Int. J. Pure Appl. Sci. 9(2);369-380 (2023)

IJPAS
ijpas@munzur.edu.tr
ISSN: 2149-0910

Research article/Araştırma makalesi
DOI:10.29132/ijpas.1365407

Systematic Literature Review and Scientific Maps on Ecological Architecture and Eco-Architecture

Emine Banu Burkut[1]*, Murat Dal[2]
[1]*Konya Technical University, Department of Architecture, Konya Türkiye*
[2]*Munzur University, Faculty of Fine Arts, Design and Architecture, Department of Architecture, Tunceli, Türkiye*
**burkutbanu@gmail.com, muratdal@munzur.edu.tr*
Received date:25.09.2023, Accepted date:29.12.2023

Abstract

The purpose of this article is to examine systematic literature reviews and scientific maps on the subjects of Ecological architecture, eco-architecture, and ecological architectural design. The method of this research is bibliometric analysis, one of the quantitative research methods. The data of the research are publications in the Scopus database between 2000 and 2023. For the analysis, graphics from the Scopus database and the Biblioshiny software program were used. Research findings offer a comprehensive overview of theories, concepts, trends, and publications in the field of ecological architecture, eco-architecture, and ecological architectural design. Additionally, the concepts that stand out in the publications are ecology, sustainable architecture architectural design, environment, green building, design, energy efficiency, architecture design, green architecture, experimental simulation, sustainable design, landscape, nature, sustainable design, thermal design, architectural education, climate change, construction, ecological architecture design. The significance of this research lies in its provision of a conceptual foundation for future studies in the intersection of ecology and architecture. For future research, it is recommended to conduct studies using various databases such as Web of Science, ProQuest Dissertations & Theses Global, etc., at different intervals over the years.

Keywords: Ecological architecture, eco-architecture, ecological architectural design, bibliometric analysis, systematic literature review

Ekolojik Mimarlık ve Eko-Mimari Üzerine Sistematik Literatür Taraması ve Bilimsel Haritaları

Öz

Bu makalenin amacı Ekolojik mimari, eko-mimari, ekolojik mimari tasarım konularında sistematik literatür taraması ve bilimsel haritaları incelemektir. Bu araştırmanın yöntemi nicel araştırma yöntemlerinden biri olan bibliyometrik analizdir. Araştırmanın verileri Scopus veri tabanında 2000-2023 yılları arasında yapılan yayınlardır. Söz konusu analiz için Scopus veri tabanı ve Biblioshiny yazılım programının grafikleri kullanılmıştır. Araştırma bulguları ekolojik mimari, eko-mimari ve ekolojik mimari tasarım alanındaki teoriler, kavramlar, eğilimler ve yayınlara ilişkin kapsamlı içerik sunmaktadır. Ayrıca, yayınlarda öne çıkan kavramlar ise ekoloji, sürdürülebilir mimari mimari tasarım, çevre, yeşil bina, tasarım, enerji verimliliği, mimari tasarım, yeşil mimari, deneysel simülasyon, sürdürülebilir tasarım, peyzaj, doğa, sürdürülebilir tasarım, termal tasarım, mimari eğitim, iklim değişikliği, inşaat, ekolojik mimari tasarım. Bu araştırmanın alana katkısı ise ekoloji ve mimarlık üzerine gelecekteki araştırmalar için kavramsal bir temel sunmasıdır. Gelecekte yapılacak diğer araştırmalar için farklı veri tabanlarında (Web of Science, ProQuest Dissertations & Theses Global vb.) farklı yıl aralıklarında araştırma yapılması önerilebilir.

Anahtar Kelimeler: Ekolojik mimari, eko-mimari, ekolojik mimari tasarım, bibliyometrik analiz, sistematik literatür incelemesi

INTRODUCTION

The rapid increase in population, the unconscious overproduction of natural resources, the universal dimensions of the environmental crisis, and the impact of human activity first became the subject of the 1987 report of the World Commission on Environment and Development on Sustainable

Int. J. Pure Appl. Sci. 9(2);369-380 (2023)

IJPAS
ijpas@munzur.edu.tr
ISSN: 2149-0910

Research article
DOI:10.29132/ijpas.1365407

Development Strategies. In order to address this situation, which led to the development of ecological architecture, the field of architecture should prioritize healthy and environmentally friendly building design. The challenges posed by ecological architecture in sustainable building design are examined under important headings: sustainable design principles, economic architectural artificial environment design, building material selection, air conditioning systems, waste management, building shell design, building geometry, and space organization. Ecological architecture is the process of designing and producing buildings while considering all living and non-living elements within the ecosystem. Efforts are being made to minimize the impact of artificial environments on natural systems (Porteous, 2013; Tönük, 2001).

The necessity of preserving the ecological balance and using alternative resources instead of natural resources leads architects, designers, and investors to produce new ideas and take new measures, which accelerates the construction of buildings that take into account the principles of ecological sustainable design (Brebbia & Pulselli, 2014). Ecological architecture and interior design make use of natural materials. Ecological building design should prioritize environmental friendliness, adhere to sustainable principles, and promote a healthy ecological cycle while optimizing resource usage.

