

Bali's Bamboo Spaces: A Salutogenic View

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Abstract— This study examines bamboo architecture in Bali through a phenomenological and salutogenic perspective, positioning it as a spatial practice that transcends material sustainability and engages deeply with human experience and well-being. Rather than treating bamboo as a mere construction resource, the research interprets it as an architectural mediator that connects body, environment, culture, and perception. The Balinese context provides a distinctive framework where bamboo is embedded within ecological abundance, craft traditions, and everyday spatial practices, allowing architecture to emerge as a relational and lived condition.

The study adopts a qualitative methodology combining phenomenological analysis, salutogenic interpretation, and sketch-based observation. Analytical hand sketches function as methodological tools to reveal spatial atmospheres, material logics, and environmental interactions that extend beyond measurable performance. These visual analyses are integrated with thematic readings based on spatial legibility, environmental adaptability, and experiential meaning, enabling a comprehensive understanding of how bamboo spaces are perceived and inhabited.

Findings indicate that bamboo architecture in Bali operates through spatial permeability, material authenticity, and environmental responsiveness, fostering sensory coherence and embodied orientation. Semi-open configurations, visible structural systems, and the integration of natural elements such as light, air, water, and vegetation contribute to environments that support psychological comfort and experiential continuity. Architecture is thus understood not as a closed object, but as a dynamic threshold that frames human presence within nature.

The study concludes that bamboo architecture in Bali offers a philosophical and spatial model in which well-being emerges through relational dwelling, sensory engagement, and ecological alignment, providing insights relevant to contemporary discussions on sustainable and human-centered design.

Keywords— Architecture, Bali, Bamboo, Phenomenology.

I. INTRODUCTION

Bamboo stands among the earliest construction materials shaped by human hands, emerging long before the codification of architectural knowledge or the development of formalized building technologies. Despite its deep-rooted presence in vernacular traditions, particularly across the Asian subcontinent, the material gradually receded from mainstream architectural imagination during the waves of industrialization and modernization in the twentieth century. Conventional building systems, reinforced concrete, mass-produced steel, and standardized components, overshadowed the ecological intelligence embedded in locally available natural materials. Yet, this period of relative disregard did not diminish bamboo's intrinsic architectural potential; rather, the material silently persisted within rural landscapes, awaiting a renewed interpretive lens. In the past two decades, global architectural discourse has witnessed precisely such a reawakening.

Contemporary interest in bamboo has largely been propelled by visionary practices, most notably Vo Trong Nghia Architects, whose pioneering experiments have reframed bamboo as a structurally ambitious, aesthetically expressive, and environmentally regenerative material.

Their works have challenged the longstanding misperception of bamboo as merely a temporary construction resource, revealing instead its remarkable tensile capacity, adaptability, and capacity for prefabricated structural logic. This newly visible global enthusiasm has also introduced the expression “Green Steel”, emphasizing bamboo’s high strength-to-weight ratio and its compatibility with sustainable construction paradigms. As the climate crisis intensifies, bamboo’s rapid renewability, minimal carbon footprint, and low-tech construction requirements position it as a critical material for rethinking architectural futures.

Within this expanding global conversation, Bali occupies a distinctive and illustrative position. The island hosts one of the world’s richest living traditions of bamboo architecture, shaped by both ecological abundance and deep cultural entanglements. In Bali, bamboo is neither an exotic innovation nor a nostalgic remnant: it is an evolving architectural language. Iconic structures such as the Green School campus, eco-resorts, community pavilions, and vernacular compounds demonstrate how bamboo can articulate spatial experiences that are simultaneously environmentally sensitive and culturally grounded. This study situates its inquiry within the Balinese context to examine how bamboo architecture not only performs structurally but also constructs meaning, perception, and well-being.

Accordingly, the article adopts a phenomenological and salutogenic framework, investigating how bamboo spaces in Bali shape bodily experience, sensory engagement, and psychological orientation toward comfort and coherence. Phenomenology allows us to interpret bamboo not simply as a material but as a mediator of light, texture, sound, and microclimate, qualities that influence how spaces are perceived and inhabited. Through a salutogenic lens, the research further evaluates how bamboo environments contribute to human well-being, using Aaron Antonovsky’s Sense of Coherence model to explore dimensions such as manageability, comprehensibility, and meaningfulness within bamboo-built settings.

To ground these theoretical perspectives, the study incorporates author-produced analytical hand sketches, which function not merely as illustrations but as methodological instruments. These sketches capture spatial atmospheres, structural articulations, and material interactions that may elude photographic documentation. They serve as interpretive tools bridging phenomenological observation with architectural analysis, offering a tactile and situated understanding of bamboo’s spatial agency.

