Analysis of the Impact of COVID-19 on the Sustainable Development Goals (SDGs): Bibliometrics-based Visualization and Review

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Abstract

The COVID-19 pandemic negatively impacts Sustainable Development Goals and presents obstacles to their achievement. To meet this challenge, a comprehensive analysis of the effects of the COVID-19 outbreak on sustainability is required. Using the methodology of A Bibliometric Analysis and Literature Review, the literature in the Web of Science database on the influence of COVID-19 on the SDGs was thoroughly examined in this paper. The findings demonstrate that, despite the research's broad scope that spans multiple fields, its depth is insufficient. Although the epidemic poses a more significant threat to sustainable development in developing nations than in developed countries, most research is conducted in the United Kingdom, the United States, and China. To serve as a helpful decision-making guide and source of scientific and technological assistance for the prediction and early warning of sustainable development, optimal regulation, and future dynamic simulation, the essay concludes with recommendations.

Keywords: COVID-19, SDGs, Bibliometrics, Visualization Analysis and Review

1. Introduction

In 2015, the United Nations adopted "Transforming Our World: the 2030 Agenda for Sustainable Development" (Transforming Our World: the 2030 Agenda for Sustainable Development), which formally designated seventeen Sustainable Development Goals (SDGs) (Colglazier, 2015). Over 15 years, the agenda intends to achieve 17 Sustainable Development Goals worldwide (Bain et al., 2019). These 17 Sustainable Development Goals replace the Millennium Development Goals of 2000 (Resasco, Wang, & Sabatini, 2018). However, after years of development, due to violent wars, climate change, uneven economic growth, and other factors, humanity's present achievements in sustainable development are threatened by reversal (Allen et al., 2017). At the 2019 United Nations Sustainable Development Goals Summit, leaders of various national governments, international organizations, and other leaders unanimously

adopted a political declaration entitled "Gearing up for a Decade of Action and Delivery for Sustainable Development". They pledged in it to raise funds, strengthen implementation, and achieve the SDGs (Ting & Wenwu, 2019). SDGs Acceleration Action refers to the voluntary initiatives or pledges suggested by governments, organizations, and other stakeholders to expedite the implementation of the 2030 Agenda for Sustainable Development (Leal, 2020). Before the outbreak of COVID-19, governments, organizations, and other stakeholders had submitted 141 SDG acceleration measures. However, it is unclear whether these actions are compatible with the level of sustainable development and whether they are relevant to regional requirements.

The 2019 novel coronavirus (COVID-19, Corona Virus Disease 2019) spread globally, posing a significant threat to human life and impacting both the globalization process and the economic and social growth of the world. Humanity's pursuit of sustainable development goals has veered further from the established path due to the widespread decline of production activity in numerous nations and the significant harm to national economies (Thornton, 2020). According to a UN progress report on the 17 Sustainable Development Goals, COVID-19 will lead millions of people into extreme poverty and hunger. The 2020 Goalkeepers report demonstrates that the COVID-19 pandemic has disproportionately affected women and racial and ethnic minority groups; the global demand for unpaid care work is on the rise. The rise will result in more significant burdens for women who experience more severe unemployment issues (Gates & Gates, 2020). A relevant study indicates that COVID-19 has a favorable short-term influence on the natural environment (Kumar et al., 2020), and the halt of human activity during a COVID-19 pandemic reduces CO2 emissions (Le Quéré et al., 2020). As the economy recovers, CO2 emissions will return to pre-recession levels (Wang et al., 2020). Overall, COVID-19 has fallen significantly behind the 2030 Sustainable Development Goals. The COVID-19 pandemic and new viral strains demonstrate the significance of implementing the 2030 Agenda (Coccia, 2020). Having learned from the pandemic, governments and academic institutions desire to increase the use of renewable resources and sustainable technology to produce energy. Access to timely, high-quality, transparent, and disaggregated data is crucial to these reforms because it enables governments to develop effective and equitable metrics and policies (Bouman, Steg, & Dietz, 2021).

