



VOL. 9, NO. 1 (2023)

TOWARDS A NEW ETHICS IN BUILDING

TEMA
Technologies
Engineering
Materials
Architecture

Journal Director: R. Gulli

Guest Editors: A. Sanna, G. Di Giuda, L.C. Tagliabue

Assistant Editors: A.C. Benedetti, C. Mazzoli, D. Prati

Cover illustration: Jewish Museum Berlin by Daniel Libeskind, The Garden of Exile, Berlin, Germany, 2001. © Riccardo Gulli (2009)

e-ISSN 2421-4574
DOI: 10.30682/tema0901



e-ISSN 2421-4574

ISBN online 979-12-5477-288-1

DOI: 10.30682/tema0901

Vol. 9, No. 1 (2023)

Year 2023 (Issues per year: 2)

Editor in chief

Riccardo Gulli, Università di Bologna

Associated Editors

Annarita Ferrante – Università di Bologna

Enrico Quagliarini – Università Politecnica delle Marche

Giuseppe Margani – Università degli Studi di Catania

Fabio Fatiguso – Università Politecnica di Bari

Rossano Albatici – Università di Trento

Editorial Board Members

Ihsan Engin Bal, Hanze University of Applied Sciences – Groningen

Antonio Becchi, Max Planck Institute – Berlin

Marco D’Orazio, Università Politecnica delle Marche

Vasco Peixoto de Freitas, Universidade do Porto – FEUP

Stefano Della Torre, Politecnico di Milano

Giuseppe Di Giuda, Università di Torino

Luca Guardigli, Università di Bologna

José Luis Gonzalez, UPC – Barcellona

Francisco Javier Neila Gonzalez, UPM Madrid

Alberto Grimoldi, Politecnico di Milano

Antonella Guida, Università della Basilicata

Santiago Huerta, ETS – Madrid

Richard Hyde, University of Sydney

Tullia Iori, Università di Roma Tor Vergata

Raffaella Lione, Università di Messina

John Richard Littlewood, Cardiff School of Art & Design

Camilla Mileto, Universidad Politecnica de Valencia UPV – Valencia

Renato Morganti, Università dell’Aquila

Antonello Sanna, Università di Cagliari

Matheos Santamouris, University of Athens

Enrico Sicignano, Università di Salerno

Lavinia Chiara Tagliabue, Università di Torino

Claudio Varagnoli, Università di Pescara

Emanuele Zamperini, Università di Firenze

Assistant Editors

Cecilia Mazzoli, Università di Bologna

Davide Prati, Università di Bergamo

Anna Chiara Benedetti, Università di Bologna

Journal director

Riccardo Gulli, Università di Bologna

Publisher:

Ar.Tec. Associazione Scientifica per la Promozione dei Rapporti tra Architettura e Tecniche per l’Edilizia

c/o DICATECH - Dipartimento di Ingegneria Civile, Ambientale, del Territorio, Edile e di Chimica - Politecnico di Bari

Via Edoardo Orabona, 4

70125 Bari - Italy

Phone: +39 080 5963564

E-mail: info@artecweb.org - tema@artecweb.org

Publisher Partner:

Fondazione Bologna University Press

Via Saragozza 10

40123 Bologna - Italy

Phone: +39 051 232882

www.buponline.com

TEMA: Technologies Engineering Materials Architecture**Vol. 9, No. 1 (2023)**

e-ISSN 2421-4574

Editorial

5

Towards a New Ethics in Building*Antonello Sanna, Giuseppe Di Giuda, Lavinia Chiara Tagliabue*

DOI: 10.30682/tema0901n

The ecological transition of cities

9

Federico M. Butera

DOI: 10.30682/tema0901a

Environmental ethics and sustainability of techniques. From hyper-specialisation to multifunctionality for a resilient inhabitable space

21

Mario Losasso

DOI: 10.30682/tema0901b

Innovation and knowledge-based growth for low carbon transitions in the built environment.**Challenges and open research questions**

27

Massimiliano Manfredi

DOI: 10.30682/tema0901c

COVID-19, design and social needs: an investigation of emerging issues

41

Vito Getuli, Eleonora D'Ascenzi, Saverio Mecca

DOI: 10.30682/tema0901d

Towards a technical sentiment lexicon for the maintenance of human-centred buildings

52

Marco D'Orazio, Gabriele Bernardini

DOI: 10.30682/tema0901e

Fostering the consensus: a BERT-based Multi-label Text Classifier to support agreement in public design call for tenders

62

Mirko Locatelli, Giulia Pattini, Laura Pellegrini, Silvia Meschini, Daniele Accardo

DOI: 10.30682/tema0901f

Building energy consumption under occupants' behavior uncertainty in pre and post-renovation scenarios: a case study in Italy

74

Gianluca Maracchini, Elisa Di Giuseppe

DOI: 10.30682/tema0901g

Ecological transition for the built environment: natural insulating materials in green building rating systems <i>Stefano Cascone</i> DOI: 10.30682/tema0901h	84
Testing and comparison of an active dry wall with PCM against a traditional dry wall in a relevant operational environment <i>Marco Imperadori, Nicole Di Santo, Marco Cucuzza, Graziano Salvalai, Rossano Scoccia, Andrea Vanossi</i> DOI: 10.30682/tema0901i	96
Digitization of building systems using IFC to support performance analysis and code checking: standard limits and technological barriers. A case study on fire safety <i>Carlo Zanchetta, Maria Grazia Donatiello, Alessia Gabbanoto, Rossana Paparella</i> DOI: 10.30682/tema09011	110
Preventing COVID-19 spread in school buildings using Building Information Modelling: a case study <i>Carmine Cavalliere, Guido Raffaele Dell'Osso, Francesco Iannone, Valentina Milizia</i> DOI: 10.30682/tema0901m	121

Vito Getuli, Eleonora D'Ascenzi, Saverio Mecca

DOI: 10.30682/tema0901d

This contribution has been peer-reviewed.
© Authors 2023. CC BY 4.0 License.

