

WILL BIOPHILIC DESIGN BECOME ANOTHER CHECKLIST?

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ABSTRACT

The dominance of an environmental solution – in green building certifications – over the social and the economic led many scholars and practitioners to consider Biophilic Design (BD) as an innovative way of designing. Deriving from “biophilia”, the term suggests reconciling the innate human desire of nature with our built environment. In a sense, there is a deliberate attempt to merge the philosophy of BD with pre-existing standardised certification systems, confirming compliance with established norms and standards; however, the certification of healthy buildings should primarily be determined not only by the technical characteristics of materials, rules and procedures, but also by the quality of life considering occupants’ emotional, intellectual and physical well-being. The literature review in this research paper included recent scientific publications about Biophilic Design, sustainability and green building certifications. To narrow down the selection criteria of references, researches that are of empirical nature and contextualised in Dubai were selected; moreover, the qualitative investigation in this research was enhanced by a pedagogical application in which students enrolled in the course “Building Systems and Codes” at the American University in the Emirates proposed ways to integrate Biophilic Design at buildings and urban scales. The findings of this research demonstrate that the concept of Biophilic Design is being considered in green building certifications like LEED, WELL, Fitwel, Living Building Challenge Certification and BREEAM. While the term “biophilic” was recently coined, its principles and tools were already previously implemented in architecture, as example in the famous Falling Water by Frank Lloyd Wright. Interpretation of Biophilic Design in formalisation and standardisation remains challenging to achieve human-centred design. The quest to measure Biophilic Design firstly, in construction costs and, secondly, humans’ well-being adds another layer of complexity. The critical approach of “biophilia” may be where the real value is.

Keywords: Biophilic Design, green building certifications, sustainability, design education, Dubai.

1 INTRODUCTION

Biophilic Design (from the word Biophilia as an innate human desire for nature) is an innovative way of design. Biophilia is not a separate characteristic of a person, but is an internal orientation that determines a person’s way of thinking and acting. In a sense, it is a “relative” of green design – the philosophy of designing physical objects that are harmoniously integrated into the environment and do not harm it. The aim of Biophilic Design (BD) is to bring the elements of nature into the room. It is believed that over the course of many years of life in their natural habitat, a person has formed certain genetically encoded reactions to light, weather, terrain, plants and animals [1] and now part of our emotional, intellectual and physical well-being depends on the ability to interact with these elements. Recently, BD has come to be seen as an element to better merge urban planning with architecture.

People spend most of their lives indoors and continue to worry exclusively about the outside world [2]. Climate change, environmental pollution, garbage disposal, deforestation and the disappearance of various species of wild animals have remained at the top of the discussed news for decades. The quality of life inside the premises seems to worry the mass consciousness much less. Many scientific studies reason qualitatively and quantitatively regarding well-being problems and solutions where living environments may positively intervene. One will find numerous spam messages, real estate ads, advertising brochures from



construction companies, discussions about apartment design, the right selection of furniture, streaming product promotion without social agenda.

In regulated societies, certification systems for buildings and structures are understood as measures aimed at confirming the compliance of construction work, materials and equipment with established norms and standards. Adding new regulations to those existing, even with the best of intentions, may complicate, the process of construction work. The certification of healthy buildings should primarily be determined not only by the technical characteristics of materials, rules and procedures (which, of course, need to be developed), but also whether they adhere to the rules of the specific certificate and fulfil their structural and functional role [3].

Accordingly, we are not talking about another unification and standardisation of construction, but about the formation of a movement for healthy buildings, in which rating and ranking are far from the first place, but serve as auxiliary elements for monitoring the quality of construction work and will facilitate the decrease in the depression and perceived stress levels of its residents especially in view of the COVID-19 pandemic [4]. In a document-centric management culture, Awadh [5] points out the dominance of an environmental solution over social and economic. If successful innovations in construction become possible only in developed countries, it is not because they have a larger money supply, but because success may be an inverse function of the formalisation and bureaucratisation of efforts [6]. The emphasis of the certification system for healthy buildings on human requests is not a figure of speech, but a postulate, an axiom that determines further steps in the interpretation and implementation of requirements set along the lines of a specific standard manifested in world approved systems, namely LEED, WELL, Fitwel, Living Building Challenge Certification and BREEAM.

