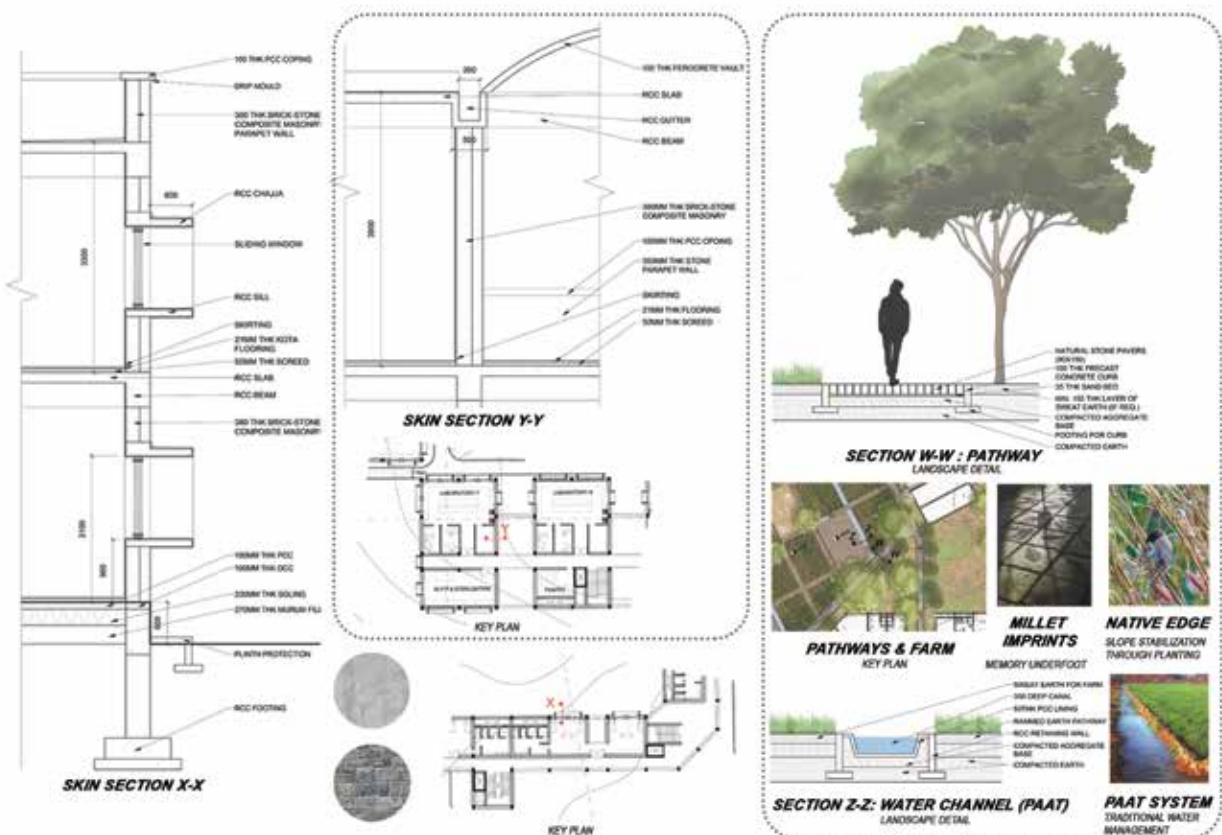


Figure 9: Skin sections and landscape construction details



"The Courtyard of Ideas, anchored by the Seed of a Good Idea sculpture"



"View across the Experiential Farms toward the elevated bridge and galleries"

Figure 10: The seed, in symbol and substance

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This thesis argues that meaningful agricultural transformation begins with the creation of meaningful places. By holding research, cultivation, industry and consumption within a single spatial framework, rather than as separate efforts working past one another, the project demonstrates how architecture becomes an active participant in a food system that once sustained both land and diet, positioning the Millets Research and Outreach Centre at Shirwal as a catalyst for its revival.

All Images Courtesy: Author



Ar. Isha Chiplunkar, graduated from BKPS College of Architecture, Pune (IIA-IM-016), is an architect with a keen inclination towards design and research, exploring the relationship between architecture, landscape, materiality, and human experience. Her work explores contextual and thoughtful design, with a particular interest in landscape and the integration of natural systems into built environments. Alongside design, she enjoys writing and critically engaging with architecture, exploring ideas around place, culture, and the evolving role of the built environment. With an exploratory approach to design, she is passionate about creating meaningful, responsive spaces that connect architecture, landscape, and people.

Email: ishaa.chiplunkar@gmail.com



Dr. Abhijit Natu (A 12879) is the Principal at BKPS College of Architecture, Pune with more than 28 years of teaching experience. He is the former Chairman, Board of Studies in Architecture and Academic Council, Savitribai Phule Pune University. He has over 60 research papers published in national and international journals and conference proceedings. He received the Best Teachers Award by Pune University in 2011 and the Teachers Day Award by IIA Pune Centre in 2024. Since 2021, he initiated the first Marathi Conference on Architecture at BKPS in collaboration with the Regional Office of Technical Education, Pune.

Email: asnatu@bkps.edu

Role of Social Media and Crowd-Sourcing in Disaster Mitigation

Case of Ekta Nagari, Pune Floods

By Tanisha Daruwale and Prof. Vasudha Gokhale

1. Introduction

The frequent occurrence of disasters across the globe, resulting in precious life losses, property and damage to infrastructure, result in a significant impact on everyday life and the social order. Increased urbanisation exacerbates flood risk due to the fragility and complexity of urban infrastructure and architectural development overlooking flood risk. This results in severe flooding events annually, leading to loss of life, property damage and economic loss (Hartono, Novita, Gusniani, & Oriza, 2010). Urban flooding impacts include the inundation of property and critical infrastructure, as well as indirect consequences like loss of productivity and business opportunities. Recent urban flooding is attributed to unplanned urbanisation, particularly construction activities on floodplains, which have significantly increased its severity. Land-use changes and the large-scale use of impervious surfaces reduce water absorption, leading to increased runoff and rapid floodwater accumulation. An essential prerequisite for stimulating urban resilience largely relies on participatory governance and cooperation of multiple stakeholders. People's engagement in identifying vulnerabilities associated with urban floods helps architects and urban planners enhance resilience in urban development (Seemuangngam & Lin, 2024).

The increase in urban flooding incidents over the past few decades underscores the need to adopt reliable flood-mitigation strategies urgently. Flood-risk management (FRM) is a pressing global issue that requires collective action. Ensuring that real-time disaster information is collected and communicated promptly, can empower communities

and decision-makers alike. Limited resources and poor data availability in developing countries like India underscore the importance of society's role in improving disaster mitigation capabilities during emergencies.

The recent shift in Disaster Risk Management (DRM) represents a move from a top-down to a bottom-up, community-based approach. In past events, local stakeholders without scientific knowledge have played a significant role in resilience-building and knowledge risk management in hydrological contexts, such as floods and droughts. Moreover, the boom in information and communication technologies, which has facilitated the use of the Internet, smartphones and social media, has revolutionised knowledge creation. It has made it diverse, multidirectional, inclusive and decentralised, thereby significantly enhancing disaster risk management.

"The Sendai Framework for Disaster Risk Reduction" supports social media (SM) usage for communicating disaster risk. Additionally, the focus of flood management is shifting from flood control to resilience, emphasising the importance of innovative tools like SM. The use of mobile technologies and SM is also part of the Indian government's ten-point agenda for reducing disaster risk (NDMA, M. o. H. A, 2019). This research is motivated by the realisation that, in the current scenario, urban dwellers need capacity and resilience to withstand the ever-increasing risk of flooding. Here, risk is a function of vulnerability, hazard and exposure. Hazard is the probability of a hazardous event occurring in a particular place; vulnerability is the potential damage; exposure is the area's property, people and tangible assets liable for potential losses. Although

SM has played a significant role in multiple instances, crowd-sourced data have not yet been fully utilised as a resource for disaster mitigation in India. This research aims to highlight the significant role of SM through crowd sourcing in the context of Ekta Nagar, a residential facility severely impacted by flooding along the riverbank adjoining Sinhgad Road, Pune.

2. Role of SM in Past Disasters

Since the beginning of the twenty-first century, the unprecedented rise in social media usage, supported by ubiquitous computing via internet-connected mobile devices, has been observed worldwide. Social media platforms enable users to create content and provide concerned individuals with vast, diverse and dynamic datasets (Andreotta, et al., 2019).

With recent technological advancements, disaster-related data is collected using portable devices such as smartphones and other mobile devices with additional features. Additionally, customised mobile apps further facilitated the collection of user information across various social media platforms. In many past events, crowd-sourced information from Twitter or current “X” has been gathered and analysed to create real-time flood maps, detect clusters and categorise flood-related information (Sukhwani & Shaw, 2020).

A remarkable use of Twitter data was noticed in Jakarta, yielding valuable real-time information helping local authorities in disaster mitigation, developing a website for sharing of information and crowdsourcing, developing a crisis map and using mobile apps is also used in many countries worldwide, Australia, Kenya, Philippines, Argentina, France and New Zealand (See, et al., 2016). During the 2015 Chennai floods, the use of Twitter and Facebook facilitated information dissemination and communication for victims stranded or seeking to locate missing family members and friends (Yadav & Rahman, 2016). It has been observed that SM is used to share information, stay connected, rebuild services and collect donations during the disaster recovery phase. For instance, in Australian bushfire in 2019–2020, SM was used to mobilise donations, encourage tourism (e.g., hashtags #HolidayHereThisYear) and incinerate economic activities (e.g., hashtags like #buyfromthebush) (Seneviratne, Nadeeshani, Senaratne, & Perera, 2024).

IIT Mumbai examined the use of crowd-sourced information and the data obtained from the SM post was found to be accurate, reflecting the ground reality. Many researchers generated flood maps based on the data retrieved from “X” previously

known as Twitter. Images posted on SM helped improve and channel humanitarian aid during the 2018 Kerala floods.

3. Challenges in SM Use in Disaster Management

Processing social media data for flood hazard assessment involves challenges like unstructured formats, large volumes and multilingual content, which can hinder timely disaster response. Recognising these issues is essential for developing tools that automatically extract and classify information, ensuring effective disaster mitigation efforts.

Data acquisition for flood hazard is a complex task, with issues regarding precision, temporal and spatial coverage. Besides, instrumental network installation and maintenance are expensive affairs and local people’s involvement helps minimise such issues. Rainfall data is collected and shared on social media by individuals, filling temporal and spatial gaps in hydrological network data to monitor rainfall in real time (Oh & Syn, 2015). Fake news constitutes another challenge stemming from manipulated and misleading information, which often creates panic and poses SM as a threat to social order (Ninan, 2022). Sifting through information to find reliable sources is critical, as misinformation and rumours are common. In addition, the extracted data must inform actions and decisions related to disaster response, relief and recovery.

An ontological approach uses domain-specific terms and their interrelationships, which experts analyse. Machine-based processing is followed, yielding semantically authentic data and applicable information. In this process, natural language processing (NLP) technology is used to understand and extract useful information from SM generated text content (Phengsuwan, Shah, James, Thakker, Barr, & Ranjan, 2020). Application of various forms of citizen science beyond crowdsourcing is challenging because they involve not only collecting information and generating new knowledge but also applying it. In India, crowdsourcing for disaster management faces several challenges, including reliability and limited outreach. Besides, the available disaster-related apps are primarily designed for educational purposes. Moreover, people require adequate training to contribute, while the availability of resources and support from the local authority becomes challenging (Mazzoleni, et al., 2018).

4. Theoretical foundation

To provide a comprehensive understanding of the multifaceted nature of disasters, the following

section synthesises and presents various concepts and theories.

Resource-based view theory: This theory posits that in humanitarian operations resources are limited underscoring the timely use of available resources.

Dynamic capabilities theory holds that the automation of data, intelligent metadata and other emerging technologies is transforming the humanitarian response landscape.

Digital humanitarianism theory: This theory emphasises the use of digital technologies and online networks, along with tools such as social media, data analytics and mobile technologies, to facilitate efficient communication, resource allocation and overall response in conflict situations and disasters (Duffield, 2016). The fundamental aspects of digital humanitarianism theory include citizen-led humanitarianism, leveraging digital platforms for communication, information sharing and community building and employing sophisticated data analytics for resource allocation and logistics (Burns, 2015).

Attribution Theory: This theory considers attribution a psychological construct representing the cognitive function inferred by people concerning another person's conduct. It examines how people perceive causality and respond to it. Attribution theory holds that people's actions are influenced by exposure to an adverse, unforeseen event. It includes the three phases of attribution, observation, determination of intent and causal attribution. In the first phase, when a person notices a particular behaviour, in the second phase, the behaviour is assumed as deliberate. In the phase three the behaviour is attributed to either the circumstance or person. It is assumed that a disaster-vulnerable community is likely to be persuaded to use SM for disaster management, considering its role in reducing disaster risks (Sawaneh, Fan, & Sesay, 2023).

