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## **RELIGIOUS BUILDINGS AND SUSTAINABLE BEHAVIOUR: UNDERSTANDING IMPACT OF DESIGN ELEMENTS ON HUMAN BEHAVIOUR**

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### **ABSTRACT**

Peoples' behaviours are projection of their experiences in everyday life. Mental adaptation of rapid changing environment results in subconscious stress. This has become one of the major concerns in current developing urban contexts. Well planned architectural elements contribute significantly to environment influences well being and sustainable behaviour. Religious buildings are apt cases of those environments designed for human mind and higher spirituality. Study mapped human behaviours in three different religious buildings, i.e., mosque, temple and church located in Bhopal city of India. It compares the conscious and subconscious behaviour of visitors based on common parameters mapping of movement patterns, sitting angles and resting points in religious premises. These behaviour patterns analyze with sensory perception of those design elements and principles which provoked the same common to all case studies. Study discusses impact of design elements on user mind and their effect on sustainable behaviour and well-being.

Key Words: Build Environment, Design Elements, Sustainable Behaviour, Religious Buildings

## 1. INTRODUCTION

India is a country rich with various religious architectural styles. Every style differ with common design principles and purposes i.e., an experience of well being and higher spirituality. During last decade, India is the fastest developing economies influencing infrastructure and built-environment catering large population. Since, maximum times are spent in either work place or home; built environment is integral part of our lives and has a significant contribution in formation of our experiences. Along with new work culture; increase in productivity, better output and maintaining good health has become priority and therefore demand of alternate practices like Vaastu and Feng shui has increased to keep pace with current life style by making spaces positive in experience and sustainable behaviour. Religious building design and its elements evolved with spreading of culture based on geographic conditions, availability of material, craftsmanship and cultural influences. These design principles and elements contribute to unique experience of spiritual self. Objective of study is to find those elements and principles which contribute to spiritual experience and sustainable behaviour. Many interdisciplinary researches are focusing user experiences within a built environment. Neuroscience, psychology and environment behaviour are few of such disciplines. Focus of the study is to understand mind experiences through human behaviour mapping by analysing design elements and sensory perception within build environments of religious buildings. Results re-evaluate design principles focusing user experience of existing religious buildings in current context. The understanding can taken forward to future religious buildings design and spiritual built environments integrating contemporary approaches and advance technologies. Also, the learning can apply to other built environments focusing human experience and well being resulting in sustainable behaviour.

## 2. LITERATURE REVIEW

Experiencing architecture is a sensory exercise of various design elements like lines, colours, materials, texture, etc. that has psychological and physiological affect over biological and spiritual self. Therefore, it's important to understand definition and relationship of spirituality and sustainable behaviour. Thereafter, the process of affordance discusses influence on sensory perception and cognition induced by elements of design. Perception leads to precognitive emotional responses in a build environment which cause conscious and subconscious behaviours.

### 2.1. Spirituality and Sustainable Behaviour

The principle function of human mind is to make sense of itself with respect to environment that brings one closer to awareness of self, consciousness and truth each time we contemplate.<sup>1</sup> “*Spirituality is a way of being in the world in which a person feels a sense of connectedness to self, others, and/or a higher power or nature; a sense of meaning in life; and transcendence beyond self, everyday living, and suffering.*”<sup>2</sup> Similar to a piece of an art, profound architecture connects consciousness back to world; and direct our senses to self and being. Collective stimulation of senses construct self-image to get imbibes in our experience of the world and makes us experience as spiritual being.<sup>3</sup> The brain, mind and behaviour of humans are resultant of biological and cultural evolution of past.<sup>4</sup> Our mind perceives spirituality in various forms and needs. Few of those needs are social, seeking sense of belonging, self-actualization, seeking meaning or truth, wisdom and justice.<sup>5</sup> These formulate sustainable behaviour. Sustainable behaviour integrate realization of values, norms, beliefs and senses of responsibility focused to provide well-being for self and other living beings, including present and future generations.<sup>6</sup>

### 2.2. AFFORDANCES OF BUILT ENVIRONMENT

Based on people's experiences in an environment, in 1970's, J.J.Gibson coined a concept called *affordances*. Affordance is cognitive abilities of understanding opportunities offered by a space or an object, by indulging or communicating within an environment.<sup>7</sup> For example, a doorway invites to pass through it and stepping stones in garden lead to walk a specific route. According to Jon Lang any built environment has potential to induce human experience and behaviour:

