

## Article

# Derailment or Turning Point? The Effect of the COVID-19 Pandemic on Sustainability-Related Thinking

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**Abstract:** A pandemic has always been a milestone, forcing intellectuals to reassess the directions of development at their time. This fact has generated vivid debates about the possible reactions to the new situation, highlighting the vulnerability of current socio-economic structures as well as the need to reconsider the current way of development. The new challenge has created an unprecedented increase in academic publications. The aim of the current paper is to analyze the socio-economic aspects of the growing interest in the sustainability-related facets of the pandemic. Based on English language journal articles (n = 1326), collected on the Web of Science website, the authors analyze the different aspects of COVID-related discussions connected to sustainability. Applying the triangulation approach, the publications have been classified on the basis of their intellectual roots, co-occurrence of different words and strategic diagramming. Results highlight that, notwithstanding the remarkable number of papers, there is a strong need for the in-depth analysis of the long-term consequences in the fields of (1) health logistics and policy; (2) the future of education and work, based on experience and evidence; (3) the re-thinking of the resilience of large-scale supply systems; (4) global governance of world affairs, (5) the role of distant teaching, telecommunication, telework, telehealth, teleservices.

**Keywords:** bibliometrics; coronavirus; SARS-CoV-2; pandemic; distant work; big data; natural language processing; scientometrics



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## 1. Introduction

It is well documented that contagious diseases have played an important role in the history of mankind, considerably influencing the history, and shaping the way of thinking on human–environment relations; we introduce some examples in Table 1. Pandemics have appeared relatively suddenly and have interrupted several historical processes either temporarily or more persistently. Each of these structural breaks has exercised a tangible influence on our ways of thinking. Leading intellectuals in each era have faced challenges generated by general health problems, highlighting the fragility of existing socio-economic structures, human impotence, limited efficiency of science and technology, underlining the importance of such values as solidarity and human dignity [1].

Pandemics and their consequences, presented in Table 1, offer some generalizable lessons. The most important of them are as follows: (1) pandemics not only form history, but can be considered locomotives for the development of our ways of thinking, highlighting not just the importance of the sophistication of methods of prophylaxis and treatment, but also of intelligentsia and decision makers’ awareness of the vulnerability of societies

and socio-economic structures; (2) pandemics have helped ruling classes understand the importance of agricultural and logistical systems in providing supplies to the urban population; (3) pandemics have enhanced the public appreciation of the importance of globalization and the exposure of individual nations to extramural processes.

**Table 1.** Role of pandemics in changing development and thinking—some examples.

Pandemic	Cause	Changes in Thinking/Social Behavior
Plague of Cyprian; 249–262 [2]	Low hygiene and intensive migration	Destabilization of the structural integrity of the Roman empire
Plague of Justinian; 541–750 [3]	Low hygiene, migration and lack of public administration, unsatisfactory storage conditions of grain (rats)	Rural depopulation, declining importance of urban markets, communication systems and local governments, decreasing role of territorial control of cities
Smallpox in Japan, 735–737 [4]	Low hygiene and migration	Administrative barriers against migration from rural to urban areas
Bubonic pest; 1348–1351 [5]	Low hygiene, malnutrition and iron deficiency	short-term increase of wages and decreasing social inequalities
English sweating sickness; 1485–1552 [6]	Low hygiene and malnutrition	The socio-economic crisis of traditional European societies improves the conditions of proliferation of Protestantism
Plague in France; 1667–1778 [7]	Low level of animal and human hygiene	Development of public administration and information systems, strengthening the hygiene and establishment of veterinary service systems
Cholera outbreaks in London; 1866 [8]	Unsolved waste disposal management problems, low level of potable water quality	Modernization of waste disposal system and drinking water supply system
Spanish flu; 1918–1919 [9]	Low level of public hygiene, unsatisfactory general condition of population after World War I	Re-organization of hygienic systems, modernization of hygiene related education and health statistic system [10] Decreasing propensity for cooperation [9]
Ebola, 1976 [11]	New, emergent disease	More focus on specific problems of the poorest countries of the world [12]
AIDS late seventies of 20th century	Lack of understanding the mechanism of proliferation, late reactions	Specific focus on minorities, understanding the importance of education and complex, system-based approach [13]

The coronavirus disease (caused by SARS-CoV-2, hereinafter: COVID) pandemic has been the first global epidemic event, the consequences of which (1) can be experienced practically all over the world [14]; (2) the drop back, caused by this pandemic is hardly comparable to any other non-war decline in economic performance [15]; (3) as a consequence of global communication systems the different events can be seen and perceived practically in real time [16]; (4) modern science and technology have concentrated unprecedented energy to understand the causes and consequences of the crisis, and to develop adequate defense technologies. This is well indicated by the fact that the number of English language articles, registered in the Web of Science (hereinafter: WoS) database, published on COVID-related topics in 2019–2020 (up to 9th December) is 28,472, higher than the total number of publications on Life sciences and biomedicine topics, published in the years 2015–2016, which totals 23,328 English-language articles.

