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THE ROLE OF AESTHETICS IN BUILDING SUSTAINABILITY ASSESSMENT

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This theoretical study examines the role of aesthetics in the assessment frameworks of sustainable architecture. The article is organized into two main sections: a general literature review and the results. The results section encompasses an analysis of the place of aesthetic quality in the understanding of sustainable architecture, and an overview and discussion of the general sustainable building assessment frameworks and the main sustainable buildings certification systems (LEED, BREEAM, WELL, Living Building Challenge), identifying the existing and potential place of cultural sustainability and aesthetics in them. Finally, four architectural theories holding the potential for balancing human and environmental criteria in the assessment of sustainable architecture are presented. These theories are: sustainability aesthetics, genius loci, biophilia, and a regenerative approach. The conclusion was made that these approaches hold the potential for the breakthrough of aesthetic quality and uniqueness of sustainable architecture.

Key words: **sustainability, sustainable architecture, sustainable building, sustainability assessment, aesthetics, sustainability aesthetics.**

INTRODUCTION

Since the second half of the 20th century, sustainable development has emerged as an alternative to the predominant socio-economic development of humanity (Lozano, 2008). Buildings and built environments in general are a crucial part of the human habitat and make considerable social, economic, and environmental impact. Therefore, the building sector and architecture are given considerable attention in sustainability research and strategies. In this research *sustainable architecture* is considered as architecture that is fully based on the principles of sustainability, such as the pursuit of material and intangible prosperity, justice for present and future generations, justice within and between societies, protection and promotion of cultural and environmental biodiversity, precautious decision-making, and recognition of the interdependence of phenomena (Throsby, 2002). Architectural sustainability must be programmed during the development phase of a project and occur throughout its life cycle; sustainable architecture must not only be sustainable, long-lasting and environmentally friendly, but also contextual, aesthetic and psychologically acceptable (Kamicaityte-Virbasiene and Grazuleviciute-Vileniske, 2011). *Architectural quality* is the aim of both architects and societies as a whole and includes such aspects as urban integrity, accessibility and mobility, respect for the environment and energy efficiency, quality of construction and well-being, innovation, aesthetics and image, as well as functionality and flexibility, costs etc. (European Commission, 2009). It is evident that the expression of a building and the *aesthetics of architecture* have constituted a fundamental part of architectural quality since antiquity (Stauskas, 2009). However, with the rise of environmental and energy saving concerns in the building sector, energy-related requirements are greatly increasing and becoming the main focus of designers and engineers. Meanwhile, some authors identify the negligence towards aesthetics, which is an integral part both of architectural

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sustainability and general architectural quality, in the design of sustainable buildings and their assessment (Wines, 2002; Heymann, 2012). With this in mind, the article focuses on the role of aesthetics in sustainable architecture. The aim of this study is to carry out theoretical research based on a literature analysis and to determine the importance of aesthetics in the definition of sustainable architecture, as well as to define the role of aesthetics in the existing sustainable architecture assessment frameworks. This study is organized according to the following framework: 1) a general literature overview in order to reveal the relevance of the research and the existing research gap related to building aesthetics and sustainability; 2) an analysis of the place of aesthetic quality in the understanding of sustainable architecture; 3) an analysis of the existing general sustainable architecture assessment frameworks and sustainable buildings certification systems (LEED, BREEAM, WELL, Living Building Challenge), including an analysis of current and potential places of cultural sustainability and the aesthetics in them; and 4) the identification and discussion of architectural theories relevant to the integration of aesthetic criteria in the assessment of sustainable architecture and balancing them with the existing environmental criteria. These theories include: *biophilic design*, focusing on the direct and indirect use of natural systems, processes, and materials in the design of the built environment (Kellert *et al*., 2008; Gillis and Gatersleben, 2015); *sustainability aesthetics* - the expression of underlying ecological attitude in design; *sense of place (genius loci)* - the intangible quality of a place, determining its distinctiveness and expressing it in the tangible qualities of the environment (Vecco, 2019); and *regenerative design* - a movement that strives towards harmonious human-environment co-evolution and the development of built environments as ecosystems (Dekay, 2012).

LITERATURE REVIEW

There are numerous definitions of the sustainability concept due to its wide and general character. There were already 70 different definitions of sustainable development recorded in the literature by 1992 (Lozano, 2008). A similar situation can be identified in the environmentally oriented architecture and construction sectors. Numerous definitions, such as green architecture, sustainable architecture, ecological architecture, green buildings etc. exist and are used interchangeably with one another (Wines, 2002; Berardi, 2013). This proliferation of terms reflects the imperative for sustainability in architecture (Lee, 2011) and the endorsement of this principle by the architectural community (Fox, 2000). According to Fox (2000, p. 5-6), the "1993 World Congress of the Union of International Architects declared that they would commit themselves individually and professionally to place environmental and social sustainability at the core of their practices and professional responsibilities".

The term "sustainable architecture" generally implies that such architecture is based on the paradigm and principles of sustainability in the social, cultural, economic and environmental spheres, and it definitely contributes to the implementation of sustainability goals. Increasing interest in the topic is revealed by a quantitative literature review using the keywords "sustainable architecture" in major scientific databases (Table 1). Since the 1980s the number of published papers on this theme has increased from several to hundreds and thousands. The field of engineering dominates in sustainable architecture research.

