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BIOPHILIC DESIGN IN THE URBAN ENVIRONMENT ON THE CASE STUDY OF LIBRARY BUILDINGS

PROJEKTOWANIE BIOFILICZNE W ŚRODOWISKU MIEJSKIM NA PRZYKŁADZIE OBIEKTÓW BIBLIOTEK

Abstract

In recent years, the trend of biophilia has been gaining ground in the discourse on the development of cities. Society has noticed that progressing urbanisation leads to a loss of contact with nature, which can result in problems with maintaining good human psychophysical condition. The urban environment is particularly vulnerable. Biophilia demonstrates the human dependence on nature that goes far beyond reliance on a physical perception of the world, and buildings should enable a full range of physical and mental benefits. The examples of library buildings, as institutions that shape the cultural hearts of cities, demonstrate the potential for the practical implementation of biophilic design.

Keywords: biophilic design, library, sustainable development

Streszczenie

W ostatnich latach coraz więcej miejsca w dyskursie o rozwijaniu się miast zajmuje trend biofilii. Społeczeństwo zauważyło, że postępująca urbanizacja prowadzi do zerwania kontaktu z naturą, co może skutkować problemami z dobrą kondycją psychofizyczną człowieka. Szczególnie wrażliwe jest środowisko miejskie. Biofilia wykazuje zależność człowieka od natury, która wykracza daleko poza poleganie na fizycznym odczuwaniu świata, a budynek powinien umożliwiać osiągnięcie pełnego zakresu fizycznych i mentalnych korzyści. Przykłady budynków bibliotek, jako instytucji kształtujących kulturalne serca miast, ukazują możliwości wdrożenia założeń projektowania biofilicznego w praktyce.

Słowa kluczowe: biofilia, biblioteka, zrównoważony rozwój

1. BIOPHILIC DESIGN – DEVELOPMENT AS A TREND

We owe the term biophilia to Erich Fromm, who used it to describe the psychological orientation opposite to necrophilia (a love of that which is dead). Necrophilia was not a one-dimensional phenomenon, but a complex syndrome of characteristics. Biophilia thus became its natural antithesis, recognising that love of life is an elementary attitude of all living beings. A person in whose personality biophilic orientations prevail is productive and engages in the processes of life in its many manifestations[1].

[1] M. Gałkowska-Jakubik, *Tendencje konstruktywne i destruktywne w ujęciu Ericha Fromma*, „Studia z Psychologii w Katolickim Uniwersytecie Lubelskim" 2006, vol. 13, pp. 17–19.

The nature of Fromm's research remained strictly sociobiological and, in subsequent years, was developed in a way closer to the contemporary understanding of the word by Edward O. Wilson, a researcher associated with broadly understood evolution and the co-author of the concept of biodiversity. In his landmark book *Biophilia*, the biologist argued that contact with the environment is the most important, primal element of human functioning, and that its disruption results in mental, emotional and health imbalance. He based his hypotheses on the fact that humans have had constant contact with nature for most of their existence on Earth, hence genetically, human instinct responds positively to nature. This link between humans and nature is, Wilson argues, a necessity, which enables attaining satisfaction and good mental health. Wilson's idea can be translated into the operation of modern 21st century society, which has been greatly influenced by technological advances. Being in a natural setting, eating healthy food, exercising, gardening and walking are all activities that are essential for proper human development at all stages of life[2].

It is worth noting that biophilic contact with nature should be active and multisensory. In his book *Unified Architectural Theory: Form, Language, Complexity*, Nikos Salingaros, a mathematician and design complexity theorist, addressed, among other things, the perception of objects whose form derives from or is inspired by nature. The urbanist notes that interaction with the environment depends on features related to the environment, which are light, sound, smell, weather, flora, but at the same time on proportions, sequences, divisions, or patterns, which can be described as the so-called geometry of nature. In this context, architecture is a human creation – an activity that has an irreversible impact on the ecosystem. Considering the aspects of experiencing nature through the prism of biophilia, the researcher notes the message's sincerity, rejecting solutions that he perceives as a so-called aesthetic costume, which deprives experiences of authenticity[3].