Bibliometrics commonly provides an overview of developments in emerging fields (Mehmood et al., 2016), especially concerning sustainable development and the introduction of new areas for innovative development partnerships (Chernysh & Roubík, 2020). Bibliometric research is increasingly vital in responding to global public health emergencies (PHEIC). Despite the significance of this strategy, a bibliometric analysis of the impact of the COVID-19 pandemic on SDG achievement is still lacking. Consequently, this paper conducts a quantitative analysis of pertinent literature using Cite Space software and an in-depth analysis, discussion, and outlook based on objective data. Thus, the Sustainable Development Goals will be achieved more rapidly during the following decade. This will also provide information for formulating national policies in response to the public health issue.

The primary information of this article is organized into four chapters. This is the remainder of the research. The second section of the study design discusses the methodological framework and data sources for this research; the third section demonstrates the key bibliometrics research results. The fourth section presents the influential components of the pandemic to the SDGs and sustainable development strategies. The investigation aims to provide systemic evidence for further research and strategic decision-making.

2. Literature Review

MDGs, also known as the Millennium Development Goals, are one of the most influential and historical forms of mobilization at the global level. At the international level, it is crucial to accomplish various essential societal goals. The issue relates to the general public on a wide scale. These issues involved gender equality, environmental degradation, sickness, lack of education, poverty, and hunger. By organizing these priorities into distinct groups, it is possible to fulfill time-sensitive objectives.

On the other hand, MDG also contributes to an increase in global awareness and political accountability. Consequently, social feedback is also enhanced. Therefore, during the past two decades, MDG has played a crucial role in combating poverty (Mahida, Sendhil, & Ramasundaram, 2021).

Sustainable goals were initially described in the literature approximately four decades ago. Researchers have defined sustainable development as "progress that meets the demands of the present without jeopardizing future generations' ability to meet their own needs." Several earlier studies have defined and discussed the concept of sustainable development in terms of its social, environmental, and economic dimensions. Generally, the sharing economy has a close relationship with sustainability. It is characterized in previous research as a means of achieving a sustainable and fair economy, a sustainable means of advancing consumption, and an economic development potential. Consequently, these sustainable development goals are necessary for achieving sustainable development during the next five to seven years (Boar, Bastida, & Marimon, 2020).

These sustainable development goals were established in 2015 as a crucial precursor to the Millennium Development Goals. SDGs are defined by the United Nations as "integrated and indivisible, global in character and universally applicable, taking into account diverse country realities, capacities, and levels of development, and respecting national policies and objectives." On the other hand, targets are defined in the literature as global and aspirational, in which the government sets its national targets to international standards with varying ambitions. The literature mentions seventeen SDGs that are interconnected. These SDGs acknowledge that government actions in this area will also have repercussions in other sectors. These 17 SDGs must promote environmental, economic, and social sustainability through balance (Sachs et al., 2019).

Seventeen sustainable development goals for the change of the globe have been mentioned in the literature. These 17 SDGs include partnerships, solid institutions and justice, life on land, life below water, climate action, responsible production and consumption, sustainable communities and cities, reduced inequalities, infrastructure and innovation in the industry, economic growth and decent work, clean energy, clean water, gender equality, quality education, the well-being and good health of citizens, and the elimination of hunger and poverty. Each of the seventeen SDGs has a unique objective. Approximately ten SDGs are associated with reducing inequality, while four are associated with enhancing educational quality (Clemente-Suárez et al., 2022). In addition, researchers have noted that these 17 Sustainable Development Goals

(SDGs) have over 170 goals, and a number of these indicators will appear in the Agenda 2030 for Sustainable Development (Boar et al., 2020). Several nations have committed to distinct priorities. The nations design these SDGs to eradicate poverty and hunger (Mair et al., 2018; Malik, 2020).

These designed SDGS are quantifiable objectives that are interdependent. On the other hand, these measurable objectives encounter comparable obstacles. These objectives are addressed for all societal sectors, including the business, nonprofit, civil, and government sectors. A country's private sector will play a significant role in achieving these objectives. This sector also contributes significantly to attaining the SDGs (Glass & Newig, 2019). The business and sustainable development commission suggests that SDGs should be incorporated into company strategies. Following the recommendations of previous studies, enterprises must use the notion of sustainability from an orientational standpoint to transform business strategies. This must be appropriate to both the academic and practical aspects of society. In this manner, organizations and businesses will serve as SDG agents. According to previous research, businesses must play a role in adopting SDGs for sustainable development (Mio, Panfilo, & Blundo, 2020).