The literature review revealed two distinctive trends in research developments on sustainable architecture that relate to the theme of this study. The first trend is the analysis of architectural expression and aesthetics in the context of building sustainability. Researchers raise and try to answer questions such as: is there a distinctive aesthetic face of sustainable architecture? Does the sustainability paradigm influence architectural aesthetics and how? (Cucuzzella, 2015); what trends in sustainable architecture and the built environment can be distinguished? (Guy and Farmer, 2001; Wines, 2002; Sauerbruch and Hutton, 2011; Di Carlo, 2016); how can sustainability aesthetics be defined (Kagan, 2011) and experienced? (Dekay, 2012). The second relevant research trend relates to the development, analysis and comparison of building sustainability assessment frameworks, systems and tools. As these assessment approaches and tools are constantly developed and improved, the number of such studies is growing, several of which can be mentioned. Cole (1999) discusses the existing building sustainability assessment systems, the approaches towards the formulation of criteria and indicators, and the general building sustainability assessment frameworks. Todd *et al*. (2001) present a comparison of building sustainability assessment tools. Al Waer and Sibley (2005) present an overview of building sustainability assessment methods and trends. Poveda and Lipsett (2011) provide a comprehensive assessment of existing approaches, strategies, models, appraisals, and methodologies in this field. The general literature review revealed the gap between the research trends in sustainable architecture mentioned above, and the gap between aesthetics and sustainability assessment. Thus, the following research questions can be asked:

- Is aesthetic quality a part of sustainable architecture?
- What role does aesthetics play in building sustainability assessment frameworks?
- What are the possibilities of including the aesthetic dimension in building sustainability assessment?

RESULTS

The place of aesthetic quality in the understanding of sustainable architecture

The notion of sustainability is expanding beyond the triad of social-economic-environmental factors (Berardi, 2013) and the cultural dimension of sustainability is emerging in research and international documents (United Cities and Local Governments, 2010; Moldavanova, 2014; Meireis and Rippl, 2019). The emerging cultural dimension of sustainability introduces such themes as aesthetics and artistic qualities into the frame of discussion based on sustainable architecture. For example, Berardi (2013) underlines that cultural perception and inspiration are integral aspects of sustainable buildings. Accordingly, such buildings should increase "social equity, aesthetics

Table 1. Quantitative literature overview using keywords "sustainable architecture" in the Scopus and Web of Science databases

Scopus database search						
Total number of sources: 7382						
Years	Number of sources	Main keywords	Dominant author	Dominant field	Dominant country	Dominant source
1983 - 1987	6	Architecture (3)	Levine, R.S. (2)	Engineering (6)	-	Wescon Conference Record
1988 - 1992	5	Architecture (2)	Glass, C.J. (1)	Engineering (3)	USA (3)	Journal of Architectural Education
1993 - 1997	31	Architecture (7)	Wu, J.S. (2)	Engineering (16)	UK (5)	Corporate Environmental Strategy
1998 - 2002	109	Sustainable development (43)	Farmer, G. (2)	Engineering (61)	USA (26)	Places
2003 - 2007	697	Sustainable development (381)	De Weck, O. (6)	Engineering (452)	USA (208)	International Journal of Engineering Education
2008 - 2012	1746	Sustainable development (899)	Zeiler, W. (9)	Engineering (900)	USA (345)	World Applied Sciences Journal
2013 - 2017	2688	Sustainable development (1279)	Mileto, C. (14)	Engineering (1666)	USA (370)	Xi'an Jianzhu Keji Daxue Xuebao/ Journal of Xi'an University of Architecture and Technology
2018 - 2021	2102	Sustainable development (858)	García-Soriano, L. (7)	Engineering (1067)	USA (218)	Journal of Materials Science and Technology
Web of Science database search						
Total number of sources: 4358						
Years	Number of sources	Main keywords	Dominant author	Dominant field	Dominant country	Dominant source
1990 - 1994	13	Architecture (5)	Blake J. (1)	Architecture (5)	USA (4)	Architecture
1995 - 1999	52	Energy fuels (22)	Jain K. (2)	Energy fuels (22)	USA (13)	Journal Of Urban Technology
2000 - 2004	117	Architecture (32)	Oktay D. (3)	Engineering (45)	USA (24)	Energy And Buildings
2005 - 2009	346	Architecture (97)	Lehmann S. (5)	Environmental studies (108)	USA (74)	Journal Of Green Building
2010 - 2014	1090	Architecture (245)	Gambardella C. (18)	Engineering (451)	China (162)	Applied Energy
2015 - 2019	2294	Green sustainable science technology (416)	Gambardella C. (12)	Engineering (681)	USA (258)	Scientific Reports
2020 - 2021	446	Green sustainable science technology (135)	Kim Y. (5)	Science technology other topics (156)	China (73)	International Journal Of Engineering And Geosciences

improvements, and preservation of cultural values" (Berardi, 2013, p. 76), along with other aspects. The sustainability framework developed by Musacchio (2011), which is applicable to landscapes as well as architecture, contains factors related to: the environment, economics, equity, aesthetics, experience, and ethics. Thus, it also reflects the complexity of sustainable architecture and the presence of both tangible and objective, and intangible and subjective dimensions in it, such as aesthetics and a sense of place.

