



Application of Biophilic Criteria in Libraries: Oodi Helsinki Central Library

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Abstract

The design of biophilic spaces that are directly or indirectly integrated with nature is an important requirement in social spaces that affect the mental and physical health of users, such as libraries. Built in 2018 in Helsinki, Oodi Central Library is a building that attracts attention with its biophilic design features. In the study, the evaluation of the building is based on three different approaches developed by Kellert and Calabrese in 2015; direct experience of nature, indirect experience of nature and experience of place and space. The components of the building such as light, air, plants and materials were analyzed within the scope of biophilic criteria and the findings of the analysis were transferred to a table. The biophilic design of the library increases the interaction of users with nature. While this study emphasizes the importance of biophilic design for library buildings, it also serves as a resource to show how biophilic criteria can be used effectively for future designs. In this way, it demonstrates the potential of biophilic design in architecture and interior design and increases the body of knowledge in this field. Ultimately, the study contributes to enriching users' quality of life and learning outcomes by advocating for the wider adoption of biophilic design in public spaces.

1. INTRODUCTION

Today, the places where people spend most of their time are indoor spaces such as homes, offices, shopping malls and libraries [1-2]. This tendency towards closed spaces has brought about a separation from nature [3]. On the other hand, many recent studies have revealed that nature and natural places have positive social, mental, cognitive and physical effects on human health [4-5-6-7-8-9-10]. In this context, biophilic design, developed based on humans' innate biological bond with nature, is gaining importance as the world's population continues to urbanize. This design approach, known as "biophilic design", encourages the use of natural processes and systems in the construction of built environments [11]. Biophilic design supports the principles of sustainability and environmental responsibility, provides energy efficiency and offers living spaces in harmony with nature. Using the biophilic approach in spaces also provides many health benefits. It can reduce stress, improve creativity and cognitive function, increase well-being, and accelerate recovery [12]. As a result, biophilic design is a sustainable design approach that aims to connect and integrate people with nature to positively impact users [13].

Applying biophilic design criteria in a public space such as a library positively increases both user experience and overall well-being. Thanks to biophilic design, libraries become not only information access centers, but also places where users can rest, renew and work more efficiently. In this context, the aim of this study is to investigate and analyze the presence of biophilic design criteria in the formulation of the Oodi Helsinki Central Library. In the analysis, criteria developed by Kellert and Calabrese [14] and classified as "direct nature experience, indirect nature experience and place and space experience" were used. In this context, the research aims to contribute to the potential possibilities of applying biophilic designs to interior spaces.

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1.1. Biophilic Design Concept and Models

One of the most negative consequences of rapid urbanization is the loss of nature and living elements. This situation both severs people's relationship with nature and creates destructive effects for natural spaces [15]. In this process, the concept of biophilic design developed as an approach to re-establish interaction with nature. In 1984, E.O. Wilson expressed the biophilia hypothesis as the desire to establish relationships with other life forms [16]. According to this hypothesis, there is an organic and instinctive connection between humans and other ecosystems. Biophilia, derived from the words “bio” (life) and “philia” (love), expresses human connection to nature [17]. Biophilic design aims to create healthier and sustainable urban environments by re-establishing the broken relationship between humans and nature. This approach aims to meet people's quality of life and psychological and physiological needs by integrating nature elements into urban spaces.

Biophilic design aims to integrate nature into urban spaces in an active and systematic way. It aims to actively benefit from various elements, changes and processes of nature [8]. The biophilic understanding, which argues that the essence of human beings is connected to nature, is dominated by an understanding aimed at satisfying the human instinct to be exposed to nature and to use it [17]. In the application of the biophilic design approach, natural elements and processes that connect humans to nature constitute the design source [11]. However, the selection of design resources in the built environment is also related to physical, sociological, cultural and economic factors such as the intended use of the building, the scope of the project, economic factors, logistical factors, legal requirements, cultural and ecological conditions [14].

In the literature, studies on biophilic design are produced in different contexts. Studies examining the effects and characteristics of biophilic spaces as restorative spaces are increasing [13-18-19-20-21-22]. Various studies have also been conducted on the applicability of biophilic properties to spaces [23-24-14]. Browning, Ryan, and Clancy [24] developed 14 design parameters that are adaptable and applicable to the design of the built environment, incorporating previous work on biophilic design. The parameters, which they categorized into three categories: nature in space, analogy of nature, and nature of space, are shown in Table 1.