For a strictly architectural perspective, the research of Stephen R. Kellert proved especially significant. The researcher – continuing Wilson's ideas – believed that contact with nature during childhood had an impact on cognitive development and, as a result, resulted in a better psycho-physical condition. In 1993, in collaboration with Edward O. Wilson, Kellert wrote *The Biophilia Hypothesis*, in which he argued that the experience of nature is one of the greatest challenges of our time, and that humanity's dependence on nature goes far beyond reliance on the physical sensation of the world. The problems of societies that emerged in the late 20th century, namely anxiety and stress disorders, are associated with a decrease in this contact. It is generally understood satisfaction that is the overarching goal for contemporary biophilic architecture. In Kellert's perspective, biophilic design thus means seeking a connection between people and nature, and the perception of architectural space should be through our senses, which should not be reduced to sight alone. Over four decades of research on understanding relations between humans and the environment, as well as between humans and buildings, led Kellert to indicating a complementary image of what constitutes a biophilic approach to place-building in a way that minimises the division between people and nature. As a result, he created a clear division into groups of

[2] B. Modrzewski, A. Szkołut, *Biofilia – Teoria i praktyka projektowa.* [in:] F. Górski, M. Łaskarzewska-Średzińska (eds.), *Biocity*, Fundacja Wydziału Architektury Politechniki Warszawskiej, Warszawa 2015, pp. 181–188.

[3] N. Salingaros, *Unified Architectural Theory: Form, Language, Complexity,* Vajra Books, Portland 2013, pp. 8–18.

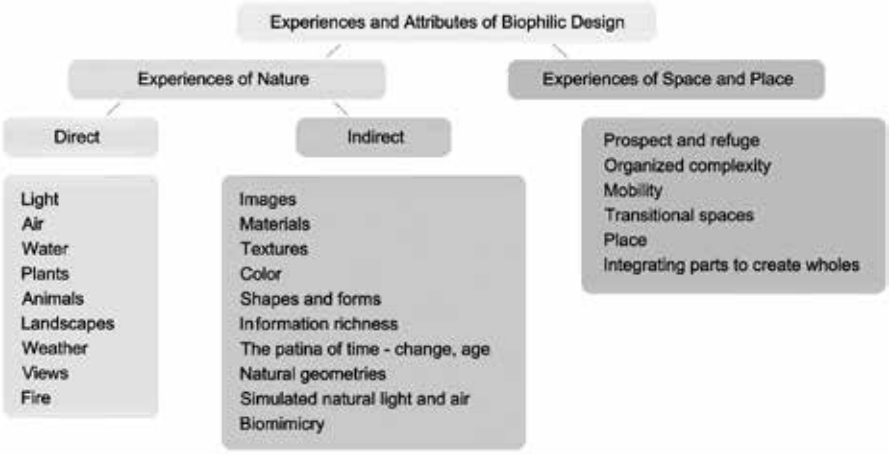
experiences and their accompanying attributes, exploring both the theoretical and practical considerations assigned to them[4].

Popular science publications by Juhani Pallasmaa, one of Finland's best-known architects and thinkers, are also relevant in the context of the multi-sensory perception of architecture. Although Pallasmaa did not explicitly refer to the biophilic movement, many of his remarks on how a building can interact with humans fit into the biophilic concept. It is worth stating here that biophilia does not boil down to creating flamboyant, oval forms with which it is typically associated, but is an extensive and coherent set of elements that a designer can draw on.

Timothy Beatley, an urbanist and researcher associated with the idea of sustainable cities, points to a biophilic approach in design which assumes that, in addition to the construction of individual buildings, it is important to apply a new way of working in urban areas, reinforcing choices and identifying lifestyles and potential for residents to connect with nature, which should be primarily visible in the actions and policies of local authorities. Hence, along with the slogan of biophilia, it is necessary to develop broadly understood green infrastructure, so that every resident is close to a space with natural assets, or to strive to reduce CO_2 emissions by building a healthy living environment[5].