Abstract

The global public health crisis generated by the spread of COVID-19 has revealed – and is still showing – the strong correlation between two apparently disparate fields of research: built environment and health. Although in this time of emergency, the science of architecture could offer a remarkable contribution to rethinking new living and working spaces, the ongoing pandemic has, in terms of people's well-being, disclosed the weaknesses of a vast number of architectural design choices implemented until now. Hence, the impact of the COVID-19 pandemic on the users' space fulfilment has been herein explored and analysed through a systematic literature review process for collecting data and exploring gaps and opportunities revealed in this period. The COVID-19 pandemic and especially the quarantine constrictions have revealed a high level of dissatisfaction with the quality of living space as well as the lack of flexibility and adaptability. This study has outlined the main critical aspects to be considered for shaping and re-building new ways of living in a post-COVID-19 society. Thus, rather than focusing on specific future solutions, this study aims to collect the main issues and planning opportunities by showing the need for a valuable transdisciplinary approach that could address people's demands, especially from a sociological, anthropological, psychological and health perspective.

Keywords

COVID-19, Quality living, Built environment, Architecture, Well-being.

Vito Getuli*

*DIDA - Dipartimento di Architettura,
Università degli Studi di Firenze,
Firenze (Italy)*

Eleonora D'Ascenzi

*DIDA - Dipartimento di Architettura,
Università degli Studi di Firenze,
Firenze (Italy)*

Saverio Mecca

*DIDA - Dipartimento di Architettura,
Università degli Studi di Firenze,
Firenze (Italy)*

* Corresponding author:
e-mail: vito.getuli@unifi.it

1. INTRODUCTION

On March 9, 2020, the Italian Government signed an Executive Order that has marked the history of the Country: Article 1, Paragraph 1 of the DPCM introduced restrictive measures against the spread of the COVID-19 virus, starting from bans on travelling and restrictions on leaving home without proven work requirements, situations of need and/or health reasons. China, the heart of the pandemic, first adopted the restrictions (23-28 January 2020) that were afterwards introduced worldwide through National Government orders. A slogan such as

“stay at home” was used in different languages to invite people to contain the spread of the pandemic. Moreover, schools, universities, offices, retail as well as commercial activities were closed due to the increase in deaths and the rapid and unstoppable transmission. Consequently, people have been forced to stay home and reduce public space use in lockdown conditions by reinventing themselves and their available spaces for different and unforeseen functions. People dealt with the importance of the quality of life as it concerns their house and its spaces,

their interior design, together with neighbourhood, city, streets and so forth. This unprecedented and unexpected set of conditions has caused professionals such as architects, engineers, planners, and designers to rethink spaces by offering suggestions for the future development of new spaces.

However, the debate on the re-shaping of cities and houses has divided into two different categories: the first is related to the idea that everything will not be the same and the design thinking should be reconsidered completely; the second is that everything will come back to normality. On the one hand, solutions for liveable spaces with physical distancing precautions as well as the introduction of new design approaches that take into account flexibility, have been proposed. On the other hand, the temporariness of this current pandemic situation has been pointed out by outlining that, even if we live in unique conditions, by adopting the business-as-usual approach, everything will return to normal sooner or later. At the time of writing, approximately two years after the diffusion of the pandemic, it is difficult to say who is right, even if this can, in fact, be traced. It is interesting to highlight how the pandemic forced us to reflect on high-quality living and the fairness of the historical design choices adopted to date. Houses, once considered merely places to sleep, are now places to live all day: they have, in fact, been jammed with all family members, becoming, by necessity, offices, gyms, schools, restaurants, places of recreation and so on. Public spaces (such as roads, streets, and squares) and semi-public spaces (retail, offices, and businesses) have been emptied and used just for purposes of necessity. All of this has contributed to an ever-growing acquired consciousness of the importance of the living quality for users and inhabitants, better defining what they want and especially what they do not want for their spaces. For example, there is a shared recognition of the significance of green spaces with the proven correlation between their use and benefits for physical/mental health. The exploration of peer-reviewed articles has provided other fundamental insights into what high-quality living means, especially after the outbreak of the COVID-19 pandemic. This paper offers a point of view on the theme by collecting and analysing peer literature reviews to provide initial

documentation, which this study of the emerging factors of the COVID-19 impact brings to light, and where the adopted solutions of planning and design have failed.