The guidelines created by Browning et al. [24] seek to maximize multidisciplinary accessibility by establishing a common vocabulary, offer a precise and consistent terminology for biophilic design, and employ a variety of concepts to characterize biophilia and biophilic design.

Table 1. *Biophilic Design Criteria* [24]

Nature in the space	Natural analogues	Nature of the space
Visual Connection with Nature	Biomorphic Forms & Patterns	Prospect
Non-Visual Connection with Nature	Material Connection with Nature	Refuge
Non-Rhythmic Sensory Stimuli	Complexity & Order	Mystery
Thermal & Airflow Variability		Risk/Peril
Presence of Water		
Dynamic & Diffuse Light		
Connection with Natural Systems		

Kellert and Calabrese [14] stated that biophilic design practices consist of two different design strategies called experiences and qualities. The parameters they categorized into three categories as “direct experience of nature, indirect experience of nature and experience of space and place” are given in Table 2. In the categorization developed by Kellert and Calabrese [14], “direct experience of nature” refers to a direct connection with environmental features such as air, natural light, plants, water, animals and landscapes. “Indirect experience of nature” refers to exposure to certain patterns and processes such as pictures, natural materials, decorations inspired by shapes and forms occurring in nature, wealth of information, natural geometries, symbols of the natural world. “The experience of space and place” refers to spatial features characteristic of the developed natural environment [14].

Table 2. Biophilic Design Criteria Presented by Kellert and Calabrese [14]

Direct Experience of Nature	Indirect Experience of Nature	Experience of Space and Place
Light	Images of nature	Prospect and refuge
Air	Natural materials	Organized complexity
Water	Natural colors	Integration of parts to wholes
Plants	Simulating natural light and air	Transitional spaces
Animals	Naturalistic shapes and forms	Mobility and wayfinding
Weather	Evoking nature	Cultural and ecological attachment to place
Natural landscapes and ecosystems	Information richness	
Fire	Age, change, and the patina of time	
	Natural geometries	
	Biomimicry	

2. SCOPE AND METHODOLOGY OF THE RESEARCH

In the study, an evaluation is made based on the biophilic design parameters put forward by Kellert and Calabrese in 2015 [14]. The biophilic design parameters of the building are presented in a table and the applications for the parameters are supported with photographs.

Within the scope of the research, a library building was selected as a case study as a public space where biophilic design criteria can be effectively applied. Oodi Central Library, built in Helsinki in 2018, is a building that stands out with its biophilic design features. Designed by ALA Architects and opened on December 5, 2018, the building is located in Kansalaistori Square in the center of Helsinki. The building is surrounded by many industrial buildings and the Parliament Building. Constructed with local materials in accordance with local climatic conditions, the building constitutes an important public space in Helsinki [25].



Figure 1. Oodi Helsinki Central Library / ALA Architects [26]

The three-storey building covers an area of 17,250 square meters. Steel and concrete are used together as the structural system, while glass and wood materials are used extensively on the facade. The square in front of the building, the entrance canopy with retracted organic forms and the terrace area formed on top with the retraction of the entrance transform the building into an important public space in the city [27].