2. BIOPHILIC DESIGN STRATEGY

Stephen Kellert clarified the universal characteristics of a biophilic understanding of architecture using the delineation of three groups – ways of experiencing nature, space and place through a designer's creative actions. The researcher distinguished for each group specific attributes associated with it.



Ill. 1. Basic division of biophilic ways of feeling nature divided into three groups, based on research by Stephen Kellert (source: diagram prepared by the author).

[4] K. Dennehy, *Remembering Stephen Kellert, Who Explored Links Between People and Nature*, [in:] Yale School of the Environment, https://environment.yale.edu/news/article/remembering-stephen-kellert-longtime-professor-of-social-ecology (access: 19.06.2023).

[5] T. Beatley, *Biophilic Cities: What Are They?* [in:] T. Beatley, *Biophilic Cities*, Island Press, Washington, DC 2011 https://doi.org/10.5822/978-1-59726-986-5_3 (access: 19.06.2023).

Within each group there are attributes associated with it, which clarify their potential. The first group concerns *direct experiences* that involve actual contact with features of the natural environment. The second group consists of *indirect experiences*, which include broadly understood inspirations and interactions with nature. The third group is a *space- and place-based experience* that relates to the wider spatial context, which enhances the message.

In biophilia – as the Kellert stressed – the early stage of a design proposal, i.e., defining the essential motivations, assumptions and goals of a project, is highly essential. The construction of a biophilic building should be a complete and integrated action, which leads to a so-called holistic experience and a sense of belonging to both the community and the environment. In the first instance, architects should define a package of measures, means of expression and technological indications that will lead to a diversification of sensations and the fullest possible experience of the space in an authentic manner. The main aim should always be to improve human physical and mental health, as well as to obtain other positive emotions from the recipient, depending on the intention behind the building.

The starting point is to understand the site on which the project is to be carried out by identifying the environmental conditions and specifying the most important issues to be faced. Historical and cultural context analyses are also key, and are particularly evident when the project is located in a strict urban centre. For effective work to be possible, close cooperation is recommended, not only between multidisciplinary planners, but also between specialists who are relevant to specific needs: historians, sociologists, geologists, biologists, botanists or meteorologists[6].

2.1. DIRECT EXPERIENCES

Direct experiences of nature are related to primal contact with the natural environment's attributes, which include naturalistic features like light, air, water, fire, water, the climate, vegetation and the landscape. Constructing buildings based on direct experiences is the easiest when dealing with a setting or elements that are natural, which are either on site or nearby. However, alongside this understandable approach focused on opening up to greenery, direct experiences as understood by Kellert can be enhanced by taking a deeper look at the perception of architecture through the senses.

Natural light accompanies a person and allows one to understand space and time, facilitates orientation in the surroundings and the changes that take place within them. It is crucial to provide sufficiently long periods of daylight access to rooms, adequately to their use. Biophilia encourages innovation in operating with natural light, where, in addition to standard glazing, solutions that take advantage of the specific characteristics of light are promoted, e.g., using translucent and diffuse materials, as well as reflective, mirror-like and other effects that utilise the sun's rays.

Access to fresh air is also important, and is often overlooked, while it is important to note how much impact it has on a person's health and well-being. Air is related to controlling atmospheric conditions, humidity and ensuring the comfort of use of a building. Despite technological advances, the use of natural ventilation may also be desirable today. Natural ventilation can be simulated by manipulating airflow, temperature, humidity or barometric

[6] S.R. Kellert, *Nature By design – The Practice of Biophilic Design*, Yale University Press, New Haven 2018, pp. 18–26.

pressure. Appropriate air-using solutions make it possible to influence the senses of touch and smell.

Water is considered an essential condition for human existence, and human contact with an aquatic environment generates undeniable psycho-physical benefits. Insofar as the location allows, new buildings include a visual and even functional connection to existing water bodies, but design strategies can include new manmade ponds, fountains, waterfalls or aquariums, as well as aquatic environments modelled after natural ones, e.g., via bioretention, rain gardens or wetlands.