“Information about the environment is obtained through perceptual processes that are guided by schemata motivated by needs. These schemata are partially innate and partially learned. They form the linkage between perception and cognition. They guide not only the perceptual processes but also emotional responses (affect) and actions (spatial behaviour), which in turn affect the schemata as the outcomes of behaviour are discerned.”<sup>8</sup>

<sup>1</sup> (Zeisel, 2006)

<sup>2</sup> (Weathers, McCarthy, & Coffey, 2015)

<sup>3</sup> (Pallasma, 2008)

<sup>4</sup> (Gazzaniga, 2008)

<sup>5</sup> (L.Nussbaumer, 2014)

<sup>6</sup> (Dunja Andic (University of Rijeka, 2014)

<sup>7</sup> (Goldhagen, 2017)

<sup>8</sup> (Kder)

### 2.3. Perception of Design Elements – The Stimulus to Mind

Act of mind coordinated with inputs from senses results in perception.<sup>9</sup> Human sees space upright create a vertical axis of reference and since, we see from two eyes at equal height create the horizontal axis of reference to observe our immediate environment. Distance between point of observation and object of observation create depth which ultimately leads to sense of space in human mind.<sup>10</sup> Most fundamental concept of human mind is to find meaning from the information gathered by the sensory system. Our mind is an outcome of primitive evolution, it start interpreting preliminary data instinctively gathered from random visual or aural phenomenon. Hence, perception is influenced by already known information embodied in human mind. Visual perception is one of the dominant affordance offered by architecture. The basic elements of architecture those contribute to perception are: Proportion, Scale, Rhythm, Texture, Light, Colour and Ornamentation.<sup>11</sup> These elements contribute significantly to aesthetic experience of mind.

### 2.4. Senses – Windows to Cognition

The senses act as interaction points to the world. Sensory cognition leads to thoughts and perception.<sup>12</sup> The mind perceives a space through visual sense which is soon informed by all other senses- sensory and motor system, and by the memory and the metaphors.<sup>13</sup> Edward T. Hall (1982) classified human sensory systems in two categories, i.e., Distance Receptors and Immediate Receptors. Distance receptors cover visual, auditory, olfactory and gustatory senses whereas immediate receptor which is touch or skin based are kinesthetic, tactile and thermal senses.<sup>14</sup> Senses are the windows to human mind. Cognition is nonconscious to conscious process in collaboration of mind, body and environment. We cannot recall memory unless we revisit at least a few elements of the place where it happened either consciously or nonconsciously.<sup>15</sup> Vision is one of the most important sense in perceiving architecture and its aesthetics. Colours strongly influence emotions. Natural light has not only significant psychological but physiological effect on human beings.<sup>16</sup> By reducing the noise, tranquillity becomes most powerful auditory experience of any good architecture.<sup>17</sup> High noise creates stress, increase blood pressure and heart rate; on the other hand, music does the reverse and is comforting.<sup>18</sup> A carefully carved architectural environment is sensitive to silence, sound and echo. Olfactory Sense has deeper memories than vision or sound.<sup>19</sup> Tactile sense integrates our experience of world to our experience of self as body. Skin is the oldest and first medium of communication to our environment. Hence tactile sense is parent to all our sensory organs.<sup>20</sup>

### 2.5. Human Behaviour – Reflection of Mind Experiences in an Environment

Even though spaces are organized in a systematic order but most of the time user is unable to identify the pattern in a designed environment. While user present in the environment, senses and motor system are active without him aware of it. Instead user registers nonconsciously such spaces and chooses the affordances while experiencing the environment. Brain becomes conscious with constant bombardment of stimuli in a built environment. Cognition can be linguistic or pre-linguistic which can happen in realm of nonconscious to consciousness. <sup>21</sup> Metaphors are linguistic tools for creative cognition.<sup>22</sup> Our fundamental conceptual system of thinking is metaphorical in nature. For example, “Argument” is “War”, “Good” is “Up” and “affection” is “warmth”.<sup>23</sup> Similarly, architecture is interpreted and experienced through embodied metaphors. For example, high plinth symbolizes power, fat columns symbolize strength and high minarets or vaulted ceiling symbolizes greatness. Complex processes in mind with both stimulus i.e., external (visual) and internal (metaphorical) evokes involuntary emotions, memories and thoughts. Mental and physical response of human body to environment is called behaviour. External physical responses are overt behaviours whereas internal responses like emotions and feelings are covert behaviours.