5. The concept of citizen science

Citizen science is defined as science developed and enacted by non-scientists. It follows the 'public understanding of science and technology' (PUST) tradition, focusing on enhancing public knowledge and outreach and 'public engagement in science' (PES), which emerged from community science, focusing on participatory research, practice and policy (Paul, et al., 2018). It refers to collaborative research involving local people in the scientific research process at different stages, contributing to knowledge sharing, the research design and data collection alongside professional researchers. Citizen science is often referred to as volunteered

geographic information, crowdsourcing and citizen observatories. The contribution of CS during the disaster phase is crucial, as in such situations, collecting data is extremely difficult or nearly impossible using conventional methods (Kocaman, Anbaroglu, Gokceoglu, & Altan, 2018). Citizen engagement in the disaster phase also contributes to social learning, helping build their capacity to manage disaster risk in post-disaster contexts (Tidball & Krasn, 2012).

Citizen science is classified based on the level of citizen participation like

- Data collection - Crowdsourcing
- Data Interpretation- Distributed intelligence
- Problem definition- Participatory science
- Defining problem definition, analysis and disseminating results - Extreme CS

In the past, CS contributed significantly during flood events using social media and mobile apps. Crowdsourcing is a significant realm of citizen science, an online data-gathering system that engages broader citizen participation, creating more diverse data and increasing the ability to mitigate disasters (McCormick, 2012).

6. Crowdsourcing

Crowdsourcing represents an unsolicited group of people (the crowd) voluntarily contributing information, services, or ideas via the Internet using digital devices to record and capture real-time photos of hazards. Such data is transformed and leveraged to provide valuable information for victims, emergency responders and decision-makers (Hicks, et al., 2019).

Here, citizens post their contributions on social media platforms, which are then retrieved using various information discovery techniques, providing ideas and evidence to decision-makers (Bono, et al., 2023). Crowdsourcing has two approaches namely active and passive. Traditionally, active crowdsourcing is a specialised application and platform designed to enable users to respond to a call for information (Harrison & Johnson, 2016). Such platforms are formulated and executed by the non-governmental organisations (NGO's) or affected people. Passive crowdsourcing is an information-sharing platform and resource, enabling information sharing through SMS, WhatsApp, Twitter, Facebook, email, or other online channels, thereby unravelling the ground situation of an event (Tong, Su, Yang, & Hao, 2014). In many instances, citizens themselves devise communication tools to communicate with others and government bodies. Passive crowdsourcing

technologies are applicable across the phases of the disaster management cycle: preparedness, mitigation, response and recovery.

Crowdsourcing with SM is used in the following ways:

- To share information and spread awareness
- Supporting relief operations through volunteering and community building
- Fund collection
- Monitoring the situation

7. Current Use of Crowdsourcing in Disaster Management

Some examples of crowdsourcing include the Philippines' Typhoon Pablo in 2012, where about 20,000 tweets were analysed in 10 hours, on which the official UN crisis map was prepared. In this event, a Twitter request has generated 30,000 pounds. In

June 2013, the Facebook pages "Uttarakhand flood disaster 2013: information, help and relief" and "Uttarakhand Disaster, Khoya Paya" used pictures to trace missing people's information. The Uttarakhand State government's Facebook page, "Uttarakhand State Govt. Initiative- Operation Connect," had successfully connected families with missing people.

The crowdsourcing applications are actively adopted by government agencies worldwide for crisis management. The Indian government's flagship program 'Digital India' is concentrating on digital literacy, digital resources, digital platform's collaboration to make India a digitally empowered knowledge economy. Under this, the Indian Government has taken many initiatives to use crowdsourcing and other applications for disaster management, some of which are presented in Table 1.

Table 1: Indian Government Initiatives

Source: Author

S. N.	Agency	Application Name	Year	Description
1.	Government of India (Ministry of Electronics and IT)	MyGov	2014	Citizen participation platform to gather suggestions, feedback and reports from citizens on various governance issues, including disasters.
2.	Indian Space Research Organisation (ISRO) - NRSC	Bhuvan G-Governance Portal	2011	Geo-portal offering satellite imagery and crowd-sourced geo-tagging features for disaster-affected regions
3.	National Disaster Management Authority (NDMA), India	Sachet	2017	Platform for disseminating early warnings and collecting feedback or incident reports from citizens
4.	India Meteorological Department (IMD)	Mausam App	2020	Mobile app providing location-specific weather forecasts, real-time alerts for cyclones, heavy rainfall, etc
5.	India Meteorological Department (IMD) & Indian Council of Agricultural Research (ICAR)	Meghdoot App	2019	Agro-advisory mobile app for farmers, providing weather-based alerts and advisories.
6.	CGNet Swara Team (NGO with MIT Media Lab technical support)	CGNet Swara	2010	Voice-based citizen journalism platform for tribal and rural communities to report issues including disaster effects.
7.	State Disaster Management Authorities (e.g., Tamil Nadu SDMA, Maharashtra SDMA)	HelpMe App	2018 2020	Mobile apps designed for citizens to send SOS alerts, share location and report emergencies.
8.	Indian Institute of Public Health Gandhinagar (IIPHG) with support from international agencies	InAMPro+	2016	Mobile platform for gathering real-time disaster information and enhancing preparedness
9.	Ushahidi Foundation (Open-source platform)	Ushahidi Crowmap Platform	2013	Interactive mapping platform allowing citizens to report incidents via SMS, web, or social media.

8. The Research Context

Pune is situated at 18° 32' N latitude and 73° 51' E longitude covering a geographic area of 15.642 km², while a 518 km² area is under the municipal corporation. Mutha and Mula are the rivers that flow across the city's urbanised areas. The other rivers include the Pawana, Ram, Dev and Indrayani. Mutha River has four dams: Khadakwasla, Panshet, Warasgaon and Temghar. Khadakwasla dam supplies water to Pune city and rural areas. On July 12, 1961, a breach in the Panshet Dam triggered flash floods that affected the city of Pune, a landmark event in the city's history. The Mutha river overran its banks and the water entered the city, submerging roads in the neighboring 'Peth' areas, resulting in 59 people missing, 29 dead, leaving 50,000 people in dire need of food, clothing and shelter (Fig. 1).

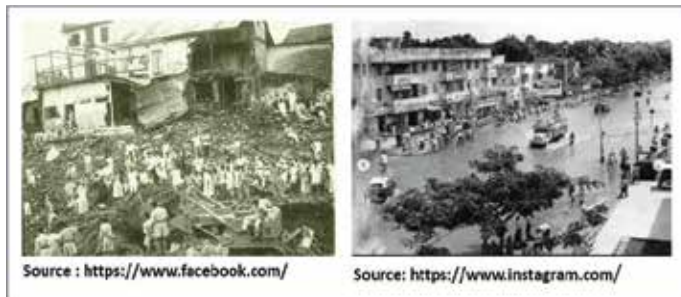


Fig. 1: Panshet Flood, 1961

Source: As mentioned

The Sangam Bridge connecting Pune's two main rivers, Mula and Mutha broke and other bridges, including the Holkar Bridge, were underwater. The flood water reached the third floor in areas such as Sadashiv Peth, Narayan Peth and Shaniwar Peth, among others. Other affected areas included Deccan, Apte Road, located about a kilometer away from the riverbed.

In 2005, a 24-hour rainfall total of 944 mm led to severe flooding in Mumbai, also affecting the Pune region to some extent. However, in 2019, Pune experienced flash flooding due to heavy rainfall, killing 21 people and causing damage to buildings and infrastructure. Social media was flooded with posts indicating the grave situation from different perspectives. In last decade Pune is experiencing concurrent flooding and consequent disruption to day-to-life and property (Fig. 2)

In July 2024, heavy rainfall caused the Mutha River to overflow, flooding several housing societies and shops along Sinhgad Road. Social media was flooded with images and videos of floodwater entering localities, including Futura Society, Swami Vivekananda Society, Sarita Society, Sadguru Society, Patil Estate, Pulachi Wadi, Chandtara Chowk and Ekta



Fig. 2: Pune Floods

Source: Author

Nagar, following the surge of 36,000 cusecs water from the Khadakwasla dam. The impact of floods was analysed, with Ekta Nagar among the most affected areas due to its proximity to the riverbank. The area has 20 to 25 buildings housing about 3,000 residents.

9. Research Methods

The research employed a three-step process, starting with the collection and analysis of crowd-sourced data, newspaper media posts. Platforms-Facebook, 'X' (Twitter), YouTube and Instagram were chosen for their widespread use and relevance during flood events. This selection aimed to capture diverse perspectives and types of information, such as real-time images, videos and textual updates, to enhance data reliability and comprehensiveness.

In the second step, the crowd-sourced data was verified using the Physical trace observation method, a systematic observation of the environment's physical condition that describes previously occurring activity. The third step included informal interviews with the affected residents and city officials.

10. Data Analysis and Findings

Social media content was gathered using four data sets: Facebook, "X" (Twitter), YouTube videos and Instagram, which were analysed to ensure the accuracy of the data. The three distinct content typologies initially included were: information about the contributor's current location and a highlight of the current situation in that area. The flood conditions were communicated in different ways, including by stating the water height in empirical units or by referring to the human body, such as knee-high. Real-time pictures obtained show the impacts of flooding on people, buildings and infrastructure. The second typology, which comprises text, explains the situation's severity and the request for evacuation and help. Large-scale data was gathered, including feedback and reviews on local government flood-mitigation initiatives, complaints about non-cooperation and a lack of help and support from the local government and expressions of gratitude. Some of the sources are presented in Table 2.

Table2: SM Media Data
Source: Author

Link/Address	Source
Pune: Glimpses of Army's Rescue Operation in Flood-Affected Ektanagari, Sinhgad Road, on Sunday. By Punekar News Facebook	Facebook
Pune Flood Pune Flooded After Heavy Rain, Schools Shut, 3 Electrocuted Pune Waterlogged	You Tube
Pune Flood Situation In Ekta Nagar खडकवासला धरणातून पाण्याचा मोठा विसर्ग	You Tube
Pune Flood Situation: Ekta Nagar Faces Severe Flooding, Fire Brigade Deployed shorts	You Tube
Pune Ekta Nagar Flood एकता नगरचा पूर ओसरला, खडकवासल्यातून विसर्ग थांबवला.	You Tube
पुण्यातील एकतानगर पुन्हा पाण्याखाली Ekta Nagar Flood	Facebook
Waterlogging Reported In Hinjewadi Phase 2 Area Due To Heavy Rain In City Today. By Punekar News Facebook	Facebook
http: x.com/iasouthern	"X"
http: x.com/hashtag/punerains?	"X"

The SM data regarding flood damages to Ekta Nagar in 2024 indicated the area was submerged in water and needed rescue efforts to save the residents. In year 2025 the same damage pattern observed. The semi structured interviews confirmed that this is a recurring phenomenon which they have to face for many years in the lack required mitigation measures from city officials (Fig. 3).

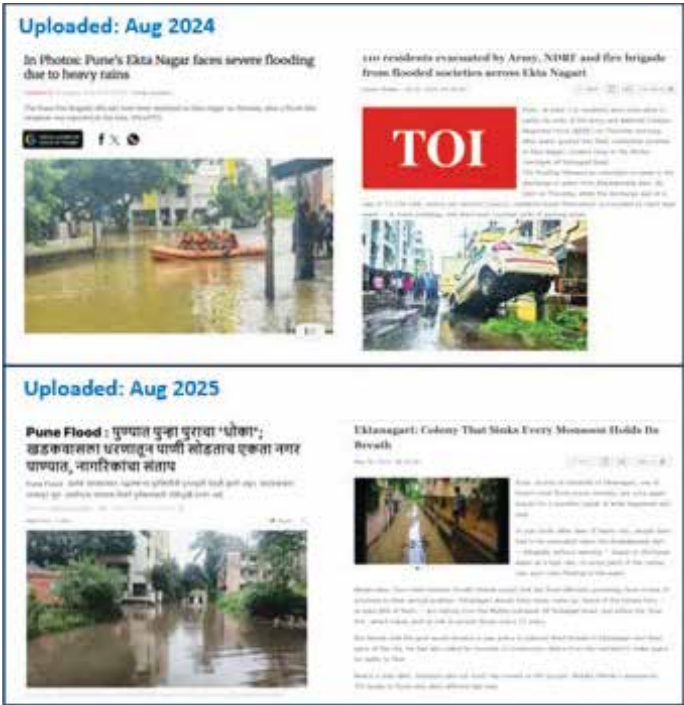


Fig. 3: Flooding in Ekta Nagar
Source: Author

People posted photographs on different SM sources explaining the real ground situation about buildings and infrastructure some of which are presented in Fig. 4.