2 LEED

Some consider Leadership in Energy and Environmental Design (LEED) certification system as the world's most successful, thoughtful and widely accepted assessment of healthy buildings. It is not surprising that the authors dwell in detail on the basic principles and norms, describe the mechanisms for obtaining and maintaining the status of a leader in energy and environmental design. The certification covers nine areas: (1) sustainable sites – maintaining the integration and complexity of building solutions; (2) location and transport – location and transport infrastructure; (3) education and priority; (4) water efficiency – efficiency of water consumption; (5) energy and atmosphere – energy consumption and atmospheric parameters; (6) material and resources – consumption of materials and resources; (7) indoor environmental quality; (8) innovation – design innovation; and (9) regional priority – regional characteristics and priorities. Mind, little has been mentioned on the integration of the building into nature. The main aim is to “support and improve human health, well-being and productivity by providing and incorporating elements of nature in the indoor environment”. Therefore, the focus is on the human being and one's role within the structural system of the built environment.

Developed in 1994 by the U.S. Green Building Council (USGBC) under the scientific leadership of Robert Watson, LEED certification has transformed from a linear set of standards and procedures into a comprehensive certification system that takes into account the individual developer profile, sociocultural environment and government priorities [7]. The interdisciplinary nature of certification requires the involvement of specialists in urban and transport planners, architecture, electrical and water supply, urban design, biology and botany, but most importantly, social researchers who connect professionals and users of premises, allow for trust and productive relationships [8].



3 WELL BUILDING STANDARD

A new WELL Building Standard has appeared in the international certification system, which assesses the “health” of buildings. The WELL Building Standard was developed in 2015 by a group of scientists who identified the main factors affecting the health of workers. Over the course of seven years of scientific and medical research, scientists have developed a technical standard and put into it the requirements that a modern “healthy” office building must meet. According to the WHO definition, health is not only the absence of diseases, but also the state of physical, social and mental well-being of people. During their work, they spend less time outdoors, and more time indoors. The state of health and labour productivity depend on the quality of the internal environment, engineering systems and working conditions. The results of research by scientists indicate that the cause of respiratory, cardiovascular diseases, allergic reactions and obesity is the poor quality of the internal office space [9]. WELL focuses on the design, operations and behaviours within the allocated space bearing in mind the potential of optimisation to advance human health and well-being. Therefore, the main focus is also the health and wellness of final residents with immense attention paid to the space itself incorporating nature, pattern and the aspect of interaction with nature.

Although the WELL Building Standard is relatively new, it is closely intertwined with the existing ones. For buildings certified to BREEAM or LEED green building standards, it is much easier to implement the WELL Building Standard. WELL certification for existing buildings will increase the market value of the property, the building’s operational efficiency and marketing advantages over competitors [10]. For new construction projects, WELL Building Standard, together with LEED/BREEAM certification, will attract foreign tenants, improve the quality of design solutions, reduce operating costs and increase corporate and social responsibility.

4 FITWEL

Fitwel is another healthy building standard. It is, like WELL, focused on human health. In estimate BREEAM and WELL have about 30% overlap, while WELL and Fitwel have about 60%. Nevertheless, Fitwel is very different from its closest “competitor” and has every chance of becoming more popular. According to statistical data, in 2018 as much as 600 projects attempted to be certified through Fitwel in 20 countries. First, Fitwel is a much more democratic standard. To obtain the WELL certificate, one is required to carry out a large number of instrumental tests: water, air, and others. At the same time, WELL has technical requirements that are overestimated in some positions, and even impracticable in others. For example, in terms of ventilation the standards range from one country to another, and the same is for building materials. Fitwel does not provide any measurements at all, and, in general, is determined by the results of the on-site inspections [10]. Yes, Fitwel has testing requirements such as air quality. But it is enough to carry out tests on them and simply demonstrate their results to tenants. Accordingly, since there are no costs for all kinds of measurements, the price for a Fitwel certificate is significantly lower. For example, if WELL costs about \$100,000, Fitwel would cost about \$15,000–\$20,000.