<sup>9</sup> (Benson, 2007)

<sup>10</sup> (V.S.Parmar, 1973)

<sup>11</sup> (Roth, 2007)

<sup>12</sup> (Karunamuni, 2015)

<sup>13</sup> (Goldhagen, 2017)

<sup>14</sup> (L.Nussbaumer, 2014)

<sup>15</sup> (Goldhagen, 2017)

<sup>16</sup> (L.Nussbaumer, 2014)

<sup>17</sup> (Pallasma, 2008)

<sup>18</sup> (Kder)

<sup>19</sup> (L.Nussbaumer, 2014)

<sup>20</sup> (Pallasma, 2008)

<sup>21</sup> (Goldhagen, 2017) pg-113

<sup>22</sup> (Indurkha)

<sup>23</sup> (Johnsen, 2003)

### 3. METHODOLOGY

Three religious buildings were selected i.e., Mosque, Temple and Church within a city. Physical environment of these buildings were recorded individually based on elements of design and sensory perception. User analysis and their behaviour were recorded for each case study based on common parameters, i.e., movement pattern in the complex, halting zones, sitting zones and talking or interaction zones. Similar patterns identified in all three case studies induced due to design elements and sensory perception. Finally, behaviour pattern analysis was done with respect to design elements and sensory perception common in all case studies to understand relationship of design elements, sensory perception and human behaviour.

#### 3.1. Case Studies

Following religious buildings are identified as case studies (Figure 1). The study executed during month of September. All the selected buildings are important structures located at Bhopal, a city in central India:

##### 1. Moti Mosque (Case Study-I, Mosque):

It is an Islamic religious structure built in 1860. Located on the junction of busy roads, the noise is significantly cut by high plinth and introvert courtyard planning. The structure is built in Indian Islamic style with three gateway approach. Fourth side has mihrab facing west, the direction for offering prayer. The name "Moti" means pearl was given to mosque because of its mihrab's construction in white marble highlighting it from the rest of the building constructed in red sandstone including two huge minarets.

##### 2. Laxmi Narayan Temple (Case Study-II, Temple):

Also known as Birla Mandir was constructed in 1960. The site of Hindu temple is located on one of the highest point in the city with cliff towards north. The panoramic view of city creates added interest among visitors. The tall cupola and bright colours highlight the building and its complex from a distance located on a silent road. The building structure sits in the middle of landscaped complex periphery covered with deciduous trees along with high plinth and facing east direction.

##### 3. St. Francis of Assisi Cathedral (Case Study-III, Church):

The oldest church in Bhopal city was funded by the British constructed before independence in 1824. It is a typically designed Christian structure with central isle and nave constructed in vault structure, beautifully painted rear wall and cross behind the Altar catches the eye of the visitor entering the church. The tapered high façade catches the eye with sculpture of St. Francis and cross on top while entering the small complex. Statue of Mother Mary of left and baby Jesus grotto on right to entrance gate are cosy places to sit and contemplate under large shades of trees' canopy in hot summers.



[Figure 1] Left: Moti Mosque, Centre: Laxmi Narayan Temple, Right: St. Francis of Assisi Cathedral

### 4. FINDINGS

#### 4.1. Analysis of Design Elements

Several common findings while analysing design elements in the religious buildings. Scale and built forms of all case studies are large span structures to accommodate large numbers of visitors with emphases on verticality. Tapered façade of church, tall cupola in temple and minarets in mosque are examples of same. The building structures rest on plinths almost twice the human height in case of mosque and temple. All the buildings designed symmetrically to central axis accommodating other design elements like entrance and centre of worship. Orientation of axis in mosque and temple are aligned to particular direction based on religious believes. Carvings and cornices are based on respective architectural styles. Most of the elements like openings, vaults, columns constructed with constant pattern also representing the structural system of these buildings. Tall main halls segregated by humane entrance foyer or canopy. All entrances are highlighted by mouldings or carvings along with detailed wooden door in all cases. Local stones are used in floor except the church where new tiles are used during later renovation. The wall surfaces are painted plaster in church & temple whereas mosque is built in sandstone majorly. Where church is white in colour; the mosque exhibit natural colours of stones applied that is red and white. The temple is painted in bright colours. Other features like water body in mosque; small worship structure and water body in temple and; grotto and Mother Mary statue are parts of enhancing the build environment.