Fig. 4: Social media about Impact of Flood
Source: Author

The local government announced many measures to save the residents. However, the SM contents revealed the failure to provide required assistance to the people as indicated in social media posts in year 2024 and 2025 (fig. 5).



Fig. 5: Local Government Initiatives
Source: Author

As per SM posts, water entered Jalpujan, Jaltrang, Shamsunder, Dwarka, Raj and Sai Siddharth societies, with floodwaters reaching 8 to 9 feet due to inadequate storm water drainage, forcing families to evacuate ground-floor houses and shops. People faced difficulties due to ankle-deep water around the footpath and access roads. There were numerous posts on SM explaining that water rose to the first floor, flooding the ground-floor parking spaces and the side setbacks, leaving residents stranded on the upper floors without access (Fig. 6).



Fig. 6: Flooded Access
Source: As mentioned

The posts on social media were compared with the observed traces to confirm the water levels, revealing that the buildings experienced significant flooding, with floodwater reaching 8 to 9 feet. Traces of water were found up to the first-floor level (Fig. 7).



Fig. 7: Flood affected upper floors
Source: As mentioned

The citizen posts explained the difficulty of evacuation, particularly from the upper floors. The observations revealed that this aspect was attributed to the ill-designed parking space, with closely spaced columns and narrow stairs that affected the evacuation routes. The low plinth level and the absence of an adequate storm water drainage system fuelled the accumulation of floodwater in the parking lot, making the evacuation process challenging. The parking area was completely submerged in water even after 6-7 days after flooding as shown in (Fig. 8).



Fig. 8: Flooded Parking
Source: As mentioned

Crowd-sourced data revealed waterlogged streets, with submerged vehicles causing significant disruption to daily life. Water marks on the boundary walls indicate the flooding of access roads (Fig.9).



Fig. 9: Waterlogged streets
Source: As mentioned

SM data indicated the deployment of the Army to Ekta Nagar with workforce, including a specialised Engineer Task Force from the Bombay Engineers Group (BEG), Infantry Troops and medical staff from MH Khadki. Semi-structured interview data confirmed that the flood rescue teams played a crucial role during and after the flooding events. Using boats for rescue operations, they also assisted with evacuations (Fig. 10).



Fig. 10: Rescue Operation
Source: As mentioned

The informal interview data with city officials revealed that posts on Facebook, Twitter and other platforms were used to enhance situational awareness. This aspect helped implement effective response plans and address requests for specific actions. It enabled them to promptly identify people's specific needs and adjust their actions accordingly. They also examined how their information is processed and propagated to assess the effectiveness and reach

of the mitigation efforts. The information from SM is used to update alerts and take actions, such as dispatching a rescue team and providing relief to a specific location, which can reassure the affected population of coordinated efforts.

Analysis of the site revealed that Ekta Nagari is located in an area that was changed from an 'agriculture zone' to a 'residential zone' in 2000 and is within the blue flood line representing the 25-year flood risk zone of the Mutha River. This aspect highlighted flaws in urban and site planning.

11. Conclusions

The uncertainty around disasters limits the availability of reliable real-time disaster data, which can hinder architects and planners from effectively learning from actual building and infrastructure failures. This research gathered real-time information in Ekta Nagar through a range of sources, including crowd-sourced data, physical trace observations and semi-structured interviews, to mitigate these limitations. In this work, sensationalism is not found in crowd-sourced data; rather, it refers to exaggeration, a focus on extreme visuals that often dramatise and fear-mongering. Analysis of trace observation data revealed that most of the damage to the buildings and infrastructure was realistic. Although many important and relevant details about performance and architectural features were missing from SM posts contributed by residents who were not well-versed in technical matters, combining multiple data sources enhances overall reliability. These aspects underscore the importance of training volunteers to contribute the necessary data in an emergency voluntarily. Physical trace observations enhance the authenticity of SM data, which are critical not only for timely responses but also for improving future resilience and avoiding mistakes that can lead to catastrophic consequences.

It is recognised that timely and location-specific information is required to identify locational aspects and design deficiencies, which can significantly improve disaster response and resilience. Crowd-sourcing can play a crucial role in providing such information. A citizen-centric process is adopted, generating data from people, sharing their experiences with images and social media status updates using a variety of SM applications, thereby enabling rapid and localised data collection that informs decision-making.

The research substantiated the Resource-based view theory, given the widespread use of SM platforms despite limited available resources. Alignment with

the Dynamic Capabilities Theory, as the exploitation of new technologies in disaster mitigation is evident, with a large-scale emphasis on online and digital technologies that facilitate prompt communication, disaster response and resource allocation. People found blaming the local government substantiated the Attribution Theory, where external attribution is placed on others and their own response is internal attribution that leads to saving them from the event.

This research demonstrated that crowd-sourced data provided crucial insights into the performance of buildings, spaces and infrastructure under actual flooding conditions, enabling architects and planners to identify the specific shortcomings of current designs. In this work, passive crowdsourcing was adopted, where citizens were not trained to share information systematically. To improve data quality and utility, more efforts are needed to pursue active crowdsourcing with proper training and secure institutional support. Gaining a deeper understanding of vulnerabilities through enhanced crowd-sourcing facilitates the development of performance-based design criteria and damage-control philosophies, making buildings and infrastructure more resilient to future events.

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Tanisha Daruwale is a final year student of B.Arch., Dr. Bhanuben Nanavati College of Architecture, Pune. Her academic pursuits are anchored in architectural design and spatial research. Her deep-rooted passion for architecture, design and research marks her as a committed and emerging voice, driven by the belief that architecture holds the power to transform lives and communities.

Email: tanishadaruwale@gmail.com



Prof. Vasudha Gokhale (A11084) has done her B.Arch. from MANIT, Bhopal and M.Arch and PhD from IIT Roorkee. She is a Professor and the Head of the Research Centre at BNCA, Pune. She has been affiliated academically with several universities in India and abroad. She has over 145 publications in international national journals and conference proceedings. She is a recognised PhD guide, with 14 candidates awarded with PhD degrees under her supervision.

Email: gokhale.va@gmail.com

Vastushastra and Lifestyle

Harmonising Architecture with Well-being

By Dr. (Prof.) Manita Saxena

1. Introduction

"When architecture aligns with nature, life aligns with harmony—Vastushastra is not just about structures, but about shaping well-being and a balanced lifestyle."

Vastushastra is an age-old Indian architectural science which has made its profound impact on architecture throughout ages. The meaning of these two Sanskrit words are 'dwelling' or 'habitat' and 'science' or 'knowledge', respectively. For instance, these sciences provide standards for the shape, form, proportion, land preparation, volume and spatial geometry of structures.

Vastushastra starts with five living elements - earth, water, fire, air and sky, forming the basis for ancient constructional magic (Acharya, 1997). This science originated in ancient Hindu philosophy and leaves its stamp upon temples, palaces, forts and even humble dwellings. The Brihadeeswarar temple in Tamil Nadu and the Jaipur city labyrinth clearly display its influence. Great personalities such as Acharya Vishwakarma and timeless texts like Mayamatam and Manasara Shilpa Shastra explored its roots and combined ancient philosophy and practical guidelines for construction. Lately attempts to uncover connections between the age-old concepts and modern-day green practices such as energy conservation, air flow and the impact of interior design on one's state of mind have emerged (Jain, 2015). At present, Vastushastra gets renewed attention due to the clashes between solar building designs and the ecological practices involving the use of bricks. The discipline creates an interesting interaction between artificially created spaces and natural features in order to increase intelligence

concerning the energy use and cosiness and provide an opportunity for some peace of mind.

2. Principles of Vastushastra

There are several overarching principles on which Vastushastra (Figure 1) is based while designing and arranging the living spaces. These principles are as follows:

a. *Orientation and Directions*

Orientation of the building in relation to the cardinal directions is one of the most significant considerations made in Vastushastra. According to Vastushastra, each direction has its deity and elemental properties:

- North (Kubera - Wealth): Best suited for doors and wealth-related matters.
- East (Indra - Power & Energy): All main doors and windows should ideally face east for receiving the early morning sun rays.
- South (Yama - Strength & Stability): Generally, a bad choice for the entrance but useful for storage areas.

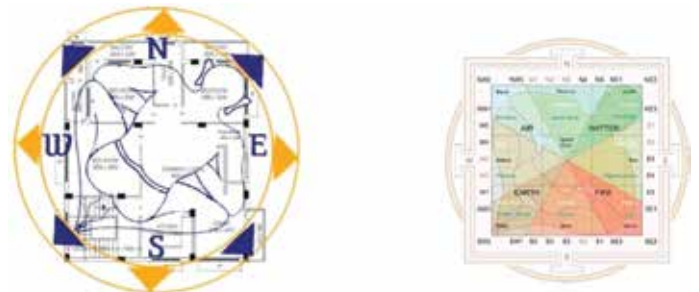


Figure 1: Vastupurush Mandal
Source: Author

- West (Varuna - Water): Excellent choice for dining rooms and water-related areas.

b. *Panchabhutaa*

The five elements Vastushastra tries to bring a balance into the space are as follows:

- Earth (*Prithvi*): Element of stability and support and can be seen in the form of foundations of buildings.
- Water (*Jal*): Element of movement and flow and therefore useful for the placement of water bodies.
- Fire (*Agni*): Energising element used for the arrangement of kitchen.
- Air (*Vayu*): It means circulation of air coming in through windows and open courtyard spaces.
- Space (*Akasha*): It means expansion and connection to the world and in reality, the consideration of roof and outer space.

c. *Vastu Purusha Mandala*

It is a term used in Vastushastra, which means a grid pattern that depicts the cosmic deity referred to as the *Vastu Purusha* (Figure 2). This mandala helps to arrange the rooms in an appropriate manner for the balance of all energies.

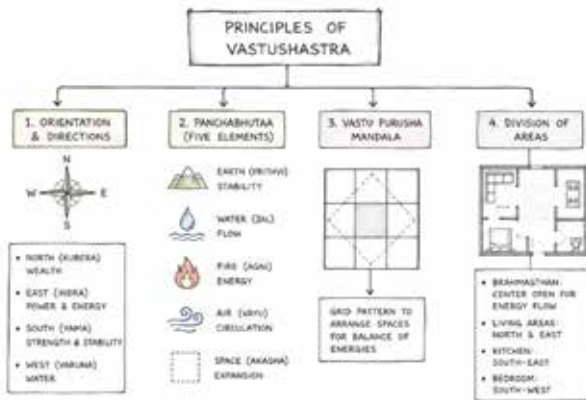


Figure 2: Principles of Vastushastra

Source: Author

d. *Division of Areas*

All areas of the house have their own function based on different aspects:

- *Brahmasthan*: The centre of the house should remain open for energy flow.
- Living Areas: Mostly North and East for natural light and interaction.
- Kitchen: South-east associated with fire.
- Bedroom: South-west for calmness and soothing environment.

3. *Vastushastra and Lifestyle Enhancement*

Vastushastra has a huge impact on our day-to-day life by creating mental peace, good health and balanced ambience in one's home. Good planning of spaces and facilities within a residential or an office building can help us live comfortably. Proper ventilation and lighting make us healthier and improve the quality of air in the environment; besides, they help create a comfortable living environment. Proportional space planning creates less stress, relaxation and increased focus for individuals. Well-designed spaces contribute to good social interaction among people and society. Layouts of workspaces and residential buildings according to the principles of Vastushastra increase productivity and success in both professional and personal lives.

Situating the bedrooms in the southwest for stability and rest, work in the north helps with productivity and financial stability. Additionally, the importance of natural light and airflow as well a large open space are in line not only with modern principles of health but also with another term – environmental psychology. Spaces with good lighting and ventilation have been found to help lower stress levels and enhance cognitive abilities. Natural environment elements, such as indoor plants and water, increase the feeling of relaxation and happiness. Moreover, the use of Vastushastra in urban planning can lead to livelier cities. Appropriate orientation, convenient access to courtyards and natural environment encourages people to be involved into the community life and makes it ecologically viable. Using ancient wisdom and modern architecture, Vastushastra presents an all-inclusive approach to the improvement of people's lives (Jain, 2015).

Vastushastra's comprehensive architectural design system makes sure that there is consistency between the human habitats and environmental elements. When it is combined with the sustainable design practices of today, the timeless architecture principles could inspire healthy surroundings that have an impact on mental and physical well-being. Further, scientific validation studies of Vastushastra principles will make it more relevant for the modern world.