During the ecological architectural design process by the designer, it is necessary to consider ecological principles in detail in design, architecture and planning. These principles are alternative energy use in buildings (solar, wind, geothermal, biomass, biogas, biodiesel, etc.), reuse of wastewater, rainwater collection, use of composted fertilizer, use of environmentally friendly materials and renewable landscaping elements (Demet, 2003).

In this research, the publications that can be accessed from the literature research on ecological architecture, eco-architecture, and ecological architectural design are as follows: ecological architecture (Crowther, 1990; Lau, 2005; Uffelen, 2009; Kwak et al., 2009; Grupta, 2012; Schröpfer, 2012; Porteous, 2013; Muller, 2014; Brebbia & Pulselli, 2014). Also sustainable design (Williams, 2007), socio-environmental impact (Ibrahim, 2010), and additionally environmental strategies (Bielek & Bielek, 2012). Additionally, ecological buildings: new strategies for sustainable architecture (Lucas, 2021), influence of the green economy (Semenyuk, 2017), green roofs (Konyuhov et al., 2019), eco-architecture and the design of energy-efficient buildings (Semenyuk et al., 2018); sustainable mobility (Garcia, 2014), passive and active solar systems (Zareba, 2022), eco-architecture and revolution (Marangoni & Mucci, 2023), aesthetics artworks (Ardiani, 2022).

Also ecological architecture design method (Lan, 2011; Wu et al., 2011); biomimetic approaches (Krivenko et al., 2021); educating ecological architecture—ecological educational architecture (Costa Sontos et al., 2010); and science fiction, sustainability, and architecture design studio (Troiani, 2012). In this article, a systematic literature review and scientific mapping of ecological architecture and eco-architecture were conducted, and the analyses were evaluated.

Figure 1 Ecological Buildings (Lucas, 2021)

MATERIAL AND METHODS

This research is a systematic literature review and scientific mapping method. The systematic literature review is the process of collecting data in the Scopus database between August 15, 2023, and September 15, 2023. During the data collection process of the research, publications between 2000 and 2023 were included in the research, and publications from other years were excluded from the Scopus database.

Scopus database was searched with the words title-abs-key *("ecological architectural design")* or title-abs-key *("ecological architecture")* or title-abs-key (*"eco-architecture"*) or title-abs-key *("ecological architecture building"*) or title-abs-key (*"ecological architecture education"*)). The graphs visualized in the Scopus database after this search is as follows;

Int. J. Pure Appl. Sci. 9(2);369-380 (2023)

IJPAS
ijpas@munzur.edu.tr
ISSN: 2149-0910

Research article
DOI:10.29132/ijpas.1365407

documents by year, document by subject area, document by affiliation, and documents by country or territory.

In this research, we analyze images of Biblioshiny software created for bibliometric analysis and scientific mapping. Massimo Aria and Corrado Cuccurullo developed Bibliometrix software in 2017 (Aria & Cuccurullo, 2017). The analyses visualized in this article were created in Biblioshiny software: most relevant words, trend topics, word clouds, co-occurrence network analysis, multiple correspondence analysis, and factorial analysis/words by cluster visuals.

RESULTS AND DISCUSSION

A search in the Scopus database yielded 255 documents with the keywords title-abs-key ("ecological architectural design"), title-abs-key ("ecological architecture"), title-abs-key ("eco-architecture") or title-abs-key ("ecological architecture building") or title-abs-key ("ecological architecture education")) 255 documents results between 2000 and 2023. The research results were evaluated under two headings: firstly, the results from the Scopus database, and secondly, the results from scientific maps.

Results of Scopus Database

As seen as Figure 2 document by year (2000-2023) in the chart, it started to increase rapidly after 2009 and was at its peak with 28 publications in 2011. There are also 24 publications in 2021 and 20 publications in 2021 in the Scopus database (Figure 2).

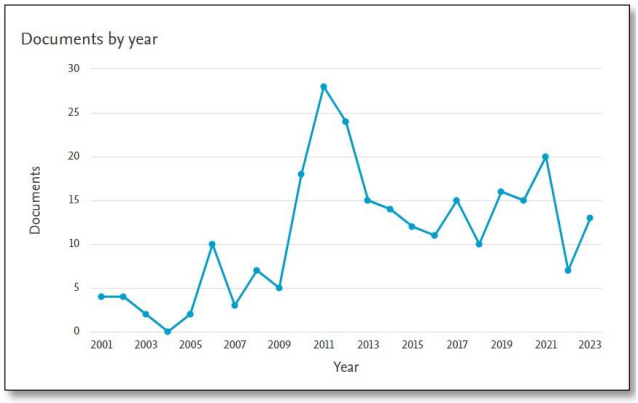

Figure 2 Documents by year (2000-2023)
(Copyright © Elsevier. All rights reserved. Scopus®)

As seen in Figure 3, documents by subject area are: "Engineering" 141 document (31,5%), "Environmental Science" 76 document (17,0%), "Social Sciences" 56 document (12,5%), "Arts and Humanities" 34 document (7,6%), and "Computer Science" 34 document (7,6%). Additionally, "Earth and Planetary Sciences" 24 document (5,4%), "Energy" 21 document (4,7%), "Materials Science" 14 document (3,1%), "Agricultural and Biological Sciences" 13 document (2,9%), and "Mathematics" 8 document (1,8%) (Figure 3).