The aim of the current research is to map the socio-economic debate generated by the COVID pandemic on the sustainability-related aspects of the crisis.

In the framework of the current research four hypotheses will be tested. These theses were formulated based on an in-depth study of the literature.

**Hypothesis 1 (H1).** *After analyzing the intellectual consequences of former pandemics we have assumed that the crisis has been inducing a debate about the further ways of development of societies in general and the different sub-systems of socio-economic structure (e.g., education) in particular, highlighting the problems and dilemmas related to the concept of sustainability.*

**Hypothesis 2 (H2).** *On the basis of the continuity of the science [17] the COVID-related pandemic has boosted, accelerated and accumulated research on the impact of COVID and epidemics in general, a considerable part of which began in previous decades: the intellectual origins of the current flood of COVID-and sustainability related articles are deeply rooted in results achieved by psychology, sociology and system-theory.*

**Hypothesis 3 (H3).** *The effects of the pandemic have consequences on all fields of socio-economic life [18], which are highlighted in the Sustainable Development goals of the United Nations.*

**Hypothesis 4 (H4).** *Research on distant teaching, telecommunication, telework, telehealth and teleservices has become more prominent.*

## 2. Materials and Methods

The research has been built on the Web of Science database. There is an implicit academic consensus that this database can be regarded as a highly authentic source of scholarly literatures [19,20]. Publications from 1975 up to 1 December 2020 have been taken into consideration.

Theoretically, different databases could have been used for analysis (WoS, Scopus, Pubmed, Google Scholar); however, the scope of PubMed was too narrow, and the data quality of Scopus and Google Scholar is rather low [19]. Therefore, we have chosen the WoS. The flowchart of the investigations is presented in Figure 1.

In the process of optimizing the search strategy, we tested different keyword-combination. Search results have been evaluated and discussed by two researchers of the team (Z.L. and Á.T.). The most reliable and interpretable results have been obtained with the following keyword combinations:

(TS = (((“COVID\*” or “corona virus” or “SARS” or “mers”)) AND (“sustainab\*” OR “environ\*”) AND (“econo\*” OR (“societ\*”)))) AND LANGUAGE: (English) AND DOCUMENT TYPES: (Article), Timespan: All years. Indexes: SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC.