However, some researchers have noticed biases in the approaches towards sustainable buildings, such as an overly eco-centred approach, managerialism and technoctaric control (Berardi, 2013). Indeed, with multiple regulations and certification systems, construction is increasingly

viewed as a process and the focus is on the life cycle of the building (Sauerbruch and Hutton, 2011). On one hand, it is helpful to better understand and manage the environmental and other impacts; on the other hand, less tangible and more subjective aspects, such as a sense of place, aesthetics and artistic quality can be lost in such a broad and managerial approach.

According to some researchers, a certain level of sustainability appears to be inevitable in the architectural and building fields as a matter of professional commitment as well as of governing policies (Fox, 2000; Jauslin, 2011). Accordingly, all architecture could become sustainable. Thus, it is worth looking at the understanding of general architectural quality and what role sustainability plays in it. The criteria that determine architectural quality have been under consideration since antiquity's Vitruvius triad (Stauskas, 2009). Stauskas distinguished the functional and cultural contents, form, environment and technical-economical aspects as determinants of architectural quality. Sets of architectural quality criteria are presented in national and international regulations as well. For example, the guidelines to the architectural policy of the European Commission (European Commission, 2009, p. 4-7) distinguish urban integration, accessibility and mobility, respect for the environment and energy efficiency, quality of construction and well-being, innovation, aesthetic aspect and image, functionality, modularity and flexibility, costs, and cohesion as the common thread, in this particular case meaning "the establishment of a symbolic common thread linking all the buildings and building clusters occupied by the Commission". Similar criteria are, for example, distinguished in the Lithuanian Law of Architecture (Lietuvos Respublikos Seimas, 2017) (Table 2).

environmental aspects. In order to better understand the role of aesthetics in building sustainability and the potential of the sustainable architecture movement to influence the aesthetic expression of buildings (Heymann, 2012), the existing building sustainability assessment frameworks are analyzed in the following sub-section.

The potential place of aesthetics in the assessment frameworks of sustainable architecture

In a further analysis of the links between the sustainability and aesthetics of architecture, it is worth examining the frameworks of general sustainable architectural analysis and sustainable building certification systems, which are gaining increasing importance due to the growing number of societal challenges and the impact of sustainable architecture.

Several general models – the general building sustainability analysis framework by Cole (1999), the HalStar sustainability assessment model (Pearce *et al.*, 2012) based on five capitals, and the VERSUS model based on the qualities of vernacular architecture (Guillaud *et al.*, 2014) were selected for analysis. These models go beyond the basic Bruntland model of three overlapping dimensions (Lozano, 2008) and they target the built environment. The selected models are rather diverse and thus reflect the spectrum of understanding of building sustainability.

The general building sustainability analysis framework by Cole (1999) encompasses sustainability criteria, which are subdivided into two categories - human (indoor environmental quality, maintenance, prosperity, cultural heritage integration, etc.) and environmental (resource use, ecological loadings etc.). Bearing in mind the concept of

Table 2. Architectural quality criteria in regulatory documents (European Commission, 2009; Lietuvos Respublikos Seimas, 2017) and their analysis according to sustainability dimensions

Lithuanian law of architecture (2017)	Guide to the European Commission's architectural policy (2009)	Sustainability dimensions*
Urban integrity	Urban integration	
Accessibility using universal design	Accessibility and mobility	
Correspondence to sustainability principle	Respect for the environment and energy efficiency	
Quality, ergonomics and durability of the built environment	Quality of construction and well-being	
Innovativeness	Innovation	
Coherent architectural idea	Clarity of purpose and comprehensibility of buildings Cohesion: a common thread	
Aesthetics	Aesthetic aspect and image	
Functional structure of the building	Functionality, modularity and flexibility	
Economic rationality	Costs	
Preservation of immovable cultural heritage		
		7 10 6 2
Sustainability*	Cultural Social Economic Environmental	

An analysis of architectural quality criteria according to sustainability dimensions (Table 2) reveals that these criteria encompass all four dimensions, although human dimensions (cultural, social, economic) clearly dominate over the environmental dimension. The analysis reveals the mutual integration process: the cultural dimension (including aesthetics and the sense of place) is increasingly becoming a part of the concept of sustainable architecture and sustainable building. Meanwhile, the understanding of architectural quality increasingly encompasses

any building as a process with a life-cycle, the framework encompasses the dimension of time. According to Al Waer and Sibley (2005), "time scale is one of the most important factors in assessing sustainable development due to the changing nature of the performance criteria and the appearance of new ones over a period of time". The model demonstrates the possible different scales of sustainability assessment, ranging from the building materials up to the global scale. "Scale is obviously the critical dimension in relation to building environmental performance within the

context of sustainability, architecture and urban planning" (Al Waer and Sibley, 2005). This framework demonstrates the potential of integrating aesthetics as one of the human criteria (Figure 1) into building sustainability assessment. The different scales represented by the model make it possible to consider the aesthetics in the neighborhood and cityscape contexts as well.