2. METHODOLOGY

In order to analyse how and to what extent COVID-19 restrictions impacted the research on the built environment and its related issues, a systematic literature review process has been conducted involving peer-reviewed article journals and conference proceedings. The state of art methodology (Fig. 1) has been based on the research method of Content Analysis, which determines the presence of certain words, themes, or concepts within some given qualitative data (i.e., text). Using content analysis, researchers can quantify and analyse the presence, meanings and relationships of certain words, themes, or concepts in a predefined domain of interest. There are two general types of content analysis: conceptual and relational. The first determines the existence and frequency of concepts in a text, while the second develops the conceptual analysis by examining the relationships among concepts in a text.

No matter the chosen method, the analysis process reduces the volume of text collected, identifies and groups categories together and seeks some understanding of it. The presented research has been carried out by using Conceptual Analysis and, according to the standardised research process, it has been developed in three main steps, each of which is subdivided into sub-sections:

- research's definition with (1.1) related area delimitation and (1.2) keywords' search identification;
- data collection of articles within the research's scope with (2.1) literature search through selected databases corresponding to the total amount of reached articles, (2.2) limitation of articles in the field of interests, namely: the first level of screening, limitation of essays depending on publication type and language; the second level of screening (2.3) selection of articles related to chosen keywords; the third level of screening, with subsequent three levels of screening and selection (Tab. 1);

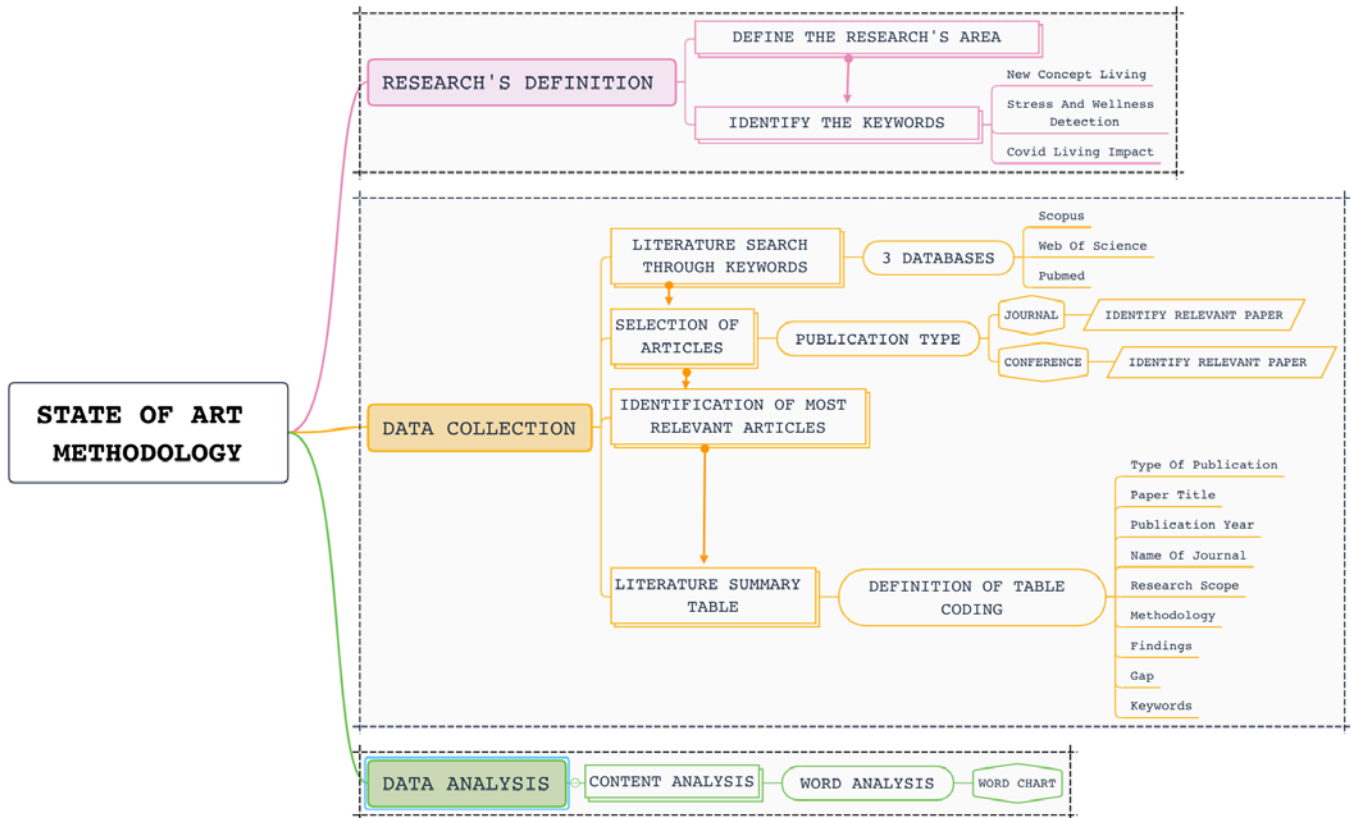


Fig. 1. State of Art Methodology.

- data analysis through word analysis and (3.1) word analysis of databases results and (3.2) word analysis of selected articles.