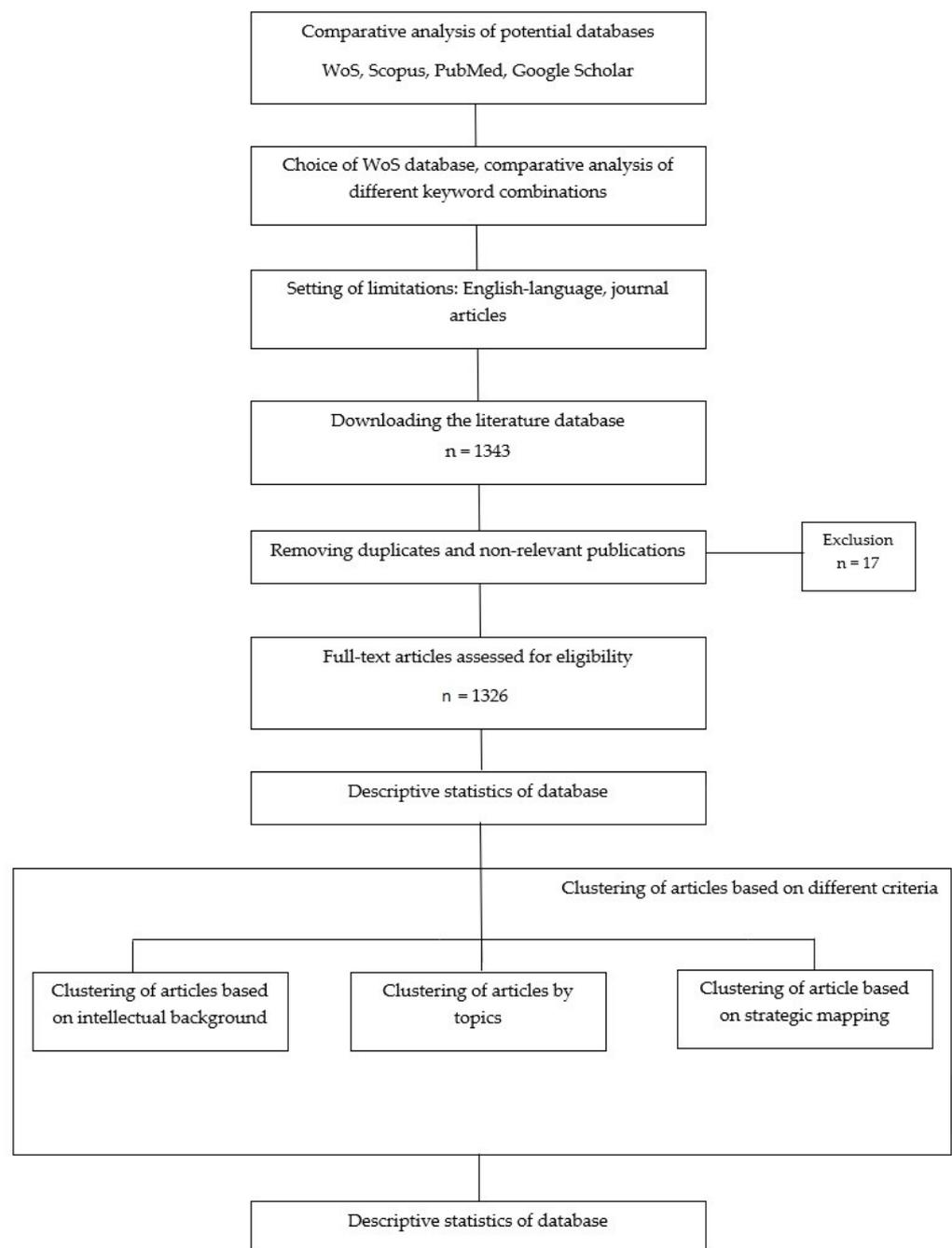
Full record and cited references have been collected, complemented with the missing literature references, and the duplicates were eliminated. In this way altogether 1326 bibliometric units had been collected.

The bibliometric units were analyzed by standard methods of modern bibliometrics, based on a combination of natural language processing, big data approach and algorithms, searching the generalizable patterns on the basis of co-occurrence of words as well as co-citations. The detailed bibliometric analysis was performed by Bibliometrix R-package [21].

In the framework of our study, we have applied a methodological triangulation, because different cluster analysis approaches were applied to uncover the roots, inner structure and strategic directions of COVID-related research.

In the first phase of our investigations, we analyzed the development of the research field over time. For this purpose, the CitNetExplorer visualization capacity [22] has been an important tool, because this way we were able to identify the most important publications and analyze the intellectual roots of different COVID-related publications. In the next phase of our analysis, we applied the Vos-viewer application [23], which offered a suitable possibility to cluster the publications based on the of similarity of keywords. In the third phase we used the science mapping algorithm of Bibliometrics.

For the validation of our hypotheses, we performed a comparative analysis of the UN Sustainable Goals and the results of the different clusterings.



**Figure 1.** Flowchart of the investigations.

### 3. Results

#### 3.1. General Characteristics of the Corpus

The corpus contained 1326 documents. The extremely high level of interest is well reflected by the fact that more than 90 percent of the papers were written in 2020, but the average citation ratio per document is relatively high, notwithstanding the short time since the publication of most documents: more than 4.44.

The majority of the papers were written in the USA (19%), UK (8%), China (8%), Italy (7%), Australia (4%) and India (4%).

Analyzing the sources by the publishing journal, it is obvious that most relevant articles have been published in a relatively limited number of journals. Ten journals published more than ten articles on these topics. The journal “Sustainability” has published

more than one hundred papers, three times more than the second most active professional journal. The ranking of the top journals is summarized in Table 2.