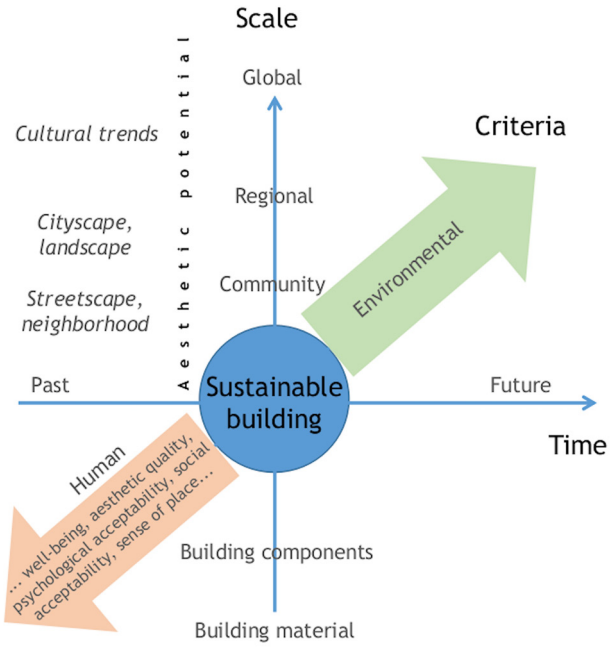


Figure 1. General building sustainability analysis framework by Cole (1999) and its potential for the integration of aesthetics into building sustainability assessment. (Source: Figure by the authors is adapted from Cole (1999) and Al Waer and Sibley (2005) by adding potential human criteria)

The HalStar sustainability assessment model was developed by the English engineering firm Halcrow. The company's goal is to encourage people to lead an increasingly sustainable lifestyle by trying to look at the problem from all possible perspectives: from small-scale to massive projects. The significant development of the company's infrastructure has also led to the development of theoretical models to address sustainability issues. This model demonstrates sustainability as the balance between five dimensions or capitals - natural, social, human, manufactured and financial. This model considers the life cycle of the project under evaluation and includes the dimension of time by identifying short-term, medium-term, and long-term time-frames (Pearce *et al*., 2012). Moreover, similar to the model by Cole (1999), this model contains scale: global, regional, local, and client. Although this model does not explicitly distinguish the cultural dimension or aesthetics in particular, it includes some culturally and aesthetically oriented factors, such as cultural heritage, happiness and motivation, quality and innovation. These factors are dispersed in the following fields: social, human, and manufactured capital.

The VERSUS model for the analysis and assessment of sustainable architecture was developed by partner institutions from Portugal, Spain, Italy, and France, with the support of the Culture Programme of the European Union. This model was based on "the identification of strategies and principles within vernacular heritage, in order to define a conceptual approach for sustainable architectural design" (Guillaud *et al*., 2014). The model has three sustainability dimensions - environmental, socio-cultural, and socio-economic. The environmental dimension encompasses five criteria or principles: to respect nature, to be appropriately situated, to reduce pollution and waste materials, to contribute to the quality of health, and to reduce the effects of natural hazards. The socio-cultural dimension encompasses the following criteria: to protect the cultural landscape, to transfer construction cultures, to enhance creativity, to recognize intangible values, and to encourage social cohesion. The criteria of the socio-economic dimension are: to save resources, to extend the lifetime of buildings, to optimize construction efforts, to promote local activities, and to support autonomy. It is evident that the VERSUS model has a strongly expressed cultural dimension acknowledging the importance of the sustainability of preserving cultural heritage, and such intangible factors as collective memory, cultural identity, sacredness, history and mythology. Respect for the cultural landscape (cityscape) might include some aesthetic considerations; meanwhile the creativity criterion explicitly mentions beauty (Guillaud *et al*., 2014).

In order to understand better the potential to include aesthetics in building sustainability analysis, it is worth looking at actual building sustainability certification systems, which are practical undertakings in evaluation and decision making (Poveda and Lipsett, 2011). This overview of popular certification systems was prompted by the claim of some researchers that these tools are discouraging, or at least do not encourage aesthetic experiments and innovations in the field of sustainable architecture. For example, Heymann (2012) notes that the LEED certification system "serves to uphold a pre-existing aesthetic; or, perhaps better, does not serve substantially or directly to take an existing aesthetic ideal apart". According to Sauerbruch and Hutton (2011), the existing certification systems focus heavily on technical and quantifiable aspects, and such aspects as beauty and aesthetics are viewed skeptically in circles linked with sustainable building certification.

