sciendo
1862 RIGA TECHNICAL UNIVERSITY

Architecture and Urban Planning
2020, Vol. 16, Issue 1, pp. 48–55
https://doi.org/10.2478/aup-2020-0008
https://content.sciendo.com
Online ISSN 2255-8764

Aesthetics of Sustainability and Architecture: An Overview

Aurelija Daugelaite, Indre Grazuleviciute-Vileniske, Kaunas University of Technology, Kaunas, Lithuania*

***Abstract* – Sustainable development – development that meets the needs of the present-day societies without compromising the possibilities of the future societies to meet their needs – became the predominant paradigm of planning policies. This concept with its environmental, social, economic and cultural dimensions has been applied to the field of architecture since the end of the 20th century. However, numerous researchers still notice technological and ecological orientation of sustainable architecture and the lack of attention to its cultural, place-based and aesthetics aspects. The question may be asked if it is possible to distinguish the aesthetics of sustainable architecture. Thus, this research analyses the question of sustainability aesthetics and the ways that it is expressed in the field of architecture. In order to reach this aim: the quantitative and qualitative literature review on the questions of sustainability aesthetics and sustainability aesthetics in architecture was performed; the discussion of the notion of sustainability aesthetics and the aesthetic trends of sustainable architecture was developed based on the results of literature analysis.**

***Keywords* – aesthetics, sustainability, sustainability aesthetics, sustainable architecture.**

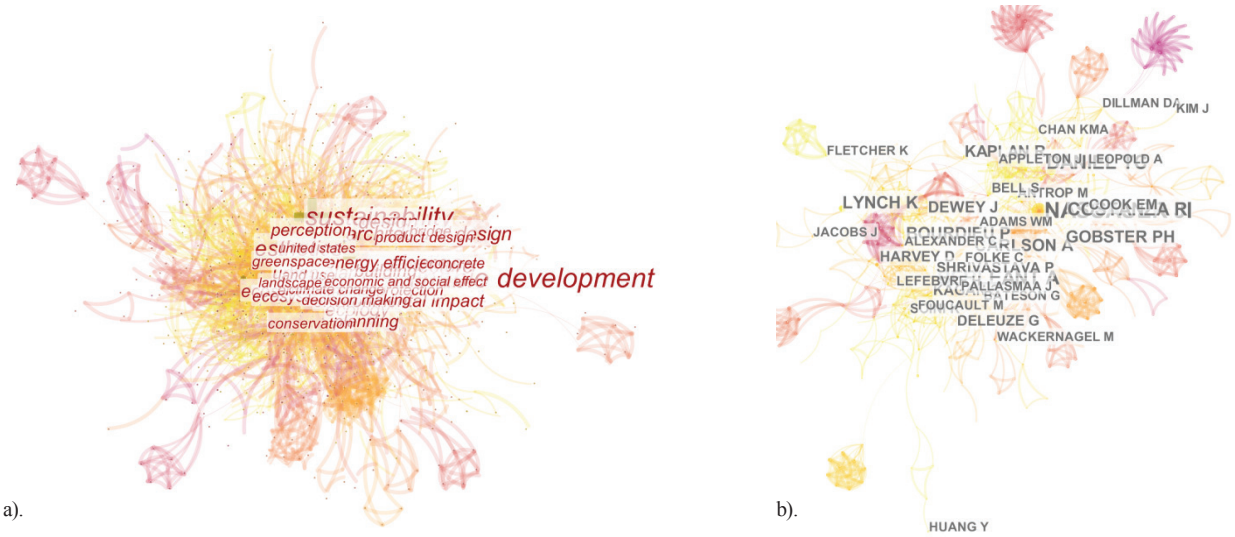
Introduction

Contemporary understanding of the often-interchangeable terms "sustainability" and "sustainable development" is usually linked to the United Nation's Brundtland Commission Report of 1987 and with human-centered approach focusing on inter-generational and intra-generational equity [1], [2]. The abstract and all-encompassing definition is constantly debated and new concepts, such as "restorative sustainability" aiming to restore a socially and environmentally balanced and healthy ecosystem, "regenerative sustainability", aiming to improve the quality of life for biotic and abiotic components of the environment [3], [4], are emerging. Both the concept of sustainability as the development paradigm of contemporary society and its further developments inevitably affect our built environment and architectural design in particular. This influence ranges from compulsory legal regulations to the inspiration and emerging design ideologies. However, the concept of sustainability in the built environment remains unclear [5], [6], [7], [8]. According to S. Wilkinson et al. [8], the term "sustainable" often relates to green, ecological, natural, Gaian, eco-friendly and environmental, environmentally sensitive, environmentally conscious, environmentally responsible, earth-friendly, smart-eco buildings, high-performance, zero energy, living, biophilic, eco-responsive architecture. All these concepts, even if reflecting the ecological orientation of architecture, can be differently defined and can have very diverse architectural expression. U. Berardi [6] attempted to provide a concise definition of sustainable building: "a building is sustainable if it contributes to the sustainability through its metabolism and by doing this it favours a regenerative resilience of the built environment among all the domains of sustainability". This definition adds the regenerative dimension to sustainable architecture. According to U. Berardi [6], a sustainable building should increase: demand for safe building, flexibility, market and economic value; neutralization of environmental impacts by including its context and its regeneration; human well-being, occupants' satisfaction and stakeholders' rights; social equity, aesthetic improvements, and preservation of cultural values. Aesthetics, as an important aspect of human-centred cultural sustainability, is mentioned in this definition; however, the peculiarities of this aesthetics remain unclear. S. Guy and G. Farmer [5] raise the question: does sustainable architecture has its own identity? Thus, this research attempts to clarify the question of sustainability aesthetics and how it is expressed in the field of architecture. In order to reach this aim: the quantitative and qualitative literature review on the questions of sustainability aesthetics and sustainability aesthetics in architecture was performed; the discussion of the notion of sustainability aesthetics and the aesthetic trends of sustainable architecture was developed based on the literature analysis results.

