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Exploring Covid-19 Research in the Built Environment Literature: A Bibliometric Analysis

*Dr. Evren ÜLKERYILDIZ

Akdeniz University, Faculty of Architecture, Department of Architecture, Antalya, Turkey

E-mail: evrenulkeryildizakdeniz@gmail.com

Abstract

The disaster of “Covid-19 pandemic” which has been introducing various radical changes on the lifestyle of people such as (1) the usage of urban spaces, (2) spatial problems, (3) the transformation of shared spaces and (4) working practices. These radical changes have been receiving an overwhelming interest from scholars from various disciplines since SARS-CoV-2 corona (i.e., Covid 19) virus set a global pandemic. As a result of this overwhelming interest, a rich but a fragment literature prevails on the radical changes caused by Covid 19 pandemic in built environment studies. The research presented herein explores this rich but fragmented literature on the effects of Covid-19 pandemic by adopting a systematic research design strategy namely bibliometric analysis. Bibliometric analysis is a research approach which enables to scholars to map the evolution of a concept, a research theme, a research stream, or domain. It uses scholarly data to identify the publication patterns based on authors, research subjects, keywords, geographic locations, time, and source type. A bibliometric analysis of the concept of Covid-19 pandemic presented herein is a timely response to the maturity level the research on the radical changes caused by Covid 19 evolved. The research presented herein offers bibliometric analysis of built environment studies on the disaster of Covid-19 based on 843 scholarly papers published between years 2020 and 2022. The research results reveal that the most commonly used research keywords or subject terms used in these scholarly published scholarly papers include epidemiology, risk assessment, aesthetic values, human activity, construction projects. It is also observed that research studies predominantly driven by two countries namely US and China. The results of bibliometric analysis also reveal that the main theme of the radical changes caused by Covid-19 pandemic includes housing, spatial, reorganization, neighborhood issues, city planning, and sustainable development and working practices. It is also discovered that the spatial reorganization response of countries to Covid 19 pandemic to varies from country to country mainly due to the regional characteristics of the countries.

Keywords: Covid-19, pandemic, spatial reorganization, working conditions bibliometric analysis.

1. Introduction

The rapid spread of the Covid-19 pandemic in 2020 has interrupted and transformed our daily life routines and in turn it has profound impact on the built environment. Covid-19 pandemic has unpredictably changed not only the built environment but also our practices and activities to conceptualize, design and construct it. A wide range of our daily practices has been sharply interrupted, constrained or/and transformed beyond our imaginations. The interruptions, restrictions and transformations observed in our daily practices obviously captured the central agenda of the built environment researchers, like any other researchers. The term “built environment” is a broad concept and in turn a difficult concept to define. It refers “to human-made structures (e.g., urban, and rural design characteristics, recreational structures) that may facilitate or impede an individual’s ability to be physically active access to the existing built environment (Amen, 2021; Aziz Amen, 2022; Amen et al., 2023; Amen & Nia, 2020) has been taken under control all over the world, and measures have been taken for social and economic life by transforming the built environment with short-term solutions” (Gray et al. 2012). It is clear that from this definition that the boundaries of research in “the built environment” is difficult to define. Yet the complex interplay of activities and entities expressed in this definition should be holistically understood and analyze. Failing to appreciate the subtle interplay of these activities and entities can significantly slows down scientific progress in the built environment research with respect to the Covid-19 spread.

Wolf (2016) argues that infectious diseases are not the main reason why we are constrained and/or forces to transform our daily life in context the built environment but it is the subtle operation of social and spatial inequalities in access to housing, health, education, economic and other resources. A brief review of the current state of the built environment research reveals that spatial, social, and economic inequalities, transformation of values with regarding the built environment, nature of human activity become more visible especially during major pandemics. With a similar foresight, Corburn (2004) points out that there is a clear link between built environment and public health issues and points out that this relationship becomes more evident under conditions of the major pandemics. However, the link between the built environment and major infectious diseases such Covid - 19 has rarely been studied before Covid-19 pandemic (e.g., Alirol, Getaz, Stoll, Chappuis, & Loutan, 2011; Matthew & McDonald, 2006). But following the Covid - 19 pandemic, analysing and identifying the relationship between the built environment and

the Covid - 19 outbreak have become a worldwide research priority (e.g., Amerio et al., 2020; Frumkin, 2021; Megahed & Ghoneim, 2020; Pinheiro & Luís, 2020; Rojas-Rueda & Morales-Zamora, 2021).