The article concludes by synthesizing these phenomenological readings with structural and environmental insights to argue that bamboo architecture, particularly as exemplified in Bali, extends beyond sustainability rhetoric. It reveals an architectural paradigm where material, culture, climate, and human well-being are interwoven. The findings underline the necessity of re-engaging traditional ecological materials not as nostalgic artifacts but as catalysts for contemporary design strategies capable of addressing both environmental pressures and human experiential needs.

II. LITERATURE REVIEW

A. Bamboo Architecture: Material, Structural, and Ecological Perspectives

Bamboo has increasingly been recognized as a regenerative construction material capable of addressing sustainability, resource scarcity, and low-carbon design challenges. Recent studies emphasize its high tensile strength, rapid renewability, and minimal embodied energy compared to conventional materials such as steel and reinforced concrete (Sharma et al., 2015). Classified as a “biogenic composite,” bamboo exhibits a strength-to-weight ratio that has prompted its comparison to structural steel, particularly in tubular and lattice systems. The material’s anatomical features, longitudinal vascular bundles, natural tapering, and fiber alignment, contribute to its resilience under bending and compression forces (Dauletbek et al., 2021).

Beyond its mechanical advantages, bamboo offers significant ecological benefits. It can be harvested in 3-5 years, stores substantial biomass carbon, and regenerates without replanting, making it a pivotal resource in climate-responsive architecture (Liese and Tang, 2015). In addition further argue that bamboo’s short growth cycle and low processing requirements position it as a strategic material for eco-friendly architecture, particularly in tropical regions

where its cultivation is abundant. Studies in sustainability highlight that bamboo buildings often require far less embodied carbon during both extraction and construction phases compared to industrial materials (Adier et al., 2023). This ecological profile underpins growing global interest in its integration within structural systems, modular assemblies, and prefabricated elements.

Contemporary architectural discourse also examines bamboo's vulnerability to decay, insects, and moisture, identifying treatment methods that enhance durability. The development of engineered bamboo products, including laminated bamboo lumber and bamboo scrimber, has expanded its architectural applications into larger-scale and more standardized construction contexts. Thus, the literature positions bamboo as both a traditional and technologically evolving material capable of supporting resilient, low-carbon architectural futures.

B. Bali's Architectural Context and Bamboo-Based Spatial Cultures

Bali provides a unique cultural-ecological setting in which bamboo architecture has flourished and evolved beyond vernacular typologies. Anthropological and architectural studies suggest that Balinese spatial culture is deeply interwoven with cosmology, ritual practice, and landscape orientation, factors that shape material choices and spatial configurations (Howe, 2005). In this context, bamboo is not merely a structural resource but a culturally embedded material central to craft, ritual construction, and community-based building systems.

The island's tropical climate further supports the viability of bamboo. Some species grow naturally in areas of intensive agricultural forestry. Some species provide suitable stems for wide-span structures, roof forms, and multi-story areas. Climatic suitability and deep-rooted craftsmanship have come together to create an architectural culture in which bamboo is meaningful both technically and symbolically.

Contemporary Balinese architecture showcases an innovative synthesis of traditional construction knowledge and experimental design. Iconic examples (such as the Green School campus, bamboo resorts, and community pavilion) demonstrate how the material is deployed to generate lightweight vaults, fluid geometries, and porous envelopes that mediate between indoor and outdoor environments (Mertens, 2019). These structures rely heavily on artisanal joinery techniques, including lashed, pegged, and fish-mouth connections, which allow for flexible, reversible, and low-impact construction.

In Bali's architectural context, bamboo's atmospheric and expressive qualities, its tactile surface, rhythmic culm arrangement, and acoustic softness, have become integral to both aesthetic expression and experiential perception. Consequently, Bali stands as a distinctive case where ecological abundance, craft heritage, spiritual landscape, and contemporary architectural experimentation converge.

C. Experience and Well-Being in Architectural Research: Phenomenology and Salutogenesis

The relationship between spatial experience and human well-being has gained prominence in architectural theory, particularly through phenomenology and salutogenic design models. Phenomenological approaches, informed by the works of Merleau-Ponty, emphasize embodied perception, how individuals experience space through sensory engagement, movement, and atmospheric qualities (Pallasmaa, 2014). In bamboo environments, these qualities manifest in the interplay of filtered light, tactile warmth, porous boundaries, and organic geometries, which shape a user's bodily orientation and sense of presence.

Salutogenic theory, originating from Antonovsky's health research, has expanded into the built-environment domain to investigate how architectural settings support psychological coherence and resilience (Antonovsky, 1996). The Sense of Coherence (SOC) framework, which are comprehensibility, manageability, and meaningfulness, has been applied to evaluate how natural materials, biophilic patterns, and culturally resonant forms contribute to stress reduction and well-being.