I. Literature Review

The search in the Scopus database, the content of which comes from over 5 000 publishers, was performed on 17.06. 2020 using the combination of keywords "(sustainability OR sustainable) AND aesthetics" with the aim to find the published research on the questions of sustainability aesthetics or sustainable aesthetics in general. The search has resulted in 1007 documents, 174 of them were published the open access sources. The time span of the published material was from 1987 till 2020. It is symbolic, as in 1987 the Brundtland report "Our Common Future" giving the definition of sustainability was published. The analysis of the search data has demonstrated that the number of publications has increased in the recent years: in 2016 and 2017, 88 papers, were published, in 2018 – 107 papers, and in 2019 – 120 papers. The overview of contributions has revealed that the majority of authors had authored 2 contributions with the exception of P. Shrivastava, who has authored 5 contributions in the field of management. The subject areas of contributions are very diverse ranging from engineering to neuroscience. The search was further limited to the subject areas relevant to the aesthetics studies and architecture. After excluding less relevant subject areas, the research was limited to 818 documents with 402 publications in engineering, 287 publications in environmental sciences and 98 publications in arts and humanities. The limited number of publications on sustainability aesthetics in arts and humanities may demonstrate that this issue is more addressed in technological sciences or the publications in humanities are not sufficiently reflected in this scientific database. This demonstrates the need

* Corresponding author. E-mail address: aurelija.daugelaite@ktu.edu



a). b).

Fig. 1. CiteSpace [9] analysis of bibliometric data from 779 publications provided by Scopus data search "(sustainability OR sustainable) AND aesthetics": a) keywords by frequency, the threshold for the keywords node is 15; b) cited authors, nodes in the graph are labelled by citation, the node threshold is 5.

Table I

Authors cited in the publications provided by Scopus data search "(sustainability OR sustainable) AND aesthetics".

Cited author	Count	Year	Research field
Nassauer J. I.	24	2002	Landscape architecture
Daniel T. C.	16	2008	Psychology
Berleant A.	16	2001	Philosophy, environmental aesthetics
Costanza R.	14	2014	Environmental science
Lynch K.	11	2013	Urbanism
Bourdieu P.	10	2016	Sociology, philosophy
Gobster P. H.	10	2007	Forestry
Carlson A.	10	2009	Climatology
Kaplan R.	9	2004	Environmental psychology
Dewey J.	8	2011	Philosophy
Shrivasatva P.	7	2016	Management
Deleuze G.	7	2015	Philosophy
Kagan S.	7	2016	Cultural sociology
Harvey D.	7	2012	Anthropology, social sciences, geography
Cook E.M.	7	2015	Urban social-ecological systems

of additional search. More than a half (438) of these publications were articles and 242 were conference papers. The source with the largest quantity of publications on the topic under analysis was interdisciplinary journal "Sustainability" (24 publications). 779 of these publications were published in English. These publications were further analyzed using open access software CiteSpace developed by C. Chen [9]. Fig. 1 shows the analysis of keywords by frequency and the cited authors. The top 10 keywords in this research context include: sustainable development (count 267), sustainability (count 190), aesthetics and esthetics (count 175), design (count 54), architecture (count 53), architectural design (count 47), ecology (count 40), urban planning (count 36), environmental impact (count 33) and biodiversity (count 33). The keyword analysis reveals that architecture is a high-ranking concern in the field of environmental aesthetics compared to landscape and urbanism. Meanwhile the analysis of cited authors reveals the relevance of landscape and urbanism concerns in this research area as well. The most cited author according to the analysis is J. I. Nassauer working in the field of landscape architecture and ecological aesthetics. The research fields of the cited authors