The Covid-19 crisis has had a significant impact on the implementation of the agenda known as the 2030 agenda. Its performance occurs at both the national and international levels. Covid 19 was discovered for the first time in China. It is one of the most recent global health concerns. The focus of countries has recently shifted from the economy to health. Covid-19 has nearly affected every economy in the world and is gradually encircling the globe. The policy interventions and initiatives adopted by organizations and governments may devastate economic progress (Iwuoha & Jude-Iwuoha, 2020). It is of the utmost importance that COVID-19 concerns have long-lasting effects on the economy, society, and psyche of the people (Fagbemi et al., 2021).

Due to the reason of the COVID-19 outbreak, the economic development of several nations has been impacted. Due to this epidemic, a significant portion of the population in numerous countries has been affected by hunger and poverty. Several analysts are concerned with the pandemic's economic and moral implications. Morally, the fact that more than two million people will have died from this pandemic

is unacceptable. According to the IMF, the world economy is affected by around 4.6% due to this epidemic. As a result, the economy fell by 7.5% compared to normal, resulting in a $6.7 trillion loss (Elsamadony et al., 2022).

Cover 19 affects a lot of societal factors. Included in these sectors are the economy, education, and health. These characteristics are related to Sustainable Development Goals 3, 8, 13, 12, and 8. As a result of Covid-19, the fundamental focus of SDGs is modified at a substantial level, and the world's realities are changed at a vast level. The lockdown caused by Covid-19 has affected the migration and mobility of individuals worldwide. The economic crisis was precipitated by the pandemic and had a significant impact on emerging nations (Fenner & Cernev, 2021). As a result, many individuals have experienced starvation and hardship. This event occurred for the first time in thirty years. The economic effects are extensive and profound, affecting employment, corporate operations, capital flow, and the economy. As a result, education has changed dramatically toward digitization, affecting 1,2 billion people in around 170 nations worldwide. This occurred during the initial shutdown of Covid-19. The decrease in democratic democracy has created an emergency scenario since the second wave of the epidemic could have the most devastating effects on society. Many of these pandemic impacts have impeded economic development and compelled people to embrace digitization to advance. Implementing SDGs at the national and international levels is crucial (Leal Filho et al., 2021).

Countries should develop a green economy to overcome the current crisis. Several countries have previously established agricultural subsidies and investments in green projects. South Korea has already implemented and tested this policy for around two decades. To develop a sustainable economy, non-cultural nations can transition to green economies by adopting solar energy, public transportation, and rainwater over several years (Syed & Miyazako, 2013).

The majority of the world's population consists of day laborers. They earn a living by arranging daily essentials for human existence. The shutdown of Covid has had a devastating effect on their life. Covid 19 affects economic growth and job availability, resulting in hunger and poverty among the population. Moreover, the fiscal mechanism is also one of the most significant areas affected by the epidemic. In

the presence of low-carbon development, the fiscal mechanism can support resilience and recovery activities. Different countries have imposed tariffs on luxury commodities in response to the pandemic.

Conversely, few economies have not altered their corporate model (Elgouacem et al., 2020; Sakamoto, Begum, & Ahmed, 2020). Their countries have not embraced work-from-home policies. Consequently, air pollution is increasing in these nations. As a result, inequality, hunger, and poverty have increased among the populace. Currently, several countries are facing the Equity problem with extreme severity. It is vital to realize that a single cause might have multiple effects. These consequences resulted in a variety of diverse effects for subsequent generations. This link between cause and effect has been addressed in several previous research. As these SDGs are interdependent, emphasis should be placed on the five Ps: partnership, peace, prosperity, planet, and people (Alamoush, Ballini, & Dalaklis, 2021).

The pandemic has had a variety of repercussions on the global population. It causes diseases and deaths among the population. The epidemic was also responsible for the socioeconomic turmoil. Across the globe, millions of people are at risk of poverty. In addition, several persons were malnourished (O'Reilly et al., 2021).