Studies show that natural materials such as bamboo foster emotional comfort, cognitive clarity, and sensory balance due to their biophilic properties and microclimatic adaptability. Research in environmental psychology suggests that tactile natural surfaces, warm color palettes, and open-air spatial typologies support psychological restoration and reduced stress levels (Kaplan, 1995).

In the context of Bali, where bamboo structures mediate nature–culture relationships, phenomenological and salutogenic perspectives intersect: architectural space becomes both an experiential field and a contributor to human well-being.

III. METHODOLOGY

A. Research Design and Conceptual Framework

This study employs a qualitative research design grounded in a dual theoretical framework combining phenomenology and salutogenesis. Phenomenology provides tools for understanding architectural space as it is lived, sensed, and embodied. Drawing from Merleau-Ponty's (2012) notion of the lived body, space is examined not merely as a physical container but as an experiential field shaped through perception, movement, and sensory reciprocity. Architectural phenomenologists such as Pallasmaa (2014) and Seamon (2018) emphasize the multisensory nature of spatial encounters, arguing that materials, textures, and atmospheres actively structure human experience. This study adopts these principles to analyze how bamboo, as a biogenic and tactile material, mediates perception within Balinese architectural settings.

Complementing the phenomenological lens, the study incorporates Antonovsky's (1996) salutogenic model, which conceptualizes well-being through the Sense of Coherence (SOC). The SOC framework has been increasingly used in built environment research to evaluate how architectural settings contribute to psychological resilience and emotional comfort. Natural materials and biophilic features are shown to enhance cognitive clarity and reduce physiological stress (Kellert and Calabrese, 2015). Applying this framework enables an interpretation of Balinese bamboo environments not only as aesthetic or cultural artefacts but as potential generators of well-being.

These two conceptual foundations are integrated into a phenomenological–salutogenic matrix, guiding data collection, field observation, sketch-based analysis, and thematic interpretation. Phenomenology identifies how bamboo spaces are experienced; salutogenesis assesses how these experiences support well-being. The dual lens is particularly suitable for bamboo architecture in Bali due to its sensory richness, climatic permeability, and cultural embeddedness.

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Recommended font sizes are shown in Table 1.

B. Case Selection: Bamboo Structures in Bali

The study focuses on a purposive sample of contemporary and vernacular bamboo buildings in Bali, chosen for their architectural significance, experiential depth, and representativeness of the island's material culture. The selected cases include:

- The Green School and Green Village, internationally recognized for their innovative large-span bamboo structures and immersive ecological design
- Eco-villages and eco-resorts such as Bambu Indah, demonstrating handcrafted joinery, natural ventilation strategies, and open-air living environments.
- Domestic compounds in rural Balinese settings, reflecting everyday spatial practices and local craft traditions.

These cases were chosen because they collectively represent the spectrum of bamboo architecture in Bali. Those are from experimental architectural practices to culturally embedded everyday spaces. The diversity of typologies allows for cross-comparison of spatial atmospheres, structural logics, and experiential qualities.

C. Sketch-Based and Observational Data Analysis

A defining element of the methodology is the use of analytical hand sketches, aligned with the tradition of visual phenomenology. As argued by Lawson (2004) and Amundadottir et al. (2017), drawing is not merely a representational act but a cognitive tool enabling deeper engagement with spatial atmospheres and environmental phenomena. Sketches produced during site

observation capture qualitative aspects that elude photographic documentation such as light gradients, tactile contrasts, material rhythms, airflow paths, and bodily orientation.

Field notes and sketches were systematically coded to derive spatial-material findings, which were then synthesized through the phenomenological-salutogenic matrix. For example, the arrangement of bamboo culms, degrees of enclosure, or acoustic qualities were interpreted in relation to SOC dimensions such as comprehensibility (legibility of structure), manageability (comfort strategies), and meaningfulness (cultural resonance).

Through this multimodal approach, the study develops a comprehensive understanding of how bamboo buildings in Bali shape sensory experience and support well-being by virtue of their integration with nature and reliance on natural materials. The combination of on-site observation, sketch-based analysis, and phenomenological interpretation reveals how these structures, open, porous, and environmentally attuned, mediate light, airflow, texture, and sound to produce distinctive spatial atmospheres. As architecture that is deeply embedded in the surrounding landscape and constructed from renewable bamboo, these buildings demonstrate how a nature-integrated design language can foster psychological comfort, perceptual clarity, and a sense of coherence. This holistic reading highlights the capacity of bamboo architecture to become not only an ecological solution but also an experiential and salutogenic environment.

D. Analytical Approach

The analytical process employs a structured yet interpretive strategy combining Sense of Coherence (SOC), based thematic coding, phenomenological description, and spatial-material synthesis derived from hand sketches. This triangulated method enables the study to move fluidly between experiential, environmental, and interpretive dimensions of Balinese bamboo architecture.