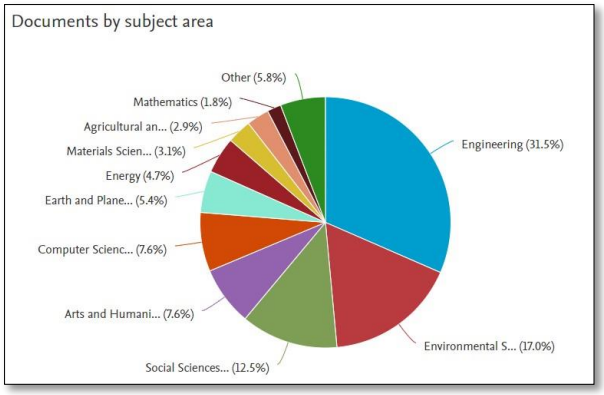

Figure 3 Documents by subject area
(Copyright © Elsevier. All rights reserved. Scopus®)

As seen in Figure 4, the following documents show affiliation: "Xi'an University of Architecture and Technology" (7 documents), "Chang'an University" (5 documents), "Polytechnic University of Madrid" (4 documents), "Bina Nusantara University" (4 documents), and "L.N. Gumilyov Eurasian National University" (4 documents). Additionally, "Southeast University" has 3 documents, "Krakow University of Technology" has 3 documents, "Seoul National University" has 3 documents, and "Wuhan University of Technology" has 3 documents (Figure 4).

IJPAS
ijpas@munzur.edu.tr
ISSN: 2149-0910

Research article
DOI:10.29132/ijpas.1365407

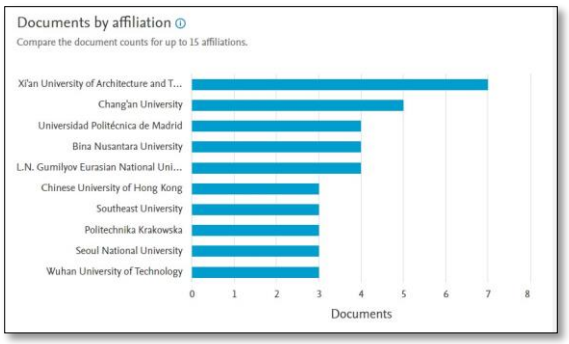

Figure 4 Documents by affiliation
(Copyright © Elsevier. All rights reserved. Scopus®)

As seen in Figure 5, documents by country or territory: China has 78 documents, the United Kingdom has 21 documents, Indonesia has 13 documents, South Korea has 12 documents, the United States has 11 documents, the Russian Federation and Turkey have 10 documents, Italy has 9 documents, and Spain has 8 documents (Figure 5).

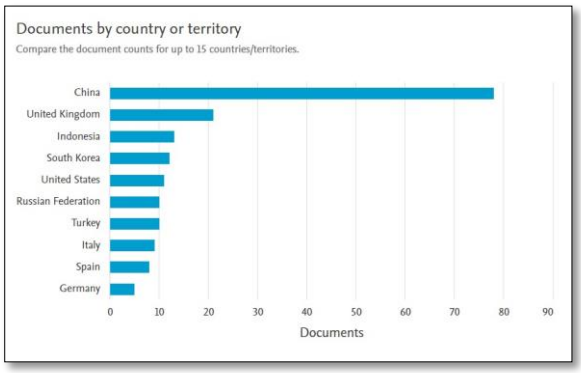

Figure 5 Documents by country or territory
(Copyright © Elsevier. All rights reserved. Scopus®)

Moreover, filter by keyword number of results: “ecological architecture” (116), “ecology” (88), “architecture” (86), “architectural design” (62), “sustainable development” (59), “design” (30), “sustainability” (24), “eco-architecture” (21), “civil engineering” (18), “energy efficiency” (17), “urban planning” (16), “planning” (16), “building materials” (16), “housing” (15), “building” (15), “energy conservation” (14), and “environmental protection” (12) in the Scopus database.

Results of Scientifics Maps

In this phase of the research, we utilized Biblioshiny software to generate the most relevant words (Figure 6), trend topics (Figure 7), co-occurrence network analysis, multiple correspondence analysis (Figure 8), and factorial analysis/word by cluster (Figure 9). As shown in Figure 6, the most pertinent words are listed based on their occurrence in the Scopus database. The words "ecological architecture" (59), "eco-architecture" (21), "sustainable development" (19), "sustainability" (13), and "architecture" (11) are shown in Figure 6.

Moreover, the figure illustrates the frequency of keywords in the field of architecture and ecology, with "ecology" (10), "sustainable architecture" (8), "architectural design" (6), "environment" (6), "green building" (6), "design" (5), "energy efficiency" (5), "architecture design" (5). Additionally "green architecture" (4), "experimental simulation" (4), "sustainable design" (4), "landscape" (4), "nature" (4), "thermal design" (4), "architectural education" (3), "climate change" (3), "construction" (3), and "ecological architecture design" being the most frequently occurring terms. Figure 7 shows a word cloud map of ecological architecture research created by the Bibliosiny software program. According to the word cloud, the terms "ecological architecture," "architecture," "ecology," "architectural design," and "sustainable development".