The most popular certification systems - LEED, BREAAM, WELL - and the Living Building Challenge were selected for the overview (Tables 3 to 6). LEED Interior Design + Construction (U.S. Green Building Council, 2020) appears to balance the social, economic, and environmental sustainability dimensions. However, environmental concerns are predominant in this system (Table 3). The only sub-criterion, quality, and the criterion innovation can be attributed to the cultural sphere. Some sub-criteria targeted at environmental and economic dimensions can have potential synergistic effects on the aesthetic expression of buildings: sensitive land protection, reduced parking footprint, protected or restored habitat, open space, rainwater management, heat island reduction, renewable energy, daylight etc. For example, the rainwater management requirement can encourage the creation of rain gardens or permeable surfaces on a site with particular ecological aesthetics, and daylight requirements can influence architectural form and the character of interiors etc. It is

possible to summarize that the LEED certification system can influence the aesthetic expression of architecture, although it is possible to agree with D. Heymann (2012) that this system does not encourage aesthetic and cultural breakthrough in sustainable architecture.

This study identified the dominance of environmental and economic concerns over social and cultural ones in BREEAM International New Construction 2016 technical standards (BREEAM, 2016) (Table 4). Only the sub-criterion innovation can be clearly attributed to the cultural sphere. Some sub-criteria targeted at the environmental and economic dimensions can have a potential synergistic effect on the aesthetic expression of buildings: visual comfort, life cycle impacts, designing for durability and resilience, adaptation to climate change, and enhancing site ecology. For example, adaptation to climate change and site ecology enhancement can include creating vertical greenery with particular aesthetic impacts, etc. Only the sub-criterion visual comfort and the criterion innovation can be directly linked with architectural aesthetics. In summary, the BREEAM certification system is not targeted at the cultural dimension of sustainability, and sustainability aesthetics are not directly encouraged by it. However, it is neccessary to mention, that both LEED and BREEAM include innovation as a criterion, which is also considered as one of the general criteria of architectural quality, as demonstrated in the sub-section above. Thus, it can be expected that innovation can be expressed not only in technologies, but also in distinctive aesthetic language.

Table 3. Analysis of the LEED building certification system according to sustainability dimensions. Criteria with aesthetic potential or impact are marked in green (Source: U.S. Green Building Council, 2020)

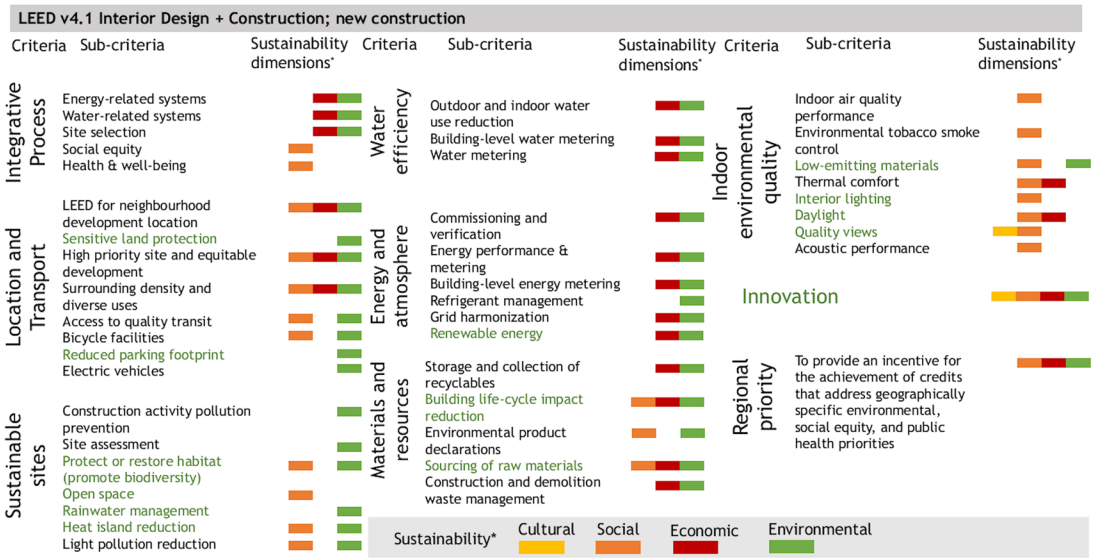
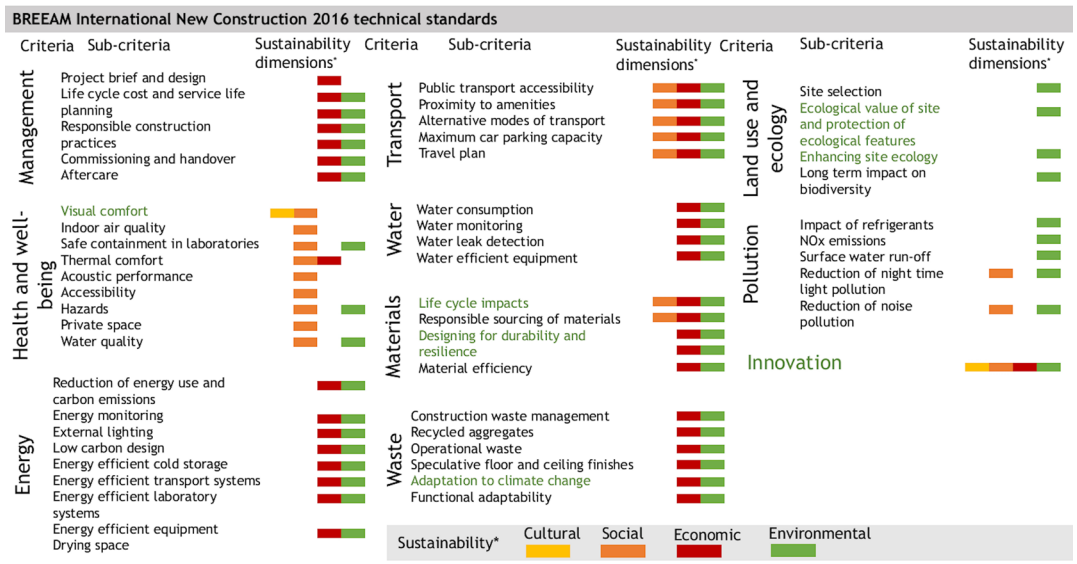