This, however, does not mean that getting a Fitwel certificate is very easy: the entry threshold is very high – you need to score at least 90 points. It should be borne in mind that Fitwel excludes the influence of the human factor, which plays an important role in obtaining the WELL certificate. All measurements in WELL are carried out by a real specialist and a lot depends on how carefully specialists check, how you interact with them.

Another fundamental difference between Fitwel and WELL is that Fitwel focuses on design, engineering, creating a certain type of living environment. Therefore, the results of the “healthy environment” certification are more noticeable to the layman in facilities built



according to the Fitwel standard. Such buildings are designed to stimulate a person to move, lead a healthy lifestyle. For example, this may include a central location and unusual staircase designs to encourage employees to walk up the stairs instead of using the elevators.

5 LIVING BUILDING CHALLENGE CERTIFICATION

Leading companies around the world are incorporating a regenerative design structure into their projects to create spaces based on Living Building Challenge (LBC) principles. There are seven of these principles, which are usually compared to the seven petals of a flower. The symbol of the LBC is a flower, metaphorically, a flower that gives more to the world than it takes. The Living Building Challenge is a certification that identifies the most advanced resilience measures – laying the foundation for design, construction and symbiotic relationships between people and all aspects of the built environment [11]. This is one of the strictest performance standards in the industry as every project requires clean energy, sustainable materials, water and waste management.

Every aspect of the Living Building Challenge is performance based, so each building must be measured for 12 consecutive months after completion before being certified. The seven petals are place, water, energy, health and happiness, materials, equity and beauty. While each of these petals hints at the need to care for the environment, there is not a single hint of unity with nature.

6 BREEAM

Another example of international green certification is the BREEAM (BRE Environmental Assessment Method) used around the world. As part of BREEAM, BRE Global maintains a Sustainable Development Council representing the largest shareholders in the construction industry. BRE Global trains independent licensed BREEAM assessors worldwide, controlled by UKAS in accordance with the ISO9001 quality system [12].

The BREEAM rating system is popular not only in the UK. Outside its borders, more than 110,000 buildings have been certified to date, and about half a million buildings have to go through this process. Exceeding legal requirements seems to be the main reason for the popularity of the BREEAM standard in the construction market. Developers and designers are interested in enhancing the performance of buildings that BREEAM provides.

Investors and urban planning authorities are interested in reducing time and financial costs. Real estate agencies provide themselves with additional advertising. The customer, tenant or potential buyer is confident in the high quality of the final product. Another feature of the assessment system is the methodology for awarding points in several sections related to various aspects of life safety, environmental impact and comfort. The scores are multiplied by weights reflecting the relevance of the aspect at the development site, then summed up and converted into a resulting score. This technique allows the BREEAM system to be adapted to different regions without sacrificing efficiency. Some of these sections are energy, water, materials, recycling and use of land.

The overall score is the rating given: satisfactory, good, very good and excellent. The BREEAM system serves as an example of a successful concept that effectively implements the protection of the environment from human activity by meeting the interests of all market participants.

7 CRITIQUE

Biophilic Design is considered young as it has not been implemented in modern building projects for a long period of time. Utilising the example developed by Frank Lloyd Wright in his Falling Water house, one can admit that the latter seemingly adheres to all standards



aforementioned. The house above the waterfall includes several blocks – this is the main house of the owners, a house for servants and a guest house, as well as a garage. Interestingly, in all of these blocks, Wright sought to organically combine artificial and natural elements [13]. For example, in some places the window panes are not inserted into the frames, but directly into the masonry. In addition, in some rooms, the architect deliberately made low ceilings, hinting to the owners that they need to spend more time outdoors and not in the building.