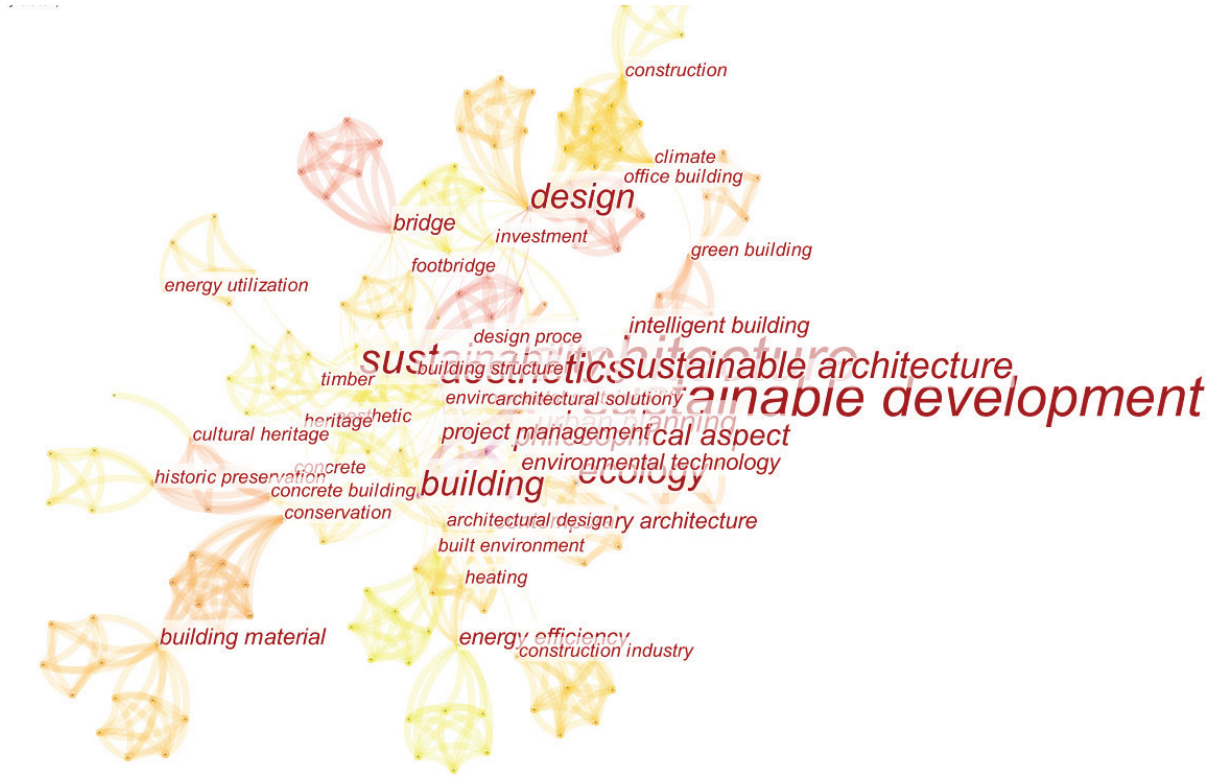


Fig. 2. CiteSpace [9] analysis of bibliometric data from 48 publications provided by Scopus related to sustainability aesthetics and having keyword "architecture". Graphs show keywords by frequency, the threshold for the keywords node is 2. Engineering concerns in the context of sustainability aesthetics of architecture are visible from the keyword clusters.

reveal the complexity and interdisciplinarity of sustainability aesthetics. The top cited authors and their research areas are presented in Table I.

After the general overview of the volume of 779 publications provided by the Scopus, the search was narrowed to those with keyword "architecture". This search generated 48 publications from relevant research areas from 1996 till 2020 dealing with sustainability aesthetics and having keyword "architecture". The analysis of this search data has demonstrated that the majority of the authors had contributed to 1 or 2 publications and do not reveal any distinguished leading author. The top sources were proceedings of conferences related to civil engineering, material sciences and the built environment. The top keywords in this search round were: architecture (count 48), sustainable development (count 30), sustainability (count 12), aesthetics (count 11), sustainable architecture (count 8), ecology (count 8), design (count 7), and building (count 7).

The overview of contents of the selected 48 publications has demonstrated that the majority of them dealt with engineering, technological aspects, integration of sustainable technologies into building design, ecological characteristics of historic and ethnic architecture (Fig. 2). 10 publications of 48 dealt directly with aesthetics of sustainable buildings or sustainability aesthetics. For example, E. Donovan [10] has analyzed different sustainable architecture movements and their aesthetic expression, L. Finocchiaro and S. I. Wago [11] analyzed the expression of zero emission buildings. M. Cenek [12] analyzed building form from the perspective of sustainability. S. Gan and H. Zhang [13] discussed ecological architectural aesthetics, M. Dekay [14] distinguished sustainability aesthetics from the point of view of levels of aesthetic perception complexity and inclusiveness. The focus of the research found in Scopus database on engineering encouraged to perform additional search in various sources (Google Scholar, Academia.edu, ResearchGate, etc.) for the sources related to sustainability aesthetics and architecture. The additional search generated a number of publications from the fields of architecture [15]–[22], landscape architecture and land management [23]–[25], urbanism [26]–[28], design [29], and cultural studies [30]. Illustrated architectural albums and books on the subject of sustainable "green" architecture can be mentioned here as well: J. Wines "Green architecture" [31], Ch. Liu "Green architecture" [32], P. Jodidio "100 contemporary green buildings" [33]. The majority of publications related to sustainable architecture and its expression deal with specific cases, although do not provide clear definition of sustainability aesthetics. Chapter III provides the analysis of the questions related to sustainability aesthetics and expression of sustainable architecture based on the above-mentioned literature sources.