4. *Modern Applications of Vastushastra*

While Vastushastra is traditionally derived, its rules can be modified to suit modern architecture (Figure 3):

a. Urban Planning: Cities designed with urban planning have energy-saving development features—greenery, water bodies and holistic road network



Figure 3: Vastu in Modern Architecture
Source: Author

systems. Proper placement of greenery and water bodies ensures sustainability of environment and good health of humans (Banerjee 2022). These features can be used to ensure ordered and evenly distributed development in cities such as Chandigarh and Jaipur using these principles.

b. Environmentally Sustainable Building Design: Passive cooling, use of solar power, rainwater harvesting and other such methods which can be used to reduce the impact on the environment as no sustainable means of building design is used. Holistic principles of contemporary sustainable architecture including LEED certification and passive house designs can be easily modified in accordance with Vastushastra recommendations for natural light, cross-ventilation and renewable energy.

c. Interior Design: Vastushastra can be used to plan furniture arrangement, colour combination and lighting to achieve balanced daylighting scheme visually. Proper placement of furniture and decoration according to directional energies creates better comfort, commonly seen in modern interior designing. Whereas Vastushastra itself is an inherited discipline, its rules can be adapted for modern architectural purposes.

- **Spaces in Corporations:** Introduction of seating arrangements and furniture that make employees more productive and mentally fit. For instance, seating arrangements that ensure optimal orientation of managers either towards the east or north direction make them more clear and decisive, space for teamwork and creativity.
- **Smart Homes:** The houses with smart technology would be able to adhere to the principles of Vastu by placing electronic appliances, lightening and ventilation system according to energy fields.

- **Healthcare Architecture:** Construction of hospitals and wellness centres to create healing environment by providing good ventilation, natural light and correct space arrangements. It has been found that healing process is faster among patients in hospitals with plenty of natural light, northern-eastern doors and peaceful surroundings.
- **Educational Institutions:** Construction of educational institutions on Vastu guidelines to enhance cognitive skills and attention and make positive learning environments for both students and teachers. Classroom arrangements, proper ventilation and lighting affect learning outcomes and participation by students. Some studies have shown that learners perform better in environments that have natural lighting and spaciousness.

These recent uses of Vastushastra demonstrate its continued relevance in modern-day architecture, where traditional wisdom is combined with contemporary trends in urban design, ecology and technology.

5. Challenges and Misconceptions

Vastushastra has a hint of mistrust in people since it is difficult to comprehend and has been used for business purposes. The major challenges (Figure 4) with Vastushastra are:

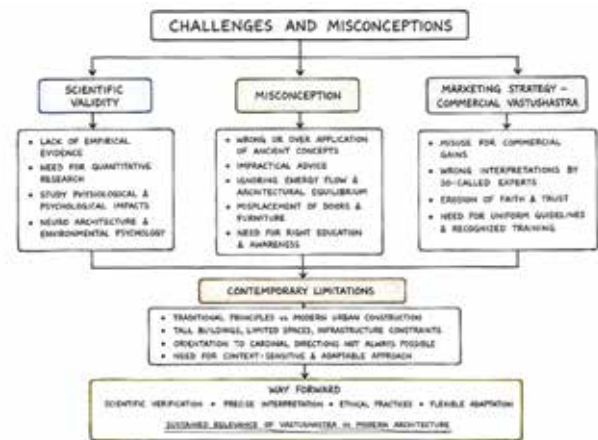


Figure 4: Flowchart for Challenges and Misconception
Source: Author

a. Scientific Validity: One of the main criticisms of Vastushastra theory is the absence of an empirical investigation that would substantiate it. Energy equilibrium and space organisation are the architectural guidelines provided in the classical literature about design, but most of the contemporary theoretical architectural studies are only in their infancy. Researchers have proposed that further analysis of the physiological and

psychological impacts of the Vastushastra designs is required through quantitative means like neuro architecture and environmental psychology.

b. Misconception: Another misconception regarding Vastushastra is the wrong application or over application of the ancient concepts. A lot of practitioners or consultants give impractical advice that is not congruent with the classical text. For instance, even when one does not know how energy flows or proper placement of doors and furniture results in non-productive and unrealistic outcomes. This will prevent all these misuses and preserve true Vastushastra by the right education and awareness.

c. Marketing Strategy of Commercial Vastushastra

This has distorted and, in certain respect, has exploited the art. Sometimes, the so-called experts will provide Vastushastra advice based on their wrong understanding for commercial gains and not according to the genuine principles of Vastushastra. There has been an erosion of faith and suspicion among the masses in general. In order to retain the true identity of Vastushastra as a true science tool as well as its acceptance in modern architecture in a scientific manner, there is a need for uniform guidelines and recognised training program by Vastu consultants (Basu, 2020).

d. Contemporary Limitations: Vastushastra is premised on the idea of the traditional home with many open spaces, natural ventilation and a particular configuration of spaces within these. The modern urban construction involves tall buildings, minimal spaces and infrastructure constraints unlike ancient cities. One of the limitations of integrating Vastushastra into modern construction techniques, especially from the point of view of urban planning, is the suffocating congestion. We could give examples, where the buildings oriented to cardinal directions cannot be possible in urban setting. It has been recommended that a context-sensitive and more adaptable version of Vastushastra in tune with modern architectural practices and sustainable technologies can solve the gap. It is in the attempt of scientific verification, exact and intelligent interpretations, minimises ethical practices and flexible forms that we can ensure that Vastushastra retains its relevance and use in today's architectural society.

6. Empirical Evidence and Case Analysis

In addition, several studies on different cases have been carried out in order to improve Vastushastra, making it more relevant.

Case Study 1: Living Spaces

The houses built following the rules of Vastushastra consume 20% less energy due to better natural airflow and daylight. Studies have examined the influence of house orientation and room arrangement in the house on the living spaces (Figure 5) and showed that the right orientation improves indoor air and thermal comfort.

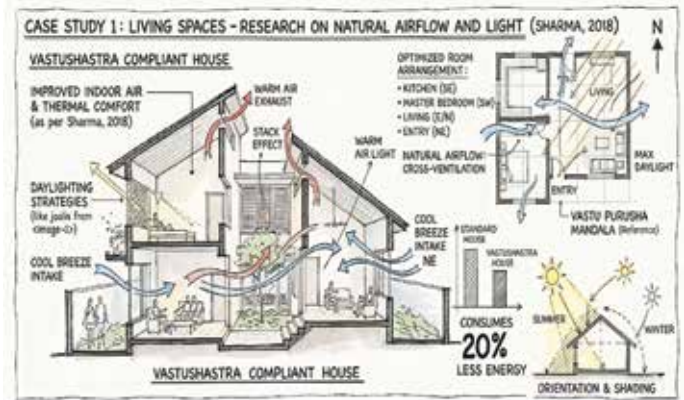


Figure 5: Case Study 1: Living Spaces

Source: Author

Case Study 2: Working Spaces

The impact of architecture on the performance of the organisation and employee comfort. Research shows that in corporate offices (Figure 6) built according to Vastushastra, employees became 15% more efficient and had a reduction of 10% in their stress level.

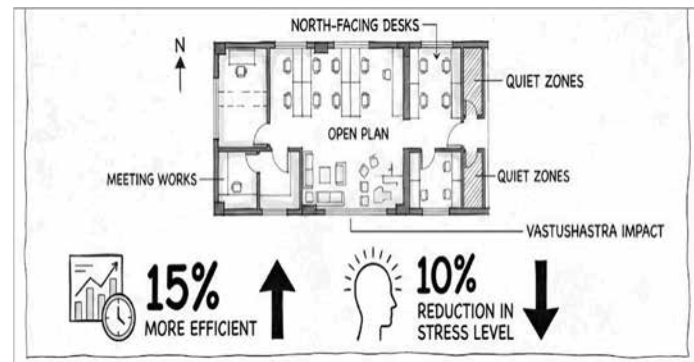


Figure 6: Case Study 2: Working Spaces

Source: Author

Case Study 3: Eco-oriented City Planning

Cities like Jaipur and Chandigarh exemplify the impact of Vastushastra in master planning (Figure 7). The cities can be used as examples of future urban planning through incorporating the water and greenery into the city for an ecological sustainable journey. These examples show us how Vastushastra can be successfully utilised in the current architectural designs and urban planning by incorporating the principles of Vastushastra using modern design techniques.



Figure 7: Case Study 3: Eco-oriented city planning
Source: Author

7. Prospects for the Future and Digital Unification

The architecture is evolving and integration of Vastushastra and modern technologies opens ways for new innovations (Figure 8).

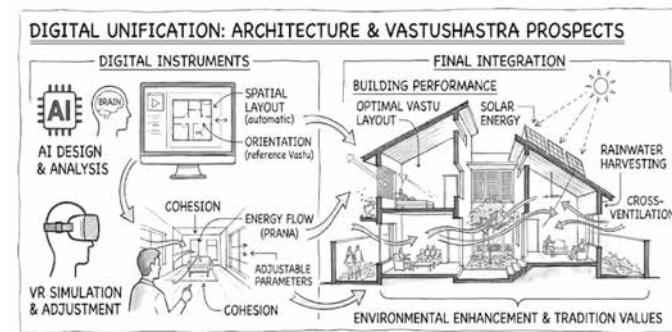


Figure 8: Digital Unification
Source: Author

a. Artificial Intelligence and Intelligent Design Instruments

Through the incorporation of Vastushastra principles into artificial intelligence based architectural instruments, a solution to effective design of buildings becomes possible. AI powered instruments that analyse the spatial layout, orientation and materials used following the principles of Vastushastra thus providing an optimal blend of trade-off and values of tradition. Applications of such instruments could completely revolutionise architecture planning through automated methods of implementing Vastu (Mukherjee & Sen 2023).

b. Simulation in Virtual Reality

Virtual reality (VR) is among the most powerful instruments available to architects and homeowners to envision the effects of Vastushastra before you start the construction of the building. With the help of 3D simulations, it is possible for designers to

simulate the effect that various designs in relation to orientation and spatial changes will have on the flow of energy, air and cohesion within the building.

c. Sustainable Energy

Use of sustainable technology like solar energy, wind energy and rainwater harvesting through Vastushastra principles is a part of the design making that brings about environmental enhancement.

According to Vastushastra, there is a need for natural light and flow of fresh air in addition to the use of sustainable building materials that are compatible with green energy technology. By combining Vastushastra principles with technology, architects and designers would create buildings that utilise natural resources as well as promote human health. With time and further research into the field, Vastushastra could become more credible in the architecture fraternity.

8. Conclusion

Vastushastra still is a valuable source for creating an environment conducive to health, sustainability and equilibrium. The holistic approach of Vastushastra of integrating nature into man-made buildings will continue to influence the creation of healthier and symbiotic environments. Outside the ambit of architecture, the importance of Vastushastra can be seen empirically and with case studies in our present buildings, their effect on physical and mental wellbeing, sustainability and prosperity.

The future of Vastushastra lies in the ability to solve the 'adapt or perish' question of progress for the emerging technologies in our age. Vastushastra can be commoditised for modern urbanisation and next generation sustainable architecture, with help from AI enabled design software, VR experiences and sustainable energy techniques. More research needs to be done for establishing its scientific veracity through empirical investigations and multidisciplinary approaches. The interpretation of Vastushastra for the purpose of creating spaces that are good for the entire individual is something that can be attempted through blending of tradition and necessity.

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Dr. Manita Saxena (A18199) Principal and Professor at the School of Architecture, IPS Academy, Indore, is an accomplished architect, academician, researcher and architectural educationist. With extensive experience in architectural education and research, her work focuses on sustainable architecture, peri-urban development, climate-responsive design, urban planning and built-environment studies.
Email: manitasaxena450@gmail.com

When Buildings Refuse to Stay Still

By Ar. Gunja Goyal

What a century of moving architecture can teach us about adaptability

Architecture is supposed to stay where we put it.

That assumption is so basic that we rarely question it. A building may weather, age, be extended or renovated, but the building itself remains fixed while everything around it changes—the sun moves, seasons change, views are blocked, cities expand and sometimes even the ground beneath it becomes unstable.

Ahmedabad’s famous Jhulta Minara, or Shaking Minarets, have long fascinated visitors for an unusual

phenomenon: when one minaret was set into motion, the other was observed to vibrate while the connecting structure remained comparatively still.

The more radical shift came when movement stopped being something that happened to a building and became something deliberately designed into it.

When the whole house turns

Nearly a century ago, engineer Angelo Invernizzi asked an extraordinary question at Villa Girasole (Figure 1) in northern Italy: what if a house did not simply receive whatever sunlight its orientation allowed? What if the house itself could turn?