IJPAS
ijpas@munzur.edu.tr
ISSN: 2149-0910

Research article
DOI:10.29132/ijpas.1365407

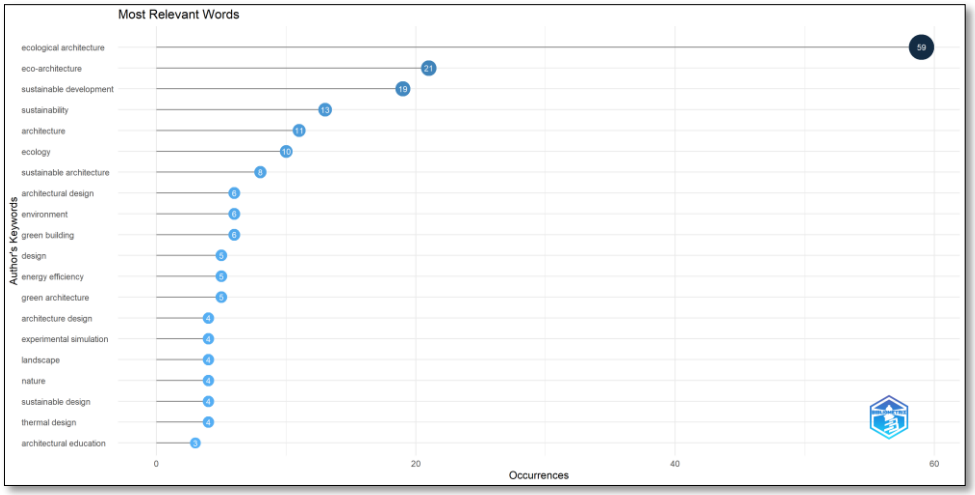

Figure 6 Most relevant words (Created by authors using R Studio- Bibliometrix Biblioshiny software)

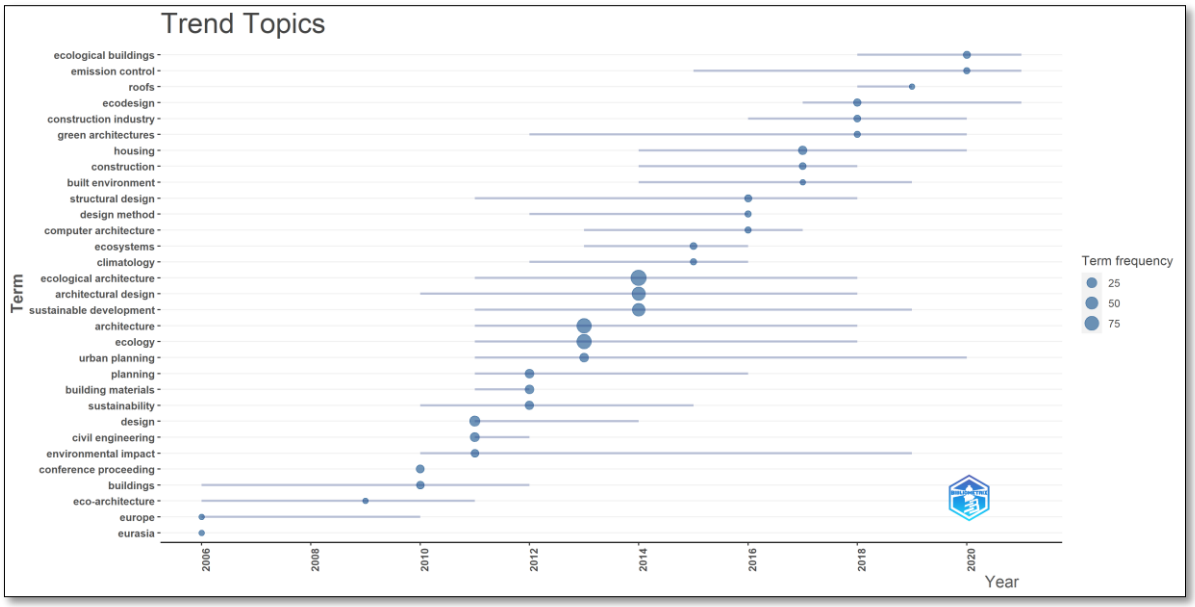

Figure 7 Trend topics (Created by authors using R Studio- Bibliometrix Biblioshiny software)

Int. J. Pure Appl. Sci. 9(2);369-380 (2023)

IJPAS
ijpas@munzur.edu.tr
ISSN: 2149-0910

Research article
DOI:10.29132/ijpas.1365407

Table 1 *Results of trend topics analysis*

	item	freq	year_q1	year_med	year_q3		item	freq	year_q1	year_med	year_q3
1	ecological architecture	99	2011	2014	2018	17	structural design	8	2011	2016	2018
2	architecture	81	2011	2013	2018	18	ecological buildings	8	2018	2020	2021
3	ecology	80	2011	2013	2018	19	ecosystems	7	2013	2015	2016
4	architectural design	64	2010	2014	2018	20	construction	7	2014	2017	2018
5	sustainable development	56	2011	2014	2019	21	construction industry	7	2016	2018	2020
6	design	26	2011	2011	2014	22	climatology	6	2012	2015	2016
7	civil engineering	18	2011	2011	2012	23	computer architecture	6	2013	2016	2017
8	building materials	16	2011	2012	2012	24	design method	6	2012	2016	2016
9	planning	16	2011	2012	2016	25	green architectures	6	2012	2018	2020
10	urban planning	16	2011	2013	2020	26	emission control	6	2015	2020	2021
11	sustainability	15	2010	2012	2015	27	Eurasia	5	2006	2006	2006
12	housing	15	2014	2017	2020	28	Europe	5	2006	2006	2010
13	conference proceeding	12	2010	2010	2010	29	eco-architecture	5	2006	2009	2011
14	buildings	10	2006	2010	2012	30	built environment	5	2014	2017	2019
15	environmental impact	10	2010	2011	2019	31	roofs	5	2018	2019	2019
16	eco design	9	2017	2018	2021						