The introduction of vegetation into site development, and currently also into the building itself, is a common strategy of creating direct human-nature contact. Biophilia recommends first and foremost that the potential for locality be considered, and therefore the use of local species. It is not appropriate for the space created to be artificial, for example through the use of exotic species, but also as a result of the excessive use of plant containers. At the same time, we should organise green spaces to retain their natural character and define transition zones and multiply or dose impressions. Design that utilises the landscape takes on a different character. It can range from the simple exposition of an attractive natural feature to a location that makes use of scenic values, to the introduction of nature into the functional zones of a building. In doing so, the creation of so-called artificial landscapes and spaces that are not engaging for the viewer should be avoided.

We associate vista attributes with the landscape. A biophilic scenery should incorporate a variety of natural elements to enable a multi-sensory experience. The building can be an exposed in a more distant view, e.g., reach the horizon and a view of the mountains, a forest, etc., or have a closer exposition with significant emotional value, such as a meadow, a tree or a pond. In constructing a building, we should avoid the exposition of decayed natural systems and artificial environments. Natural vistas can also complement or merge with building interiors, continuing biophilic ideas[7].

2.2. INDIRECT EXPERIENCES

Indirect experience of nature is a group in which we find attributes related to the processing of natural elements. The role of the architect is to introduce images and create representations of nature through human artisanship. One can use symbols, motifs, patterns and other elements that appear in nature and are creatively processed by the designer. The basis of such experiences is to enhance the perception of the building through touch, sound, movement or smell.

Natural materials are a popular and effective stimulus to gain indirect contact with nature. Natural raw materials have visual and tactile qualities and are distinguished from artificial ones primarily by their uniqueness. Preference is given to those that build positive associations, they can, for instance, bring to mind warmth or safety. The right materials evoke a strong, deeply satisfying multi-sensory response.

Related to the senses of sight and touch is another attribute that can be described as texture. What is important are its qualities that emphasise shape, quality and proportions. Properly applied texture helps to give a space the expected properties. These links are also related to the visible effects of the passage of time, the so-called *patina of time*. Change, age,

[7] *Ibidem*, pp. 28–48.

the ageing process are inherent features of the natural system of life. It is assumed that buildings should defy the static perception of the world and exist for as long as possible without losing their properties, but in the idea of biophilia this makes them inauthentic. The use of naturally aged materials or corrosion improves their perception.

Natural forms and shapes are another yet effective way of introducing an indirect experience of nature. Biophilia encourages the creation of organic, nature-inspired shapes, whether in form, detail or furniture. It is obvious to be inspired by the organicity of nature, but natural geometry also refers to mathematical properties found in nature, such as fractals. The extensive use of nature-inspired forms creates a sense of balance, symmetry and harmony[8].

2.3. EXPERIENCE OF SPACE AND PLACE

The experience of space and place is a group that is primarily concerned with solutions related to the spatial organisation of a building. The starting point for identifying biophilic space is to understand the concepts of perspective and sheltering spaces.

Perspective refers to the distance in the perception of a building, or part of a building, and sheltering spaces can be considered a closer and more intimate look. The ideas of perspective and shelter can be achieved by visually connecting spaces, e.g., by introducing balconies, terraces and courtyards.

Organised complexity is an unconventional attribute that combines two complementary spatial relationships whose role is to enhance human wellbeing and fitness. The term 'complexity' covers design based on a wealth of detail and diversity, whilst 'organisation' is a structured and coherent arrangement. The biophilic design strategy encourages the creative combination of these two ideas to ensure that the user experience is multiplied – noting that nature is always unique, although it is made up of the same elements, each time they are more or less different, e.g., forest–tree–leaf.

The attribute of transitional spaces primarily connects the interiors of buildings with the external area, where transitional zones are intended to foster a sense of orientation, mobility and multiplication of experiences. The lack of such spaces can create a sense of confusion and even frustration. Bipolar spaces often support the effect of multiplication[9].