Table 4. Analysis of the BREEAM building certification system according to sustainability dimensions. Criteria with aesthetic potential or impact are marked in green (Source: BREEAM, 2016)



In comparison with the LEED and BREEAM systems, the WELL Building Standard version 2 (WELL, 2020) is basically socially oriented (Table 5). This system is oriented at the well-being of building occupants; however, the cultural dimension of sustainability is also omitted here. Only the criterion innovation and the sub-criterion nature and place can be linked with the cultural sphere and aesthetics. Some sub-criteria targeted at social, environmental and economic dimensions can have a potential synergistic effect on the aesthetic expression of buildings: visual lighting design, day light strategies, nature and place, restorative spaces, and enhanced access to nature. These sub-criteria can be directly linked with the biophilic design concept (Kellert *et al.*, 2008), which is currently growing in popularity. It is peculiar that the WELL system, being clearly human-centered, does not include cultural and aesthetic aspects. However, the biophilic design-oriented criteria can evolve into a synergistic approach simultaneously targeting ecology, personal well-being, aesthetics and connections to place.

The Living Building Challenge 4.0 Standard (new construction) (Living Building Challenge, 2020) system is most successful at achieving a balance between the sustainability dimensions compared to the other systems analyzed in this paper (Table 6). The cultural dimension here is reflected by the criteria place and beauty and the sub-criteria human scaled living, beauty & biophilia, and education & inspiration. It is possible to see clearly in this system that some material and wellness-related criteria can have a direct impact on the aesthetic expression of design: access to nature, responsible materials etc. This system underlines the importance of place, which is both a cultural and ecological concept. Moreover, the implementation of the beauty & biophilia sub-criterion can have synergistic positive effects on all the sustainability dimensions as mentioned above.

Architectural theories relevant to balancing the aesthetic and environmental criteria in the assessment of sustainable architecture

The integration of sustainability into architectural quality criteria, the rise in popularity of certification systems and the overall global sustainability agendas demonstrate that certain aspects of architectural sustainability are inevitable. However, the question still remains of how to avoid a merely techno-centrist or eco-centrist approach, and to balance the social, cultural, economic and environmental aspects of sustainable architecture. Moreover, some authors note the current lack of and need for a particular aesthetic language of

Table 5. Analysis of the WELL building certification system according to sustainability dimensions. Criteria with aesthetic potential or impact are marked in green (Source: WELL, 2020)

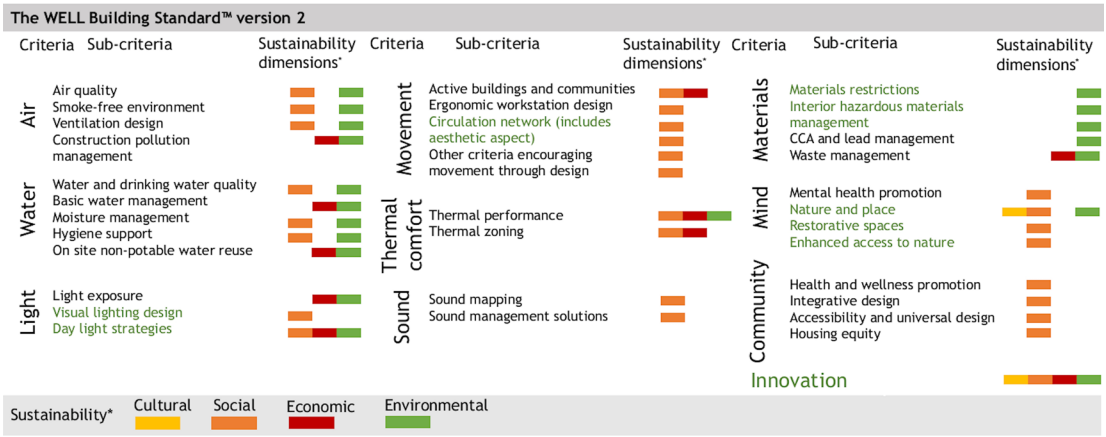
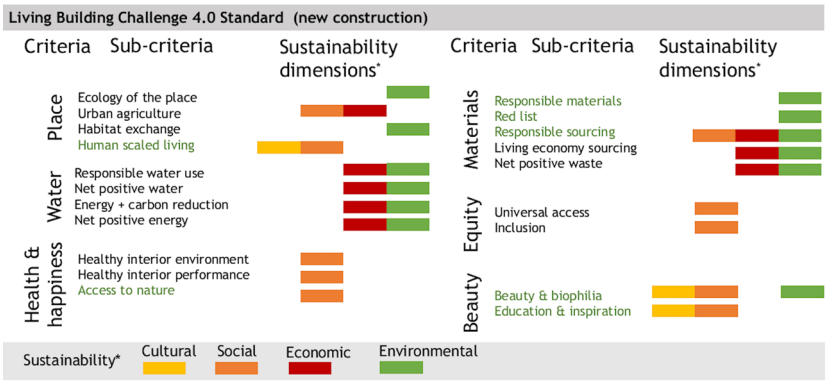