#### 4.2. Sensory Perception

Prominent stimuli were observed in context to common design elements in all religious case studies. Design elements leads to perception and experience. Design elements like high plinth and tall structure attract attention of user. While perceiving case studies visually; traditional carvings and motifs leads to stimulation of cultural memory, taking one mentally in past, and bringing attention to dynamics of time. The precognitive emotions of time are further strengthen by wear-tear of natural materials like stone, wood, trees, and metal enhancing consciousness of mind. Silence and sound has unique effect on user's experience. In all case studies, religious buildings cut sound due to design elements like thick walls, high plinths and dense natural vegetation. Ringing sounds of bells or chants of prayers draw attention from our own thoughts as well as take mind to a soothing and contemplative zone. The source smell is from flowers or incense used during ritualistic ceremony in the religious case studies. Since, observations were noted at different time frame of the day; the ambiance varied through morning to afternoon and till evening. Stone transferred heat in temple and mosque through the day time whereas wooden bench in the church protected the touch of cold in the evening. Shade of trees and water features reduced ambient temperature on a sunny day. The touch of wind while cross ventilation from window openings and at high plinth comforts the skin in all these premises.

#### 4.3. User Behaviours

Behaviour of visitors mapped in each case study. User's movement patterns, halting locations, talking zones, sitting location and the orientation of sittings along with group size details were noticed. Following are the behaviour similarity pattern observed common in all the built environments:

##### 4.3.1 Users:

The typology of users identified based on gender and group size in all the case studies. Mosque had either individual or pair of local regular users with largely male visitors. Temple had both, regular and tourist visitors, with mix of males, females and children where majority were in groups or pair but rarely single. Females were dominant visitors in church during evening time visiting in pairs or individually and less in groups.

##### 4.3.2 Movement patterns:

Most of the movements happened on the primary or secondary axis of buildings. This behaviour caused due to affordances induced by design elements like entrance gate to site, steps to plinth, design features in complex, entrance porch and worship point planned on the primary axis. Deviation of movement patterns from primary axis caused due to secondary magnets or design features like grotto and mother Mary statue in church, secondary worship points in temple and priest's room in mosque; or due to solar pattern. Movements deviated from major axis and followed shadow zones in case of mosque and temple. Since, temple complex is located at edge of cliff, visitors moment influenced by panoramic city view towards south of the complex. Also, visitors approached close to holy place in temple and church while distance was maintained from mihrab while movement in court as per religious believes.

##### 4.3.3 Halting zones:

Halting zones observed either on the major axis or close to prominent design features in the religious complexes. These zones represent attentive behaviour, mark of respect or realization. For example, halt zones in front of entrance doors represent footwear removal points as mark of respect in all the case studies including church in Indian context. Halting points inside main halls of temple, front of water feature in mosque; and close to Alter represent zones of attention in the built environments. All the halting points outside covered area are influenced by shadow of either building or trees; and points of secondary worship inside temple and church complex.

##### 4.3.4 Sitting zones:

These are well defined zones either inside buildings or under shadow zones in open. Important thing to notice about the behaviour was that maximum of these zones are visually connected to worship place if inside the building and sitting orientation was facing towards the same. External sitting zones were dominated by shadow patterns in the day time.

##### 4.3.5 Talking zones:

Talking happened within groups and pairs of visitors. Maximum of these activities coincides with sitting zones and almost maximum of these are away from worship points showing subconscious acknowledgement to environment.

### 5. RECOMMENDATIONS:

The study restricted within Bhopal. The study applied on larger geographic conditions with specific time periods will provides new insights. Also, validation of facts based on extensive interviews will give better understand of human experiences in future studies.

### 6. DISCUSSION:

We see world with the eyes of our mind. Design elements are part of the world that affect our senses and perception of our minds. This generates precognitive emotional response and thus feelings. Sensitively designed elements make one aware of self as being in the world. This contemplation leads to mental rest, peace and improved spiritual

experience in religious settings. Design elements like axis, symmetry and rhythm are subtle experiences and thus remain unconscious to mind whereas elements like scale and proportions stimulate mind to gain attention. Natural elements like sunlight and shadows, water, wind, trees and natural materials keeps mind connected to world in architectural settings whereas, traditional patterns makes mind travel back to time.