The first stage applies SOC-informed thematic coding, adapted from Antonovsky's (1996) salutogenic framework. Field notes, observational transcripts, and sketch annotations are coded under the three SOC dimensions: comprehensibility, manageability, and meaningfulness. Recent built-environment scholarship emphasizes that these dimensions can be operationalized in architectural analysis to evaluate how material choices, spatial clarity, environmental responsiveness, and cultural embeddedness influence human well-being (Dilani, 2001). In this study, comprehensibility is read through spatial legibility and structural honesty; manageability through comfort strategies, microclimatic control, and material accessibility; and meaningfulness through cultural resonance and nature-integrated atmospheres.

Following thematic coding, the second stage uses phenomenological description to articulate the multisensory and embodied qualities of each architectural setting. Drawing on Merleau-Ponty's (2012) concept of the lived body and Pallasmaa's (2014) discussion of atmospheric perception, the analysis attends to tactile surfaces, light modulation, acoustic softness, airflow patterns, and the bodily orientation encouraged by bamboo geometries. This descriptive layer captures spatial atmospheres as they are encountered rather than abstractly represented, highlighting how natural materials and porous boundaries mediate environmental experience in Bali.

The third stage involves a synthesis of spatial-material findings extracted from analytical sketches. Sketch-based research has been shown to facilitate deeper engagement with spatial complexity and environmental phenomena by allowing the researcher to externalize perceptual impressions into visual form (Lawson, 2004; Amundadóttir et al., 2017). Each sketch is examined for patterns of material rhythm, enclosure gradients, light trajectories, and structural articulation. These visual cues are then integrated with SOC-coded themes and phenomenological descriptions to produce a holistic interpretation of how bamboo structures function as nature-integrated environments.

Through this multi-layered analytical approach, the study generates an interpretive framework capable of revealing how bamboo buildings in Bali support sensory coherence, psychological ease, and experiential well-being.

IV. SPATIAL EXPERIENCE AND WELL-BEING IN BAMBOO ARCHITECTURE

TABLE I BAMBOO ARCHITECTURE IN BALI WITHIN THE SOC FRAMEWORK

SOC Component	Theoretical Dimension	Physical Manifestation in Bamboo Architecture
Comprehensibility	Spatial clarity and legibility	• Clear circulation paths and permeable partitions guiding movement
		• Visually readable structural system expressed through exposed bamboo joints
		• Rhythmic column–beam patterns revealing structural logic
		• Typological clarity between pavilions, thresholds, and gathering spaces
		• Distinct transitions between open and semi-open zones
		• Natural light wind directions functioning as intuitive orientation cues
	Predictability and order	• Consistent spatial arrangement between primary functions
		• Modular structural rhythm created by repeated bamboo spacing
		• Regular node intervals producing a recognizable structural pattern
		• Clearly articulated functional layers (seating, circulation, activity areas)
Manageability	Environmental control and comfort	• Preservation of Balinese spatial hierarchy and cosmological order
		• Predictable behavior of daylight patterns reinforcing perceptual stability
		• Continuous visual connection to the surrounding landscape
		• Deep roof overhangs supporting intuitive wayfinding
		• Functional zones identifiable through material and geometric cues
	Material accessibility and usability	• Airflow direction subtly guiding spatial orientation
		• Material continuity reinforcing spatial coherence
		• Geometric consistency enabling rapid mental mapping
		• Natural cross-ventilation ensuring passive cooling
Meaningfulness	Cultural resonance and identity	• Elevated roofs and porous envelopes reducing heat accumulation
		• Low thermal mass of bamboo supporting thermal comfort
		• Sloped roofs directing rainwater efficiently
		• Densely arranged bamboo elements acting as natural sun-shading devices
		• Ground-level airflow maintaining humidity regulation
	User agency and adaptability	• Easily repairable bamboo joints and binding systems
		• Craft techniques compatible with local knowledge and skills
		• Lightweight material enabling modular additions and removals
		• Material aging visibly detectable by users
Meaningfulness	Biophilic connection and sensory attachment	• Simple maintenance cycles (oiling, drying, re-shading)
		• Reusable, renewable, and recyclable structural components
		• Movable bamboo screens enabling daily spatial adjustments
		• Portable seating, shading, and storage elements
		• Open-plan typology supporting multiple uses
	Sense of purpose and experiential depth	• Natural topography adaptable to programmatic changes
		• Easily perceived and negotiated spatial boundaries
		• Flexible pavilion structures fostering communal and individual use patterns
		• Bamboo structures aligned with Balinese ritual and spatial culture
Meaningfulness	Biophilic connection and sensory attachment	• Visible craftsmanship emphasizing local identity
		• Open living typologies harmonizing with daily cultural rhythms
		• Communal pavilions (<i>bale banjar</i>) supporting collective practices
		• Natural materiality reinforcing cultural continuity
		• Spatial orientation aligned with Balinese cosmology (<i>kaja–kelod</i> axis)
	Sense of purpose and experiential depth	• Semi-open spaces fully integrated with surrounding vegetation
		• Natural light producing textured patterns on bamboo surfaces
		• Soundscapes shaped by wind, foliage, and bamboo resonance
		• Organic forms mediating between architecture and landscape
Meaningfulness	Biophilic connection and sensory attachment	• Elevated floors engaging the natural terrain
		• Bamboo's scent and tactile warmth fostering emotional attachment
		• Nature-integrated living spaces generating a sense of belonging
		• Sustainable material use communicating ethical and ecological meaning
		• Flexible spatial arrangements supporting everyday rituals
	Sense of purpose and experiential depth	• Daylight rhythms fostering time–space awareness
		• Material lightness cultivating existential sensitivity and mindfulness
		• Shared communal zones producing meaningful social interactions