The research definition has first been conducted by delimiting the research’s area of interest, namely the impact of COVID-19 on the perception of the built environment, and second by identifying related keywords. Therefore, the search has been conducted through the following systems: “TITLE (COVID-19) or (Covid) or (pandemic) and TITLE (architecture) or (‘built environment’) or (‘living space’) or (living)”. The second step of the state of art methodology consists of data collection, with the selection of databases, the limitation of articles and the selection of targeted articles. Three academic databases have been screened for literature review: Web of Science [1], Scopus [2] and EBSCO [3]. This choice guaranteed a broad coverage of the theme in the field of the built environment, architecture, design, engineering, and sociology. Thus, the research has been confined to peer-reviewed articles and conference proceedings written in English and Italian.

The targeted selection of articles concerned three main screenings and depends on the field’s consistency, such as the theme’s congruence and consistency after the abstract as well as the full article’s reading. Finally, careful data analysis has been carried out through words and content analysis. A first-word analysis was made on the main results obtained through specific databases, thanks to the use of Vos Viewer Software [4]. A second-word analysis of selected targeted articles was made through Voyant Tools. The content analysis has involved the outline of the main impacted and discussed fields and the related prominent issues.

As shown in the following Table 1, a total number of 419 articles were found, and after the above-mentioned screening and the elimination of 22 repetitions, 49 papers have been deeply analysed.

Database	Total	Total after 1st screening	Total after 2nd screening	Total after 3rd screening
WoS	141	71	36	18
Scopus	223	110	19	15
Ebsco	55	54	22	16
Total	419	235	77	49

Tab. 1. The total number of reviewed articles.



Fig. 5. Word analysis and keywords detection through Voyant Tool.



Fig. 6. World analysis and empirical content keywords through Voyant Tool.

distancing, environment, housing, community, crisis, and challenge. Thus, usual terms such as green space, health, mental health, concept, and perception cover the search topic more frequently. Overall, this analysis shows how the main keywords related to the impact of COVID-19 on the built environment focus more on health/mental health/experience rather than on planning design choices. Consequently, when considering that users' experiences should be a core topic of the architectural investigation interests, the social and psychological role of the built environment emerged.

Another content analysis was carried out by considering the authors' and empirical content analysis keywords of the 49 selected articles, again using Voyant Tool Software. Regarding what has been said, Figure 5 and Figure 6 show the results. It appears that the most frequently used words deal with the theme of architecture, space, urban, covid, pandemic, public, green space, health, quality, and resilience, confirming that besides the keywords rightly used for finding purposes. The focus on social and psychological aspects has been confirmed by the theme's definition (such as covid, pandemic, architecture and so on). The following section discusses how the built environment has been intended in the foundation articles and the main related aspects of relevance in terms of the COVID-19 impact.

3.2. CONTENT ANALYSIS

In all research, it is essential to begin by clarifying what the researcher wants to discover, from whom and how.

The purpose may be of a descriptive or exploratory nature based on inductive or deductive reasoning. Inductive reasoning is the process of developing conclusions from collected data by interweaving it with new information. The researcher analyses the text with an open mind to identify meaningful subjects to answer the research question. Deductive reasoning proceeds in an opposite but logical way that moves from multiple premises – generally assumed to be true – to a conclusion. Due to the idea of the authors to identify future research lines based on a systematic investigation, the adoption of inductive reasoning has been used. The results are presented in this paragraph. Figure 7 graphically depicts the results of the main impacted spaces and related issues due to COVID-19.

Five space variables and their main issues were identified, indicating the main topics to focus on. As shown in Fig. 7, the identified peer-reviewed articles and conference proceedings concentrate mainly on public spaces, green spaces, city, interior design/home and generically built environments. Regarding this last aspect, the evaluation of the COVID-19 impact has generally been considered by authors at a different scale, starting from the design scale and progressing to urbanism. In all scales of the Built Environment, social inequalities have been pointed out by locating the correlation between financial difficulties and dramatic inequalities that exist among the spaces in which we live [5–8].

Following this aspect, it is crucial to highlight the association between inadequate spaces and mental health issues, especially concerning poor-quality views and in-