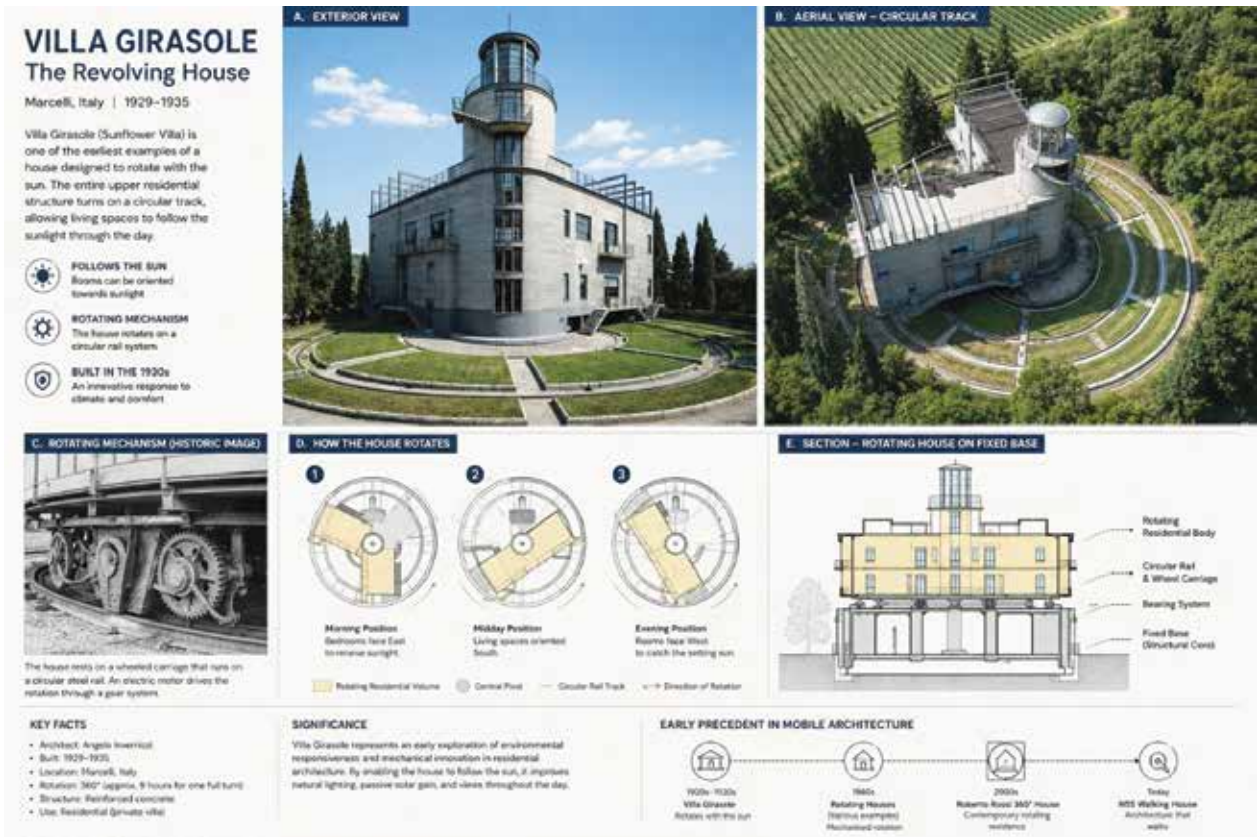


Figure 1: Villa Girasole, Marcellise, Italy
Source: Author-prepared visualisation based on published project information

Completed in the 1930s, the residence was constructed around a central tower, with two inhabited wings travelling slowly along a circular rail system. The architecture could change its relationship with the sun without its occupants changing rooms. That distinction is important. Villa Girasole was not simply a mechanical curiosity. It challenged one of architecture's most persistent conventions: orientation need not always be permanent. Almost a century later, that question has not disappeared. It has simply acquired many more answers.

On Prince Edward Island in Canada, Around the Sea (Figure 2) takes the rotating house in a somewhat different direction. The two-level building contains an owner's residence above and four vacation suites below, while the building itself can rotate. A complete revolution takes approximately an hour before the direction is reversed.

Here, movement is less about demonstrating that a building *can* rotate and more about what rotation gives its occupants. Sun or shade, changing orientation and, particularly importantly in a multi-suite property, desirable views need not belong permanently to one side of the plan. A fixed building

distributes such advantages at the moment it is designed: this room receives the morning sun, another gets the view, while a third faces the less desirable direction. A rotating building makes some of those relationships temporary.

Contemporary rotating houses, including Roberto Rossi's 360-degree house in Italy (Figure 3), show that the fascination with whole-building rotation has survived well beyond the experimental age of Villa Girasole. Yet repeating the same mechanical feat is not where the story becomes most interesting.

The more useful question is: does the whole building really need to move?

When only part of the building moves

Sliding House (Figure 4) in Suffolk offers one answer. Designed by dRMM, the project consists of fixed architectural elements transformed by a large mobile roof-and-wall enclosure travelling along tracks. As the outer shell changes position, it can cover or expose different portions of the house, producing different combinations of enclosure, outdoor space, sunlight and view. Instead of turning the entire building towards a new orientation, Sliding House makes one

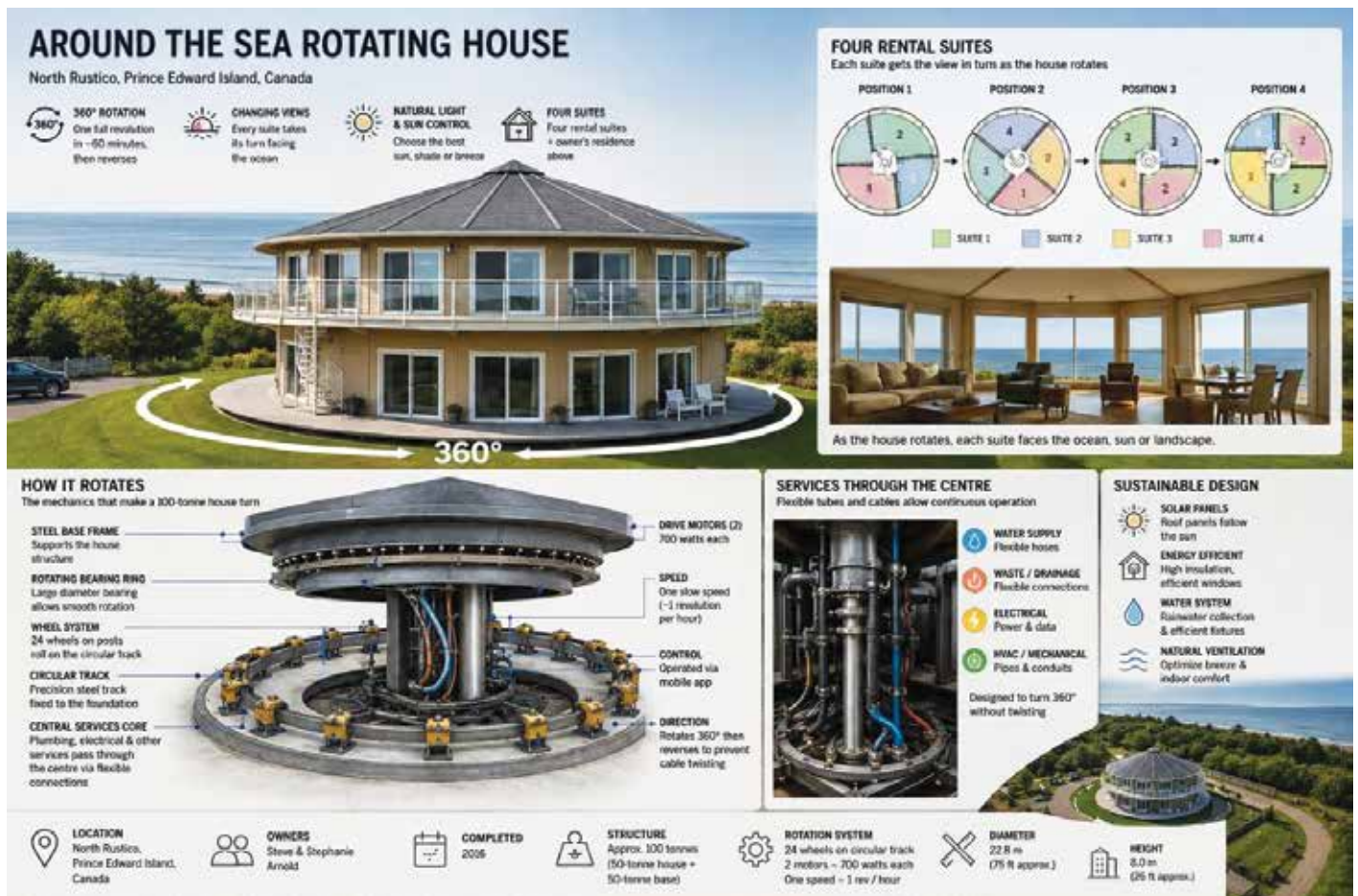


Figure 2: Around the Sea Rotating House, Prince Edward Island, Canada.

Source: Author-prepared visualisation based on published project information



Figure 3: 360° Rotating House, Rimini, Italy

Source: Author-prepared visualisation based on published project information

substantial architectural layer mobile while much of the architecture remains exactly where it is.

Sharifi-ha House in Tehran (Figure 5) takes that idea further. Designed by Next Office, the house contains three inhabitable volumes that can rotate outward. Spaces including a breakfast room, home office and guest room can become projecting volumes when open or return to the façade when closed. The architects describe different seasonal, lighting and occupancy possibilities created by these turning rooms. The interesting part is not simply that the elevation looks different after the boxes turn. The rooms themselves participate in the transformation. A space that feels contained can become outward-looking; its relationship with daylight changes; an outdoor terrace can appear as part of the operation.

Here, movement becomes selective. That may ultimately be more useful than rotating an entire house. The primary structure can remain stable while only those spaces that genuinely benefit from transformation are asked to move. And if an entire room does not need to move, perhaps the next step is smaller still.



Figure 4: Sliding House, Suffolk, United Kingdom

Source: Author-prepared visualisation based on published project information



Figure 5: Sharifi-ha House, Tehran, Iran

Source: Author-prepared visualisation based on published project information

When the skin starts responding

At Al Bahr Towers (Figure 6) in Abu Dhabi, movement is distributed across the façade. The twin towers are wrapped in an external shading system whose geometry and environmental role draw from the traditional *mashrabiya*. Individual units open and close in response to solar conditions, creating a dynamic second skin outside the glazed façade.

The contrast with Villa Girasole is striking. Villa Girasole asks a very large piece of architecture to move in relation to the sun. Al Bahr Towers leave the towers exactly where they are and instead move much smaller components where shading is required. This is perhaps where kinetic architecture becomes less about spectacle and more about precision.

The question is no longer *how much of the building can we make move?*

It becomes *what is the smallest useful thing we need to move?*

That distinction matters because movement is never free. Motors, tracks, bearings, controls and joints introduce additional construction, energy, maintenance and possibilities of failure. A moving element therefore has to earn its place.

And this is where the story unexpectedly comes back to India.

Ahmedabad: movement behind a wall of stone

At first glance, Matharoo Associates' Moving Landscapes (Figure 7) residence near Ahmedabad appears almost determined not to move. Its outer enclosure uses large stone-clad panels—heavy, solid elements that seem closer to permanent walls than kinetic architecture.

Then that impression changes.

Large portions of the enclosure can pivot or slide, revealing the lighter glazed spaces behind them and radically altering the relationship between house and landscape.

The result is more significant than a changing elevation. Closed and open positions create different degrees of privacy, enclosure, daylight and connection with the outdoors. Rather than making an entire house rotate, movement is concentrated in the layer where transformation can directly alter everyday occupation. There is something particularly appropriate about finding this example in Ahmedabad.

AL BAHR TOWERS ABU DHABI

Architecture that Responds

Al Bahr Towers are a landmark example of kinetic architecture. The twin office towers feature a dynamic mashrabiya-inspired facade that opens and closes in response to the sun, reducing solar gain, enhancing comfort and saving energy.

COMPLETED
2012

ARCHITECT
Aedas

LOCATION
Abu Dhabi, UAE

KINETIC UNITS
~2,000 adaptive units across the two towers

ENERGY PERFORMANCE
Up to 50% reduction in solar gain and ~20% reduction in solar energy absorption (Design report)



The twin towers with a dynamic facade inspired by traditional mashrabiya.

THE KINETIC FACADE



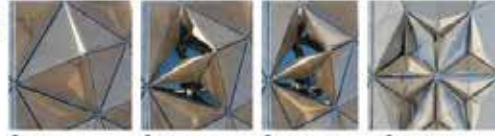
Each unit is a motorised, computer-controlled shading device.