Table II
Features of Sustainable Architecture According to Literature Review [6], [37], [38]

Features of sustainable architecture	*Environmental*	Designed from life-cycle perspective [38] Minimized environmental impact (resource efficiency, waste and emissions reduction, material selection) [38] Adaptable throughout service life and end of life strategy [38] Environmentally friendly operation [37]
	Social	Provide social value over time [38] Provide sense of place for its occupants [38] Reflect the identity of the place [37] Healthy (e.g., indoor air quality) [38] Comfortable (e.g., acoustic, thermal, visual, olfactory comfort) [38] Safe (e.g., working conditions) [38] Accessible for all [38] User-friendly, simple [38] Psychologically acceptable [37]
	Cultural	Provide cultural value over time [38] Related and integrated into the local culture [38] Connected with environment [37] Aesthetic [6], [37]
	Economic	Deliver economic value over time [38] Cost-effective in operation [38]
	Political	Integrated into the relevant local plans and infrastructure, and connected into the existing services, networks, urban and suburban grids [38]
	Philosophical	Holistic approach [38] Collaborative approach [38]

II. Sustainability Aesthetics and Architecture

Sustainability aesthetics. S. Kagan [30] provided an overview of sustainability aesthetics concept including its origin from ecological art and ecological aesthetics and general definition. Ecological art had emerged in North America and Western Europe in the late 60s. The artists of this trend had rejected the creation of art for just aesthetic or commercial purposes and were involved in social engagement, awareness raising and working with nature practices [30], [34]. The notion of ecological aesthetics has gradually emerged within this movement; ecological aesthetics "pays attention and respect to the own complex dynamics of natural phenomena in their relationships to human interventions, and that wants to highlight these aspects in the artistic working process" [30]. Ecological orientation of aesthetics further evolved into sustainability aesthetics. S. Kagan based his definition of sustainability aesthetics on G. Bateson's concept as aesthetics as response to connecting patterns [35]. According to S. Kagan, aesthetics of sustainability is a subset of aesthetics that is focused on relations and processes and based on a "sensibility to patterns that connect at multiple levels and at the same time is attentive to complexity and highlighting the beauty of the complementarity of antagonisms" [30]. Variations, differentiations, and multiplicities are important for sustainability aesthetics [27]. The following features of sustainability aesthetics can be distinguished based on S. Kagan [30]:

- *characterized as* relation-centred; process-centred; attentive to complexity; combining and contrasting unity; complementarity of antagonisms;
- *necessary literacy* – ecological literacy, literacy of complexity;
- *sensibility to* emergence; environments' complex and dynamic webs of life; social, political and economic complexities of contemporary societies;
- *openness to* uncertainties; generativity of chaos; agitations of disorders.

Table III

Sustainability Expression [30] in Architecture [20] and Urbanism [26]: the Grey Sections of the Table Identify the Common Trends: Organic, Biomorphic Forms and the Regulatory, Normative Aspect

M. Sauerbruch and L. Hutton [20], trends of sustainable architectural practices	**I. Di Carlo [26], trends of sustainable urbanism**
Orientation towards aesthetics of the past Such architecture conveys the message that what looks like an old building also functions like one, and what looks old will also last longer. The classical clichés of luxury (old, monumental buildings, for example) come together with added ecological value in an iconographic coherence [20].	
Aesthetic sustainability potential: relation-centered, complementarity of antagonisms	
	Baroque Supermannerism: the aesthetics of excess and redundancy projects whose fluid tectonics, born from the masterly use of morphogenetic algorithms, are characterized by excess and exuberance, overabundance and profusion along with a pseudo-organic reference, repetitive but incrementally modified [26].
	Aesthetic sustainability potential: relation-centered, attentive to complexity, complementarity of antagonisms.
Aesthetic language of technology and progress: form follows ecological performance. The performative aspect of building leads to the limited conclusion that ecological architecture should develop exclusively from the consideration of ecologically functional form. Buildings with biomorphic forms are supposed to function like living organisms as well; however, the synergy with nature often remains a mere intent [20].	*Bio-Mimeticism: the aesthetics of artificial naturalism.* This macro-set contains two sub-groups: the first one aims to study and rehabilitate the performances and the metabolic processes of biological systems in a particular environment. The second group limits itself to simply copying natural forms in a superficial way [26].
Aesthetic sustainability potential: process-centred, relation-centred, complementarity of antagonisms.	*Aesthetic sustainability potential:* process-centred, relation-centred, complementarity of antagonisms.
	Analytics: vectorized aesthetics of processes. Urban, social, economic and ecological performances and processes expressed through the vectorization of space are the basis of the formal research. Flows, meshes, paths, and density mappings are at the core of a fluid and diagrammatic aesthetics [26].
	Aesthetic sustainability potential: relation-centred, attentive to complexity.
	Hyper-Technologic: the additive aesthetics of high-tech. The aesthetics of super-tech: very little sensual, very much cerebral. It is the aesthetics of specialized elements, components, of the hyper-trophic green in the form of roof gardens, green roofs, green facades and urban gardens [26].
	Aesthetic sustainability potential: combining and contrasting unity, complementarity of antagonisms.
Emphasis on quantifiable aspects and life-cycle of the building. Architecture and its aesthetics tend to be looked at sceptically with a heavy focus on the technical and quantifiable aspects of building. The tendency to view a building as a temporary storage of materials that will become building waste in the future [20].	*Regulatory: an-aesthetic.* The normative, transfigured into a set of numerous and often redundant prescriptive rules, is the an-aesthetic of sustainability [26].
Aesthetic sustainability potential: process-centred.	*Aesthetic sustainability potential*: –
	Eclectic. These five morphological expressions have a tendency to hybridize with each other in a series of eclectic solutions [26].
	Aesthetic sustainability potential: attentive to complexity