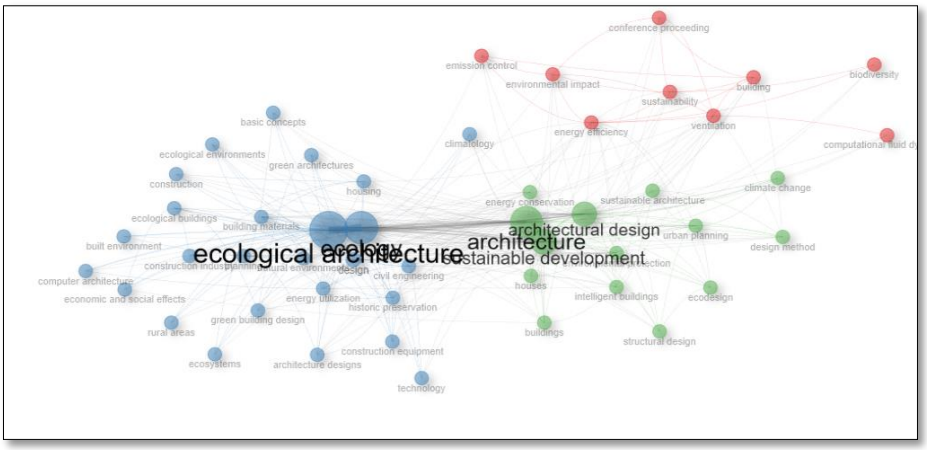

Figure 8 Co-occurrence network analysis

IJPAS
ijpas@munzur.edu.tr
ISSN: 2149-0910

Research article
DOI:10.29132/ijpas.1365407

Table 2 *Results of co-occurrence network analysis created by authors using Biblioshiny software*

Node	Cluster	Betweenness	Closeness	PageRank
energy efficiency	1	9,747137449	0,013157895	0,023619047
sustainability	1	2,661973197	0,011764706	0,015540089
building	1	1,010748967	0,011494253	0,011877353
conference proceeding	1	0,098039216	0,010989011	0,008949448
environmental impact	1	0,712724614	0,011494253	0,011036683
ventilation	1	2,750454858	0,012195122	0,013417923
emission control	1	0,132993707	0,011111111	0,006966254
biodiversity	1	0	0,010638298	0,005756445
computational fluid dynamics	1	0	0,010869565	0,005183503
ecological architecture	2	260,0710949	0,019230769	0,118590206
ecology	2	136,543863	0,01754386	0,10072709
design	2	6,915798388	0,013513514	0,030266038
civil engineering	2	2,443172667	0,012345679	0,026082943
building materials	2	1,061599412	0,012195122	0,023248113
planning	2	2,439799596	0,012345679	0,024206338
housing	2	0,485444071	0,011627907	0,012986181
energy utilization	2	0,683004444	0,012048193	0,015157453
architecture designs	2	0,020408163	0,011494253	0,011244698
ecological buildings	2	0,58423536	0,011627907	0,012361901
ecological environments	2	0	0,011235955	0,010818239
historic preservation	2	1,533394269	0,0125	0,015697559
rural areas	2	0	0,010989011	0,007961742
construction	2	0	0,011111111	0,007518604
construction industry	2	0,216303355	0,011494253	0,010401579
ecosystems	2	0	0,010869565	0,006698656

