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Biophilia: From A Sociological And Environmental Theory To An Urban And Architectural Approach

* [1] Dr. **Djouad Fatima Zahra** , [2] Dr. **Salah Salah Hana**, [3] **Bechlem Rayen** , [4] **Ramdane Meriem**
[1] *Department of Architecture, Faculty Of Science and Technology, 08 Mai 1945 Guelma University, Algeria*
[2] *Department of Architecture, Faculty Of Science and Technology, 08 Mai 1945 Guelma University, Algeria*
[3,4] *Department of Architecture, Faculty Of Science and Technology, 08 Mai 1945 Guelma University, Algeria*
E-mail [1]: djouad.fatimazahra@univ-guelma.dz or fatimazah.djouad@gmail.com , E-mail [2]: salahsalah.hana@univ-guelma.dz

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A b s t r a c t

Bipohilia is a sociological, psychological and environmental theory based on the reality of human beings' close relationship and attachment to nature and natural processes. This behavior is defined through an analytical approach based on the way in which human beings conceive their architectural and urban space, integrating the natural element as a principal element of spatial design. How can the theory of biophilia be introduced as an urban and architectural method and approach? The present work proposes a complex approach to ensure a clear, logical transition that has already been adopted in published scientific articles.

K e y w o r d s : biophilic design ; biophilic behaviour; landscape; urban space; architectural space.

1.Introduction

A close link exists between man and nature, often nourished by the development of human needs in the multiple facets of life (Pinson, 2004). This relationship that each individual has with nature is transposed into the city, it is then created at different scales: that of the territory, spatial planning, urban composition, and architectural space (Stauskis, Gediminas, 2020). Theorized by biophilia, the man/nature relationship is studied through the presence of natural elements in urban space according to three principles: nature in space, natural analogues and the nature of space (Sevinç-Kayihan, Özçelik-Güney, Ünal, 2017) How can we ensure the transition from the theory of biophilia to an urban and architectural analysis approach? The objective of this article is to determine whether biophilia can be adopted as an approach in urban planning and architecture, to interpret the inhabitant/nature relationship through the domestic space/nature relationship.

2. Biophilia: A Sociological and Environmental Theory

In the first centuries, man considered nature as a resource to meet his needs for food, clothing, housing, etc. This vision of a resource evolved in parallel with the thinking and needs of human beings.
In 1993, Wilson introduced the theory of biophilia, based on the reality of the existence of genes and a behavior of attachment to nature and natural processes by human beings.
In "The Biophilia Hypothesis" in 1993, Kellert determined human biophil behavior through a typology of interactions and experience of nature. He identifies nine values recognized in Nature. In an evolutionary process of the previous typology, Kellert in 2014 brought together the two experiences: aesthetic and naturalistic in a single heading (Table 1).

Table 1. Nature experiences.Source: Kellert (1993, 2014), adapted by the Authors, 2021.

Experience	Description
Utilitarian	The exploitation of nature's vast resources, including food, clothing, tools, medicine and shelter.
Naturalist and aesthetic	A contact characterised by fascination, wonder and admiration for the beauty and complexity of nature and its diversity.
Ecological science	Motivation to study biophysics systematically model, structures and functions of the natural world.
Symbolic	Refers to the use of nature's symbols to communicate.
Humanist	A deep emotional connection with the sensitive aspects of nature and its individual elements.
Moralist	A strong sense of affinity and a sense of ethical responsibility for the natural world.
Dominionistic	The desire to master and control the natural world, often associated with destructive tendencies.
Negativist	The negative affect associated with nature including fear, aversion and disgust.

3. Biophilia: an urban and architectural approach

Biophilic urbanism seeks to build a relationship between natural elements and the built environment. Furthermore, it attempts to interpret the understanding of biophilia in urban planning and design (Totaforti, 2020) and architecture (Stauskis, Gediminas, 2020).

At the building level biophilic elements are those that can be integrated on, in and around a building (Sevinç-Kayihan, Özçelik-Güney, and Ünal, 2018). At the street scale are those integrated in and along streets, roads, sidewalks and public gardens (Bechlem, Djouad, Salah-Salah, 2024 ; (Amen, Afara, and Nia 2023; Aziz Amen 2022; Amen and Nia 2020). At the city scale are larger in size and are likely to be fewer in number. (Bouhalit, et al., 2024).