Expression trends of sustainable architecture. The importance of aesthetics in contemporary architecture is emphasized by numerous researchers. Some of them were mentioned by A. Štelbienė [36]: W. S. Saunders, the founding editor of Harvard Design Magazine, had reviewed critical architectural writings and identified aesthetics as one of the most important features of architectural quality, which is supposed to provide intense emotional experience; the famous Danish landscape architect S. L. Andersson insisted on new symbiosis between rationality and aesthetics in his work "Empowerment of Aesthetics". According to A. Štelbienė [36], the focus is primarily on artistic expression of the building when evaluating a built object; however, at the same time she notices the prevailing indifferent attitude towards aesthetics in architectural design. Similar situation can be noticed analyzing theory and practice of sustainable architecture. Even if aesthetics is considered as one of the features of sustainable architecture [6], [37] (Table 2), it is often ignored and the attention is focused on the energy requirements, life-cycle of the building, etc. [20]. According to E. Donovan [10], „while sustainable architecture has showcased ethical technology, it lacks the holistic aesthetic language needed for the discipline to progress". Other authors also note the emphasis on quantity in sustainable architecture and urbanism [21], the lack of understanding of aesthetics possibilities of sustainability in architecture [18]. According to I. Di Carlo [28], when dealing with sustainability in architecture and urbanism, "we should care not just about the ethic dimension but also about aesthetics, style and emotions". According to her, contemporary ecological urban solutions without aesthetics are just partly sustainable. M. Hemmati [25] also notes that ecological aspects of sustainability dominate and overshadow the aesthetic ones. S. Guy and G. Farmer [5] note techno-centric agenda in sustainable architecture and the lack of sensibility to culture and place. However, literature review has revealed numerous distinct sustainability aesthetic trends, which are briefly presented below and can serve as an inspiration for sustainable design.

Architect, artist, and architectural researcher J. Wines [31] has considered the expression of sustainable architecture already in 2000. According to him "without art, the whole idea of sustainability fails. People will never want to keep an aesthetically inferior building around, no matter how well stocked it is with cutting-edge thermal glass, photovoltaic cells, and zero-emission carpeting". He has distinguished 6 trends of expression of sustainable architecture: anesthetization of ecological technologies or eco-tech buildings, the building-garden concept, the building-landscape concept, the trend of interpretation of natural forms or organic building design, the use and interpretation of vernacular technologies and forms, interpretation of historic urban forms or the trend of harmony with historic urban environment. S. Guy and G. Farmer [5] provide similar classification, they distinguish eco-technic (commercial, modern, future-oriented), eco-centric (harmony with nature, decentralized autonomous buildings), eco-aesthetics (iconic ecological aesthetics), eco-cultural (local, low-tech, vernacular), eco-medical (passive, non-toxic natural environments for health and well-being), and eco-social architecture (flexible, participatory, locally managed architecture). These are the first attempts to develop sustainable design typologies.

Architectural and urbanism practices have changed a lot since the year 2000 when these classifications were formulated summarizing the experience of the end of the 20th century. Not only attitudes towards architecture and environment have changed. Principles of contemporary architectural form creation evolved greatly since the last decades of the 20th century. Nowadays architectural form is most often created in the digital space, which determines different artistic expression of architectural objects [39], [40], moreover, the architectural objects are more and more integrated into urban development and urban development is more and more integrated with landscape practices. Table III presents two more recent classifications of sustainable architecture [20] and urbanism [26] practices.