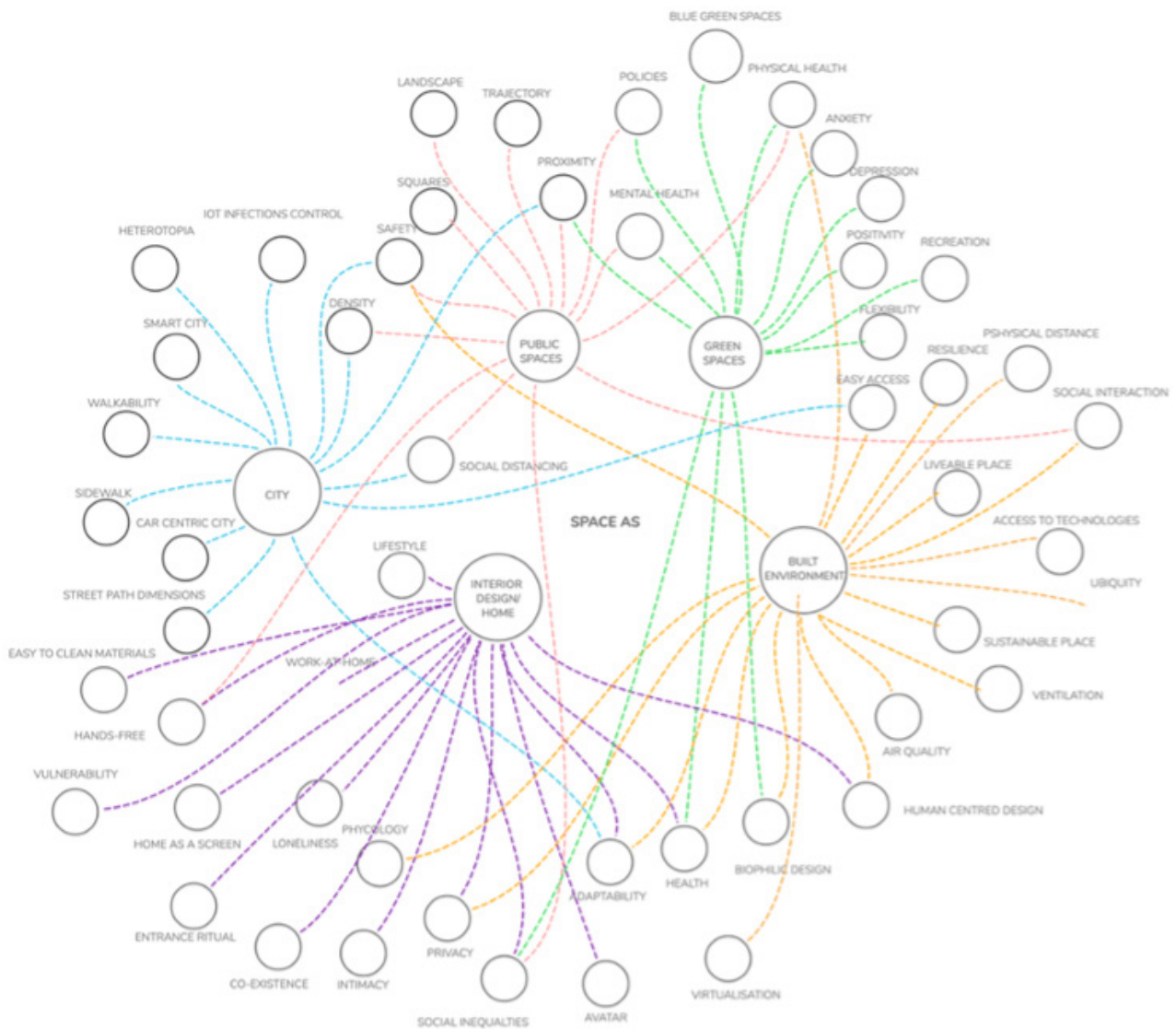


Fig. 7. Topic issues due to COVID-19's impact on life.

door areas that cause depressive symptoms [9]. On the other hand, fewer symptoms of depression and anxiety have been demonstrated when inhabitants can access a garden or simply view nature [10]. Consequently, the correlation between mental health and the built environment has a primary place [11, 12].

4. DISCUSSION

This paper finds that architecture has been under discussion due to the weak reaction to an unforeseen event such as COVID-19, revealed in a lack of flexibility and adaptation. This points to such fragile planning that mental, physical, and psychological health issues of users have become the subject of significant debate

by design professionals. In other words, COVID-19 brings to light a pre-existing problem not clearly disclosed until that moment: the planning's current lack of resilience and its rupture with a strategy based on one's health.

However, if, on the one hand, the role of architectural practice to respond to living needs appears to have failed, on the other hand, the determination to shape, invent, and re-build new ways of living in a post-COVID-19 society is preminent. It should be based precisely on socio-spatial non-fulfilment. As such, this section offers insights into various design liabilities according to the five planned spaces under investigation in this study: built environment, green space, public space, the city and design/home.

4.1. BUILT ENVIRONMENT

The authors have analysed the importance of health spaces at different scales. As reported by Fezi [13], who outlined how the impact of COVID-19 on the built environment is related to object scale (among others) with the related issues of hygiene; people scale with distancing and isolation; cities and transportation with proximity, downscaling and mobility. According to Pinheiro [14], historical pandemics such as the Black Death, cholera, and tuberculosis have changed the design by moving thinking forward to minimalist design. However, in the case of the COVID-19 outbreak, one of the main aspects upon which we should reflect is the temporary positive effects on the environment, with a win-to-win relationship between nature, breath (fresh air) and the safeguarding of health. Other studies have been conducted to highlight the association of built environments with the spread of COVID-19 [15] with the aim to adopt new design strategies, starting from air quality improvement systems [16] or rediscovering both for health and social reasons, filtering the air in areas such as courtyards, balconies, stairs, condominium terraces [17].

By saying it with the words of Keenan [18, p. 219], we should “learn from disasters” and try to understand what is working and what is not in the face of this unique situation. Other main issues of the built environment relate to privacy, adaptability, virtualisation and social interaction. Thus, the built environment should be considered a space that should help us live in a healthier way [21] by reconsidering the evaluability and liveability of places. A transdisciplinary approach that covers unrelated fields is needed, but as COVID-19 has demonstrated, such as psychology, sociology, medicine and so on, are not so.