**Table 2.** Ranking of the top journals by the number of published sustainability-related COVID articles.

Journal	Rank	Published Articles
SUSTAINABILITY	1	119
INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH	2	34
SCIENCE OF THE TOTAL ENVIRONMENT	3	26
TOURISM GEOGRAPHIES	4	21
ENVIRONMENTAL & RESOURCE ECONOMICS	5	20
FRONTIERS IN PSYCHOLOGY	6	15
TEMA-JOURNAL OF LAND USE MOBILITY AND ENVIRONMENT	7	14
WORLD DEVELOPMENT	8	12
JOURNAL OF HOSPITAL INFECTION	9	11
PLOS ONE	10	11
ENERGY RESEARCH & SOCIAL SCIENCE	11	9
ENVIRONMENT DEVELOPMENT AND SUSTAINABILITY	12	9
INTERNATIONAL JOURNAL OF INFECTIOUS DISEASES	13	9
APPLIED SCIENCES-BASEL	14	7
BMC PUBLIC HEALTH	15	7
JOURNAL OF CHEMICAL EDUCATION	16	7
AEROSOL AND AIR QUALITY RESEARCH	17	6
AIR QUALITY ATMOSPHERE AND HEALTH	18	6
AMERICAN JOURNAL OF TROPICAL MEDICINE AND HYGIENE	19	6
CUREUS	20	6
FRONTIERS IN PSYCHIATRY	21	6
JOURNAL OF AIR TRANSPORT MANAGEMENT	22	6
SUSTAINABLE CITIES AND SOCIETY	23	6

### 3.2. Results of the Cluster Analyzes

#### 3.2.1. The Intellectual Roots of COVID Research

We have clustered the publications by three approaches. The first classification is based on their intellectual roots. Eight clusters could be identified by the algorithms of the CitNetExplorer software. The number of articles in these eight clusters are illustrated in Figure 2.

The largest cluster of publications analyzes the logistical and economic aspects of the pandemic (333 publications) [Cluster No. I/1]. In this case we have not been able to identify a “cornerstone” publication. A possible explanation can be that mankind (and within it the academic sphere) had not been prepared to lay down the scientific background of the logistical aspects of such a rapid pandemic [24–26].

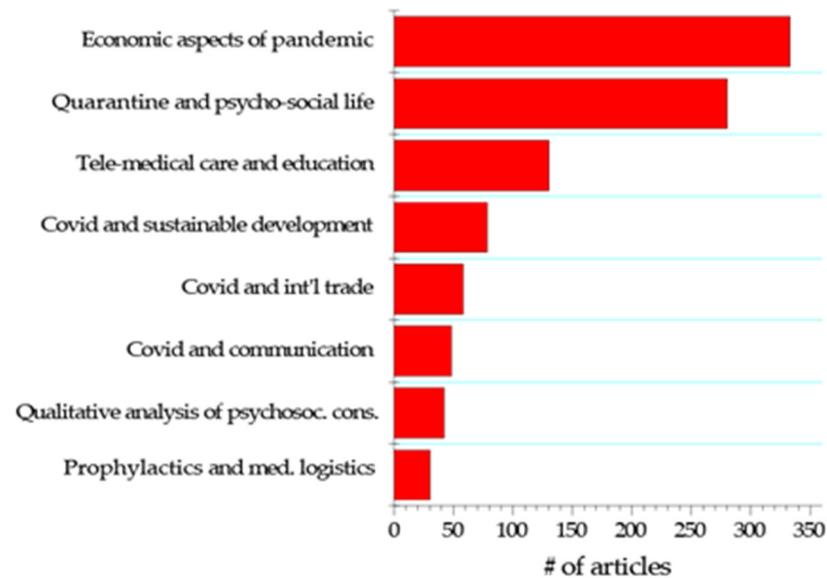
The second cluster analyzes the consequences of COVID-induced quarantine on psychological and social life, as well as the new challenges of the lockdown [Cluster No. I/2]. A very important forerunner of these publications is Maudner et al. [27].

Papers assigned to the third cluster analyze the problems of the application of telecommunication methods in medical care and education [Cluster No. I/3]. A common, characteristic feature of these publications is that they mainly apply conceptual models as

opposed to the papers assigned to the sixth cluster, where the most important method has been the direct question survey.

The fourth cluster is focusing on the relations between COVID and sustainable socio-economic development [Cluster No. I/4].

The fifth cluster considers the pandemic as a global phenomenon and focusses on the consequences of COVID on international trade and the division of Labour [Cluster No. I/5].



**Figure 2.** Number of articles in the different clusters by the intellectual bases of the research.

The sixth cluster [Cluster No. I/6] focusses on the application of modern communication infrastructure and telework in times of the lockdown; in this research, its role has been explored with the help of online tools. The authors of these publications widely applied different questionnaires, and the main methodological framework of this research has been structural equation modelling. This explains the importance of Fornel and Larcker's [28] paper in this context.

The seventh cluster [Cluster No. I/7] embraces the publications that analyze the social-psychological aspects and consequences of COVID, focusing on the role of different communication methods to decrease the stress caused by the restrictions. The COVID has created a new situation and researchers, faced with this unusual condition of research, have searched for tools suitable to uncover the rules governing human behavior and interpersonal relations under the specific conditions of the isolation. This was the thematic analysis. This rather loosely defined and just partially acknowledged qualitative method has been systematized by Braun and Clarke [29], thus this publication can be considered an intellectual light boat of this research. In this field the intellectual stepping stone is the seminal paper of Jones et al. [30] on global trends in emerging infectious diseases.