Both classifications are made to express a critical view towards contemporary developments by their authors, however, the analysis of these trends comparing them to the characteristics of sustainability aesthetics distinguished by S. Kagan [30] (Table 3) reveal that they hold some potential for the realization of sustainability potential.

Challenges of sustainability aesthetics in architecture. The literature review has revealed the potential of architecture to embody the sustainability aesthetics, however, the researchers distinguish some challenges in this field as well. It is important to note that contemporary concept of aesthetics is not anymore based only on the idea of beauty. The role of aesthetics currently is more complex. It supposes to "sense and eternalize the identity of the historical period and the society" [36]. Even more, new concept of estheticism in art philosophy combines all aesthetic categories such as beauty, harmony, grandeur, tragedy, heroism, irony, etc. [41]. The question can be raised, what ideas or values are reflected in sustainable architecture expression. The researchers identify two trends: 1) revealing the contemporary state of unsustainability of our world, demonstrating the ecological threat, e.g., G. Hill [17] underlines the design's capacity "to reveal the unsustainable ground of our world and architecture's role within it"; 2) "creating the seduction" [27], [28]. According to M. Sauerbruch and L. Hutton [20], it is possible to create architecture as an attractive carbon-free product, which "can literally be an advertisement for these alternative lifestyles and show that reduction in consumption does not necessarily mean a reduction in quality". G. Hill [17] also identified the trend that can be referred to as the "normalizing effect" of sustainable architecture awards: the first examples of environmental architecture of the 70s seemed to be radical, unusual, "disordered and cluttered"; the establishment of sustainable architecture awards with the intention to promote the sustainability in architecture actually caused "aesthetic normalizing" and "de-radicalizing" of environmentally friendly architecture. The same effect can be attributed to sustainability certification systems, such as LEED, which help maintaining usual architectural aesthetics and do not encourage any sustainable architecture aesthetic breakthrough [42]. Another trend, which could be seen as negative, could be referred to as "greening of iconic buildings". According to D. Briggs [43],

the famous "star architects" are commissioned to design iconic buildings, which are adapted to the requirements of sustainability rating systems by the third-party consulting companies. In this way the link between sustainability performance and the artistic form of the buildings may not be sufficiently explored.

Conclusions

Many recent publications cover technological aspects of sustainable architecture, however there is still a lack of research approach that covers conceptual, philosophical and artistic perspective of the field. It is important to investigate how important are social, psychological and, especially, aesthetic aspects of the sustainable architecture.

At the start of ecological movement the environmentally friendly architecture had distinctive and sometimes radical expression, for example, the interpretations of organic forms of the 70s. Contemporary sustainable buildings that are certified and highly rated by sustainability certification systems often lack any distinctive architectural expression. This encourages looking at the concept of sustainability aesthetics and its application in architectural design. The sustainability aesthetics as defined by S. Kagan [30] can be characterized as relation-centred, process-centred, attentive to complexity, combining and contrasting unity, complementarity of antagonisms.

Sustainable architecture has acquired a greater diversity of expression, inspired by both technology and the experiments of the late 20th century and 21st century architecture. There are several researchers that tried to classify sustainable architecture according to its expression. The distinguished expression trends encompass such radical differences as eco-tech developments and vernacular place-based designs; the more recent classifications reflect the negative influence of abundant regulations, turning-back to nature inspired forms and integration with larger scale landscape and urban complexes. The overview of these trends reveals that they can successfully embody the characteristics of sustainability aesthetics.