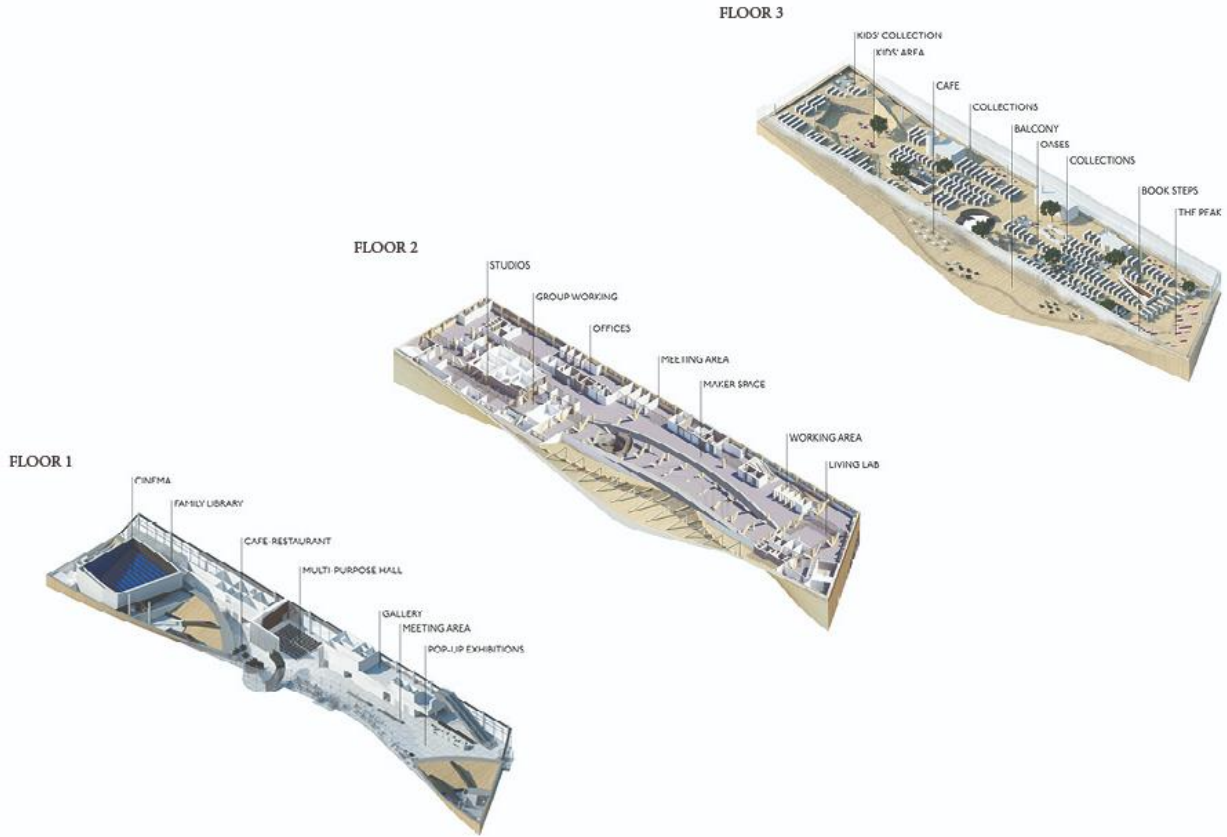



Figure 2. Library Floor Plans [28]





Local building materials and regional climate were taken into account in the construction of Oodi library. The building's wooden components were made and assembled on site. The organic façade of the building was developed using algorithm-supported parametric design methods [28].



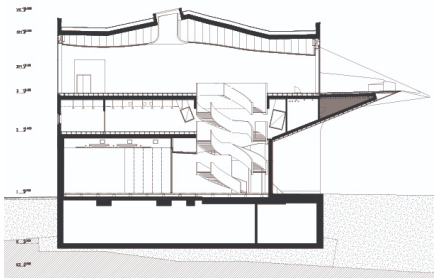
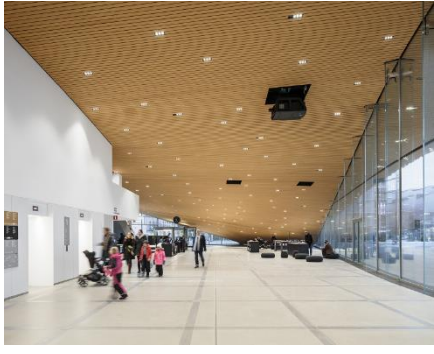

3. EVALUATION OF OODI HELSINKI CENTRAL LIBRARY IN THE CONTEXT OF BIOPHILIC DESIGN CRITERIA






In this part of the study, the biophilic criteria in Oodi Helsinki Central Library were identified and presented in Table 3.



Table 3. Findings from the Evaluation Context

Biophilic criteria		Images of the building	Explanations
Direct Experience of Nature	Light		The library's large glass facades and skylights allow daylight to illuminate the interior spaces.