COVID-19 has an impact on all segments of the global population. This epidemic continues to harm the populations of various nations. Consequently, the global population is continuously impacted. Those affected include indigenous people, youth, individuals with disabilities, the elderly, and those afflicted by poverty. This virus has worsened the economic and health conditions of the countries, according to historical evidence. Homeless individuals were in grave danger of contracting this illness. On the other side, this poses a grave threat to the disabled, migrants, refugees, and those suffering from a lack of food and water. COVID-19 also hampered the employment chances of the affected population (Heggen, Sandset, & Engebretsen, 2020).

Last year, he contacted me worldwide to report the covid 19's remarkable recovery. In the year 2022, the majority of economies had expanded by 6%. This is due to vaccines' consistent but unequal availability in developing and underdeveloped countries. Therefore, post-pandemic growth was predominantly observed in

industrialized nations. Since last year, a small number of impoverished nations have experienced a negative impact on their GDP. Few countries' travel restrictions have had both short- and long-term effects on their GDP (Lekagul et al., 2022).

In general, pandemic 19 harms the ecosystem across the globe. COVID-19 is one of the severe environmental conditions that humans have generated. This issue has affected the wild habit date because of packing, plastic bags, and other non-recyclable materials, resulting in the spread of pandemic 19 among humans. Previous research has identified partnership and peace as one of the most significant elements in pandemic development. Do issues that later impacted nationalism and politicization in several countries due to poor health governance still exist? (Srivastava, Sharma, & Suresh, 2020). Government failure in the health sector negatively affects population control, harming global development. The suicide rate is higher at the household and individual levels due to a pandemic caused by marital abuse, psychological effects, homelessness, and unemployment (Lekagul et al., 2022).

One factor determining the severity of a country's pandemic-related suffering and how quickly it recovers is its level of prosperity. Consequently, the distribution of countries in terms of coping with Covid-19 is one of the most critical determinants of post-Covid-19 performance among nations. The nations that have been able to implement the SDGs are in a much better position to deal with pandemics. For example, countries with clean water access for all in terms of SDG 6 and countries with very few slums in SDG 11 successfully reduced the pandemic's danger. While better communication was provided for SDG 9 through Internet penetration and smartphones, The implementation of the healthcare system following SDG3 and the social protection system following SDG1 and SDG8 were the most important (Clemente-Suárez et al., 2022).

The experience of a pandemic has provided low-income countries with numerous insights. They have realized that they cannot disregard the sector's emphasis on healthcare. They should build these sectors at a very high level and never neglect them. These nations must implement distinct long-term, intermediate-term, and short-term policies to protect their citizens. During the pandemic, the International Monetary Fund anticipated that the world economy would lose a further

243

3%, totaling double digits. As a result, the accomplishment reward for several SDGs, particularly SDG 1, could be impacted, as the income of various countries was affected by the epidemic. As a result of the pandemic-induced worldwide recession, more than 71 million people suffered from poverty and starvation. Moreover, the aim to reduce inequality in the form of SDG 10 was significantly impacted by the pandemic, as the majority of vulnerable groups, such as the informal sector, medium enterprise, small enterprise, low-pay workers, youth, and women, were severely affected (Jewett et al., 2021).

Agenda 2030 places a primary emphasis on pandemic-caused concerns. To achieve this agenda of sustainable development, it is necessary to adopt a multidisciplinary mindset and strategy to uncover and investigate the connections between humans, wildlife, and the environment to reach health objectives. Nations can attain urban vitality through the adoption of conservation policies. Moreover, it is essential to address global pressures for Indians to reach their goals (Naidoo & Fisher, 2020).

Several scholars have pointed out the negative and beneficial effects of the 2030 Agenda for Sustainable Development on other SDGs. Researchers employ a variety of techniques to analyze the interplay between SDGs. These methods also include a 7-point scale and a Goal interaction score (Ament et al., 2020). Currently, the link between SDGs mostly depends on the opinions of specialists. Previous studies have examined the connection between objectives and goals or between various stakeholders. They have indicated that a substantial connection exists between sustainability and many SG.