Table 6. Analysis of the Living Building Challenge building certification system according to sustainability dimensions. Criteria with aesthetic potential or impact are marked in green (Source: Living Building Challenge, 2020)



sustainability (Kagan, 2011; Heymann, 2012; Di Carlo, 2016). The lack of cultural criteria in sustainability certification systems and the emphasis of environmental and economic dimensions might be the causes of the slow development of sustainability aesthetics. Below we distinguish and discuss four architectural theories that hold the potential of balancing the human and environmental criteria and could potentially become a part of sustainable architecture assessment systems: sustainability aesthetics, spirit of place (*genius loci*), biophilic design, and a regenerative approach.

Sustainability aesthetics. The notion of sustainability aesthetics (Kagan, 2011) has evolved from the environmental movement and ecological art that started in the 1960s and 1970s. Such art relied on natural materials, natural and social processes, and creativity based on the mutual interaction of humans with nature and society. The human-nature co-creation approach also emerged in landscape architecture in this period (McHarg, 1969). The results of ecological art were particularly complex, dynamic, open aesthetics based on sometimes radical environmental ethics. Several authors have defined what the term sustainability aesthetics actually means. According to Kagan (2011), it focuses on "relationships and processes and is based on a sensitive response to connecting structures at many levels". Kagan emphasizes the following qualities and features of sustainability aesthetics: reconciliation, complementarity of opposites (focusing on the visible diversity, complexity and differences and metastructure connecting the living world), openness to the creative power of chaos, unexpectedness of results, interest in "complex and dynamic life networks in the environment and the social, political and economic complexity of modern societies". It is evident that this aesthetics draws a lot from environmental art, which is more flexible than architecture or urbanism. However, it can be presumed that sustainability aesthetics reveals and emphasizes the intrinsic beauty of our connectedness to ecosystems and sustainable systems and holds potential for the built environment as well.

Shrivastava (2011), working in the field of sustainability research, notes that radical behavioral and organizational changes are necessary in order to achieve global sustainability. He states that this change first of all requires a change in human consciousness, "the emotional change in human-nature relationships". He urges us to employ the human capacity for art to achieve this transformation, and even bases this claim on the idea that arts serve the evolutionary functions of humanity. In this context the sustainability aesthetics of architecture can even stimulate the further development of harmonious human-nature relationships.

Spirit of place (genius loci). I. Brook (2000) identifies the sense of place or the so-called spirit of place, also known as *genius loci,* as an imperative for environmental ethics. This idea links the cultural and environmental realms in environmental ethics, which often tends to concentrate on the radical biocentric and ecocentric approaches. The VERSUS model discussed above also includes protection of the cultural landscape and recognition of intangible values as characteristics of sustainable architecture. The Living Building Challenge certification system includes the criterion of place, WELL includes the sub-criterion nature and place. Place in its nature integrates both natural and cultural aspects. Thus, place and *genius loci* can become the drivers both for ethical, environmentally friendly construction and the aesthetics of sustainable architecture in a particular place. *Genius loci,* which is seen as intangible, and place which is mainly viewed as tangible, and their actual inseparability (Vecco, 2019), reveal that both spatial aspects and intangible ones matter for the sustainability of architecture. The importance of understanding the intangible dimension in the context of sustainability even transcends the question of architecture and is receiving the increasing attention of researchers (Grant, 2010; Vecco, 2019). Grant (2010), analyzing the potential of sustainability aesthetics, emphasizes the general necessity of replacing the current consumer culture with alternative value systems. Sustainability is often viewed as a behavioral problem (Grant, 2010; Shrivastava, 2011), which invites us to consider consumption and production from the psychological/behavioral perspective. Grant (2010) supports the idea that "the problem of material overconsumption is rooted in the lack of skilled consumption" and presents a literature overview on less tangible and more sustainable forms of consumption, so-called "resource-light and resource-free activities", which "require a more cultivated mind" including increasing the role of artistic creation, fostering appreciation in daily life and general intellectual culture like reading a good book, listening to music or intelligent conversation, etc. Harper (2012) mentions anti-consumption or at least minimal consumption in the context of sustainability aesthetics. The empathetic involvement in a place, grasping its *genius loci* and sensitive architectural development, are forms of skilled sustainable consumption and production. Nevertheless, *genius loci* as an asset nowadays is often ignored (Petrusonis, 2018). Vecco (2019) proposes a three-fold process: rethink, protect and transmit the place and its spirit. She asserts that this process needs to be circular and incremental, and the role of sustainable design and sustainable heritage preservation cannot be underestimated in this process.