From the external point of view, the building is a set of parallelepipeds, arranged with each other, having fairly recognisable proportions. The lower level has an orientation to three cardinal points. On the second floor there are the bedrooms and the study of the owner of the house, each room has its own spacious terrace overlooking the stream and waterfall. On the upper third level, there is a gallery bedroom, which also has access to its own outdoor terrace. Whether a given solution meets the criteria for organic architecture must be investigated and proven separately, having previously understood the basic concepts [14]. All vertical elements of the building are made of durable local stone, its individual fragments protrude from the masonry, demonstrating their natural texture. The horizontal parts of the house are made of reinforced concrete using monolithic technology. Wright played with the protruding part of the natural rock, making it one of the central elements of the interior of the house.

Despite the evident fit to the explanation of Biophilic Design, there still has been little research done on the topic where scholars considered the long-term issues within the field. Other concerns relate to the upfront and maintenance costs of projects to implement costly BD principles. This may be due to the lack of research discussed above, as there is little information available on payback times for investors. Another concern may be the cost of the required technology; however, this should eventually come down as the concept becomes more prevalent.

People spend most of their lives indoors, so it is time for social researchers to pay attention to such an important area of human existence, to think about the most important living conditions and the characteristics of green buildings and the overall interconnectedness with nature [2]. These include, first, possible environmental threats (radiation, chemical, physical and biological) [1], [15]; second, building design (ventilation, pressure boosting, filtration, lighting, acoustics); third, social factors (location and safety); fourth, behavioural factors (biography of residents, employment and health care); fifth, the quality of the adjoining territory (chemical composition, walking accessibility, noisiness and landscaping) [16]; sixth, architectural design (availability of fitness centres, food courts, BD and open space for daylight); seventh, maintenance (repair work, cleaning and pest control). It is necessary to move on to the study of the private, intimate – housing that can make us happier, or can slowly annihilate any aspirations for success, independence and well-being.

8 APPLYING BIOPHILIC DESIGN IN A PEDAGOGICAL FRAMEWORK

One of the program learning outcomes in the Interior Design (ID) program at the American University in the Emirates is to appraise sustainability in industry practices; however, currently, environmentally friendly design framework is limited to technical criteria measured in different assessments across several courses in the program. To bridge the gap between a quantifiable, technical approach in understanding environmental sustainability and the human innate desire to connect with nature, BD has been introduced in the pedagogical framework of the ID program, specifically, in the course Building Systems and Codes [17]. The assessment was introduced in the form of a research paper through several phases following a workshop introducing students about BD. Participating students analysed secondary data from published research papers then considered their outcomes for possible



implementation in the Emirate of Dubai, where ID students are currently pursuing their studies. Building Systems and Codes was offered in Spring semester (from January to May 2022) and a synthesis of the results pertaining to BD assessment is demonstrated in the following sections.

One of the workshop participants noted that while biophilic patterns exist outside the campus building, the indoors of the American University in the Emirates Campus may benefit using a “five-zone strategy” [18]: departmental units, project units, creative groups, imaginative groups, and centre of gravity. This would entail reconfiguration of spaces and major redesign of layout and aesthetic components. While the suggested strategy may not be fully implemented, the proposal implies a practical aspect to BD in indoor university campuses, boosting innovation and sustainability.



Figure 1: Campus of the American University in the Emirates. (Source: Sanjana Garag.)