3. Data sources and research methods

3.1. Data sources

This study employs the Web of Science Core Collection as the search source. It employs the custom search formula TS=(COVID-19) AND TS=(Sustainable Development Goals) in a limited year (2020 to 2022) limited document type range (Article). Under the search conditions, 670 pieces of literature were found (as shown in Figure 1). The information from these 670 kinds of literature was extracted and saved as "full records with cited references" in plain text file format.

3.2. Research methods

Cite space is utilized for data processing in this study. During the visualization process, the data should be normalized. Initially, data normalization can assess the relationship between the data. Cite space will generate a knowledge map based on the data relationships. The difference will cause a difference in the data's relationship measure. Cite space primarily contains the Cosine, Jaccard, and Dice algorithms

Cosine similarity calculation algorithm. You can determine the degree of similarity between two vectors by calculating the cosine of the angle between them. The cosine similarity determines the angle of a vector by placing it in a vector space based on its coordinate value, such as the most common two-dimensional space. Determine the cosine value that corresponds to the included angle; this can be used to describe the similarity between the two vectors. Consequently, the magnitude of the included angle permits us to determine the degree of similarity between two vectors. There is a more significant similarity as the encompassing angle decreases.

Li and Chen (2016) state that the cosine of the angle between two vectors in two-dimensional space equals

$$\cos\theta = \frac{A \bullet B}{|A| \bullet |B|}$$

(1)

This formula is not only applicable in two-dimensional space but also in multi-dimensional space, multi-dimensional space vector cosine similarity (Brandes, Borgatti, & Freeman, 2016):

$$cos\,\theta = \frac{\sum_{i=1}^{n}(A_i \times B_i)}{\sqrt{\sum_{i=1}^{n}(A_i)^2} \times \sqrt{\sum_{i=1}^{n}(B_i)^2}}$$

(2)

The second formula compares the similarity of any two text documents by inserting the number of words in each text into the space vector, generating two multi-dimensional vectors, and calculating the cosine value of their included angle. And the closer the cosine value is to 1, the more similar they are. Because cosine similarity primarily expresses the difference in data rather than the distance relationship, the relative distance of nodes, when drawn in Citespace, does not necessarily reflect their relationship.

Similarity algorithm Jaccard: The Jaccard coefficient, also known as the Jaccard similarity coefficient, is used to analyze the similarity and dispersion of a sample collection. The Jaccard coefficient is determined by the ratio of the sample set to the sample set (Niwattanakul et al., 2013), that is,

$$J = |A \cap B| \div |A \cup B|$$

(3)

To determine the degree of similarity between two texts, divide the total number of words in each text by the intersection of their everyday words. The two paragraphs resemble one another more and more as the value approaches 1. Typically, the Jaccard coefficient is applied to symbolic or Boolean values to determine the degree of similarity between two individuals. All of a person's distinguishing qualities are expressed as symbolic measures or Boolean values, making it difficult to quantify the exact extent of the difference. Consequently, the Jaccard coefficient is only concerned with the consistency of the shared characteristics between people.

The Dice Similarity Coefficient can be used to determine the similarity between two strings. (Niwattanakul et al., 2013):

$$Dice = \frac{2 \times comm\ (S_1, S_2)}{leng(S_1) + leng(S_2)}$$

(4)

In formula (4), comm (S_1, S_2) is the number of identical characters in S_1 and S_2, and length (S_1) and length (S_2) are the lengths of strings S_1 and S_2. Because Dice is also a measure of the similarity of document sets, it has the same function as the Jaccard similarity coefficient in solving the similarity of documents. Through the analysis of the formula, it can be seen that Citespace compares the two items in the set, and it can be intuitively seen that the two items are in The number of shares occupied in each set. The above three algorithms are Citespace standardized algorithms (Chen et al., 2015).

4. Results

4.1. Journal distribution

According to the classification of the 670 papers by source publications, there are a total of 198 source publications, with more than 10 publications listed below. In the research fields influenced by Goals, SUSTAINABILITY has published 125 papers and received a total of 656 citations, making it a journal representing research findings. Most relevant articles are published in environmental science, green and sustainable science and technology, environmental research, and public and occupational health journals.