3. BIOPHILIC DESIGN IN PRACTICE – A STUDY OF LIBRARIES

The premises of biophilia are particularly relevant in highly urbanised areas, where contact with the natural environment has been largely lost, or nature is introduced in an ill-considered manner.

This paper presents examples of the application of the biophilia method based on the function of the library, noting that it is an institution with a great reputation in shaping the cultural centres of cities and with a strong educational potential.

Contemporary libraries are first and foremost open to the public, which can be seen in their form which often reveals the interior, through barrier-free spatial organisation, and the promotion of sustainable solutions.

[8] *Ibidem*, pp. 60–77.
[9] *Ibidem*, pp. 90–99.

One example of a project that fully illustrates the characteristics of direct experience is the 'El Roure' Community Center and 'La Ginesta' Library (designed by Calderon-Folch-Sarsanedas Arquitectes).

The project is located in Begues, a province of Barcelona distinguished by its attractive location in the natural landscape of Catalonia, adjacent to the Garraf Natural Park.

It was the natural surroundings that became the starting point for the building's distinctive shape, which simultaneously translates into its spatial organisation. The architects adopted the goal of achieving a socially valuable space and opening up to the nearby Fonda Creek. The shape of the plot, the meander of the stream and the existing stand of trees dictated the organic form of the building's plan, which was continued in its form and aesthetic. The building's massing resembles the bank of a stream.

Ill. 2. 'El Roure' Community Center and 'La Ginesta' Library – nature-inspired façade that mimics the bank of a stream, source: Centro Cívico El Roure y Biblioteca La Ginesta [in:] Calderon--Folch Studio, https://www.cfs.cat/?portfolio-item=centro-civico-el-roure-y-biblioteca-la-ginesta (access: 19.06.2023).

Ill. 3. 'El Roure' Community Center and 'La Ginesta' Library –social spaces in relation with nature, source: Centro Cívico El Roure y Biblioteca La Ginesta [in:] Calderon-Folch Studio, https://www.cfs.cat/?portfolio-item=centro-civico-el-roure-y-biblioteca-la-ginesta (access: 19.06.2023).

An internal semi-open courtyard was created by geometrically aligning the building with the boundaries of the triangular plot. The result is a place for meetings, interaction, artistic activities, etc. On the one hand, the massing remained diverse, knowing that it would conceal three different functions, while remaining harmonious. Along the

courtyard, opening up to the landscape, the primary functions of the library area, the multipurpose spaces and the café were located, while closed functions such as the theatre and the rehearsal room remained recessed inside the floor plan. Just as the shape of the building, the facades, through their double skin made with wood and glass, reflect and at the same time dematerialise the landscape, achieving an ethereal effect of the blending of the original and the new[10].

The direct experience of a building in relation to the role of light and air can be seen in the example of the building in Dornbirn.

The Dornbirn library (designed by Dietrich | Untertrifaller Architekten + Christian Schmoelz Architekt) arose from the need to create an intergenerational meeting and learning space. Taking advantage of a site situated on a green square, the architects decided to propose a massing with an oval form that stands out autonomously against the background of the neighbouring traditional buildings, while at the same time fitting in with the park-like setting.

Ill. 4. Dornbirn Library – facade relating to the role of light and air in the comfort of the building, source: Pintos P., *Public Library Dornbirn / Dietrich | Untertrifaller Architekten + Christian Schmoelz Architekt* [in:] ArchDaily, https://www.archdaily.com/960499/public-library-dornbirn-dietrich-untertrifaller-architekten (access: 19.06.2023).

Soft forms are also evident in the layout of the paths that surround the building. One of these crosses the ground floor plan, creating a passageway through the hall. Of interest in the project is the approach to the availability of natural light and the overall atmosphere inside the building. The central, skylight-topped part of the building is a high atrium into which the first-floor galleries open. To avoid excessive sunlight, high beams were designed to break it up.