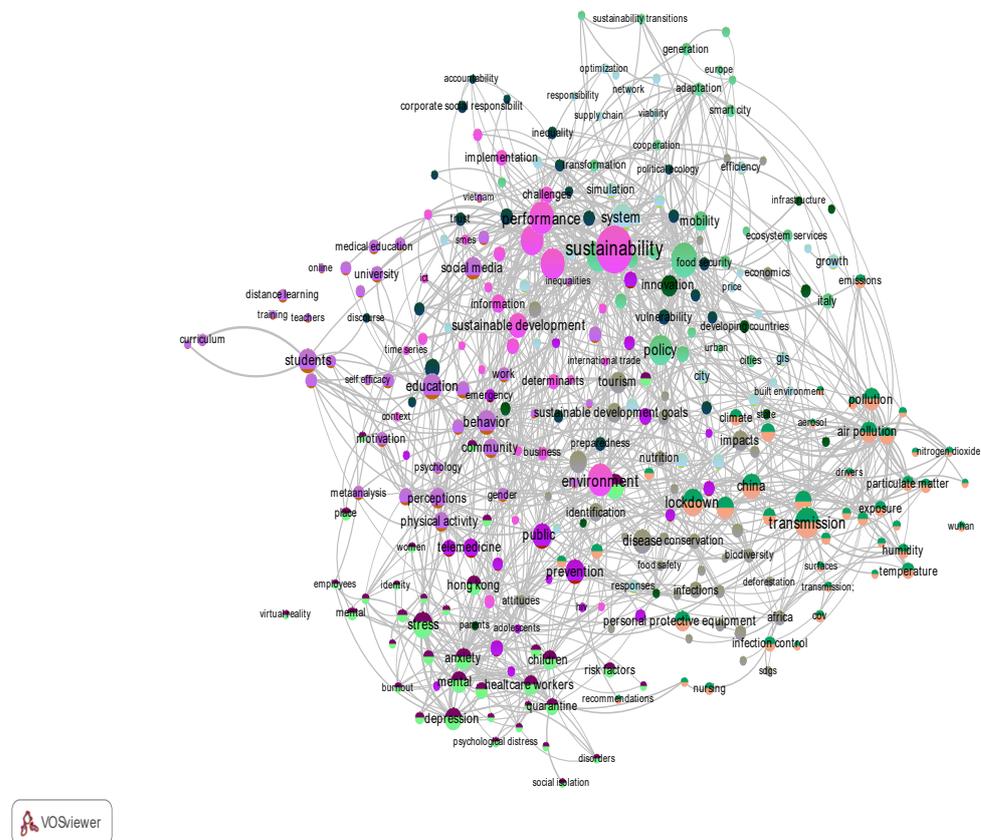
The eighth cluster [Cluster No. I/8] analyzes the COVID-related problems from the point of view of prophylactics and diagnoses. The geospatial aspects of this disease are analyzed as a specific problem.

As a summary it can be concluded that the research community has tried to apply a wide range of methodological tools to understand the situation. Increasing interest has generated an extensive application of qualitative methods, which are extremely useful for explorative research, and a wide range of application of structural equation models.

### 3.2.2. The Conceptual Structure of Research Directions Based on Co-Citation Analysis

Our second approach relies on the analysis of articles based on the co-occurrence of different keywords in abstracts, titles, and keywords of the publications. The results of

the investigation are summarized in Figure 3. Based on this approach an extremely wide spectrum of investigated problems can be visualized.



**Figure 3.** The conceptual structure of papers has been analyzed by co-citation analysis.

The clustering of publications has been based on references. An exact description of the algorithm can be found in Hota et al. [31].

Analyzing the results of sustainability-related research, 10 different clusters can be identified based on the co-occurrence of words.

The largest cluster (indicated by magenta) is dominated by sustainability and the analysis of COVID–environment relations. In this cluster the system-based approach, and the effect of COVID on the environment dominates. A rather big cluster (indicated by orange color) analyzes the adverse aspects of intense air pollution on the effects of COVID-related illness. China has a key role in this context, which can be explained by the high level of environmental pollution in this country. An important cluster (depicted by purple) analyzes the role of communication during this crisis. In this cluster the concept of the changing methods of teaching and the increasing role of social media dominate the landscape. A relatively compact cluster depicted by green represents research activities devoted to the analysis of the psychological consequences of the pandemic and quarantine. A relatively diffuse cluster deals with the social role of medicine in times of crisis. These publications analyze the place and role of modern communication technologies in medicine as well as the specific needs of vulnerable groups, e.g., HIV-positive persons. The clusters are shown in Table 3.