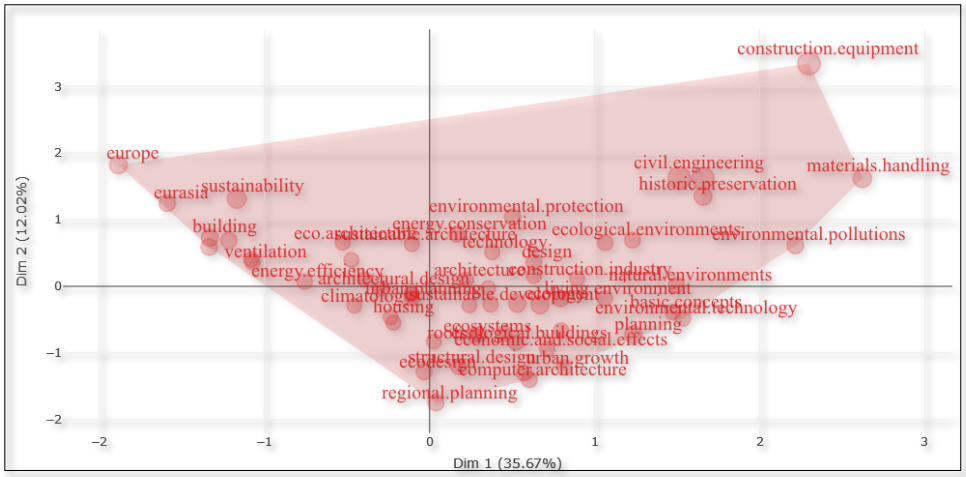

Figure 9 Multiple correspondence analyses

IJPAS
ijpas@munzur.edu.tr
ISSN: 2149-0910

Research article
DOI:10.29132/ijpas.1365407

Table 3 *Factorial analysis/Word by cluster*

Words	Dim.1	Dim.2	cluster	Words	Dim.1	Dim.2	cluster
ecological architecture	0,53	-0,26	1	ecological buildings	0,52	-0,84	1
architecture	0,22	0,1	1	ecological environments	1,23	0,69	1
ecology	0,67	-0,28	1	historic preservation	1,66	1,35	1
architectural design	-0,29	-0,03	1	intelligent buildings	-0,11	-0,12	1
sustainable development	0,37	-0,27	1	rural areas	0,46	-0,71	1
design	0,63	0,37	1	structural design	0,18	-1,2	1
energy efficiency	-0,76	0,07	1	sustainable architecture	-0,11	0,63	1
civil engineering	1,51	1,63	1	construction	-0,22	-0,55	1
building materials	1,66	1,62	1	construction industry	0,89	0,11	1
planning	1,23	-0,73	1	ecosystems	0,27	-0,73	1
urban planning	-0,11	-0,18	1	natural environments	1,5	0,02	1
housing	-0,24	-0,46	1	climatology	-0,46	-0,29	1
sustainability	-1,17	1,31	1	computer architecture	0,6	-1,4	1
building	-1,33	0,73	1	design method	-0,39	0,11	1
energy conservation	0,16	0,78	1	economic and social effects	0,71	-0,94	1
environmental protection	0,5	1,04	1	emission control	-1,08	0,41	1
conference proceeding	-1,34	0,59	1	green architectures	0,3	-0,72	1
buildings	0,36	-0,03	1	green building design	0,63	0,16	1
energy utilization	0,79	-0,19	1	technology	0,38	0,51	1
environmental impact	-1,22	0,69	1	basic concepts	1,47	-0,39	1
eco design	-0,03	-1,28	1	built environment	0,57	-1,3	1
houses	0,24	-0,29	1	construction equipment	2,3	3,35	1
ventilation	-1,07	0,37	1	eco architecture	-0,53	0,66	1
architecture designs	1,06	0,65	1	environmental management	-0,11	-0,1	1
climate change	-0,47	0,4	1	environmental pollutions	2,22	0,61	1

Int. J. Pure Appl. Sci. 9(2);369-380 (2023)

IJPAS
ijpas@munzur.edu.tr
ISSN: 2149-0910

Research article
DOI:10.29132/ijpas.1365407

Figure 10 Word cloud map of ecological architecture researchs'

(Created by authors using R Studio- Bibliometrix Biblioshiny software)

In this research, comprehensive concepts, frequencies, and cluster analyses related to ecological architecture have been created. These analyses are detailed in figures and tables. Trend topics (Figure 7) and results of trend topics analysis (Table 1), co-occurrence network analysis (Figure 8), and additionally results of co-occurrence network analysis created by authors using Biblioshiny software (Table 2), multiple correspondence analyses (Figure 9) and factorial analysis/word by cluster (Table 3). The results of this analysis are important in terms of contributing to the field. It contains important data for researchers in the field of ecological architecture and eco-architecture to understand the concept, theory, and density.

In this research, the publications related to ecological architecture that can be accessed are: Setiawan, 2020; Chen, 2021; Hsiao, 2021; Sipahi and Kulözü-Uzunboy, 2021; Lavrentyev, 2022; Liao et al., 2022; Olga et al., 2022; El-Hitami et al., 2023; Zhang, 2023; Pratiwii 2023; Durak and Ayyıldız, 2023 in the Scopus database. Additionally, publications in the Scopus database are limited to Turkey: Canan et al., 2006; Eyüce, 2007; Sarı et al., 2011; Beyhan and Erbas, 2013; Bicer, 2016; Danacı and Kavas, 2016 in the Scopus database.

A thorough examination of these publications, comparing their aims, methods and findings provides an important literature for clarifying the issue of ecological architecture and for future research. In recent years, eco-architecture, ecological architecture. The number of researches on green buildings, sustainable building and sustainable cities, sustainability in interior design, sustainable furniture and interior architecture, ecological materials in interiors is increasing. The increase in the number of these publications and more research in the field is a positive development.

CONCLUSION

In architecture, it is necessary to create a healthy combination of the natural environment, society, and artificial environment. For this purpose, it is recommended to develop ecological awareness and encourage practices in this field. In addition, architectural applications should be shaped in line with ecological principles. Research conducted in line with these recommendations is important, and they represent the contribution of this study to the field. This article is to examine a systematic literature review and scientific maps on the subjects of ecological architecture, eco-architecture, and ecological architectural design. The method of this research is bibliometric analysis, one of the quantitative research methods. The Scopus database had results with the words ecological architectural design, ecological architecture, eco-architecture, ecological architecture building, and ecological architecture education in 255 documents between 2000 and 2023. The results of the research were evaluated under two headings: firstly, the results of

IJPAS
ijpas@munzur.edu.tr
ISSN: 2149-0910

Research article
DOI:10.29132/ijpas.1365407

the Scopus database, and secondly, the results of scientific maps.