	Air		The library has integrated mechanical and natural ventilation systems. Natural air flow and fresh air circulation are provided to the interior spaces through large glass facades and movable windows.
	Water		Water use was not observed.
	Plants		Indoors, a variety of plants not only provide aesthetically fresh spaces but also improve air quality.
	Animals		No animal use was observed.
	Weather		The library's sophisticated air conditioning systems adjust the indoor temperature based on the outside weather. You can sense the natural cycle of the seasons in the atmosphere this produces. Breathable exterior glass facades and movable windows let in natural light and fresh air.
	Natural landscapes and ecosystems		The library's expansive glass façade and terraces allow the surrounding natural landscape to be brought within. Furthermore, the parks and green spaces around the library help patrons feel more connected to the outside world.
	Fire		The use of fever was not observed.
Indirect Experien	Natural materials		The natural materials used in the library (such as wood and stone)

ce of Nature	Natural colors		create a warm and organic atmosphere in the interior.
	Natural materials		Natural materials reflect the textures and color tones of the natural world, creating a cozy feeling in home design. The earthy and natural color palette, which creates a tranquil and serene atmosphere, is inspired by these hues.
	Evoking nature		
	Simulating natural light and air		Warm tones and dynamic lighting systems that emulate natural light are used in the interior lighting design. Users may now feel how the light changes throughout the day thanks to this.
	Naturalistic shapes and forms		Nature served as the inspiration for the interior design's organic shapes and curving lines. For instance, patterns and textures found in tree bark and other natural surfaces are incorporated into the design of wooden ceiling panels and wall coverings.
	Biomimicry		
	Age, change, and the patina of time		The building material exhibits changes over time, including color shift, abrasion, melting, and moisture. The library's green spaces and flora lend credence to the concepts of aging and transformation.
	Information richness		

	Natural geometries		<p>The building's overall design and façade feature organic, flowing lines. The facade's dynamic structures and curved shapes are a reflection of the organic forms and movement of the natural world. Natural geometric shapes are widely utilized in interior design for both furniture and accent pieces.</p>
Experience of Space and Place	Prospect and refuge		<p>Spaces such as quiet reading corners, relaxation areas with comfortable armchairs and personal study rooms are designed.</p>
	Organized complexity		<p>Building design brings together disparate places and functions. The library's floors each have a unique theme and purpose. There are spacious, open places for social gatherings and classes on one floor and peaceful reading areas on the other.</p>
	Integration of parts to wholes		<p>The library has floors with different functions that are integrated to provide a holistic experience. The transitions between floors allow users to move freely around the space and explore different areas.</p>
	Transitional spaces		<p>Wide and bright corridors, open staircases and elevators allow users to move freely between different floors and areas.</p>

	<p>Mobility and wayfinding</p>		<p>The library is open and spacious, allowing users to move freely. Connections between floors are easily accessible thanks to wide staircases, ramps and elevators. These transition areas are illuminated with natural light and surrounded by large glass surfaces.</p>
	<p>Cultural and ecological attachment to place</p>		<p>The design of the building reflects the cultural values of Finland and blends them with modern architecture. The natural materials used in the interior and the large glass surfaces emphasize the love of nature and sensitivity to the environment.</p>

4. CONCLUSIONS

In the evaluation of the Oodi Helsinki Library in the context of biophilic design criteria, it has been determined that elements of nature and elements of experience are successfully included. Within the scope of direct and indirect experience of nature, natural light, air, plants and natural shapes are effectively integrated. However, elements such as water, fire and animals were not directly observed. In indirect experiences of nature, elements such as natural materials, imitation of natural light and air, natural shapes and forms, and biomimicry were prominently used. However, the presence of elements such as natural associations, richness of information and natural geometric forms were less evident. In terms of the experience of place and space, criteria such as refuge, organized complexity, transitional spaces, mobility and wayfinding are successfully applied. The library offers an environment that creates a strong connection with nature and enriches the user experience.

The use of biophilic elements in library design is important because libraries are public spaces where people spend long periods of time as learning and accessing information. Therefore, the biophilic design approach enriches library interiors with elements such as natural light, vegetation, and natural materials to help users relax, focus, and access information more efficiently. As a result, the use of biophilic design in library environments improves the user experience, has positive impacts on health and well-being, and is recognized as an important step towards sustainable urban development.

As a result, this study can be used as a resource to produce productive, stress-free, healthy and comfortable library designs. In the future, researchers who want to work on this topic can measure user experiences by surveying library users.

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