Pinheiro and Luís (2020) argue that there has been an increase in the number of publications related to Covid-19 on Web of Science (WoS), and so many references can be found on Science Direct, but less than 1% of them relate to the built environment in 2020. The primary objective of the analyzed research studies in past appears to be on the examination of spatial-temporal variations of Covid-19 in different contexts (Liu, Liu, & Guan, 2021). The research studies reports the association between the built environment and Covid - 19 pandemic based on variables such as population density (Carozzi, Provenzano, & Roth, 2020; Hamidi, Sabouri, & Ewing, 2020), housing (Amerio et al., 2020; Rogers & Power, 2020), social and economic issues (Andersen, Harden, Sugg, Runkle, & Lundquist, 2021).

Previous research studies on Covid-19 based on spatial analysis are precious for public health measures. Additionally some researches indicate that social isolation and distancing are important for community responses which provides people to have safe access and secure housing (Rogers & Power, 2020). Furthermore, it reveals the necessity of comprehensive transformations that will ensure spatial justice for all users rather than temporary solutions in the design of the post-pandemic built-environment. For this reason, each situation should be considered, from subjective/local suggestions to spatial problems arising from the pandemic to consequences that are likely to bring a more inclusive and holistic approach to the built environment from an objective/global perspective. However, this requires a detailed analysis of every issue discussed in the relevant literature on the Covid -19 pandemic related to the built environment.

The worldwide spread of Covid-19 has resulted in numerous research studies which focus on the identifying the impact of Covid-19 pandemic on the built environment. It is clear that built environment does not have a universal practices, organizations, forms or structures. Therefore, the impact the Covid-19 pandemic and action plans to mitigate its negative outcomes have not been purely identical or generic on contrary they should be context dependent. Various analytical lenses should be used to explore the built environments because the built environments are produced and shaped at different social, political, biological, economic domains and scales. The challenges presented pandemics life Covid-19 can only be address by adopting multiple and different frameworks (Wolf, 2016). Furthermore, the built environment in different parts of the world is affected differently by climatic conditions, life expectancies, water infrastructures, legal regimes, transnational mobility, financial resources, population density, health beliefs and practices, development plans and governance structures (Wolf, 2016).

A critical analysis of the Covid-19 pandemic and built environment research can provide important insights on how the built environment research is positioning itself and developmental trajectory, in particular, sensitivity to local context and the presence of pluralist approach, how the diverse research perspective of the built environment responding to the multiple, complex and highly localized nature of Covid-19.

Analyzing Covid-19 research studies related to the built environment requires an analytical method that fits its purposes. In this study, bibliometric analysis method has been used to examine built environment factors related with the pandemic. Bibliometric analysis is a research approach which enables to scholars to map the evolution of a concept, a research theme, a research stream, or domain. It uses scholarly data to identify the publication patterns based on authors, research subjects, keywords, geographic locations, time, and source type (Ellegaard & Wallin, 2015).

2. Research Methodology

The objective research presented herein is to conduct a bibliometric analysis on the Covid 19 pandemic in the built environment. The search for the relevant articles was performed at the Scopus database. The search yielded 843 articles published between 2020 and 2022. The search results were analyzed by using bibliometric analysis software (VOS viewer). The research presented herein uses descriptive and quantitative approach to explore the response of built environment research to Covid 19 pandemic and trace the trajectory of emerging research field. It adopts bibliometric analysis method based on articles indexed at Scopus database. The bibliometric analysis method used in the research presented herein was designed in the light of guidelines recommended by Prado et al. (2016). The research design adopted herein includes five main stages: (1) research operation, (2) search procedures, (3) selection procedures, (4) data adequacy and (5) scientific production analysis (Figure 1). The scientific production analysis, Stage 5, is the core bibliometric analysis and yields results in two categories: (1) performance analysis and (2) scientific trajectory mapping. The performance analysis in bibliometric analysis explores the *contributions* of research constituents, whereas scientific trajectory mapping focuses on the *relationships* between research constituents (Donthu et al., 2021). The Boolean operators “AND” and “OR” were used to identify the relevant articles (Figure 2). The search in the Scopus database was performed through topics including title, keywords and abstract. The topics used in this search process includes: Covid-19, construction industry, architectural and design. Four search filters were also applied: (1) the search will be limited to articles, only; (2) the search time will comprise all the years; (3) the search will be performed in only engineering, social, business, energy, arts, economy, and health

subject areas; and (4) the search will be conducted in English. The search on Scopus database was performed in July 2022.