Table 1. Distribution of main sources of research

Publication name	Five-year impact Factor	Count of articles	Total Citations	H-index
SUSTAINABILITY	4.089	125	656	14
INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH	4.798	13	77	3
ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH	5.053	12	21	2
ENERGIES	3.333	8	9	1
JOURNAL OF ENTERPRISE INFORMATION MANAGEMENT	5.639	8	24	3
SCIENCE OF THE TOTAL ENVIRONMENT	10.237	8	62	4
VESTNIK MEZHDUNARODNYKH ORGANIZATSII-INTERNATIONAL ORGANISATIONS RESEARCH JOURNAL	-	8	3	1
AGRICULTURAL SYSTEMS	7.131	6	98	5
RENEWABLE & SUSTAINABLE ENERGY REVIEWS	17.551	6	78	4

4.2. Distribution of core authors

Statistics suggest that just three writers from three institutions have published more than four papers. Taghizadeh-Hesary of TOKAI Res Inst Environm & Sustainabil TRIES authored four articles with the highest total frequency of citations. The overall frequency of citations is 99. Ali, SM from Bangkok University of Engineering & Technology (BUET) has published four papers with a total citation frequency of fifty-four; Leal, W from Manchester Metropolitan University has also published four papers. The overall frequency of citations is 81. The lack of a clear core author group in the research field of the influence of COVID-19 on Sustainable Development Goals is evident from the authors' collaboration. In contrast, the distribution of authors is quite varied. (see Figure 1).
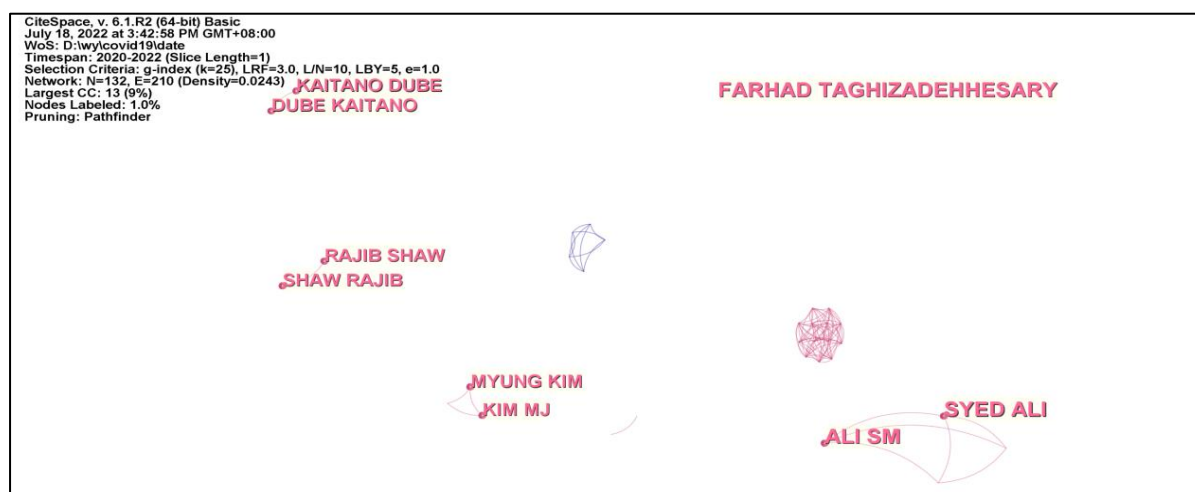

Figure 1. A visualization of the distribution of core authors' network

4.3. Author's country or region distribution

This research collected 670 publications from 129 countries/regions. The United Kingdom, the United States, and China each contribute 17.16%, 14.78%, and 10.30% of the total number of papers (as shown in Table 2). The quantity and quality of documents generated by various nations and regions vary. Regarding maximum citation frequency, South African, Brazilian, and German publications are cited less frequently than those from the United Kingdom, the United States, China, and Australia. The United Kingdom, the United States, and China are the most critical

research countries in the field of study on the influence of COVID-19 on Sustainable Development Goals, with Australia, Spain, India, South Africa, and Italy among the sub-core Countries. The knowledge map of cooperation between countries/regions in this field demonstrates this. When examining international collaboration, it is essential to recognize the intricate web of links and cooperation between numerous nations (as shown in Figure 2).