The facades were made as double-skinned, with original ceramic coating that interprets the book motif in a visually creative way, and shields the glass, allowing the sun's rays to filter into the interiors during the day and in the evenings, it permits impressive illumination[11].

[10] Calderon-Folch Studio, El Roure Centre and La Ginesta Library [in:] Divisare Journal, https://divisare.com/projects/316386-calderon-folch-studio-pol-viladoms-el-roure-centre-and-la-ginesta-library (access: 19.06.2023).

[11] Dietrich | Untertrifaller Architekten ZT GmbH, Dornbirn Public Library, exploration of computerized research methods [in:] The Plan Webzine, https://www.theplan.it/eng/award-2020-culture/dornbirn-public-library-exploration-of-computerized-research-methods-dietrich-untertrifaller-architekten-zt-gmbh (access: 19.06.2023).

The indirect experience of nature through the use of form and light is a concept that is perfectly suited to both park and strictly urban locations. The Maranello Library (designed by Andrea Maffei Architects + Arata Isozaki) was built in a residential district of Modena, Italy, in a neighborhood of architecture of traditional form.

Ill. 5. Maranello Library – the character of the building is emphasized by the biomorphic form, source: Saieh N., Maranello Library / Andrea Maffei Architects [in:] ArchDaily, https://www.archdaily.com/355478/maranello-library-andrea-maffei-architects (access: 19.06.2023).

The architects wanted the newly introduced development to provide a contrast to the existing buildings and to introduce a space that would be surprising and attractive to the viewer. The building's function was encapsulated in an underground storey and an above-ground, single-storey form, whose rounded shape alludes to forms that can be observed in nature. The reading rooms have an open plan feel and remain visible from the outside, as all facade walls are glazed. The effect of the uniqueness of the space is reinforced by the decision to introduce a high wall along the boundaries of the plot, which will be covered with climbing plants. In addition, the surface of the floor between the wall and the facade was made with a bespoke glass mirror material in a delicate green colour. All elements of the interior were made in perfect white, and the floor and furniture were given additional glare with a resin finish. The curvilinear walls, the use of reflective materials and the choice of white caused the building to dynamically change according to the movement of the sun[12].

The Thionville Library (designed by Dominique Coulon & Associés) is an extension of the idea of a building enclosed in right-angle-free, curving, soft lines.

The architects' idea was to create an inspiring building that would also positively affect emotions. The search for both direct and indirect contact with nature is evident in many of its aspects. The designers chose to hide the impressive form of the building behind rows of trees which, planted along the facade, form the foreground. The curvilinear facades that bring to mind a ribbon, form spaces of varying size through their outline while also revealing the interior in places. In the zone closer to the street, the ribbon lowers, which further enhances the dynamic perception of the massing.

Part of the roof was designated as a summer garden – a meeting and event space – accessed by a ramp covered with a green carpet that imitates grass. Walking along this promenade, we gradually lose contact with the neighbouring buildings, and as we approach

[12] Maranello Library Architecture and Design in Italy [in:] Founterior, https://founterior.com/maranello-library-architecture-design-italy/ (access: 19.06.2023).

the horizon line the city disappears completely, leaving the sky visible. It also continues with the idea of providing the viewer not only with function, but also offering them new experiences and emotions, which simultaneously relates to the sought-after assumptions of the experience of space and place in biophilic architecture.

Ill. 6. Thionville Library – ribbon forms shaping the building's facade delineate a variety of spaces, including the original ramp leading to the roof with social significance, source: *Media Library [Third-Place] in Thionville / Dominique Coulon & associés* [in:] ArchDaily, https://www.archdaily.com/804682/media-library-third-place-in-thionville-dominique-coulon-and-associes (access: 19.06.2023).

Ill. 7. Extensive use of – inspired by nature – soft lines can also be seen in the interiors of the library, source: *Media Library [Third-Place] in Thionville / Dominique Coulon & associés* [in:] ArchDaily, https://www.archdaily.com/804682/media-library-third-place-in-thionville-dominique-coulon-and-associes (access: 19.06.2023).