Dimensions shown in the Table I outline a deeply embodied understanding of how bamboo architecture is perceived, lived, and felt within the Balinese landscape. Spatial clarity and legibility establish a gentle but persistent rhythm that guides the body intuitively, while

predictability and cognitive orientation allow the user to move through space with a sense of ease and assurance. Environmental comfort and material accessibility foreground the palpable qualities of bamboo, the coolness under the hand, the softness of filtered air, the slight resonance under shifting winds, revealing how the building breathes with its surroundings. User agency emerges through the flexibility of porous boundaries and movable elements, which invite participation rather than merely accommodating it. At a deeper layer, cultural resonance and identity tie the structure to the island's cosmology and ritual life, grounding experience in shared memory. Biophilic connection heightens sensory intimacy: dappled light on bamboo culms, acoustic textures shaped by leaves and airflow, the scent of organic material aging gracefully. Ultimately, a sense of purpose and experiential depth arises as the user becomes attuned to the building's ecological and existential presence, experiencing space not as an object, but as a living atmosphere.

A. Spatial Organization and the Structuring of Experience

In bamboo architecture, spatial organization operates as an experiential framework rather than a rigid functional diagram. Especially within the Balinese context, space is conceived through gradients of openness, climatic responsiveness, and bodily movement, allowing architecture to unfold as a continuous environmental sequence. Instead of clearly demarcated interior, exterior boundaries, bamboo buildings frequently rely on layered spatial arrangements that mediate between landscape, structure, and occupation. This approach reflects a spatial logic deeply aligned with tropical living patterns and ecological conditions (Mertens, 2019).

From a phenomenological standpoint, spatial organization in bamboo architecture supports embodied orientation by enabling users to perceive spatial order intuitively. As Merleau-Ponty (2012) argues, spatial experience is not constructed through abstract cognition but through the body's engagement with its surroundings. In bamboo structures, the repetition of columns, the rhythm of roof elements, and the permeability of enclosures provide continuous perceptual cues that guide movement and establish spatial coherence. These cues allow users to anticipate transitions, locate themselves within the spatial system, and develop a sense of spatial familiarity over time.

The organizational logic of bamboo buildings also foregrounds environmental integration. Open floor plans, elevated platforms, and permeable façades facilitate cross-ventilation, filtered daylight, and visual continuity with the landscape. Rather than isolating occupants from environmental forces, spatial organization enables controlled exposure to wind, light, humidity, and sound. Research on climate-responsive architecture suggests that such spatial adaptability contributes to both physical comfort and psychological well-being, particularly in hot-humid regions (Olgyay, 2015).

Within the salutogenic framework, spatial organization plays a critical role in strengthening comprehensibility and manageability. Clear spatial sequences, readable structural systems, and flexible spatial use reduce cognitive effort and support a sense of control over the environment (Antonovsky, 1996). Bamboo architecture often avoids excessive compartmentalization, allowing spaces to accommodate multiple activities without rigid functional prescriptions. This flexibility enhances everyday usability and fosters a supportive relationship between space and daily life.

Furthermore, the cultural dimension of spatial organization cannot be overlooked. In Bali, spatial layouts frequently echo traditional compound structures and communal pavilions, embedding contemporary bamboo buildings within a familiar spatial grammar (Norberg-Schulz, 1980). Such continuity reinforces meaningfulness by linking bodily experience to cultural memory. Consequently, spatial organization in bamboo architecture functions as an integrative mechanism through which environmental performance, cultural continuity, and experiential well-being converge.