INSPIRED BY TRADITION



Inspired by the geometric patterns of traditional Islamic mashrabiya screens.

KINETIC MODULE – OPENING SEQUENCE



BEHIND THE FACADE



A system of arms and motors moves each unit independently based on solar conditions.

COMPUTER CONTROLLED SYSTEM



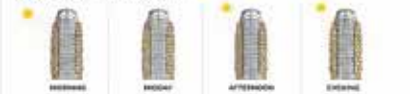
Sensors track the sun and a central computer adjusts thousands of units in real time.

ENVIRONMENTAL RESPONSE



The kinetic system acts as a dynamic filter, separating shading, daylight, ventilation and thermal comfort throughout the day.

FACADE RESPONSE TO SUN PATH



INTERIOR VIEW – CHANGING LIGHT AND EXPERIENCE



Al Bahr Towers demonstrate how technology and tradition can work together to create a responsive architecture that is beautiful, efficient and deeply connected to its context.

Figure 6: Al Bahr Towers, Abu Dhabi, UAE

Source: Author-prepared visualisation based on published architectural and engineering documentation

The city is also associated with the much older *Jhulta Minara*. The two should not be presented as historically connected; there is no reason to suggest that one influenced the other. But placed at opposite ends of a discussion about architectural movement, they make an intriguing pair.

In one, movement is something observed in an old structure. In the other, movement is deliberately designed into contemporary architecture.

Moving Landscapes also provides perhaps the clearest answer yet to the question posed by the earlier examples. The future of kinetic architecture may not lie in making increasingly larger buildings move. It may lie in identifying precisely which architectural element benefits from movement. Sometimes, a wall may be enough.

But what if the building really does have to leave?

Up to this point, all these buildings remain attached to their sites. Villa Girasole turns, Sliding House travels along its rails, Sharifi-ha changes configuration, Al Bahr Towers respond to the sun and Moving Landscapes opens itself to its surroundings—but none actually goes anywhere.



Figure 7: Moving Landscapes, Ahmedabad, India

Source: Author-prepared visualisation based on published project information

N55's Walking House (Figure 8) takes a very different position. The small modular dwelling stands on six articulated legs that allow it to move slowly across the ground. Its compact inhabited volume contains basic living provisions, while mobility is conceived as part of the architecture from the outset. Walking House is obviously not suggesting that our neighbourhoods should begin wandering down the road. Its value is

more provocative. Once a habitable structure carries its means of movement with it, the distinction between building and vehicle starts to blur.

But there are places where the ability to move is not philosophical at all. It is a matter of survival.

When movement becomes survival

Few examples demonstrate this better than Halley VI (Figure 9).

The British Antarctic Survey research station occupies Antarctica's Brunt Ice Shelf—a landscape that is itself moving. Snow accumulates, the ice flows towards the sea and fractures can develop across the shelf. Earlier generations of Halley stations demonstrated the difficulty of applying conventional ideas of permanence to an environment that refuses to remain permanent. Halley VI, designed by Hugh Broughton Architects with AECOM, approaches the problem differently. Its interconnected modules stand on hydraulic legs that can be raised as snow accumulates. More unusually, those legs terminate in large skis. The modules can be disconnected, lowered and towed individually when conditions require relocation.

This ability is not theoretical. During the 2016–17 Antarctic summer, the station was relocated approximately 23 kilometres across the ice because of concerns associated with a growing chasm. Halley VI therefore represents something fundamentally different from the houses encountered earlier.

Villa Girasole moves to negotiate sunlight. Around the Sea changes orientation and experience. Sharifi-ha transforms domestic space. Al Bahr Towers and Moving Landscapes use movement to mediate environmental conditions and enclosure.

Halley VI moves because the ground itself cannot be trusted. Here mobility stops being an architectural novelty. It becomes a strategy for extending the useful life of a building. Architecture has traditionally responded to unstable conditions by attempting to resist them: stronger foundations, deeper piles, higher barriers. Halley VI suggests another possibility.

Sometimes architecture might survive not by resisting change, but by retaining the ability to move away from it.



Figure 8: Walking House, N55

Sources: Author-prepared analytical visualisation based on N55 project documentation

HALLEY VI RELOCATION (2016–17)

ARCHITECTURE THAT PHYSICALLY MOVES

The British Antarctic Survey's Halley VI Research Station was relocated 23 km across the Brunt Ice Shelf. Eight modules were disconnected in sequence, towed on skis by specialist vehicles, and rebuilt at a new site.



Photos: British Antarctic Survey (BAS) - Relocation 2016-17. 1. Photographers: Adam Bradley

2016-2017

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Figure 9. Halley VI Antarctic Research Station, Brunt Ice Shelf, Antarctica

Source: Author-prepared analytical visualisation based on architectural and British Antarctic Survey documentation

When a building that was never meant to move has to

Kiruna in northern Sweden takes this argument one step further. Unlike Halley VI, Kiruna Church (Figure 10) was never conceived as mobile architecture. The timber church belonged very specifically to its site and to the identity of the mining town around it. But the ground beneath Kiruna changed the terms of that relationship. Expansion of iron-ore mining has required substantial parts of the town to move eastwards. Rather than demolishing every structure affected by the transformation, some culturally significant buildings have been selected for relocation.

In August 2025, Kiruna Church provided the most dramatic example. The enormous timber structure was lifted onto self-propelled modular transporters and carried to its new location. Preparing the journey itself became an urban operation, involving a specially planned route and infrastructure adjustments.

Nothing about the church suddenly became kinetic architecture in the conventional sense. Its walls did not unfold. Its rooms did not rotate. It acquired no permanent tracks.

Instead, the relationship between architecture and site became negotiable. That makes Kiruna important to this discussion. For much of architectural history, preservation has meant attempting to retain both building and place. Kiruna presents a more uncomfortable choice: when the original place can no longer be retained, is preserving the architecture somewhere else preferable to losing it altogether?

Movement here is not an architectural feature. It is an act of preservation.

And then architects imagined entire cities walking

After houses that rotate, envelopes that slide, rooms that turn, façades that respond, dwellings that walk and buildings that relocate, it is tempting to think we have reached the outer limits of architectural mobility.

Architects imagined something considerably more extreme more than sixty years ago.

In 1964, Ron Herron's Walking City, developed within the experimental world of Archigram, proposed enormous self-contained urban structures travelling



Figure 10. Relocation of Kiruna Church, Kiruna, Sweden

Source: Author-prepared visual reconstruction based on published documentation of the relocation

across land and water on mechanical legs. These mobile urban pods could theoretically connect with one another, forming temporary concentrations of habitation and infrastructure before separating and moving elsewhere. Walking City was never built, and it should not be confused with the realised projects discussed here. It belonged to Archigram's world of drawings, collages and speculative propositions rather than conventional construction. But perhaps that is precisely why it belongs near the end of this story. Archigram simply removed the architectural assumption we have been questioning throughout:

Why must architecture belong permanently to one place?

Giant cities walking across landscapes remain fiction. Yet the question behind the image has become considerably less fantastic. Halley VI can be disconnected and moved when its landscape becomes dangerous. Kiruna is moving buildings because the ground beneath an established city is changing. A tiny N55 dwelling has actually been given mechanical legs. Walking City was not a prediction that came true.

It was a question that never completely went away. So, what is actually worth moving? Looking across these examples reveals something unexpected.

The evolution of kinetic architecture is not simply a progression towards making bigger and bigger things move. In many of the most convincing examples, precisely the opposite happens. Villa Girasole moves an enormous portion of a house to change its orientation. Sharifi-ha asks only selected rooms to rotate. Al Bahr Towers leave the building stationary and move shading elements instead. Moving Landscapes concentrates transformation within selected parts of the outer enclosure.

Together, these examples suggest that architectural adaptability does not necessarily require moving more of a building; in many cases, moving less can achieve more.

That matters because movement introduces complexity. Every track, bearing, hydraulic system, actuator and motor creates another component that must be constructed, powered and maintained. Moving architecture can solve problems, but it can

also manufacture new ones. A kinetic façade requiring constant repair may ultimately be less sensible than a well-designed fixed shading device. A rotating house may provide spectacular views without necessarily providing a proportionate architectural benefit.

The appropriate question therefore isn't:

Can we make this move?

Technology has already answered that.

The better question is:

What becomes meaningfully better if it does?

At Halley VI, the answer is survival.

At Kiruna, it is preservation.

At Al Bahr Towers, movement responds to solar exposure.

At Moving Landscapes, it changes the relationship between enclosure, privacy, climate and landscape.

And sometimes—as with a rotating house—the answer may simply be experience. There is nothing inherently wrong with delight being an architectural purpose either.

Perhaps architecture doesn't need to stand still: for centuries, architecture has derived much of its identity from permanence. Buildings establish addresses. They define property. They become landmarks partly because we expect to find them tomorrow where we found them yesterday. Kinetic architecture does not make that tradition obsolete. Most buildings have no reason to rotate, slide, fold or walk, and making them do so merely because technology allows it would reduce movement to spectacle. The more interesting lesson from these experiments is subtler: Permanence does not have to mean immobility.

A building can remain architecture while one wall opens. A room can change orientation without losing its identity. A research station can retain continuity while moving across an ice shelf. Even a century-old church can remain culturally significant after leaving the ground on which it was built.

The real promise of architecture in motion, then, is not a future in which buildings endlessly rotate, slide or walk. It lies in designing movement only where change can genuinely improve how architecture responds—to climate, to use, to landscape, or even to uncertain ground beneath it.

Villa Girasole needed almost an entire house to move. Later projects have shown that sometimes a room, a screen or a wall is enough. And in exceptional circumstances, as Halley VI and Kiruna demonstrate, the building itself may have to leave.

Perhaps the measure of successful kinetic architecture is therefore not how dramatically a building moves, but how intelligently it knows what should remain still.

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Gunja Goyal (A18551) is an architect, urban planner, and doctoral researcher with interests in sustainable design, architectural heritage, inclusive environments, and evolving approaches to contemporary architecture. Her academic and professional work explores connections between architecture, cities, culture, and everyday life. She is a Life Member of the IIA and ITPI.

Email: gunjagoyal19@gmail.com

An Analysis of Energy-Neutral Housing Codes and Standards for Sustainable Built Environment

By Ar. Kiran G Singh, Dr. Tejawant Singh Brar and Dr. Lalit Kumar

1. Introduction: The Imperative For Energy-Neutral Housing In India

1.1 Global Climate Change and India's Commitments

India is becoming a major player in international efforts to lessen the severity of climate change, and the global climate crisis demands swift and coordinated action. Our country is the fourth-largest emitter of greenhouse gases (GHGs), accounting for 1293 million metric tonnes, or about 6% of global emissions. This alarming environmental impact underscores India's pivotal responsibility in addressing climate change (Garg et al, 2019).

India has committed to reduce its carbon emissions by 35% by 2030, a commitment made at the 2015 United Nations Climate Change Conference Summit in Paris. United Nations Framework Convention on Climate Change (2015). This dedication is guiding national projects in the built environment, with a three-pronged strategy: increasing renewable energy production, creating carbon sinks through tree and forest cover, and investing in energy efficiency initiatives throughout the country. This approach is important for the built environment (UNFCCC, 2015).

Important National Missions formulated under India's National Action Plan on Climate Change serve as additional drivers for the government's strategic ideas. (MoEFCC, 2008) Notably, the requirement of lowering energy use and promoting sustainable development in both urban and rural areas is directly addressed by the National Mission on Sustainable

Habitat and the National Mission for Enhanced Energy Efficiency. (MoEFCC 2008, Greenly 2023) Energy efficiency in the built environment, especially housing, is not just an economic or environmental goal, as marked by the country's high GHG emissions (WRI India, 2024), its aggressive international climate pledges, and its national missions that specifically target energy efficiency and sustainable habitats. Rather, it is a crucial, top-down policy requirement motivated by both national strategic planning and international commitments. (Chaturvedi & Shukla 2014, World Economic Forum 2025) This implies that future regulations are probably going to get stricter and more pervasive.

1.2 Energy Consumption in the Indian Built Environment

India's real estate industry has a huge impact on the environment. According to reports, buildings use 20% of the country's water, 30% of its raw materials, 40% of its energy, and 20% of its urban land. In addition to consuming resources, they are major sources of pollution, contributing 20% of city effluent discharge, 40% of carbon emissions, and 30% of solid waste generation (Satya et. al., 2016). These numbers demonstrate the enormous potential for beneficial effects from focused interventions in this industry. India's rapid urbanisation and population growth are causing a significant increase in energy demand. By 2050, 50% of the population will live in urban areas, and two-thirds of built-up land will be constructed within 20 years (BEE, 2016). This highlights the need for energy-efficient construction

methods. Residential structures consume 67% of overall energy consumption, surpassing commercial buildings' 33%. This highlights the need for a comprehensive analysis of the housing industry (EIA 2016, CSO 2015).