The study highlights the importance of all the senses in comprehending built environment. Sensory richness in an environment leads to attention to time, self and world around us, thus make being conscious. Richer the aesthetic experience, more likely lead to spiritual awareness, sustainable behaviour and well being. Rituals play important role in religious buildings. Ritualistic ceremony provides experience to olfactory and gustatory senses thus religious building becomes ordinary piece of architecture without rituals. The spiritual environment makes one aware of moment of time, experiencing through stimulation of senses by design elements in a built-environment resulting in creative imagination (meditation) of his being (conscious) which connect him with *God or Nature or Truth* and Sustainability.

## BIBLIOGRAPHY

1. Benson, N. C. (2007). *Introducing Psychology*. Cambridge: Cambridge Icon Books.
2. Damasio, A. (2010). *Self Comes to Mind: Constructing the Conscious Brain*. New York: Pantheon Books.
3. (2014). Interdisciplinary Approaches to Sustainable Development in Higher Education: A Case Study from Croatia. In C. a. Dunja An i (University of Rijeka, *Handbook of Research on Pedagogical Innovations for Sustainable Development*.
4. Gazzaniga, M. S. (2008). Human: the science behind what makes your brain unique. In M. S. Gazzaniga, *Human: the science behind what makes your brain unique* (pp. 67-98). New York : Harper Collins Publishers.
5. Goldhagen, S. W. (2017). *Welcome to Your World: How Built Environment Shapes Our Lives*. New York: HarperCollins Publishers.
6. Goody, J. (2002, April). The Anthropology of the Senses and Sensations. *La Ricerca Folklorica, No. 45, Antropologia delle sensazioni* . Grafo Spa.
7. Indurkha, B. (n.d.). On the Role of Metaphor in Creative Cognition. Hyderabad: Cognitive Science Laboratory, IIT.
8. Johnsen, G. L. (2003). *Metaphors we live by*. Chicago: London: The university of Chicago press.
9. Karunamuni, N. D. (2015, April-June). The Five-Aggregate Model of the Mind. *SAGE Open* . SAGE.
10. Kder, W. A. (n.d.). Architecture and Human Behavior: Does Design Affect Our Senses? Cairo: Cairo University.
11. L.Nussbaumer, L. (2014). Human Factors in Built Environment. In L. L.Nussbaumer, *Human Factors in Built Environment* (pp. 123-148). New York: Fairchild Books/Bloomsbury Pub.
12. Mallgrave, H. F. (2013). *Architecture and embodiment : implications of the new sciences and humanities for design*. London: Taylor and francis.
13. Mallgrave, H. F. (2013). Architecture and Embodiment: The Implications of the New Sciences and Humanities for Design. In H. F. Mallgrave, *Architecture and Embodiment: The Implications of the New Sciences and Humanities for Design* (pp. 121-129). London and New York: Routledge.
14. McCarter, R., & Pallasmaa, J. (2012). *Understanding architecture: a primer on architecture as experience*. London: Phaidon.
15. Pallasmaa, J. (2008). *The Eyes of the Skin: Architecture and the Senses*. West Sussex: John Wiley & Sons Ltd.
16. Robinson, S., & Pallasmaa, J. (2017). *Mind in architecture: neuroscience, embodiment, and the future of design*. Cambridge : MIT Press .
17. Roth, L. M. (2007). *Understanding Architecture: Its Elements, History, and Meaning*. University of Oregon, Eugene: Westview Press.
18. V.S.Parmar. (1973). *Design Fundamentals In Architecture*. Mumbai: Somaiya Publications Pvt. Ltd.
19. Weathers, E., McCarthy, G., & Coffey, A. (2015). Concept Analysis of Spirituality: An Evolutionary Approach. *Nursing Forum* , p. 15.
20. Zeisel, J. (2006). Inquiry by design: environment/Behavior/Neuroscience in architecture, interiors, landscape. In J. Zeisel, *Inquiry by design: environment/Behavior/Neuroscience in architecture, interiors, landscape* (p. 154). New York: W.W.Norton.