References

1. **Throsby, D.** *Economic and culture,* Cambridge, UK; Cambridge University Press, 2001, 228 p.
2. **Hillegas, J.V.** Defining sustainability. 2010 [online]. *Sustainability History Project* [cited 02.07.2020]. https://sustainabilityhistory.org/defining-sustainability/
3. **Brown, M., Haselsteiner, E., Apró, D., Kopeva, D., Luca, E., Pulkkinen, K., Vula Rizvanolli, B.** Sustainability, restorative to regenerative. COST Action CA16114 RESTORE, Working Group One Report: Restorative Sustainability, 2018 [online, cited 03.03.2020]. https://www.eurestore.eu/wp-content/uploads/2018/04/Sustainability-Restorative-to-Regenerative.pdf
4. **Istiadji, A.D., Hardiman, G., Satwiko, P.** What is the sustainable method enough for our built environment? *IOP Conference Series: Earth and Environmental Science*, 213, 2018, pp. 1–10. https://doi.org/10.1088/1755-1315/213/1/012016
5. **Guy, S., Farmer, G.** Reinterpreting sustainable architecture: the place of technology. *Journal of Architectural Education,* Vol. 54, Issue 3, 2001, pp. 140–147. https://doi.org/10.1162/10464880152632451
6. **Berardi, U.** Clarifying the new interpretations of the concept of sustainable building. *Sustainable Cities and Society*, Vol. 8, 2013, pp. 72–78. https://doi.org/10.1016/j.scs.2013.01.008
7. **Cole, R. J.** Regenerative design and development: Current theory and practice. *Building Research & Information*, Vol. 40, Issue 1, 2012, pp. 1–6. https://doi.org/10.1080/09613218.2012.617516
8. **Wilkinson, S., Hajibandeh, M., Remoy, H.** Sustainable development. In: Noguchi M. (ed.) *ZEMCH: Toward the Delivery of Zero Energy Mass Custom Homes. Springer Tracts in Civil Engineering,* Springer, 2016, pp. 1–29. https://doi.org/10.1007/978-3-319-31967-4_1
9. **Chen, C.** CiteSpace II: detecting and visualizing emerging trends and transient patterns in scientific literature. *Journal of the American Society for Information Science and Technology*, Vol. 57, Issue 3, 2006, pp. 359–377. https://doi.org/10.1002/asi.20317
10. **Donovan, E.** An evolution of sustainable aesthetics. *Design to Thrive: PLEA 2017 Proceedings,* 2017, pp. 208–215.
11. **Finocchiaro, L., Wago, I. S.** Architectural design and aesthetics of Zero Emission Buildings: an analysis of perceived architectural qualities in the ZEB Living LAB in Trondheim. *Design to Thrive: PLEA 2017 Proceedings,* 2017, pp. 216–223.
12. **Čeněk, M.** Architecture: concept, form and aesthetics from the perspective of sustainability. *CESB 2013 PRAGUE - Central Europe Towards Sustainable Building 2013: Sustainable Building and Refurbishment for Next Generations*, 2013, pp. 523–526.
13. **Gan, S., Zhang, H.** The discussion of the concept of sustainable development of ecological architectural aesthetics. *Advanced Materials Research*, Vol. 598, 2012, pp. 8–11. https://doi.org/10.4028/www.scientific.net/AMR.598.8
14. **Dekay, M.** Five levels of sustainable design aesthetics. Perceiving and appreciating developmental complexity. *28th International PLEA Conference on Sustainable Architecture + Urban Design: Opportunities, Limits and Needs - Towards an Environmentally Responsible Architecture proceeding,* 2012, pp. 7–12.
15. **Bothwell, K.** The architecture of the passively tempered environment. In: Lee S. (ed.) *Aesthetics of sustainable architecture*. Rotterdam: 010 Publishers, 2011, pp. 66–78.
16. **Finocchicaro, L., Hestnes, A. G.** Symbiosis and Mimesis in the Built Environment. In: Lee S. (ed.) *Aesthetics of Sustainable Architecture*. 010 Publishers, Rotterdam, 2011, pp. 259 –271.
17. **Hill, G.** The aesthetics of architectural consumption. In: Lee S. (ed.) *Aesthetics of sustainable architecture.* Rotterdam: 010 Publishers, 2011, pp. 26 –40.
18. **Jauslin, D.** Landscape aesthetics for sustainable architecture. In: Lee S. (ed.) *Aesthetics of sustainable architecture.* Rotterdam: 010 Publishers, 2011, pp. 109–119.
19. **Knowles, R. L.** Solar aesthetic. In: Lee S. (ed.) *Aesthetics of sustainable architecture.* Rotterdam: 010 Publishers, 2011, pp. 50–65.
20. **Sauerbruch, M., Hutton, L.** What does sustainability look like? In: Lee S. (ed.) *Aesthetics of sustainable architecture*. Rotterdam: 010 Publishers, 2011, pp. 41–49.
21. **Levit, R.** Design's new catechism. In: Preston, S. C., Naginski E. (eds.) *The return to nature. Sustaining architecture in the face of sustainability. Routledge*, 2014, pp. 9–19.
22. **Sunikka-Blank, M.** The concept and aesthetics of sustainable building in Japan. In: Lee S. (ed.) *Aesthetics of sustainable architecture.* 010 Publishers, Rotterdam, 2011, pp. 186–197.
23. **Spirn, A.** The poetics of city and nature: towards a new aesthetic for urban design. *Landscape Journal*, Vol. 7, Issue 2, 1988, pp. 108–126. https://doi.org/10.3368/lj.7.2.108
24. **Sheppard, S. R. J.** Beyond visual resource management: emerging theories of an ecological aesthetic and visible stewardship. In: Sheppard, S.R.J., Harshaw, H. W. (eds.) *Forests and landscapes– linking ecology, sustainablility, and aesthetics.* New York, NY, CABI Publishing, 2001, pp. 149–172.
25. **Hemmati, M.** Aesthetics of sustainability. *The relation of aesthetics and environmental sustainability. MFNZFR, Vol. 35, Special Issue: Art, Nature, City,* 2016, pp. 82–89.
26. **Di Carlo, I.** *The Aesthetics of Sustainability. Systemic thinking and self-organization in the evolution of cities.* PhD thesis, University of Trento, IAAC, institute fro Advanced Architecture of Catalunya, Barcelona, Spain, The Bartlett, UCL, London, Uk, University of Innsbruck, Austria, 2016.
28. **Di Carlo, I.** Aesthetics as an adaptive system. An evolutionary approach on aesthetics and sustainable city design. In: I. Di Carlo (ed.), *The Aesthetic of Sustainability,* Monograph.it, 2013, pp. 376–377.
29. **Marchand, A., Walker, S., De Coninck, P.** The role of beauty for sustainability: a discussion on responsible consumption, aesthetics attitudes and product design. *WIT Transactions on Ecology and the Environment*, Vol. 99, 2006, pp. 371–380. https://doi.org/10.2495/RAV060371
30. **Kagan, S.** Aesthetics of sustainability: a transdisciplinary sensibility for transformative practices. *Transdisciplinary Journal of Engineering & Science*, Vol. 2, 2011, pp. 65–73. https://doi.org/10.22545/2011/00014
31. **Wines, J.** *Green Architecture.* Koln: Taschen, 2000, 240 p.
32. **Liu, Ch.** *Green architecture.* Liaoning Science & Technology Pub., 2011, 272 p.