### 3.2.3. The Strategic Map of COVID-Related Publications

In the last phase of our analysis, we have investigated the structure of COVID and sustainability-related publications based on the Conceptual model of Cobo et al. [32], who define locomotive (motor) themes as topics which are well treated and determine the framework of discussion in the given field. The peripheral themes are found in the upper

left quadrant of the strategic map. These topics are internally developed in a sophisticated way, but there are just a few, if any, relationships between these themes and other ones, at least from the point of view of the corpus under investigation. Because of the relatively weak relationships to the problem, these themes have only a marginal significance on the development of the other topics of the academic field. Emergent (or in some cases waning) themes are those that are yet or already poorly developed. These topics can be found in the lower left corner of the strategic map of the publications. The basic themes can be characterized by a high level of centrality and a low level of density.

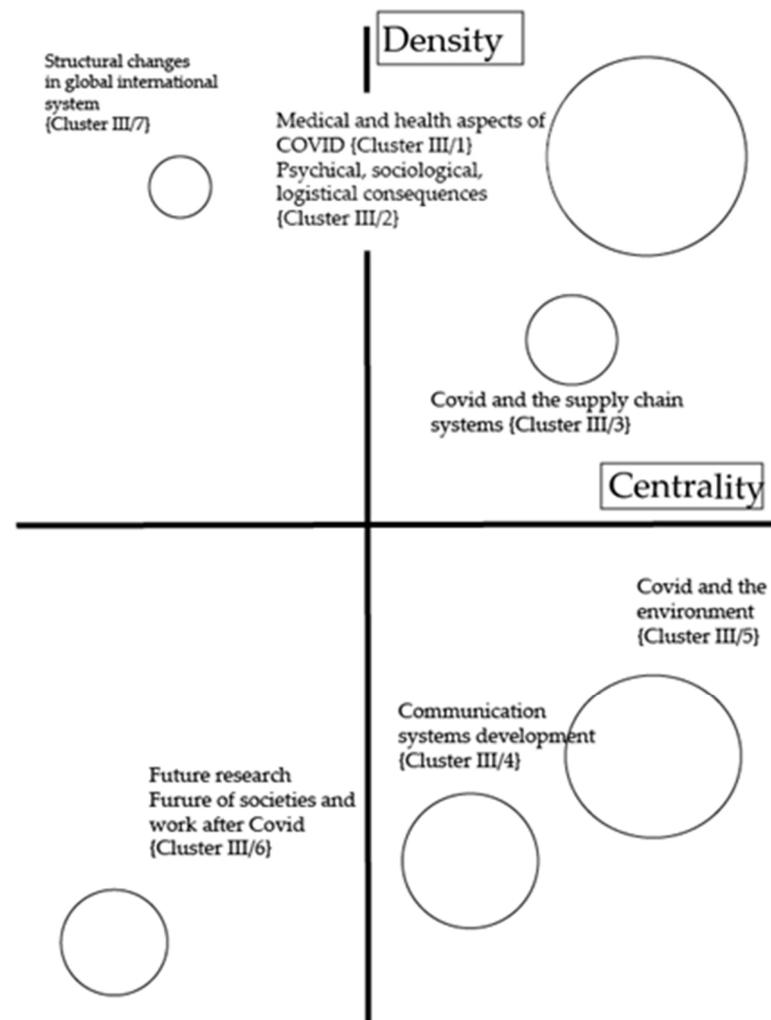
**Table 3.** The cluster structure based on of word co-occurrences.