B. Nature-Integrated Design and the Biophilic Potentials of Bamboo Architecture

Nature-integrated design has emerged as a critical paradigm in contemporary architectural discourse, particularly in response to environmental degradation and declining human well-being in built environments. Within this paradigm, bamboo architecture occupies a distinctive

position due to its material origin, ecological performance, and experiential qualities. As a rapidly renewable natural material, bamboo enables architectural forms that are not only environmentally responsive but also deeply connected to human perceptual and psychological needs.

Biophilic design theory posits that human well-being is enhanced through direct and indirect engagement with natural systems, materials, and processes (Kellert and Calabrese, 2015). Bamboo architecture inherently supports this engagement by maintaining a visible and tactile continuity between the built environment and its ecological context. Unlike industrial materials that often conceal their origin, bamboo retains its organic form, texture, and growth logic, reinforcing a perceptual link to nature. This material authenticity contributes to emotional comfort and supports restorative experiences, as suggested by environmental psychology research.

In tropical contexts such as Bali, bamboo structures frequently adopt open and semi-open configurations that allow architecture to function as an environmental mediator rather than a sealed enclosure. Roof forms, elevated floors, and permeable façades facilitate natural ventilation, daylight penetration, and visual continuity with surrounding landscapes. Such spatial strategies align with biophilic principles that emphasize natural airflow, dynamic light conditions, and multisensory engagement as contributors to reduced stress and improved cognitive functioning.

Beyond environmental performance, bamboo architecture also embodies biophilic values through its capacity to support sensory richness. The tactile warmth of bamboo surfaces, the acoustic softness generated by porous materials, and the rhythmic repetition of structural elements collectively produce atmospheres that resonate with human sensory perception. Pallasmaa (2014) argues that architecture engaging multiple senses fosters a deeper sense of presence and emotional attachment. Bamboo's materiality, therefore, enables a form of sensory continuity that reinforces embodied experience.

Cultural context further strengthens the biophilic potential of bamboo architecture. In Bali, bamboo construction is closely linked to local craftsmanship, ritual practices, and communal life. This cultural embeddedness enhances the meaningfulness of bamboo spaces, aligning with salutogenic interpretations of well-being that emphasize coherence between environment, identity, and everyday life (Antonovsky, 1996). Architecture that integrates natural materials within culturally legible forms supports not only ecological sustainability but also psychosocial resilience.

Consequently, nature-integrated bamboo architecture cannot be reduced to a merely instrumental or performance-driven environmental strategy. From a philosophical perspective, such architecture resonates with phenomenological thought, which understands space not as an abstract object but as a lived and relational condition emerging through embodied engagement with the world. Bamboo architecture, by preserving material authenticity and environmental continuity, enables a form of dwelling in which human existence remains perceptually and ontologically connected to nature rather than separated from it. In this sense, architectural space becomes a mediator of being-in-the-world, echoing Heidegger's conception of dwelling as a meaningful mode of inhabitation rather than a technical act of sheltering (Heidegger, 1971).

This holistic approach further aligns with Norberg-Schulz's (1980) notion of *genius loci*, wherein architecture gains significance through its capacity to articulate the spirit of place. The convergence of material choice, spatial configuration, sensory engagement, and cultural continuity in bamboo architecture reflects an architectural ontology grounded in place-specific meaning and experiential depth. Such environments do not impose form upon nature; instead, they emerge through dialogue with landscape, climate, and local knowledge, reinforcing a relational understanding of architecture.

From an ethical standpoint, the biophilic potentials of bamboo architecture also correspond with contemporary environmental philosophy, which critiques anthropocentric design paradigms and advocates for more reciprocal human–nature relationships (Naess, 1989). By fostering sensory attunement, ecological awareness, and emotional resonance, bamboo architecture supports a form of ecological dwelling that nurtures both environmental balance and

human well-being. In doing so, it offers not only a sustainable design model but also a philosophical proposition for rethinking architecture as an embodied, ethical, and place-responsive practice.

TABLE III BIOPHILIC ATTRIBUTES OF BAMBOO ARCHITECTURE AND THEIR SPATIAL AND EXPERIENTIAL IMPLICATIONS

Biophilic Principle	Architectural Parameter	Bamboo-Specific Architectural Expression	Experiential and Salutogenic Implications
Material authenticity	Structural and material legibility	Exposed bamboo load-bearing systems and joints	Perceptual clarity, sense of trust, reduced cognitive stress
Environmental integration	Spatial permeability and openness	Semi-open plans, permeable bamboo envelopes	Visual continuity with nature, psychological restoration
Sensory richness	Tactile, acoustic, and visual modulation	Natural texture, light filtration, acoustic softness	Enhanced embodied experience, sensory comfort
Climatic responsiveness	Passive environmental control strategies	Ventilated roof apexes, lightweight bamboo structures	Thermal comfort, sense of manageability
Cultural continuity	Vernacular spatial references and craftsmanship	Traditional joinery techniques adapted to bamboo	Place attachment, meaningfulness, cultural coherence

C. Interpretive Insights from Hand Sketches: Sensory and Emotional Readings

The hand sketches produced for this study function as interpretive devices that translate sensory impressions and material relationships into analytical insight. Rather than serving as illustrative representations, the drawings operate as cognitive instruments that allow spatial atmospheres, material logics, and environmental interactions to be examined through a phenomenological lens. Each sketch captures aspects of bamboo architecture that are difficult to quantify, such as tactile continuity, perceptual rhythm, and emotional resonance.