The interior of the library is primarily a large open space, which at the same time continues the idea of introducing soft lines. The rooms that need to be separated were enclosed in oval shapes. Just as walls determine the form of a building, light similarly illuminates spaces in a variety of ways, giving them a different character. The colour and materials used bring out variations in light and reflections. The fluid perception of the space is aided by the kinks in the ceilings and the character of the flooring within which small hills and changes in finish material appear[13].

[13] Media Library in Thionville [in:] urbanNext Lexicon, https://urbannext.net/media-library-in-thionville/ (access: 19.06.2023).

The search for a connection with nature can take place through references to the form of the building as well as through spatial organisation. The original form of a spiral, referencing a shell, can be seen in the design of the Musashino Art University campus library (designed by Sou Fujimoto Architects).

The labyrinth-like concept adopted by the architect is to treat all the walls and elements that make up the building as bookshelves. As a result, the space closes inwards, like a labyrinth, but the way of moving between the shelves is broken by the openings of the passages, which indirectly refers to the image of a forest.

Ill. 8. Musashino Art University campus library – the idea to lose the boundary between inside and outside, source: *Musashino Art University Museum & Library / Sou Fujimoto Architects* [in:] ArchDaily, https://www.archdaily.com/145789/musashino-art-university-museum-library-sou-fujimoto (access: 19.06.2023).

The outer shell of the building is only glass, which explicitly reveals its purpose. The use of wood, a natural material, and the reflective glass of the panes, which allows the surrounding trees to be reflected, multiplies impressions, as if the viewer were in an almost fairytale-like space that evokes a sylvan landscape. Ultimately, the project is an intriguing response to the search for indirect contact with nature and the experience of space and place at the same time, using many features that are close to the idea of biophilia[14].

4. CONCLUSIONS

Biophilia is becoming an increasingly popular trend in contemporary architecture, noting the growing human need to reconnect with nature. Its application is becoming particularly important in cities, where it is becoming a counterweight to urban transformations that have aggressively stripped space of its natural elements. At the same time, social life concentrated in cities is deprived of the opportunity to easily form a direct relationship with nature. Following the research conducted by Stephen R. Kellert and by implementing the biophilia methodology, it is possible to regain this lost connection while allowing the viewer to immerse themselves in the natural features of a building.

The presented cases of library buildings show the potential of implementing selected biophilic design principles in practice, highlighting the variety and wide range of solutions used.

[14] N. Pollock, *Musashino Art University Museum & Library* [in:] Architectural Record, https://www.architecturalrecord.com/articles/7488-musashino-art-university-museum-library (access: 19.06.2023).

Regardless of scale and location, the final goal of a biophilic building should be both to obtain a facility that fulfils its purpose, to improve the psycho-physical condition of the user, and to recover environmental values. The strategy of biophilic thinking is becoming a valuable tool for architects, one which is ideal when facing the transformations of contemporary cities.

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[1] Beatley T., *Biophilic Cities: What Are They?* [in:] T. Beatley, *Biophilic Cities*, Island Press, Washington, DC 2011 https://doi.org/10.5822/978-1-59726-986-5_3 (access: 19.06.2023).

[2] Calderon-Folch Studio, El Roure Centre and La Ginesta Library [in:] Divisare Journal, https://divisare.com/projects/316386-calderon-folch-studio-pol-viladoms-el-roure-centre-and-la-ginesta-library (access: 19.06.2023).

[3] Centro Cívico El Roure y Biblioteca La Ginesta [in:] Calderon-Folch Studio, https://www.cfs.cat/?portfolio-item=centro-civico-el-roure-y-biblioteca-la-ginesta (access: 19.06.2023).

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[7] Kellert S.R., *Nature By design – The Practice of Biophilic Design*, Yale University Press, New Haven 2018.

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[9] *Media Library [Third-Place] in Thionville / Dominique Coulon & associés* [in:] ArchDaily, https://www.archdaily.com/804682/media-library-third-place-in-thionville-dominique-coulon-and-associes (access: 19.06.2023).

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