In architecture, biophilic design serves to balance human needs with the value and considerations of natural environments and processes, and integrates aspects and qualities of these elements into architectural design.

The principles of biophilic design (Table 2) are explained through Kellert's typology in the following table:

Table II: Principles of biophilic design using Kellert's typology.La biophilie : une approche urbaine et architecturale.

Table 2. Principles of biophilic design using Kellert's typology.Source: Sevinç-Kayihan; Özçelik; Güney, (2018), adapted by the Authors, 2021.

Principles	Descriptions	Elements
Nature in space (direct experience of nature)	Real contact with the natural elements of the built environment.	Natural light, air, vegetation, animals, water, landscapes, etc.
Natural analogues (the indirect experience of nature)	Contact with the representation or image of nature, special processes characteristic of the natural world	Images and works of art, natural materials, ornaments inspired by forms found in nature, etc.
The nature of space (The experience of space and place)	Spatial features of the natural environment that have contributed to the advancement of human health and well-being.	Prospect and refuge, organised complexity, integration of pieces into sets, etc.

3.1. Nature in space

Nature in Space addresses the direct, physical, and ephemeral presence of nature in a space or place (Softaoğlu, 2023). This includes plant life, water, and animals, as well as wind breezes, sounds, scents, and other natural elements. Common examples include potted plants, flower beds, bird feeders, butterfly gardens, water features, fountains, aquariums, patios, and green walls or roofs. The strongest experiences of Nature in Space are achieved through creating direct, meaningful connections with these natural elements, particularly through diversity, movement, and multi-sensory interactions (Pico, 2018). Nature in Space encompasses seven biophilic design models (Browning, Ryan, & Clancy, 2016)

- Visual connection with nature: A view of natural elements, living systems and natural processes. For example, looking at the greenery through the window, can increase one's thinking abilities (Scatena, 2018).

-Invisible connection with nature: Auditory, tactile, olfactory or gustatory stimuli that deliberately and positively refer to nature, living systems or natural processes. Or Sounds, smells, taste or tactile sensations that generate a positive reference to nature.

-Non-rhythmic sensory stimulations: Stochastic and ephemeral connections with nature that can be statistically analyzed, but are not necessarily precisely predictable, a bird lands near your window, a brief but welcome distraction to restore attention

-Thermal variability and air renewal: Subtle changes in temperature, humidity, airflow over the skin and surface temperatures that mimic natural environments. Rediscover natural sensations by opening the window.

-Water Presence: A condition that enhances the perception of a place through the sight, sound, or touch of water. Intensify the soothing experience by contemplating the ripples of a wall of water.

-Dynamic and diffuse light: Variations in the intensity of light and shadow that change over time can create conditions similar to nature. Move through spaces with maximized natural lighting and variable intensities of light and shadow.

Connection to natural systems: Awareness of natural processes, especially seasonal and temporal changes characteristic of a healthy ecosystem. Observe the changes in native plants that grow and die throughout the seasons.

3.2. Natural analogies

Natural analogies involve biological, non-living, and indirect evocations of nature (Softaoğlu, 2022). Objects, materials, colors, shapes, sequences, and patterns found in nature are manifested as artwork, ornamentation, furniture, decor, and textiles in the built environment (Terrapin Bright Green LLC, 2014)
Imitations of shells and leaves, furniture in biological forms, and natural materials that have been transformed or altered (e.g. wooden boards, granite worktops), each provide an indirect link to nature. Although they are natural, they are only analogies to the materials in their natural state.≪natural≫. L'experience of'The strongest natural analogy is achieved by providing multiple pieces of information of fathiswe organizeeand sometimesevolutive (Browning, Ryan, & Clancy, 2016). Natural analogies include three modebiophilic design.