4.2. INTERIOR DESIGN/HOMES

Pertinent issues, both in the generic built environment and interior design/home, have emerged: adaptability, privacy and virtualisation. Privacy has become a relevant theme during the lockdown. Privacy concerns both real and virtual spaces since the isolation brought about enforced intimacy [19]. At the same time, spaces are displayed through virtualisation and private surroundings

have been indicated by demonstrating the boundaries between public and private life [20, 21]. According to Porcelloni [20], the inevitable online exhibition of personal space prompted people to show as little as possible of their homes due to the perception of the equivalence between private life/house and what is revealed by the screen. It is also interesting to note, even in the space of virtualisation, the mixed-use of domestic spaces which host different activities connected with education (remote school), productive activities (remote work) and so on [22], due to their new multiple functions (gym, office, leisure, education and so on) that require adaptability and flexibility [19]. The lack of privacy is a sensitive subject connected to the consequences of the lockdown measures, not only in terms of the public-private sphere but also in terms of the co-existence of different family members in the same place/space [23].

House is required to host more functions and contemporary users within the same place. For this reason, as reported by Madeddu [24], the preeminent higher quality of living required today is also indicated by the housing market. The question in evaluating a house today asks: could people face living in that same location if lockdown occurs again? Finally, by strongly showing a preference for homes with hands-free contact and easy-to-clean materials [14], the house has now been considered a safe place to shelter. For this reason, it has become a kind of holy place that sometimes has resulted in an “entrance ritual” [20, p. 641] with specific procedures such as taking off shoes, washing hands, changing clothes and so on.

Other relevant aspects, such as the correlation between house and perceptions of loneliness, conditions of vulnerability, psychological problems and health issues, emerged.

4.3. CITIES

Cities have had a crucial role to play in virus transmission and shutdown. For this reason, the debate on the relationship between cities and COVID-19 has been discussed, focusing on the main emerging issues. According to Mazzolini [25, p. 23], «each city manages covid emergency based on physical and conceptual [sic] specific to

it», and this has led to the discussion of the main uncovered issues in city planning. High-density space in cities is undoubtedly a central problem that, by replacing the car-centric city concept [25], flowed into the consequent reclaiming of the streets for people and nature. Another relevant term teamed with the idea of the city is “smart city”, “IoT city”, with the use of new technologies to improve citizens’ lives with health and safety purposes in mind: IoT infection controls [26].

4.4. GREEN SPACE

The most frequently discussed argument, regardless of the specific planning area, is the significance of green spaces. Nature has been considered the most crucial aspect to refer to during planning, especially after COVID-19’s impact on people’s perceptions, whether for housing views, the redesign of public spaces or other purposes within the city’s projects.

Nature, also called “blue-green space,” is sought for its positive effects on mental health as well as for the reduction of anxiety and depression [27], better physical health, relaxation [28], and as a recreation place [29]. The demand for green spaces has also been measured through Sina-microblog analysis [30] or a specific case study like in Oslo [29]. However, probably more than in any other field, green spaces represent current social inequalities through the inability of all to privately enjoy them because of financial difficulties [8]. Since the green-blue space generates well-being and maximises health, this aspect merges with the following public space issues.

4.5. PUBLIC SPACE

Public spaces seem to be the most impacted places due to the restrictions of social distancing and the reduction of leisure activities. Among others, the impact of COVID-19 on the design of public spaces has been mainly discussed in terms of inclusivity, accessibility and proximity [7, 31–33]. For this reason, the study of possible best practices of public space design has been reported through the analysis of cities as case studies (such as Roma, Siena, and San Benedetto del Tronto [31]), to understand how

we should rethink public space in times of the pandemic. Streets, squares and, more generally, areas for the community have been reviewed for design optimisation: walkability, proximity, easy access, and social inequalities have become the main key points [32–34].

In times when social distancing (actually physical distance) is required to prevent COVID-19 transmission, proximity and short walking distances are needed. Thus, the design of public spaces should be reconsidered by taking into account the importance of community by guaranteeing easy access to services as well as wider spaces and the careful analysis of the trajectory of flows [35–37]. Moreover, for a higher quality of life and mental/physical health benefits [38], the proximity and flexibility of public spaces are mainly required in terms of green areas.

5. CONCLUSION

This study provides outcomes on the impacts of COVID-19 on public and professional perceptions of the Built Environment. Showing the over-time vulnerabilities of planning through a systematic literature review should be considered a benchmark for the social satisfaction of spaces during the current pandemic. Compared to previous times, the lockdown restriction has revealed a different fulfilment as well as a different awareness of users. The pandemic has been, and still is, an incredible opportunity for us to pause for a moment to understand what is working and what is not in the choices Planning has adopted to date, testing the resilience of spaces for both living and working.

By revealing a high level of dissatisfaction exposed from the perspective of COVID-19, the change in the usage frequency of living places, such as the increased number of hours spent at home and the parallel reduction of hours spent in public and semi-public spaces, has contributed to a change in people’s perception of spaces.

Thus, rather than focusing on future solutions, this study has aimed to collect the main issues and opportunities of planning. The critical aspects that emerged from the literature review during this pandemic are the importance of flexibility, proximity, green space and the correlation between mental/physical health and architec-

ture. Proximity is an ongoing debatable aspect in architecture since it allows for determining a cohesive community while retaining social distancing. Over the recent years, we have witnessed the growth of cities with the expansion of suburbs lacking associated system services and mainly used as dormitories for the city. Today people are asking themselves if they could live in a specific space if faced with a lockdown again, and for this, they pay much more attention to their surroundings.