Residential energy consumption is expected to increase by more than eight times by 2050 under business-as-usual conditions, which is an alarming trend. From 734 kWh in 2008-2009 to 1075 kWh in 2015-2016, per capita energy demand has already increased noticeably, highlighting changing lifestyles and rising appliance use (GBPN, 2014). The current trend suggests an unsustainable path, potentially leading to a serious energy problem. To address this, "energy-neutral" or "net-zero" designs must be prioritised, incorporating passive solutions and well-informed material selections from the beginning. Proactive design regulations are crucial to prevent this issue due to the large number of new developments.

1.3 Defining Energy-Neutral Housing and its Relevance

Energy-neutral housing reduces the impact on the environment and lessens dependency on fossil fuels by producing as much renewable energy as it uses. When a dwelling's annual energy use is approximately equal to the amount of renewable energy generated on-site, it is said to be "energy neutral." Because of their exceptionally high energy performance, these dwellings use very less energy, which is derived from renewable sources. When all forms of energy use within the building—such as heating, cooling, lighting, etc.—are taken into account, energy neutral housing is defined as housing that produces an amount of energy equal to its annual consumption (De Leeuw and Groenleer, 2018).

Often called Net Zero Energy Buildings (NZEB) or Nearly Net Zero Energy Buildings (NZEB), energy-neutral housing is a paradigm in which a building generates as much renewable energy on-site as it uses in a year. Aggressive energy efficiency techniques that reduce energy consumption and on-site renewable energy generation—usually using solar photovoltaic (PV) panels—are combined in order to achieve this equilibrium.

1.4 Methodology

The objective of this paper is to conduct a critical analysis of the current state of voluntary green building rating systems, building energy norms, and laws in India. It will evaluate their inherent limits and present efficacy in promoting the shift to energy-neutral housing. The study will also highlight the

main obstacles and difficulties preventing the broad implementation of energy-neutral practices and offer doable suggestions for financing, technology, policy, and capacity building. The paper provides an outline of required building energy codes and regulations then optional green building rating systems are examined. A comprehensive evaluation of these frameworks' effectiveness is discussed after that. Finally, the difficulties and impediments to attaining energy efficiency in residential structures in India are assessed.

2. Overview of Regulatory Codes and Guidelines in India

2.1 Energy Conservation Building Code (ECBC)/ Energy Conservation Building Code for Residential Buildings (ECBC-R)

The Energy Conservation Building Code (ECBC) is an India-based initiative introduced in 2007 to reduce operational energy consumption in large commercial and institutional buildings. It applies to buildings with new additions, contract demand of 120 kVA or more, and connected loads of 100 kW or more (Garg et. al. 2019). The code provides specific guidelines and standards for construction elements, with two strategies for compliance: the Whole Building Simulation Approach and the Prescriptive Approach (AEEE, 2011).

Specifically created for residential constructions in India, ECBC-R, also called Eco Niwas Samhita, applies to plot sizes of 500 square meters or more. (Bureau of Energy Efficiency, 2018) In order to drastically lower energy consumption in the residential sector, it addresses crucial topics including the building envelope, electromechanical systems, and renewable energy integration. This resolves a prior issue in which certain search results appeared to confuse it with the for-profit ECBC.

2.2 National Building Code (NBC) 2016 Part 11: Approach to Sustainability

A major update to the National Building Code, "Part 11: Approach to Sustainability," was introduced in 2016. (Bureau of Indian Standards, 2016a) The National Building Code (NBC) introduced a significant update in 2016, aimed at reducing environmental impacts of buildings by incorporating indigenous architectural principles and traditional knowledge. The code encourages a comprehensive approach to building design, including water management, energy conservation, disaster readiness, eco-friendly materials, and ongoing occupant surveys. It also provides recommendations for optimal building orientation, thermal mass, shading, and form

efficiency. The NBC Part 11 Approach to Sustainability Addendum mandates routine evaluation of building performance post-commissioning and handover, allowing owners to assess the entire building or just the modified parts. However, its broad scope may limit its impact on energy neutrality, necessitating more integration with energy-specific regulations (Bureau of Indian Standards, 2016b, 2013).

2.3 National Solar Mission

The National Solar Mission, launched in 2010, aims to accelerate solar energy application in India and promote research and development. Solar energy is becoming more widely available because of programs like solar harvesting, PV integration, street lighting, and net metering laws (Haryana Building Code, 2017).

India's National Solar Mission aims to convert buildings from energy consumers to active energy generators by requiring rooftop solar PV panels and solar water heating systems. The country's solar power generating capacity is set to reach 100 GW by 2022. However, current building regulations do not require stringent requirements for residential structures, highlighting the need for solar integration.. The promotion of the "supply-side" (solar) but not the "demand-side" (building energy use) impedes energy-neutral goals, underscoring the necessity of requiring solar integration (UNEP, 2015).

2.4 Other Regulatory Frameworks and Governmental Directives

Various legislative directives and regulatory frameworks, such as the Environmental Impact Assessment (EIA) Notification of 2006, have an impact on India's sustainable construction scene. For large-scale construction projects larger than 20,000 square meters and area development projects smaller than 1,50,000 square meters, this notification is essential. Rainwater collection and appropriate garbage management are two examples of the sustainable environmental management that it requires. Although they are not required to do an EIA, several types of buildings, such as schools, dormitories, and industrial sheds, are encouraged to employ recycled materials. These protections can be implemented by local authorities after the plan is approved.

The Ministry of Environment, Forests, and Climate Change (MoEFCC) has given preferential consideration and environmental clearance to projects with Green Building ratings from programs like GRIHA, IGBC, and LEED India. BEE introduced a 5-Star Rating Scheme in 2009 to encourage projects

that incorporate high environmental standards into their architectural designs.

India's regulatory environment for sustainable buildings is fragmented and reliant on compliance incentives, slowing the transition to an energy-neutral built environment. Residential projects are particularly affected, often excluded from extensive BEE or EIA programs. Accelerating progress could be achieved through a single strategy for energy performance.

3. Voluntary Green Building Rating Systems and Standards

3.1 Green Rating for Integrated Habitat Assessment (GRIHA)

India's national rating system, known as GRIHA (Green Rating for Integrated Habitat Assessment), was created in 2007 by the Energy and Resources Institute and the Ministry of New and Renewable Energy. In 2015, it was updated to conform to sustainability objectives. The strength of GRIHA is how well it integrates with current Indian standards and rules, such as the Energy Conservation Building Code and the National Building Code. It also encourages the fusion of contemporary technologies with traditional architectural expertise.

With 31 criteria spread across nine categories, GRIHA Version 2015 (GRIHA Council, 2016) is a thorough sustainability assessment system for residential structures. It uses a 100-point rating system, and accreditation requires a minimum score of 50 points. Based on points earned, buildings are rated from 1 to 5 stars. GRIHA establishes guidelines for residential buildings' absolute Energy Performance Index (EPI), requiring 50 kWh/m²/year for mild climates and 70 kWh/m²/year for composite, warm and humid, and hot and dry climatic zones. GRIHA uses a non-linear point distribution mechanism to incentivise energy savings, with points awarded for larger reductions. It also established the Large Developments Framework (GRIHA-LD) for projects with 50 hectares or more, emphasising qualitative development and self-sufficiency in waste, water, and energy management. However, this approach may lead to a "checkbox" attitude among designers, potentially obscuring the true spirit of sustainable design (GRIHA Council, 2016).

3.2 Indian Green Building Council (IGBC) and LEED India

Based mostly on the globally acclaimed Leadership in Energy and Environmental Design (LEED) system created by the U.S. Green Building Council, the

Table 1: Summary of Key Building Energy Codes and Regulations in India
Source: Authors

Code/Regulation Name	Year of Introduction/Revision	Purpose	Scope/Applicability	Key Provisions related to Energy
Energy Conservation Building Code (ECBC)	2007 (Revised 2017)	To establish energy efficiency standards for building design and construction to reduce operational energy consumption.	Large commercial and institutional buildings (connected load ≥ 100 kW, contract demand ≥ 120 kVA, or conditioned area ≥ 1000 m ²); new additions to existing buildings.	Benchmarks for building envelope, electrical/mechanical equipment, lighting, hot water; Prescriptive and Whole Building Simulation approaches (EPI, unmet hours).
National Building Code (NBC) 2016 Part 11: Approach to Sustainability	2016	To comprehensively address sustainability in the built environment, reducing negative environmental impacts and integrating traditional wisdom.	All building types (new construction, renovation, addition, alteration).	Guidelines for integrated design (orientation, shading, thermal mass, natural ventilation, daylighting); reduced embodied and operational energy; Building Performance Tracking (Measurement and Verification).
National Solar Mission	2010	To accelerate solar energy application and promote RandD, transforming buildings into energy producers.	All sectors, with specific mandates for institutional, commercial, and large residential complexes.	Mandatory use of solar water heating systems; 3-5% of total electric energy demand from rooftop solar PV in some states; promotion of net metering and smart grids.
Environmental Impact Assessment (EIA) Notification	2006	To ensure environmental appraisal and compliance with safeguards for large-scale construction projects.	Building/construction projects $\geq 20,000$ sq. m built-up area; area development/townships $< 1,50,000$ sq. m built-up area.	Stipulates safeguards for sustainable environmental management, including waste management and rainwater harvesting; advises sustainable practices for exempted categories.
MoEFCC Decision	2011	To incentivise green building practices by granting priority environmental clearance.	Building and construction projects with Green Building ratings (GRIHA, IGBC, LEED India).	Fast-track environmental clearance for projects integrating high environmental norms.
BEE 5-Star Rating Scheme	2009	To promote energy efficiency in specific building types through a star-rating system.	Office buildings operating only during daytime in composite, hot and dry, and warm and humid climatic zones.	Energy performance index (EPI) benchmarks; IGBC-rated buildings often meet or exceed ECBC compliance.

Indian Green Building Council (IGBC) is a well-known voluntary grading system in India. By addressing performance in five crucial areas—sustainable site development, water conservation, energy efficiency, material selection, and interior environmental quality—IGBC promotes a “whole building approach” to sustainability (IGBC, 2015).

The International Green Building Council (IGBC) has developed a tiered certification system for buildings, ranging from “Certified,” “Silver,” “Gold,” and “Platinum,” with Platinum being the highest achievement level. This system is applicable to various building types and project stages, emphasising performance-based standards like energy metering, renewable energy sources, and the Energy Performance Index (EPI) (IGBC, 2015).

IGBC’s success in market branding and promoting adoption through perceived value is indicated by its popularity, especially among private developers. In contrast to locally established systems like GRIHA, LEED’s worldwide origin raises concerns about its suitability for the various agroclimatic environments and socioeconomic settings of India. The route to general energy neutrality may be hampered by this implied trade-off between fully context-specific, optimal energy efficiency for Indian housing on the one hand, and worldwide recognition and marketability on the other

3.4 Comparative Analysis of Rating Systems

Enhancing sustainability across energy, water, and material consumption is the shared objective of India’s green building grading systems, such as GRIHA, IGBC, and BEE. Their approaches, including baseline and topline values, Energy Performance Index (EPI) criteria, and the weighting of different sustainability factors, differ substantially, nevertheless. GRIHA and IGBC provide a more comprehensive evaluation of sustainability criteria, whilst BEE’s 5-star system is mostly energy-focused and corresponds with the ECBC for air-conditioned buildings. Important distinctions also exist between their EPI benchmarks; GRIHA supports absolute standards, whilst ECBC and IGBC use more intricate simulated baselines. Furthermore, GRIHA emphasises low-carbon architecture and passive design, whereas IGBC prioritises the energy efficiency of air-conditioned spaces, though both, along with NBC 2016 Part 11, acknowledge human comfort as a sustainability indicator through occupant surveys (Gangwar et al, 2020).

The Indian green building ratings system fragmentation has caused confusion and inconsistencies, causing

confusion and a lack of uniformity. This creates a paradox of choice, focusing on compliance over energy performance. The need for harmonisation and a single national standard is crucial to promote energy-neutral housing and sustainable building practices.