Table 2. Main country distribution of research fields affected by COVID-19 on Sustainable Development Goals (Top 10)

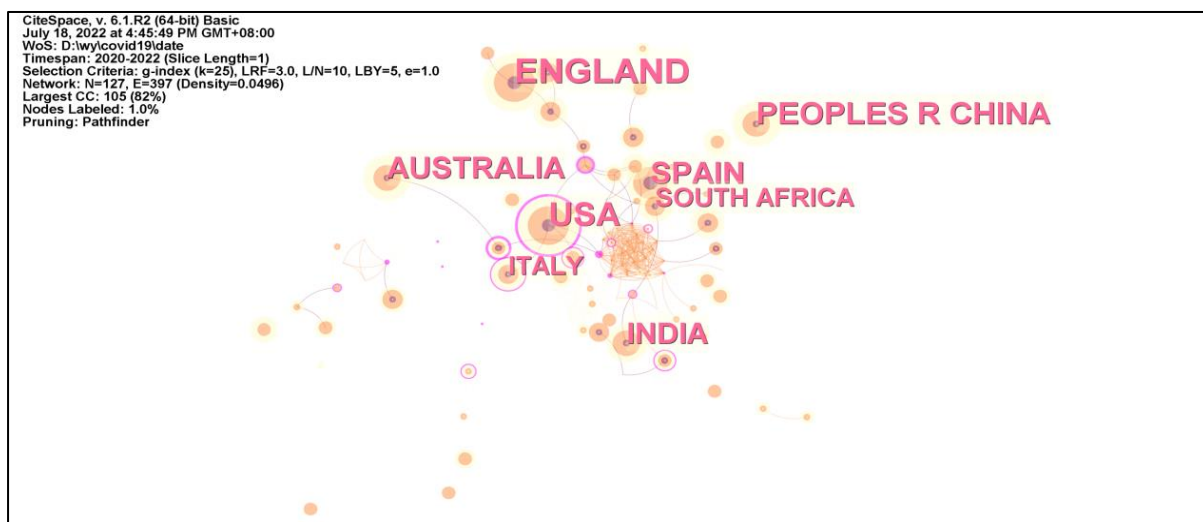| Serial number	Country	Centrality	Count of articles	Percentage	Maximum citations
1	ENGLAND	0.03	115	17.16%	854
2	USA	0.28	99	14.78%	721
3	PEOPLESR CHINA	0	69	10.30%	524
4	AUSTRALIA	0	65	9.70%	451
5	SPAIN	0	65	9.70%	338
6	INDIA	0	53	7.91%	374
7	ITALY	0.09	30	4.48%	241
8	SOUTH AFRICA	0.15	30	4.48%	205
9	BRAZIL	0	28	4.18%	169
10	GERMANY	0.08	28	4.18%	300

Figure 2. A visualization of the country collaboration network

4.4. Distribution of core research institutions

As a result of the spread of the COVID-19 virus, scientific research institutions from various nations have intensified their collaboration in the study of Sustainable Development Goals. From the standpoint of most scientific research cooperation, university cooperation is relatively close. The University of Cape Town has a centrality of 0.19, and its extensive collaboration with the Durban University of science and technology, City University of Hong Kong, etc., places it in a prominent position in the cooperation network (see Figure 3).
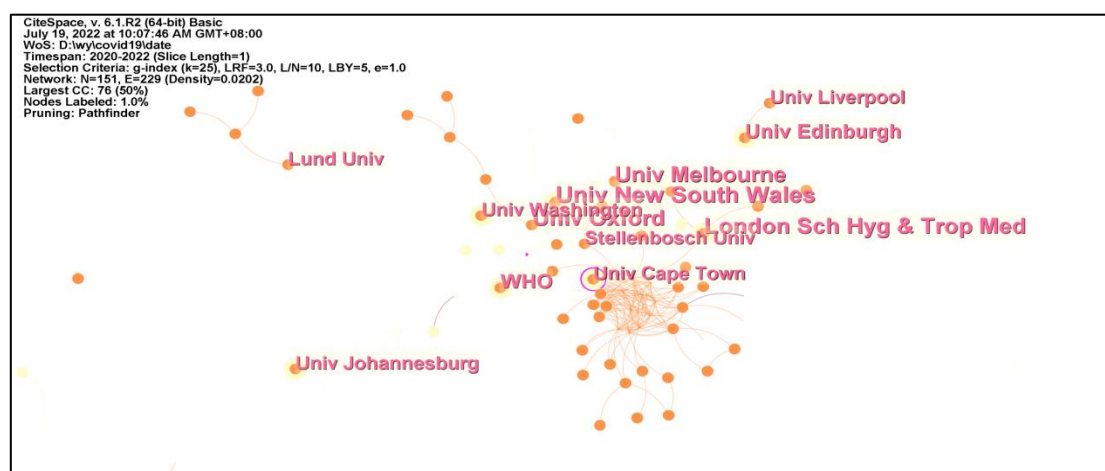