The same applies to green spaces and environments. Views over the green-blue spaces and easy access to them are in high demand. However, it is still challenging to incorporate them due to the existing social inequalities and the high price of what we consider today more than ever, the new gold: nature. Moreover, from design to urban planning, flexibility is another concept to consider, whatever the planning scale. As living beings, we are continuously evolving, and with us, nature is also in an ongoing process of change. We have learned that in a very short time, everything could change, and we probably need to address the term resilience not only as it applies to people and nature but also to the designing of the spaces that inevitably surround us and affect us.

Thus, what emerged even more strongly is the lack of a valuable transdisciplinary approach that could address people's needs to design the best places from a stylistic point of view and from the sociological, anthropological, psychological and health perspectives. These aspects were so far not considered to be significant, judging from the current opportunities in planning. For this reason, informative research about what high-quality space means in different fields should be more deeply analysed in order to refer to it as a regular informative method upon which planning should be based.

6. REFERENCES

- [1] <https://access.clarivate.com/login?app=wos&alternative=true&shibShireURL=https:%2F%2Fwww.webofknowledge.com%2F%3Fauth%3DShibboleth&shibReturnURL=https:%2F%2Fwww.webofknowledge.com%2F&roaming=true>. Accessed on April 21, 2023
- [2] <https://www.scopus.com/search/form.uri?display=basic#basic>. Accessed on April 21, 2023
- [3] <https://www.ebsco.com>. Accessed on April 21, 2023
- [4] <https://www.vosviewer.com>. Accessed on April 21, 2023
- [5] Martel A, Day K, Jackson MA, Kaushik S (2021) Beyond the pandemic: the role of the built environment in supporting people with disabilities work life. *Archnet-IJAR* 15:98–112. <https://doi.org/10.1108/ARCH-10-2020-0225>
- [6] Kim AJ, Zulueta JO (2020) Japanese families and covid-19: “self-restraint”, confined living spaces, and enhanced interactions. *Journal of Comparative Family Studies* 51:360–368. <https://doi.org/10.3138/JCFS.51.3-4.011>
- [7] Melone MRS, Borgo S (2020) Rethinking rules and social practices. The design of urban spaces in the post-Covid-19 lockdown. *TeMA Journal of Land Use, Mobility and Environmental Journal of Land Use, Mobility and Environment* TeMA Speci:333–341
- [8] Astell-Burt T, Feng X (2021) Time for ‘green’ during covid-19? Inequities in green and blue space access, visitation and felt benefits. *International Journal of Environmental Research and Public Health* 18:1–21. <https://doi.org/10.3390/ijerph18052757>
- [9] Amerio A, Brambilla A, Morganti A, Aguglia A, Bianchi D, Santi F, Costantini L, Odone A, Costanza A, Signorelli C, Serafini G, Amore M, Capolongo S (2020) Covid-19 lockdown: Housing built environment's effects on mental health. *International Journal of Environmental Research and Public Health* 17:1–10. <https://doi.org/10.3390/ijerph17165973>
- [10] Kasinitz P (2020) Rending the “Cosmopolitan Canopy”: COVID-19 and Urban Public Space. *City and Community* 19:489–495. <https://doi.org/10.1111/cico.12516>
- [11] Vereni P (2020) Il nodo gordiano e il filo di Arianna. La forma dello spazio nella crisi del COVID-19, pp 109–124. http://dx.doi.org/10.19246/DOCUGEO2281-7549/202001_06
- [12] Alraouf AA (2021) The new normal or the forgotten normal: contesting COVID-19 impact on contemporary architecture and urbanism. *Archnet-IJAR* 15:167–188. <https://doi.org/10.1108/ARCH-10-2020-0249>
- [13] Fezi BA (2020) Health engaged architecture in the context of COVID-19, *Journal of Green Building*, 15:185–212. <https://doi.org/10.3992/1943-4618.15.2.185>
- [14] Pinheiro MD, Luís NC (2020) COVID-19 could leverage a sustainable built environment. *Sustainability (Switzerland)* 12:5863. <https://doi.org/10.3390/su12145863>
- [15] Li S, Ma S, Zhang J (2021) Association of built environment attributes with the spread of COVID-19 at its initial stage in China. *Sustainable Cities and Society* 67:102752. <https://doi.org/10.1016/j.scs.2021.102752>
- [16] Mehta V (2020) The new proxemics: COVID-19, social distancing, and sociable space. *Journal of Urban Design* 25:1–6. <https://doi.org/10.1080/13574809.2020.1785283>
- [17] Veronese A (2021) Architecture post Covid-19. Using proxemics in spatial design. *Festival dell'Architettura Magazine* 52–53:162–166. <https://doi.org/10.1283/fam/issn2039-0491/n52-2020/504>
- [18] Keenan JK (2020) COVID, resilience, and the built environment. *Environment Systems and Decisions* volume 40:216–221. <https://doi.org/10.1007/s10669-020-09773-0>
- [19] Allen I (2021) Reimagining the Home. *Architectural Design* 91:46–53. <https://doi.org/10.1002/ad.2670>