Linking Building Systems and Codes with BD, an observation of another participant depicts that “Habitable spaces, other than a kitchen, shall be not less than 7 ft (2134 mm) in any plan dimension. Kitchens shall have a clear passageway of not less than 3 ft (914 mm) between counter fronts and appliances or counter fronts and walls”. denoting that existing international building codes consider minimum dimensions of space and equity especially in residential buildings [19]. Biophilic Design does not impose minimum dimensions of spaces, revealing the fact that the former is complementary to approved existing building standards and not mandatory from authorities having jurisdiction.

World Expo Dubai 2020 was one of the main events spanning urban and architectural levels. Although it was temporary, the life cycle was conceived in way that District 2020 will be a city following the infrastructure originally built for the world expo. The exhibition aimed at demonstrating exemplary projects in sustainability. In fact, one of the three main districts in the world expo was named Sustainability district in which the Sustainability Pavilion is one of the pavilions that would not be dismantled after the event. A participant in the workshop commented “Involving sun oriented power as the essential wellspring of energy rather than petroleum derivatives, particularly in the UAE, would be a huge advance towards sustainability. Dealing with the vegetation in the region by growing a variety of trees and plants would likewise help by enhancing the environment nearby and having a more secure, better climate. All this would improve the district regarding a decent climate, yet combining it with Biophilic Design would improve it for individuals of the local area” [20].

A student highlighted that Biophilic Design would have definitely been a limelight during the COVID-19 pandemic when people were forced to work from home [21]. Studies showed that productivity actually increased by working from home rather than working in office. While adhering to biophilic principles in a workplace may result in additional costs, a happy and more productive environment would be considered in the return on investment. “Both offices and schools are spaces where occupants may face stress and fatigue due to long hours of work and mental engagement where focus is necessary otherwise productivity suffers. Since productivity is a very important aspect of both offices and schools that defines their effectivity, it is necessary to try and maximise it. The benefit of using Biophilic Design is that while maximising productivity it also serves to benefit the psychological well-being of the occupants which may not always be a priority to employers who mainly seek productivity even at the detriment of the employees”.

In Dzhambov et al. [22], the study considered different sources of greenery like houseplants, green view, garden, and neighbourhood greenery. There is a direct path linking presence of houseplants to reducing depression. Houseplants are also directly related to the feeling of being away (at home) that is in its turn a mediator linked to reducing depression and anxiety. Greenery in the neighbourhood is directly linked to restorative quality that is directly connected to the feeling of social support, a mediator that is inversely proportional to depression and anxiety. Although the survey sample in the aforementioned study was not in Dubai, the quantitative results was used by a student in the workshop to propose the use of social media to promote greenery in the form of gifts offered either to the users themselves or to the others depending on the occasion. A second proposal was to implement greener neighbourhoods in Dubai similar to Al Barari and Damac Hills areas.

9 CONCLUSION

This research gave an overlook over five prominent green building certifications where Biophilic Design (BD) is being directly or indirectly integrated namely LEED, WELL, Fitwel, Living Building Challenge Certification and BREEAM. The process of standardising and commercialising BD still lingers among practitioners and researchers. As a critique, the research clarified that the principles of BD were previously implemented even though the term itself was not used. In academia, specifically, in design education, the topic is being thoroughly thought of as it is human-centred; furthermore, BD is being interwoven with sustainability in course assessments as demonstrated by the author through samples of outcomes in a workshop he conducted to Interior Design students at the American University in the Emirates in the course Building Systems and Codes. The outcomes showed some opportunities where BD may be applied in the city of Dubai as the local city where they are pursuing their degrees. It is worth mentioning that green building certification mostly used



in Dubai is LEED. If BD were to be standardized using a top-down approach in Dubai, it is only an evident possibility that BD would be integrated in LEED. Studies showed that BD has positive impact on occupants' psychological health indoors regardless the use of the considered building: office, residential, commercial, or others. Design considerations directly related to occupants' mental health must be considered as a priority over financial benefits. If BD were to be adapted as a checklist in standardisation, many disciplines must be involved in the process including urban designers, architects, engineers, psychologists, philosophers, social scientists, and artists.

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