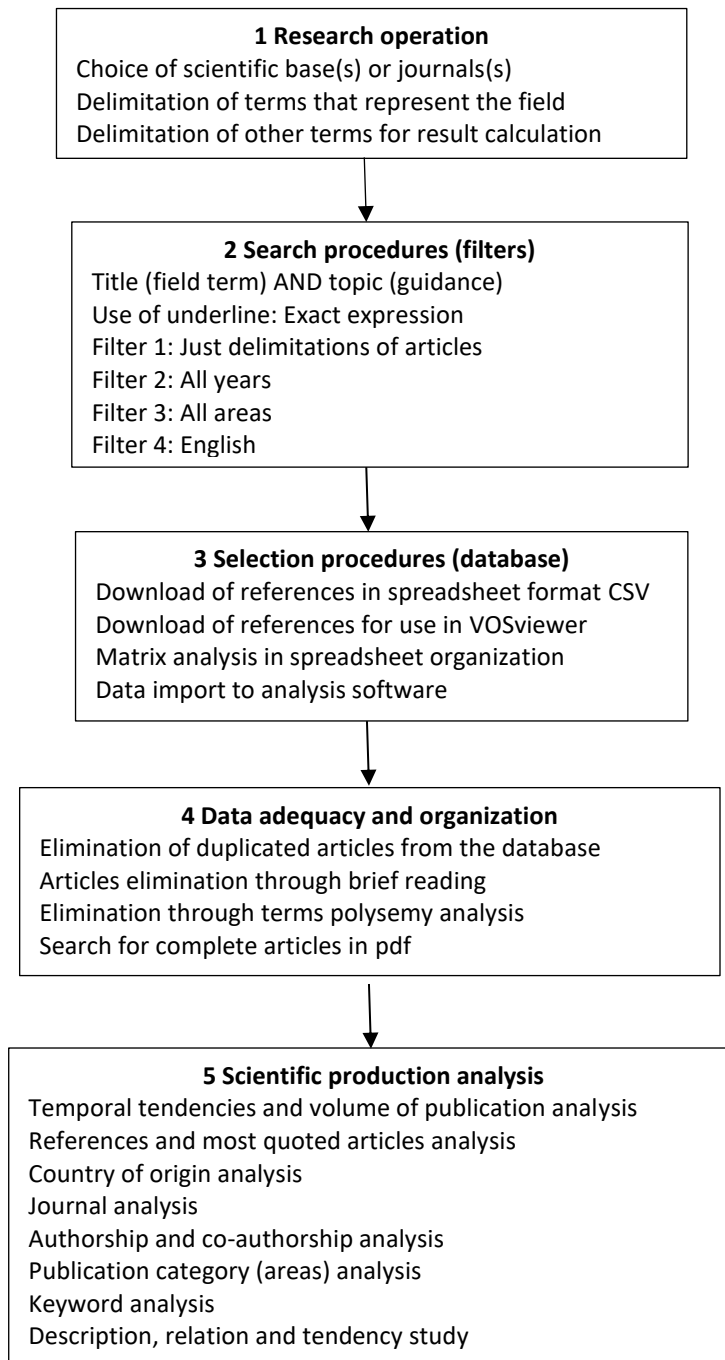


Figure 1: The Research Design (Adapted from Donthu et al., 2021; Prado et al., 2016).

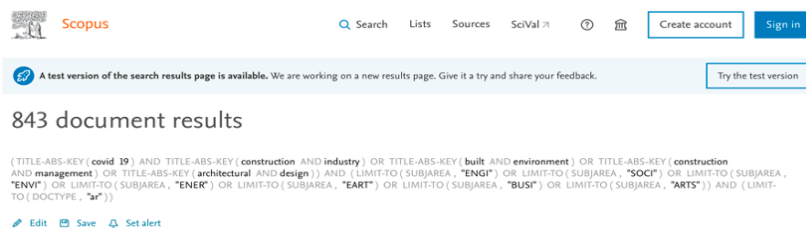


Figure 2: Search Criteria for Bibliometric Analysis.

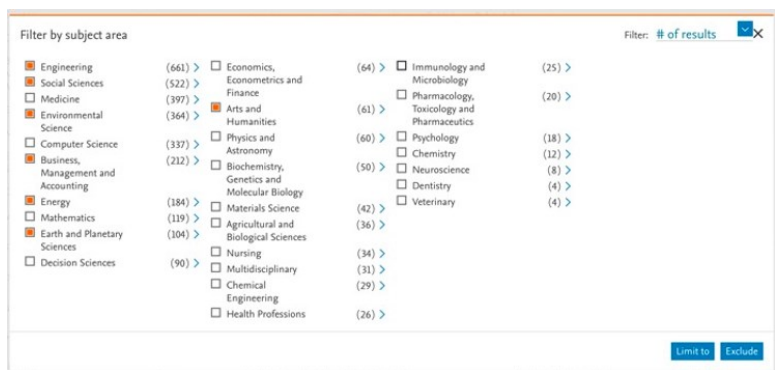


Figure 3: Subject Areas Filters Used for Bibliometric Analysis.