33. **Jodidio, P.** *100 contemporary green buildings. Vol. 1–2,* Koln: Taschen, 2013, 696 p.
34. **Helmke, J.** Eco-visualization: aesthetics for sustainability. Urban Omnibus, 2013 [online, cited 02.07.2020]. https://urbanomnibus.net/2013/04/eco-visualization-aesthetics-for-sustainability/
35. **Goodbun, J.** Gregory Bateson's critical cybernetics and ecological aesthetics of dwelling. *Field*, Vol. 4, Issue 1, 2010, pp. 35–46.
36. **Štelbienė, A.** Architektūros kokybė. Etika, estetika ir tapatybė. *Architektūros kokybės kriterijai. Mokslo straipsnių rinkinys*, 2015, pp. 28–39.
37. **Kamicaityte-Virbasiene, J., Grazuleviciute-Vileniske, I.** Premises for development of sustainable architecture in urban environment. *Town Planning and Architecture*, Vol. 33, Issue 4, 2009, pp. 363–363.
38. CIB, Conseil International du Bâtiment. Towards sustainable and smart-eco buildings. Summary report on the EU-funded project smart-ECO buildings in the EU, Rotterdam, 2010 [online, cited 03.03.2020]. https://www.irbnet.de/daten/iconda/CIB18098.pdf
39. **Mačiulis, A.** Šiuolaikinės Lietuvos architektūros meninės raiškos tendencijos. Vilnius: Technika. Vilnius Gediminas Technical University, Doctoral Thesis, 2013, 197 p.
40. **Puglisi, L. P.** *New directions in contemporary architecture: evolutions and revolutions in building design since 1988*. New Jersey, U.S.: Willey, 2008. 240 p.
41. **Adrijauskas, A.** Klasikinės Vakarų metafizinės estetikos ir meno filosofijos transformacijos: neklasikinių principų sklaida. *Estetikos ir meno filosofijos transformacijos / sudarytojas Antanas Andrijauskas,* Vilnius: Kultūros, filosofijos ir meno institutas, 2005, pp. 12–71.
42. **Heymann, D.** An un-flushable urinal. *Places Journal*, June 2012. https://doi.org/10.22269/120607
43. **Briggs, D.** Aesthetic potentials in an open network inventory system. In: Lee S. (ed.) *Aesthetics of Sustainable Architecture.* Rotterdam: 010 Publishers, 2011, pp. 272–283.

Aurelija Daugėlaitė received degrees of Bachelor of Architecture in 2016, and Master of Arts in 2019 from Kaunas University of Technology.
She is currently a PHD student at the Faculty of Civil Engineering and Architecture of Kaunas University of Technology.
Her research interests cover sustainability, sustainable architecture, environmental ethics, and aesthetics of sustainable architecture.

Indrė Gražulevičiūtė–Vileniškė received degrees of Bachelor of Architecture in 2003 and Master of Land Management in 2005 from Kaunas University of Technology. In 2009 she received a degree of Doctor of technological sciences from Kaunas University of Technology.
She has been an Associated professor with the Faculty of Civil Engineering and Architecture of Kaunas University of Technology since 2012. Her current research interests are valuation and preservation of cultural heritage, management of rural-urban interface, and sustainable architecture.

Contact Data

Aurelija Daugėlaitė
Faculty of Civil Engineering and Architecture,
Kaunas University of Technology.
Address: Faculty of Civil Engineering and Architecture,
Kaunas University of Technology, 48 Studentu St., Kaunas, LT-51367, Lithuania
E-mail: aurelija.daugelaite@ktu.edu

Indrė Gražulevičiūtė–Vileniškė
Faculty of Civil Engineering and Architecture,
Kaunas University of Technology.
Address: Faculty of Civil Engineering and Architecture,
Kaunas University of Technology, 48 Studentu St., Kaunas, LT-51367, Lithuania
Tel.: +370 37 451546
E-mail: indre.grazuleviciute@ktu.lt