The sketches documenting bamboo joint details foreground the material intelligence embedded in construction techniques. By emphasizing exposed connections, these drawings reveal the structural clarity and tactile expressiveness of bamboo assemblies. The visibility of joints allows users to visually grasp how the building is constructed, reinforcing spatial trust and contributing to a sense of coherence within the environment. Such legibility has been associated with reduced cognitive stress and increased spatial comfort in architectural settings.

As shown in Figure 1, such as dovetail techniques, the drawings highlight a shared tectonic vocabulary across materials. This visual correspondence underscores the continuity between vernacular craftsmanship and contemporary bamboo construction, suggesting that bamboo architecture extends established building knowledge rather than replacing it. This continuity strengthens cultural resonance and enhances emotional attachment to place.

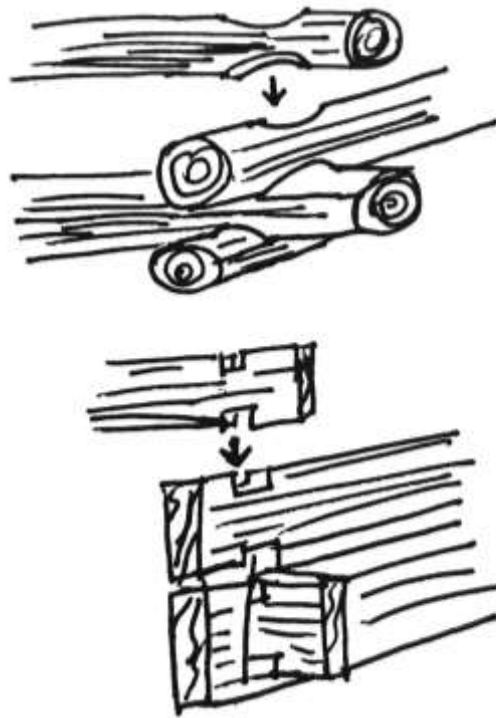


Fig. 1 Comparing bamboo connections with traditional timber joinery



Fig. 2. Structures in nature

Figure 2 shows how bamboo structures blend visually into their natural surroundings through their perforated outer surfaces and organic forms. Rather than standing out as distinct, rigid structures, these buildings gently blend into the landscape, becoming an integral part of their environment. This approach positions bamboo not as an invasive structure, but as a boundary-defining element that subtly marks the presence of space without disrupting the natural flow of the surroundings. The material choice and spatial permeability of bamboo contribute to a harmonious integration with the landscape, ensuring that the architecture does not dominate but instead complements its setting. This concept reflects the growing recognition in environmental psychology that visual integration with nature can induce restorative experiences and promote emotional calm. Such an approach to design highlights the potential of bamboo architecture to not only provide shelter but also enhance the user's connection to the environment, reinforcing

a sense of continuity between the built and natural worlds. This non-invasive architectural approach echoes the idea that the built environment can be a temporary presence within nature, capable of fading back into the landscape once its function has been served.



Fig. 3. Ventilated roof structure found in almost every building

Figure 3, illustrating the open roof apices, demonstrates the environmental logic of bamboo architecture. The intentional voids at roof peaks facilitate natural air circulation, making climatic processes perceptible rather than concealed. This visibility of environmental performance enhances users' awareness of natural forces and reinforces a sense of environmental participation.



Fig. 4. Hand sketch illustrating a semi-open bamboo space designed to support phenomenological perception through sensory integration

Figure 4 explores the phenomenological capacity of semi-open bamboo spaces to engage the full spectrum of human senses through spatial continuity and environmental mediation. The open-sided configuration allows light, air, sound, and scent to penetrate the architectural envelope, transforming the space into an experiential interface rather than a closed interior. The gently curving roof form filters daylight, producing soft gradients of light and shadow that change

throughout the day, while the open perimeter permits the movement of wind and the subtle sounds of the surrounding landscape to enter the space. The tactile presence of natural materials anchors bodily perception, reinforcing a sense of groundedness and material authenticity. This sensory integration supports a condition of perceptual wholeness, where vision, touch, hearing, and thermal sensation operate simultaneously. Within a phenomenological framework, such semi-open spaces enable an embodied experience in which architecture does not isolate the user from nature but situates the body within a continuous environmental field, fostering attentiveness, calm, and spatial awareness.