3. Research Findings and Discussion

The main search yielded to 843 articles between 2020 and 2022. These articles were used as the basis for the bibliometric analysis presented herein. Table 1 presents the 10 highly cited articles among the 843 articles analyzed. The number of citations for articles is based on Scopus database.

Table 1. The Most Highly Cited Articles (Top Ten).

	Authors	Title	Year	Source Title	Cited by
1	Li et al.	Air quality changes during the COVID-19 lockdown over the Yangtze River Delta Region	2020	Science of the Total Environment	293
2	Zhou et al.	COVID-19: Challenges to GIS with Big Data	2020	Geography and Sustainability	282
3	Venter et al.	Urban nature in a time of crisis	2020	Environmental Research Letters	232
4	Megahed and Ghoneim	Antivirus-built environment: Lessons learned from Covid-19 pandemic	2020	Sustainable Cities and Society	231
5	Amerio et al.	Covid-19 lockdown: Housing built environment's effects on mental health	2020	Int. J. Env. Res & Pub. Health.	159
6	Qian et al.	Indoor transmission of SARS-CoV-2	2021	Indoor Air	147
7	Mandal and Pal	Covid-19 pandemic persuaded lockdown effects on environment over stone quarrying and crushing areas	2020	Science of the Total Environment	104
8	Giani et al.	Short-term and long-term health impacts of air pollution reductions from Covid-19 lockdowns in China and Europe: a modelling study	2020	The Lancet Planetary Health	98
9	Alsharef et al.	Early impacts of the Covid-19 pandemic on the United States construction industry	2021	Int. J. Env. Res & Pub. Health.	90
10	Mitra et al.	Healthy movement behaviours in children and youth during the Covid-19 pandemic	2020	Health and Place	76

Li et al (2020) analyze the air quality changes during the Covid-19 pandemic in a selected region and use an empirical model investigate impact of decreased human activities on air quality changes. Zhou et al (2020) proposes a decision support model based on geographical information system to address the challenges presented by Covid-19 pandemic. Venter et al. (2020) explores the influence of Covid 19 pandemic on mobility patterns, recreational activity, ecosystem service, aesthetic values, spatial analysis, and issues regarding the environmental green justice. Megahed and Gohneim (2020) propose a road map for construct “the antivirus-built environment” based on lessons learned from Covid- 19 pandemic. Amerio et al. (2020) explore the psychological effects of Covid-19 pandemic. They report that housing plays a major role in influencing people mental health and wellbeing during Covid-19 pandemic and suggest that strengthened multi-interdisciplinary approach involving urban planning, public mental health, environmental health, epidemiology, and sociology, is needed to inform the planning implementation and monitoring of housing policies centered on population health.