Promote energy efficiency, environmental awareness and responsibility towards the environment by incorporating ecological architecture and eco-architectural and interior practices into design. A better, sustainable future should be built by following sustainable design principles and reducing negative environmental impacts. Appropriate architectural and interior solutions should be designed by the team in collaboration with architects, employers and managers, maintaining a good balance of cost, environmental, social and human benefits. The originality of this article and its contribution to the fields of architecture, design, and planning are important in terms of contributing to ecological architecture research, undergraduate and graduate education courses and curricula, seeing the trend of existing studies, and providing ideas about concepts. Additionally, although bibliometric analysis studies in the field of architecture have increased in other scientific fields in recent years, they are limited in number in the field of architecture. This study will increase the visibility of the scientific mapping method. As a recommendation to researchers, the scientific mapping method SciMat, Citespace, or VOSviewer software can be used.

Finally, the concepts that stand out in the publications are ecology, sustainable architecture, architectural design, environment, green building, design, energy efficiency, architecture design, green architecture, experimental simulation, sustainable design, landscape, nature, sustainable design, thermal design, architectural education, climate change, construction, and ecological architecture design. It provides a conceptual foundation for future research in the fields of ecology and architecture. It is advisable to consider conducting research in alternative databases at various intervals over the years.

CONFLICT OF INTEREST

The authors report no conflict of interest relevant to this article.

RESEARCH AND PUBLICATION ETHICS STATEMENT

The authors declare that this study complies with research and publication ethics.

REFERENCES

Aria, M. and Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. Journal of informetrics, 11(4), 959-975.

Ardiani, Y. M. (2022). Ecology and Architecture in the art of making an Aesthetics Artwork. In IOP Conference Series: Earth and Environmental Science (Vol. 998, No. 1, p. 012035). IOP Publishing.

Beyhan, F. and Erbas, M. (2013). A Study on Green Roofs with the Examples from the World and Turkey. Gazi University Journal of Science, 26(2), 303-318.

Bielek, B. and Bielek, M. (2012). Environmental Strategies for Design of Sustainable Buildings in Technique of Green Eco-Architecture. Journal of Civil Engineering and Architecture, 6(7), 892.

Brebbia, C. A. and Pulselli, R. (Eds.). (2014). Eco-Architecture V: Harmonisation between architecture and nature (Vol. 142). Wit Press.

Bicer, Z. O. P. (2016). Assessing the economic contribution of ecological architecture case study: Kayseri Kadir has stadium. Open House International, 41(1), 107-111.

Canan, F., Korumaz, M. and Güleç, S. A. (2006). Vision evaluation of the students in architecture about sustainable architecture in a local context in Konya/Turkey. In Proceedings of the 23rd International Conference on Passive and Low Energy Architecture, PLEA (pp. 11785-11791).

Chen, N. (2021). Research on ecological building and sustainable building development. Fresenius Environmental Bulletin, 30(3), 2998-3004.

Costa Santos, Sandra, Klein, Gerald and Despang, Martin (2010) Educating ecological architecture - ecological educational architecture. In: Eco-Architecture III. WIT Transactions on Ecology and the Environment, 3 . WIT Press, Southampton, UK, pp. 235-244.

Crowther, R. L., (1990). "Ecologic Architecture", Butterworth Architecture Press, U.S.A.

Danaci, H. M. and Kavas, K. R. (2016). Is your building, which is designed according to "Ecological Architecture", really ecological, Ecology Environment and Conservation. 22 (1). pp. (47-51).

Durak, Ş. and Ayyıldız, S. (2023). A model trial for the ecological evaluation of the traditional rural houses: Case of Yalova. Journal of the Faculty of Engineering and Architecture of Gazi University, 38(1), 85-102.

El-Hitami, H., Mahall, M. and Serbest, A. (2023). An ecology of space. Architectural design for transboundary relationships. AGATHÓN| International Journal of Architecture, Art and Design, 13, 153-164.

Eyüce, A. (2007). Learning from the vernacular: sustainable planning and design. Open House International, 32(4), 9-22.

IJPAS
ijpas@munzur.edu.tr
ISSN: 2149-0910

Research article
DOI:10.29132/ijpas.1365407

Garcia, D. A., Cumo, F., Giustini, F., Pennacchia, E. and Fogheri, A. M. (2014). Eco-architecture and sustainable mobility: An integrated approach in Ladispoli town. WIT Transactions on the Built Environment, 142, 59-68.

Gupta, V. (2012). ECO Architecture. Architecture+ Design, 29(1), 112.

Hsiao, J. S., Perng, Y. H. and Shih, S. G. (2021). Discussion of critical factors in sustainably ecological architecture design. Journal of environmental protection and ecology, 22(1), 227-235.

Ibrahim, I. (2010). Socio environmental impact in eco-architecture. WIT Transactions on Ecology and the Environment, 128, 185-195.