3.3. The nature of space

The Nature of Space is about spatial configurations in nature. It is about our innate and acquired desire to be able to see beyond our immediate surroundings, our fascination with the unknown or slight danger, obstructed views and revelatory moments, and sometimes even virtuous phobias when they include a reliable element of security. The strongest experiences of the Nature of Space can be achieved with the creation of spatial configurations deliberately amalgamated with the principles of Nature in Space, and Natural Analogies.(Browning, Ryan, & Clancy, 2016).
The most powerful experiences are obtained by alternating obstructed views and moments of revelation; all mixed with models of Nature in space and natural analogies.The Nature of Space encompasses four models of biophilic design:
-Perspective: A breathtaking view, for monitoring and forecasting. From the entrance, provide a feeling of openness and freedom through the depth of the views and the use of transparent materials.
-Refuge: A place of retreat from environmental conditions or the flow of activity, in which the individual is protected behind and above it.
- Mystery: The promise of a wealth of information, through partially obscured views or other sensory arrangements that prompt the individual to travel deeper into the environment. Testing one's curiosity and taking unexplored paths (Bechlem et al., 2024).
-Risk: An identifiable threat coupled with reliable security. Experiencing controlled vertigo sensations while using a footbridge.

Table 3. Biophilic design elements and motifs.Source: Sevinç-Kayihan; Özçelik; Güney, (2018), adapted by the Authors, 2023.

Scales	Biophilic Design Elements
Building	Green roofs, sky gardens and green atriums, roof garden, green walls, daylight interior spaces
Block	Green yards, housing clustered around green spaces, yards and native species areas, low impact development (LID).
Street	Green streets, urban trees, vegetated swales and lean streets, edible landscaping, high degree of permeability.
Neighborhood	Daylighting of streams, stream restoration, urban forest, ecological parks, community gardens, neighborhood parks/pocket parks, greening of gray fields and brownfields.
Community	Urban streams and riparian zones, urban ecological networks, green schools, urban canopy, community forest, religious forests, greening of public service corridors.
Region	River/floodplain systems, riparian systems, regional, green space systems, major greening transportation corridors.

4.Biophilic solutions, the latest trends

Aquaponics: an ancestral growing method that combines plants and fish. Aquaponics allows you to grow plants in a closed circuit, which means saving 90% of water compared to a traditional method. In aquaponics, the plants are placed in containers filled with clay balls or pebbles. The plants best suited to aquaponic growing are leafy vegetables (lettuce, spinach, chard, leeks, watercress, etc.) and aromatic plants (basil, chives, parsley, mint, coriander, etc.), to start. Then, you can start with tomatoes, cucumbers, squash, eggplant.
Green walls, an oasis in the city: Green walls are a great way to develop this feeling of connection with nature. In addition, they require little floor space and create a real oasis of freshness and bring an aesthetic touch.
Natural materials are all the rage: Biophilic design promotes the use of natural materials, preferably from local production typical of the region, in an eco-responsible approach. Depending on the region, this can be wood from sustainable production lines, wool, cork, bamboo, rattan, leather or even stone. These raw materials create a soothing atmosphere, in harmony with the natural environment.
In terms of interior design: textiles are also following this trend. Thus, natural materials are preferred over synthetic fibres, for example cotton over polyester, and linen over acrylic. For a resolutely natural room, these materials will be found in particular in the furnishings – armchairs, worktops, decorative objects, floors, and more.
Green paint, a must for a designer and natural interior: Biophilic design incorporates earthy hues and shades such as green. For a designer and natural decor, you can adopt fir green or forest green, as well as hunter green which is very trendy in the kitchen and bathroom.
Natural lighting, a must in biophilic design: Providing openings onto greenery or natural elements is essential to successful biophilic design. By increasing the surface area of windows and optimizing their orientation, designers maximize the amount

of natural light in a room. Many tricks can eliminate the barrier between the interior and the exterior, and connect the inside and the outside: architects can thus resort to installing sliding doors, skylights and, when possible, balconies.

Plants, the secret to fresh and relaxing spaces: Plants occupy a special place in biophilic design, since they combine depolluting effects and humidify the air. We can notably cite:

Spathiphyllum: Active in air depollution and which flowers all year round.

Scheffler: Decorative plant with purifying qualities.

Boston Fern: Absorbs xylene from paints and formaldehyde from building materials very well.

Chlorophytum comosum: it gives a lot of greenery to any interior room and can be planted in any type of pot.

Biomorphism, imitating the random patterns of nature: Biomorphism is the art of modeling objects or reproducing patterns and shapes that are reminiscent of nature and living organisms; in architecture, it is the facades or the entire structure of the building that can imitate nature.

5.Conclusion

Because it brings nature to the center of its concerns, biophilia can lead to the highest level of protection of the natural environment of El Kala, by adopting it as a principle and an approach in the production of urban and architectural space.

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