Biophilic design. The biophilic design concept is an evolving environmental awareness and human well-being targeted design approach. It encourages the direct and indirect use of natural systems, processes, and materials in the design of the built environment (Kellert *et al*., 2008; Gillis and Gatersleben, 2015). Biophilic design is based on the biophilia hypothesis, formulated in the 1980s by ecologist and sociologist Wilson (1984). This hypothesis maintains the "innate emotional affiliation of human beings to other living organisms" (Wilson, 1993).

Moreover, the physical and psychological well-being benefits of human-nature connections have been proven by numerous studies (Gillis and Gatersleben, 2015). The biophilic approach is increasingly integrated into building sustainability assessment. For example, the Living Building Challenge includes the sub-criterion of beauty and biophilia. The WELL system includes the sub-criteria nature and place, restorative spaces, and enhanced access to nature, all of which recall the biophilic approach, and all of these sub-criteria are placed under the criterion mind, focusing

on human psychological well-being. However, it is necessary to note that biophilic design can enhance human well-being and create aesthetically pleasing restorative environments, and at the same time positively influence the ecology of a place. Moreover, DeGroff and McCall (2016) identify two trends of the biophilic approach: one oriented towards biological systems and the other incorporating traditional practices for forming ethnic environments. This makes it possible to create various biophilic designs in harmony with the *genius loci* of a place.

Regenerative approach. Currently, attitudes towards sustainability are developed within the context of restorative and regenerative movements in the field of sustainability (Brown *et al*., 2018), with reference to regeneration as a feature of natural systems. The aim of these approaches is no longer to sustain the *status quo*, but rather to move towards the restoration of the damage done by human activities. New concepts also strive towards the harmonious built environment as ecosystems (Dekay, 2012), as well as towards achieving the properties of natural systems in man-made products and environments. Berardi (2013) distinguishes the aspects of biological and regenerative approaches towards sustainable architecture, ranging from the behavior of building materials to the building-environment and building-society interaction in his literature review. The following are examples of a regenerative approach in practice: developing building materials that would function as biological nutrients circulating through the world's systems in cycles; and considering and creating a building as a "live system with dynamic flows with nature", as "an active entity which is designed to help a metabolism of human beings that regenerates the built environment within the natural capital". This perspective of buildings as ecosystems and living entities would make it possible to move beyond the currently trendy biomorphic formalism (Sauerbruch and Hutton, 2011), when nature becomes an inspiration solely for the building form, and achieves integrated human-environment benefits including recognizable aesthetic quality.

CONCLUSIONS

Sustainable architecture, according to its definition, should be based on the paradigm and principles of sustainability involving social, cultural, economic and environmental dimensions; it definitely contributes to the implementation of sustainability goals. The dimension of cultural sustainability should be strengthened within the fields of both sustainable architecture and general sustainability. This leads to the conclusion that sustainable architecture must contribute to social equity, aesthetic qualities of the environment and the preservation of cultural values. Therefore, aesthetics must be considered as an integral part of architectural sustainability.

Architectural quality in general is determined by such criteria as urban integrity, accessibility and mobility, respect for the environment and energy efficiency, quality of construction and well-being, innovation, aesthetic aspect and image, functionality, etc. (European Commission, 2009). An analysis of architectural quality criteria through the sustainability perspective revealed that architectural quality criteria encompass all four sustainability dimensions. However, a lack of attention given to the cultural aspects while developing sustainable architecture was noticed.

An overview of selected general sustainable architecture assessment models – general building sustainability analysis framework by Cole (1999), the HalStar sustainability assessment model (Pearce *et al*., 2012) and the VERSUS model based on the qualities of vernacular architecture (Guillaud *et al*., 2014) – demonstrated that these diverse models have room for cultural aspects and aesthetics, even if these aspects are not always explicitly identified.

Analysis of the most popular certification systems – LEED, BREAAM, WELL and Living Building Challenge – according to sustainability dimensions and a search for the possible integration of cultural aspects and aesthetics in building sustainability assessment revealed the general predominance of environmental and economic aspects. However, some promising possibilities for expanding the cultural dimension and including integrated, synergistic, aesthetic and environmental criteria based on the biophilic approach were distinguished.

This research has revealed a paradoxical situation: while cultural aspects and aesthetic expression are an integral part of the sustainable architecture concept, they are not so eagerly incorporated into sustainable building assessment approaches. The results of the research suggest that the lack of cultural criteria in sustainability certification systems and the emphasis on the environmental and economic dimensions might be the causes of the slow development of sustainability aesthetics, as identified by some researchers. Another problem identified by this study is the lack of balance between human and environmental criteria. Consequently, four categories that hold the potential for balancing human and environmental criteria and could potentially become a part of sustainable architecture assessment systems were distinguished: sustainability aesthetics, spirit of place (genius loci), biophilic design, and a regenerative approach. The research maintains that these approaches hold the potential for breakthrough in the aesthetic quality and uniqueness of sustainable architecture.

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