Konyuhov, V. Y., Gladkih, A. M., Galyautdinov, I. I. and Kiseleva, T. Y. (2019). Ecological architecture: The green roofs. In IOP Conference Series: Earth and Environmental Science (Vol. 350, No. 1, p. 012035). IOP Publishing.

Krivenko, O., Pylypchuk, O., Avdieieva, N., Avdieieva, M. and Bieber, S. (2021, May). Biomimetic approaches to color formation in ecological architecture. In IOP Conference Series: Materials Science and Engineering (Vol. 1150, No. 1, p. 012007). IOP Publishing.

Kwak, M. J., Hong, Y. S. and Cho, N. W. (2009). Eco-architecture analysis for end-of-life decision making. International Journal of Production Research, 47(22), 6233-6259.

Lan, M. (2011). Create a harmonious environment together of ecological architecture design method. Procedia Environmental Sciences, 10, 1774-1780.

Lau, P. (2005). Eco Architecture. Green Building Design: Experiences in Hong Kong and Shanghai, 73.

Lavrentyev, A., Burganova, M. and Fusu, L. (2022, October). Application of foresight technologies: On the example of development of actual ecological architecture. In AIP Conference Proceedings (Vol. 2657, No. 1). AIP Publishing.

Liao, C. W., Lin, J. H. and Chen, T. W. (2022). Research on a Framework for Sustainable Campus Eco-Architecture Selection: Taking a Taiwan High School as an Example. Sustainability, 14(10), 6265.

Lucas, D. (2021). Ecological buildings: new strategies for sustainable architecture. Braun Publishing.

Marangoni, M. and Mucci, M. (2023). Eco-architecture and Revolution: A critical review of the relationship between sustainability and architecture. OFFICINA* Journal, (40), 46-53.

Muller, B. (2014). Ecology and the architectural imagination. Routledge.

Olga, S., Zhandarbek, M., Temirkhan, Z. O., Khalil, M., Azamat, D., Kaldybay, A. and Makhabbat, K. (2022). Ecological Architecture in the Steppe Zone of Northern Kazakhstan. In International Conference on Energy Engineering and Environmental Engineering (pp. 297-307). Cham: Springer International Publishing.

Porteous, C. (2013). The new eco-architecture: alternatives from the modern movement. Taylor & Francis.

Pratiwi, E. I., Sudikno, A. and Kusdiwanggo, S. (2023). Ecological Rural Expressions of Eko Prawoto's Tectonic Architecture to Create Modern House Sustainability. In IOP Conference Series: Earth and Environmental Science (Vol. 1169, No. 1, p. 012051). IOP Publishing.

Sari, R. M., Sen, D. E. and Sagsöz, A. (2011). Reflection of Ecological Design Principles in the Example of Mass Housing in Turkey. European Journal of Scientific Research, 48(3), 381-398.

Schröpfer, T. (2012). Ecological urban architecture: qualitative approaches to sustainability. Walter de Gruyter.

Semenyuk, O., Abdrashitova, T., Beloussova, E., Nechay, N., Listkov, V., Kurbatova, V. and Niyazbekova, S. (2018). The influence of ecology and economic factors on eco-architecture and the design of energy efficient buildings. World Transactions on Engineering and Technology Education, 16(2), 186-192.

Semenyuk, O., Sadykova, S., Ernar, A., Beloussova, E., Nechay, N., Listkov, V. and Jamankulova, B. (2017). The influence of the green economy on the development of eco-architecture. World Trans. on Engng. And Technol. Educ, 15(4), 349-354.

Setiawan, D. (2020). Designing co-living housing with green and ecology architecture concept. In IOP Conference Series: Earth and Environmental Science (Vol. 426, No. 1, p. 012077). IOP Publishing.

Sipahi, S. and Kulözü-Uzunboy, N. (2021). A study on reducing the carbon footprint of architectural buildings based on their materials under the guidance of eco-design strategies. Clean Technologies and Environmental Policy, 23, 991-1005.

Tönük, S. (2001). Bina tasarımında ekoloji. Yıldız Teknik Üniversitesi Basım-Yayın Merkezi, İstanbul.

Troiani, I. (2012). Sci-fi Eco-Architecture: science fiction, sustainability and design studio. arq: Architectural Research Quarterly, 16(4), 313-324.

Uffelen, C. V. (2009). Ecological Architecture. Architecture in Focus Series. Braun Publishing.

Williams, D. E. (2007). Sustainable design: ecology, architecture, and planning. John Wiley & Sons.

Wu, Y. C., Yang, A. S., Tseng, L. Y. and Liu, C. L. (2011). Myth of ecological architecture designs: Comparison between design concept and computational analysis results of natural-ventilation for Tjibaou Cultural Center in New Caledonia. Energy and buildings, 43(10), 2788-2797.

Zareba, A., Krzeminska, A., Kozik, R., Adynkiewicz-Piragas, M. and Kristiánová, K. (2022). Passive and

IJPAS
ijpas@munzur.edu.tr
ISSN: 2149-0910

Research article
DOI:10.29132/ijpas.1365407

Active Solar Systems in Eco-Architecture and Eco-Urban Planning. Applied Sciences, 12(6), 3095.

Zhang,Y.(2023).Application of ecological architecture in architectural design based on information technology integration. Applied Mathematics and Nonlinear Sciences,0(0) https://doi.org/10.2478/amns.2023.1.00327