4. Critical Review: Assessing the Path to Energy-Neutral Housing

4.1 Efficacy of Current Codes and Standards for Energy Neutrality

India’s current building energy rules and standards are not fully effective in promoting energy-neutral homes. The Energy Conservation Building Code (ECBC) has little direct effect on residential structures, primarily targeting big commercial structures. The National Building Code (NBC) Part 11 may weaken its precise energy performance requirements, despite its all-encompassing approach to sustainability. The National Solar Mission promotes renewable energy production, but lacks comprehensive rules for residential structures that include on-site renewable energy generation. This fragmented policy implementation may slow and less consistent progress towards energy neutrality, limiting the country’s potential for energy-neutral homes. A more focused and coordinated policy approach could help achieve more sustainable and efficient homes.

4.2 Strengths and Limitations of Regulatory Mechanisms

Mandatory codes in India can provide a standard for performance and encourage sustainable practices, but their effectiveness is limited by several factors. The Ministry of Environment, Forests, and Climate Change’s (MoEFCC) policy encourages green-rated projects, but it is still optional in some Indian states. Most residential buildings lack strict minimum energy performance regulations, and there is a lack of training and capacity building among stakeholders. Current standards focus on new construction, neglecting the potential for energy savings from retrofitting existing structures. The “enforcement-incentive dilemma” means that a significant segment of the market is not forced to adopt energy-efficient techniques, limiting the progress towards broad energy neutrality. A stronger regulatory foundation is needed to achieve complete change, possibly phased in alongside current incentives.

4.3 Role and Impact of Voluntary Rating Systems

Voluntary green building rating systems like GRIHA and IGBC are crucial for increasing awareness and popularising green designs. They provide developers

Table 2: Comparative Analysis of Major Green Building Rating Systems in India
Source: Authors

Key Focus Area	GRIHA	IGBC	BEE Rating Scheme	BEE (Eco Niwas Samhita)	SVAGRIHA
Origin/ Administrator	MNRE and TERI	CII-Green Business Centre (adapted from LEED)	Bureau of Energy Efficiency (BEE)	Bureau of Energy Efficiency (BEE)	GRIHA Council
Type	Voluntary	Voluntary	Voluntary	Voluntary	Voluntary
Target Building Types	Residential/ Commercial (new and existing)	Residential/ Commercial (new and existing)	Commercial/ Institutional (office buildings)	(a) 'Residential buildings' built on a plot area ≥500 sq. m and (b) Residential part of 'Mixed land-use building projects', built on a plot area of ≥500 sq. m	All new construction projects with built up area 100sqm to 2500 sqm are eligible for certification under SVAGRIHA V.3
Energy Weighting (if applicable)	20%	30%	100%	(Not specified as a percentage, but implied by residential focus)	(Not explicitly specified as a percentage)
EPI Benchmarks (if specified)	70 kWh/Sqm/year (composite, warm/humid, hot/dry); 50 kWh/sqm/year (moderate)	Based on ECBC 2017 modelled baseline	90-200 kWh/sqm/year (ECBC Compliant)	29+8 (Residential) Composite Climate	70 (This seems to be a score or target, not an EPI in kWh/Sqm/year like others)
Key Differentiators/ Comments	National system, integrates Indian codes, strong on passive design, absolute benchmarks, non-linear points for higher savings.	Popular with private developers for brand value, whole building approach, emphasis on OandM for existing buildings.	Energy-centric, relies on ECBC, 5-star rating for daytime office buildings in 3 climatic zones.	Focus on residential energy efficiency within specific plot sizes.	Aimed at smaller to medium new construction projects.
Specific Focus Areas within "Key Focus Areas"	Site Planning, Energy, Occupant Comfort, Water, Materials, Construction Management, Waste, Socio-Economic, Performance Monitoring	Sustainable Site, Water Savings, Energy Efficiency, Materials Selection, Indoor Environmental Quality	Energy Consumption (primary focus)	Energy Consumption in Residential Buildings	(Implied broad coverage for smaller projects, specific breakdown not provided in the original table for this field)

with substantial brand value, improving marketability and impression of their initiatives among consumers. Green Homes certified by the IGBC have reported observable advantages, such as water and energy savings of 30–50% and 20–30%, respectively (IGBC, 2015). Buildings with a gold rating show remarkable energy efficiency of up to 37% (AEEE, 2015). These systems also improve indoor air quality, provide superior daylighting, promote occupant health

and well-being, and boost safety (Gangwar et al, 2020). However, their complexity and difficulty for stakeholders make them difficult to understand. Critics argue that rating systems often see design as a “product” rather than an integrated design process, ignoring the true spirit of sustainable design. The effectiveness of these systems is sometimes questionable in the varied Indian environment, especially due to regional variances.

4.4 Interplay and Gaps between Codes, Regulations, and Rating Systems

India's energy-neutral housing movement is hindered by a lack of required energy rules specifically designed for residential structures, reliance on voluntary rating systems, and a lack of focus on energy-efficient retrofitting of existing buildings. The Ministry of Environment, Forests, and Climate Change (MoEFCC) encourages the integration of green construction ratings, but a disjointed regulatory framework and reliance on voluntary incentives further exacerbate the divide. The Ministry of Environment, Forests, and Climate Change (MoEFCC) also provides expedited environmental approvals for projects earning green construction ratings. The lack of a coordinated, mandated, and capacity-building-focused strategy is a significant barrier to a unified national movement towards energy-neutral housing. A more coordinated, mandated, and capacity-building approach is needed to close this gap and transition to energy-neutral housing.

5. Challenges and Barriers to Energy Efficiency in Indian Residential Buildings

5.1 Technological Barriers

The lack of an integrated strategy for energy-efficient materials and technologies in building design and construction in India is a significant obstacle to achieving energy efficiency in residential structures. Solutions are often fragmented, limiting synergistic effects. High-performance materials are expensive and unaffordable due to importation or lack of domestic accessibility. There is a lack of defined testing procedures and performance standards for these materials (Srinivas, 2015). More research and development are needed to develop thermal insulation materials, optimise glass types, investigate double-skin facades, and identify optimal solar techniques for reducing energy use intensity and improving passive resilience. Natural ventilation's potential for climate resilience is often unrealised in Indian residential building design.

5.2 Regulatory and Policy Barriers

The Energy Conservation Building Code (ECBC) in India is optional, limiting its widespread adoption and enforcement. The lack of minimum energy performance requirements for residential structures is a significant regulatory obstacle, especially in areas where local governments have not yet made it a requirement. Implementation is often hindered by a lack of training and capacity building among regulatory agencies, municipal authorities, and other stakeholders. Real-time data is also lacking to verify

the effectiveness of energy-efficient buildings. India faces a "catch-22" in its residential sector regulations, with no mandated energy codes for the industry that uses the most energy, resulting in little regulatory pressure for the widespread use of energy-neutral housing (AEEE, 2015).

5.3 Financial Barriers and Incentives

The high upfront costs of installing renewable energy systems and energy efficiency measures in buildings can be a significant financial obstacle for developers and homeowners, especially in tight market conditions. This "split incentive" phenomenon can lead to investors and stakeholders hesitant to invest more money. Energy Service Companies (ESCOs) can help reduce costs by contributing money and technical know-how, and recouping investment through energy savings. Stronger financial systems and risk-reduction techniques are needed to accelerate energy-neutral housing adoption.

6. Conclusions and Recommendations

India's ambitious carbon emission reduction target of 35% by 2030 requires a swift transition to energy-neutral housing. Despite the National Solar Mission's support and mandatory rules, the residential sector faces regulatory gaps due to the ECBC's focus on commercial structures. The NBC's sustainability mandate lacks precise goals for energy neutrality, and voluntary green building rating systems like GRIHA and IGBC are inefficient due to their intricacy, disparate standards, and reliance on incentives. A multifaceted and comprehensive approach is necessary to overcome these obstacles and hasten the transition to energy-neutral housing:

6.1. Policy and Regulatory Harmonisation:

To enhance energy efficiency in the building sector, a multifaceted strategy is needed. This includes mandatory residential energy codes tailored to building types, sizes, and climates, incorporating renewable energy generation targets and passive design principles. A unified national standard incorporating best practices from green building rating systems like GRIHA and IGBC would provide standardised energy performance standards. Energy-efficient retrofitting should be backed by clear regulations, financial incentives, and legal mandates.

6.2. Technological Advancement and Accessibility:

The construction industry must invest in domestic research and development to promote affordable, climate-appropriate building materials and technologies. Standardised testing and certification processes are crucial for quality and dependability. An

integrated passive design approach in architectural and engineering education is essential. Promoting domestic manufacturing of energy-efficient materials reduces import reliance, increases affordability, and facilitates broader adoption.

6.3. Financial Mechanisms and Incentives:

A comprehensive financial structure is crucial for promoting energy-efficient construction methods. This includes fiscal incentives like lowering interest rates on green loans, direct subsidies for energy-efficient improvements, and increased property tax rebates for green buildings. Financial instruments like guarantee programs and green bonds are also essential to reduce perceived risks for investors and developers, promoting the adoption of green construction methods.

6.4. Capacity Building and Awareness:

India needs extensive training and capacity-building programs for stakeholders to promote an energy-neutral, sustainable built environment. A national infrastructure for real-time data collection and exchange of energy use in buildings will facilitate competition, validate energy savings, and inform policy recommendations.

India can make rapid progress toward climate resilience and better living conditions for its expanding urban population by tackling these important issues with a coordinated, integrated, and required strategy.

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Ar. Kiran G Singh is an, Architect, housing planner and PhD Scholar currently serving as an associate professor at at Sushant School of Art and Architecture. Educated at SPA Delhi she has over a decade of experience and her work focuses on large scale housing typologies and energy neutrality.
Email: kiransingh9121@gmail.com



Dr. Tejwant Singh Brar (F14255) is a senior professor at Sushant School of Art and Architecture, Architect and Urban Planner. His expertise includes urban water management, GIS, remote sensing and planning pedagogy. Educated at GZSCET Bathinda and IIT Rorke he co-founded MAP Solutions and has over 60 national and international publications
Email: brartejwant@yahoo.com



Dr. Lalit Kumar has over 16 years of experience as a Professor Progressed from Assistant Professor to Asso Prof Dept. of Architecture Deenbandhu Chhotu Ram University of Science and Tech Sonipat Haryana over 16+ years at Deenbandhu Chhotu Ram University of Science and Technology.
Email: lalitkumar.arch@dcrustm.org

BUILDING BETTER TOGETHER

Birla White Strengthens Industry Dialogue with Architects Across India

Meaningful architecture is shaped not only by great design but also through collaboration, shared knowledge, and continuous learning. With this philosophy at its core, Birla White, in association with the Indian Institute of Architects (IIA), has been engaging with architects across India through a series of interactive knowledge-sharing sessions. Over the past four months, CANVAS has brought the architectural community together to foster meaningful conversations, exchange ideas, and strengthen professional relationships.



A Platform for Meaningful Conversations

The initiative brought together some of the country's leading architects for insightful discussions on the evolving landscape of architecture and construction. Birla White had the privilege of engaging with architects at the Jaipur edition of CANVAS, featuring esteemed guest speaker **Ar. Nilabh Nagar (Mumbai)**; in Guwahati, with **Ar. Pragyan Kranti Kalita (Guwahati)**; in Nagpur, with **Ar. Sachin Agshikar (Mumbai)**; and in Lucknow, with **Dr. (Ar.) K.K. Asthana (Lucknow)**. Each guest speaker brought unique perspectives shaped by years of professional experience.

The sessions encouraged open discussions on home building, project execution, design innovation, and the evolving needs of the construction industry.

Sharing Knowledge Beyond Products

The sessions highlighted Birla White's diverse product portfolio, ongoing innovations, and solutions for the evolving needs of contemporary construction. Participating architects also shared valuable insights from their professional journeys, creating opportunities for mutual learning and reinforcing the importance of practical knowledge in delivering better construction outcomes.

Strengthening Partnerships Through Collaboration

The sessions reaffirmed a shared commitment to innovation, collaboration, and excellence. For Birla White, these interactions go beyond product awareness, fostering meaningful conversations that contribute to industry-wide progress.

A Shared Vision for the Future

Birla White's collaboration with the Indian Institute of Architects reflects its commitment to the architectural fraternity through trusted products, technical expertise, and meaningful engagement. Through platforms like CANVAS, Birla White aims to inspire innovation, facilitate the exchange of ideas, and contribute to a stronger future for the built environment.

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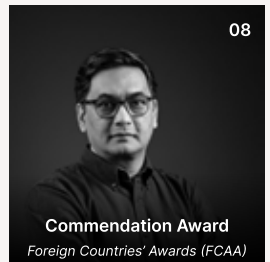
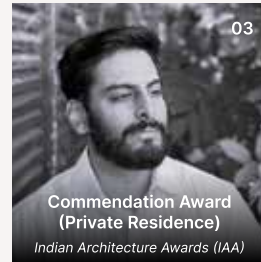


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