<b>COVID and air quality</b> <b>(Cluster No. II/1) (total: 44 items)</b>
aerosol, air pollution, airborne transmission, china, climate, emissions, environment, environmental pollution, exposure, India, humidity, infection, nitrogen dioxide, ozone, particle matter, personal protective equipment, pollutants, pollution, recommendations, region, society, temperature, ventilation waste, Wuhan
<b>Consequences of COVID on psyche</b> <b>(Cluster No. II/2) (total: 38 items)</b>
alcohol, anxiety, behaviors, burnout, children, depression, disaster, disorders, loneliness, mental, pregnancy, place, psychological distress, quarantine, qualitative research, survey, virtual reality
<b>Distance work and education</b> <b>(Cluster No. II/3) (37 items)</b>
behavior, collaboration, curriculum, distance learning, education, engagement, higher education, knowledge, leadership, medical education, motivation, networks, social media, online, perceptions, politics, self-efficacy, teaching, training, university, work
<b>COVID, food and regional development</b> <b>(Cluster No. II/4) (37 items)</b>
Africa, agriculture, biodiversity, conversation, consumption, deforestation, economic growth, food safety, global, obesity, population, poverty, sustainable development goals, technology, truism
<b>COVID and technologies</b> <b>(Cluster No. II/5) (33 items)</b>
architecture, artificial intelligence, big data, built environment, circular economy, ecology, food system, GIS, machine learning, network, optimization, renewable energy, simulation, strategies, supply chain, system, technologies, twitter
<b>COVID and the supply chain</b> <b>(Cluster No. II/6) (30 items)</b>
access, adaptation, business, challenges, companies, ICT, internet, management, noise, performance, productivity, SMEs, supply chain management, sustainability, sustainable development
<b>COVID, environment and settlements</b> <b>(Cluster No. II/7) (26 items)</b>
adaptation, carbon footprint, cities, climate change, cooperation, cycle assessment, economy, ecosystem service, Europe, future, generation, globalization, policy, policy response, resilience, smart city, sustainability transitions, sustainable tourism, system thinking, transformation, urban planning, urbanization
<b>COVID and society</b> <b>(Cluster No. II/8) (23 items)</b>
accountability, capitalism, communication, coordination, corporate social responsibility, crisis management, environmental justice, inequality, lessons, media, political economy, power, racism, risk communication, strategic management, trust, vulnerability
<b>COVID, health and vulnerable groups</b> <b>(Cluster No. II/9) (21 items)</b>
adolescents, aging, aids, diabetes, disaster management, equity, HIV, older adults, telehealth, telemedicine
<b>COVID and innovation</b> <b>(Cluster No. II/10) Cluster 10 (11 items)</b>
developing countries, innovation, intervention, parents, participation, state

The analysis of the strategic map of the different topics is difficult because the time window is rather limited to evaluate the effect and embeddedness of the different topics.

The strategic map of COVID-related research directions, illustrated in Figure 4, shows that most clusters are situated in the high density-high centrality space. Topics on the

future of the world after the COVID have relatively few connections with other ones. The density of communication and environment-related topics is relatively low. This can be explained by the fact that these clusters embrace an extremely big and diverse set of problems. The analysis of structural changes in the global international system seems to be a rather peripheral one. A possible explanation of this is the focus of the current research.



**Figure 4.** The strategic map of COVID related publications.

Analyzing the consequences of COVID from the point of view of the Sustainable development goals of the UN, it is clear that all are affected by the pandemic. This fact supports our H4 hypothesis, that the pandemic will supposedly exercise a long-range effect on every area of socio-economic life (Table 4). Almost all areas have been the subject of studies in various research fields, which justifies the assumption that the pandemic will have a significant, tangible impact on all these areas.

**Table 4.** Reflections on UN sustainable development goals in COVID-related literature.

Sustainable Development Goals of UN	Lessons Offered by the COVID Crisis	Cluster Numbers
No poverty	There are considerable differences between the COVID related mortality rates according to social status	(Cluster No. II/8)
Zero hunger	Supply chain disruptions and extensive trade restriction cause considerable problems [33]	(Cluster No. II/4)
Good health and well being	There is a need for the general reform of health care systems even in the most developed states [34]	(Cluster No. I/3) (Cluster No. II/9) (Cluster No. III/1)
Quality education	Need to re-think our approach to traditional teaching methods [35]	(Cluster No. II/3)
Gender equality	COVID-induced lockdown highlighted the gender-inequality problems [36]	(Cluster No. I/7) (Cluster No. I/8) (Cluster No. III/2)
Clean water and sanitation	The economic shrinking induced by COVID highlights the problems of safe water access and decreases resources for water treatment [37]	(Cluster No. II/7)
Affordable and clean energy	The economic stimulus packages after the “great lockdown” could and should promote the greening of the energy portfolio [38]	(Cluster No. II/7)
Decent work and economic growth	Increasing importance of cultural-, lifestyle-, and social entrepreneurship [39]	(Cluster No. I/2) (Cluster No. II/6) (Cluster No. III/2)
Industry, innovation and infrastructure	The pandemic enhances the importance of flexibility and Industry 4.0 [40]	(Cluster No. I/1) (Cluster No. II/5)
Reducing inequality	Enhanced attention towards problems of low socio-economic status, need to reduce overcrowded housing [41]	(Cluster No. I/6) (Cluster No. III/6)
Sustainable cities and communities	Importance of modernization of waste management systems (2020), importance of “antivirus-built environment” [42]	(Cluster No. I/6) (Cluster No. II/7) (Cluster No. III/4)
Responsible consumption and production	Global rationalization of production logistical systems, improvement of the resilience of supply systems [43]	(Cluster No. I/5) (Cluster No. II/1) (Cluster No. III/3)
Climate action	The COVID-related economic slowdown highlights the effects of human activity on climate [44]	(Cluster No. III/5)
Life under water	The COVID pandemic increased the use of one-way packaging, increasing the pollution burden on the sea [45]	(Cluster No. III/5)
Life on land	improvement of procurement and price systems, localization, diversification [46]	(Cluster No. II/4) (Cluster No. III/5)
People, justice, and strong institutions	there is a negative correlation between COVID-caused mortality rate and government effectiveness [47]	(Cluster No. II/8)
Partnerships for the goals	Need to strengthen global cooperation [48]	(Cluster No. II/8) (Cluster No. III/7)