- [20] Porcelloni L, Mazzanti C (2020) Safe and non-safe space: An investigation on new dwelling strategies in the context of COVID-19 pandemic. [Spazio sicuro e non-sicuro: Un'indagine sulle nuove strategie dell'abitare nel contesto della pandemia di COVID-19]. *Documenti Geografici* 633–645. https://doi.org/10.19246/DOCUGEO2281-7549/202001_40
- [21] Lozanovska M, Pieris A, Haghighi F, Taylor WM, Hou J, Smitheram J, Chee L (2020) Other Spaces of Quarantine. *Fabrications – The Journal of the Society of Architectural Historians Australia & New Zealand* 30(3):416–429. <https://doi.org/10.1080/10331867.2020.1857609>
- [22] Sandu A (2020) Pandemic - Catalyst of the Virtualization of the Social Space. *Postmodern Openings* 11:115–140. <https://doi.org/10.18662/po/11.1sup2/146>
- [23] Parreiras C (2021) The reconfigurations of domestic space in favelas brief reflections on intimacies and precariousness. *Anthropology in Action* 28:52–56. <https://doi.org/10.3167/AIA.2021.280110>
- [24] Madeddu M, Clifford B (2021) Housing quality, permitted development and the role of regulation after COVID-19. *Town Planning Review* 92:41–48. <https://doi.org/10.3828/tpr.2020.52>
- [25] Mazzolini A, Fedeli V, Concilio G, de Tejada JR (2021) Tackling the invisible during COVID-19 urban prevention: insights on housing and mobility in Maputo, Mozambique. *Town Planning Review* 92:19–24. <https://doi.org/10.3828/tpr.2020.62>
- [26] Basmi W, Boulmakoul A, Karim L, Lbath A (2021) Distributed and scalable platform architecture for smart cities complex events data collection: Covid19 pandemic use case. *Journal of Ambient Intelligence and Humanized Computing* 12:75–83. <https://doi.org/10.1007/s12652-020-02852-9>
- [27] Pouso S, Borja Á, Fleming LE, Gómez-Baggethun E, White MP, Uyarra MC (2020) Contact with blue-green spaces during the COVID-19 pandemic lockdown beneficial for mental health. *Science of the Total Environment* 756:143984. <https://doi.org/10.1016/j.scitotenv.2020.143984>
- [28] Ugolini F, Massetti L, Calaza-Martínez P, Cariñanos P, Dobbs C, Krajter Ostoić S, Marin AM, Pearlmutter D, Saaroni H, Šaulienė I, Simoneti M, Verlič A, Vuletić D, Sanesi G (2020) Effects of the COVID-19 pandemic on the use and perceptions of urban green space: An international exploratory study. *Urban Forestry and Urban Greening* 56. <https://doi.org/10.1016/j.ufug.2020.126888>
- [29] Venter ZS, Barton DN, Gundersen V, Figari H, Nowell M (2020) Urban nature in a time of crisis: Recreational use of green space increases during the COVID-19 outbreak in Oslo, Norway. *Environmental Research Letters* 15:104075. <https://doi.org/10.1088/1748-9326/abb396>
- [30] Zhu J, Xu C (2021) Sina microblog sentiment in Beijing city parks as measure of demand for urban green space during the COVID-19. *Urban Forestry and Urban Greening* 58:126913. <https://doi.org/10.1016/j.ufug.2020.126913>
- [31] Sepe M (2021) Covid-19 pandemic and public spaces: improving quality and flexibility for healthier places. *Urban Design International*. <https://doi.org/10.1057/s41289-021-00153-x>
- [32] Ugail H, Aggarwal R, Iglesias A, Howard N, Campuzano A, Suárez P, Maqsood M, Aadil F, Mehmood I, Gleghorn S, Taif K, Kadry S, Muhammad K (2021) Social distancing enhanced automated optimal design of physical spaces in the wake of the COVID-19 pandemic. *Sustainable Cities and Society* 68:102791. <https://doi.org/10.1016/j.scs.2021.102791>
- [33] Abou AJ (2021) Face to Face with Public Space. *Crit* 88:46–49. <http://search.ebscohost.com/login.aspx?direct=true&db=asu&AN=148639679&site=ehost-live&scope=site>
- [34] Law L, Azzali S, Conejos S (2021) Planning for the temporary: temporary urbanism and public space in a time of COVID-19. *Town Planning Review* 92(1):65–73. <https://doi.org/10.3828/tpr.2020.48>
- [35] Antonenko N, Rumilets T (2020) Covid-19 and Library Public Space Transformations. *Architecture, Civil Engineering, Environment* 13:5–18. <https://doi.org/10.21307/acee-2020-026>
- [36] Segapeli S (2021) Pandemic versus collective space? Towards a topology of care. *Festival dell'Architettura Magazine* 52–53:184–188. <https://doi.org/10.12838/fam/issn2039-0491/n52-53-2020/502>
- [37] Paköz MZ, Sözer C, Doğan A (2021) Changing perceptions and usage of public and pseudo-public spaces in the post-pandemic city: the case of Istanbul. *Urban Design International*. <https://doi.org/10.1057/s41289-020-00147-1>
- [38] Ahmadpoor N, Shahab S (2021) Urban form: Realising the value of green space: a planners' perspective on the COVID-19 pandemic. *Town Planning Review* 92:49–55. <https://doi.org/10.3828/tpr.2020.37>