Fig. 5. Hand sketch illustrating a semi-open bamboo space composed of water, stone, and bamboo as a unified sensory environment

Finally Figure 5 articulates a semi-open architectural condition in which water, stone, and bamboo are not assembled as discrete materials but encountered as a continuous field of experience. Space is constituted here not through enclosure, but through relational boundaries that emerge from material presence and bodily perception. The curved bamboo form does not impose itself as an object; instead, it acts as a spatial gesture that gathers ground, air, and light into a legible yet fluid whole. Architecture, in this sense, becomes an act of revealing rather than constructing.

The presence of water introduces temporal depth through reflection, sound, and subtle movement, while stone anchors the body through weight and tactile resistance. Bamboo mediates between these elements, operating as a porous membrane that allows the body to sense transitions rather than confront fixed limits. Such a space is experienced not from a distance but from within, where perception unfolds through touch, temperature, sound, and movement. Vision no longer dominates; instead, the body becomes the primary instrument of understanding.

Philosophically, the sketch suggests a conception of space as becoming rather than being, a lived condition continuously shaped by interaction between body, material, and environment. Architecture is thus redefined as an existential threshold, one that frames human presence within nature without separating it, allowing dwelling to occur as a quiet alignment between self and world.

V. CONCLUSIONS

Bamboo architecture in Bali offers more than an environmentally responsible construction approach; it proposes an alternative understanding of how space, material, body, and well-being intersect. Rather than presenting architecture as a finished object imposed upon a site, bamboo spaces in Bali articulate a spatial philosophy grounded in continuity, becoming, and relational presence. Through their open configurations, tactile materiality, and integration with natural

processes, these environments reframe architecture as a mediator between human existence and the surrounding world.

At the core of this architectural logic lies a rejection of rigid boundaries. Walls do not strictly separate inside from outside, nor do roofs function solely as protective covers. Instead, spatial limits are softened, layered, and made permeable, allowing environmental forces such as light, air, sound, and moisture to participate actively in the formation of space. This condition transforms architecture into an experiential field rather than a closed container. Space is not encountered as a static entity but as something continuously shaped through bodily movement, sensory perception, and temporal change.

The use of bamboo as a primary material reinforces this ontological stance. Bamboo does not conceal its origin or resist the logic of nature; it carries visible traces of growth, curvature, and imperfection. As a result, materiality becomes legible and expressive, enabling users to perceive how structures stand, breathe, and age. This structural honesty fosters a sense of coherence, not through control or dominance, but through intelligibility and trust. Architecture here does not demand attention; it invites attunement.

The hand sketches produced within this study serve as critical interpretive instruments for understanding this condition. By focusing on joints, semi-open sections, roof voids, and material transitions, the sketches reveal how bamboo architecture operates as a system of thresholds. These thresholds are neither purely physical nor symbolic; they are experiential. A joint becomes not only a technical solution but a point of tactile encounter. A roof opening becomes not only a climatic device but a perceptual lens through which air and light are made visible. In this sense, drawing functions as a mode of thinking, allowing spatial atmospheres to emerge through observation rather than abstraction.

Furthermore, the integration of water, stone, and bamboo within semi-open spaces introduces a layered sensory ecology. Each material contributes a distinct mode of perception, reflection, weight, texture, temperature, yet none dominates the whole. Instead, they operate in concert, producing a condition of sensory wholeness. Vision is no longer privileged over touch or sound; perception unfolds through the body as a unified field. Such environments encourage slower movement, heightened awareness, and a form of dwelling grounded in presence rather than consumption.

Culturally, these spatial practices resonate with Balinese traditions that emphasize harmony between human activity, landscape, and cosmology. However, their significance extends beyond local context. The architectural language developed through bamboo in Bali suggests a broader critique of contemporary building practices that prioritize enclosure, separation, and visual spectacle. By contrast, bamboo spaces propose architecture as an act of alignment, between body and climate, material and ground, form and meaning.

From a salutogenic perspective, well-being emerges here not as a measurable outcome but as an experiential condition. Coherence is achieved through spatial legibility, manageability through environmental adaptability, and meaningfulness through cultural and material continuity. Architecture supports health not by isolating the individual from the world, but by situating the individual within a comprehensible and responsive environment.

Last but not least, Bali's bamboo spaces invite a reconsideration of architecture's ethical and philosophical responsibilities. They suggest that building can be an act of restraint rather than assertion, of listening rather than declaring. In doing so, bamboo architecture becomes not merely a sustainable alternative, but a spatial philosophy, one that redefines well-being as a lived relationship between human beings, materials, and the world they inhabit.

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