#### 4. Discussion

Our analysis has shown that COVID has considerably contributed to the intensification of debates on the future, sustainable way of living. Based on the constantly growing literature it is clear that life after the pandemic will not be the same as before, but it is too early to draw a full balance of the future, COVID-induced and/or boosted changes yet; nevertheless, some main directions have emerged. As an intellectual consequence of previous major pandemics, our first hypothesis assumed that the issues and controversies related to the ways of social development, especially the evolution of the social economic

structure, would be amplified by the COVID-19 pandemic, and our results confirmed this. Our second hypothesis, concerning the intellectual origins of COVID and sustainability-related articles, was also supported: psychology, sociology and systems theory all play an important role in the rapidly growing number of publications. Our third and fourth hypotheses were, to some extent, related. The third hypothesis is related to the UN's objectives on sustainable development and the fourth is a smaller slice of this, but it is also relevant to the COVID pandemic. Both of our hypotheses have been confirmed, showing that the epidemic and related research have implications for almost all aspects of life.

From our results the following considerations seem to be the most important ones:

- (1) The combination of modern info-communication systems and artificial intelligence opens new horizons for the development of tele-medicine. Behavioral patterns which were formed during the pandemic (e.g., distance communication by medical staff and physicians) had considerable traditions in different countries, but they have existed in a rather rudimentary, isolated way. The COVID pandemic has catalyzed the development of these processes. This can be considered a technological leap, but it is an open-ended question regarding how society will absorb these innovations. Our results underline the importance of a complex approach and future research to determine the long-range consequences of these technologies on societies from the point of view of security, data protection, environment and legislation, to name just a few aspects.
- (2) The enhancement of the role of tele-work and teaching methods. Processes of development, which have been estimated to take a rather long time (decades), have been accelerated by forced changes (e.g., home office, distant teaching). These processes can enhance the efficiency of work and teaching and decrease the burden on the environment.
- (3) Increasing importance of communities and community-based life in modern societies, dominated by tele services and work. A significant number of publications highlighted the importance of this aspect of life. It has become clear that technology cannot replace live human interactions. The pandemic has shown that it is much easier to change the technology of communication than the mentality. Further research is needed on how to humanize telework and teaching.
- (4) Increasing importance of satisfying the specific needs of vulnerable groups (e.g., elder people, citizens suffering from different chronic diseases, citizens with lower social and cultural capital, people living in less favored areas). It has long been acknowledged that the development of modern societies went hand in hand with increasing differences between segments of the society [49]. The COVID crisis has highlighted the importance of increased social inclusion and integration and reduced segregation. This promotes the re-consideration of the role of states [50] and corporate social responsibility [51].
- (5) Naturally, it is too early yet to determine a final balance on the consequences of COVID on international relationships, but deep-rooted changes in the international balance of powers will surely take place.

In summary, it can be stated that the COVID-related pandemic has not been a short-term derailment of modern history, but an important milestone towards a more sustainable future. On the one hand, regarding the high level of vulnerability of the current, even the most developed societies have become clear. Thus, the enhancement of resilience is expected to receive considerable attention in the post-COVID reconstruction period. These facts highlight the importance of harmonic development within society (e.g., decreasing of social differences, enhancement of inclusion), as well as of harmony with the natural environment. At the same time, a sizeable re-structuration of logistical systems can be visualized, increasing the importance of local, shorter supply systems. On the other hand, the COVID crisis propels deep rooted changes in the forms of services and employment. These could also have a positive effect on sustainability.

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