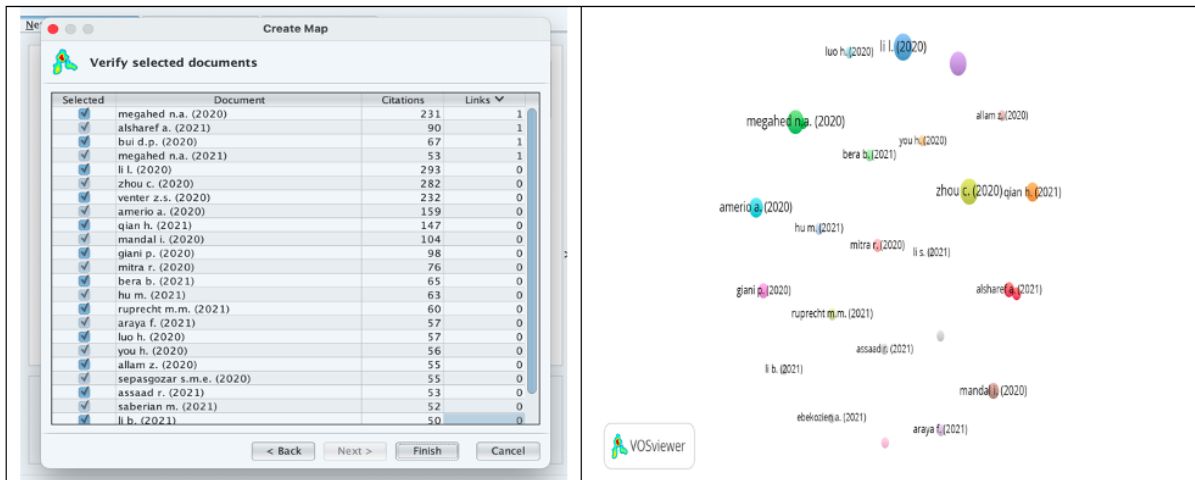


Figure 4: The Ranking of Articles Based on Number of Citations and Links

A succinct review of top ten highly cited articles reveals that they adopt pluralist approach to address the multidimensional challenges presented by Covid 19 pandemic in the built environment (See Figure 4). The link between and among the highly cited articles appear to be very weak (i.e., the link strength =1). The observed very weak strength link can be attributed to the fragmented and nature of the built environment literature. Two of out of ten highly cited articles (Li, et al.; Mandal and Pal, 2020) are published by “Science of the Total Environment” journal. Furthermore “Science of the Total Environment” journal has highest citations based on the search criteria used in this study (Total Number of Citations = 449). It is also becoming evident that “Sustainable Cities” journal (Total Number of Citations = 420) and “International Environment Research and Public Health” journal (Total Number of Citations =305) and are ranked 2nd and 3rd in the number of citations, respectively.

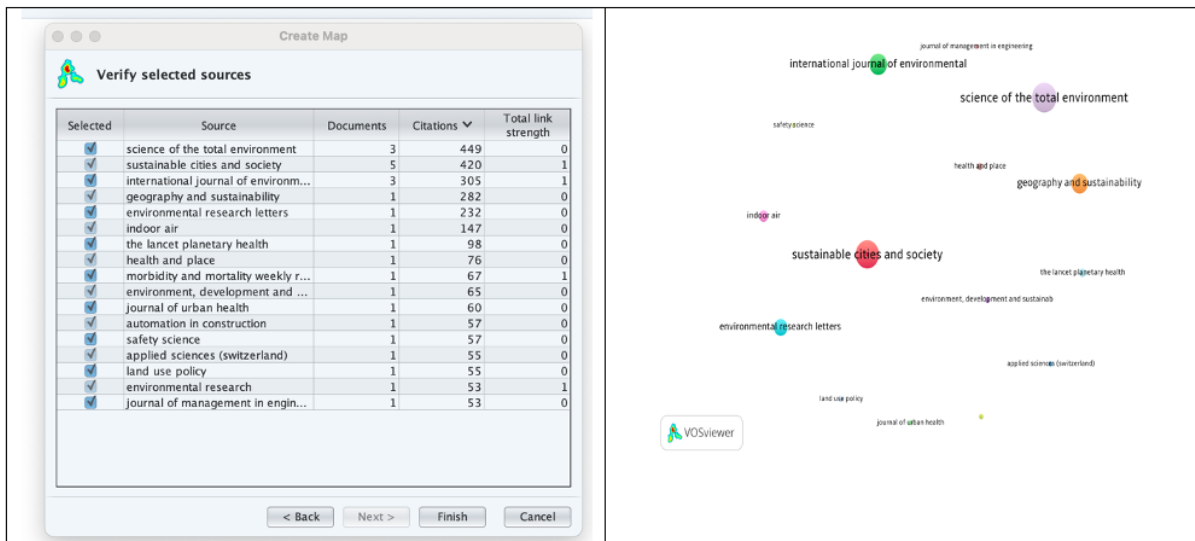


Figure 5: The Ranking of Journals based on the Number of Citations and Total Link Strength

Top three countries based the number of citations are China (6 articles and 885 citations), United States of America (8 articles and 646 citations) and Malaysia and Australia (2 articles and 333 citations) (See Figure 6).

concepts and their reflections in the built environment literature can shed some light on the direction in which the built environment research studies will evolve in the years to come.

The research presented herein has several limitations. Firstly, the bibliometric data used in this study has a limited capacity to represent all the scholarly research on Covid -19. Secondly, the actual reason for an article's citation cannot be easily inferred by performing bibliometric analysis. Thirdly, a highly cited article implies that it is influential in the literature. Yet an article citation count does not mean that the article provides a major scientific breakthrough or not. Fourthly, articles in non-English language were excluded in this research. Fifthly, articles published in scholarly journal were only included in this study. Sixthly, the time span of the (the window of analysis) bibliometric analysis presented herein is relatively short.

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Conflict of Interests

The authors declare no conflict of interest.

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