Figure 3. A visualization of the institution's collaboration network.

4.5. Distribution of main subjects

Understanding the disciplinary distribution of relevant research helps situate the field within the multidisciplinary spectrum of COVID-19's impact on Sustainable Development Goals. Figure 4 lists the top papers with the most citations according to Web of Science's classification of 10 disciplines (fields), including Environmental Sciences, Green Sustainable Science Technology, Environmental Studies, Public Environmental Occupational Health, Economics, Management, Business, Energy Fuels, Education Educational Research, Business Finance, and numerous other disciplines and fields. The study of how Covid-19 influences Sustainable Development Goals may be considered interdisciplinary. Only scholars with relevant knowledge from multiple disciplines can conduct more effective research on related topics. Important is the maturity of discipline.
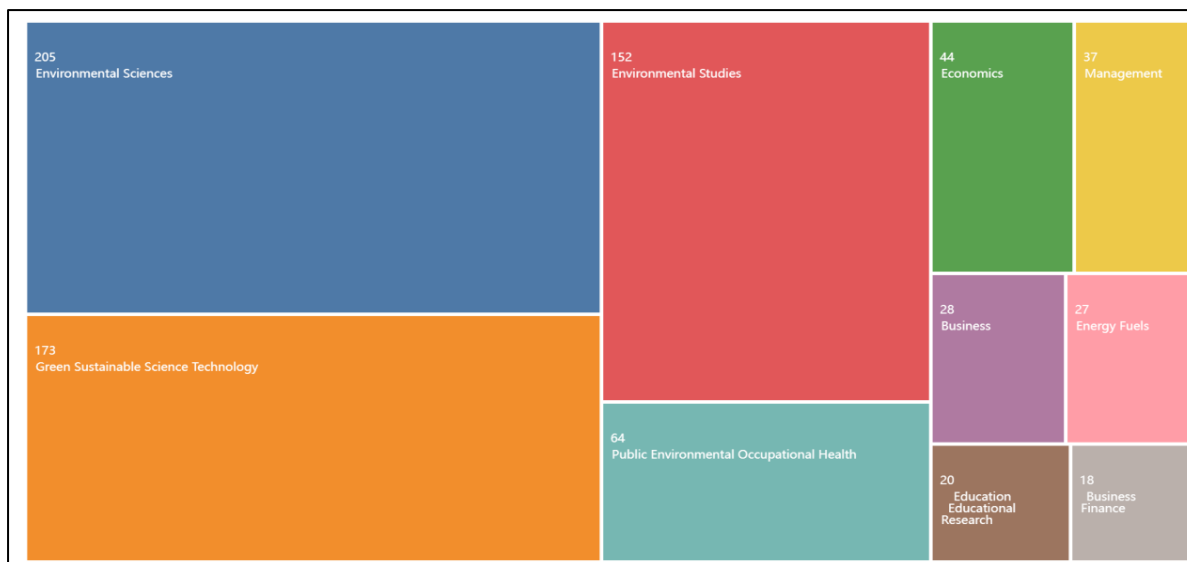
Figure 4. Distribution of main subjects

4.6. Research knowledge base analysis

Significant scientific findings in this field are frequently recorded in the classic literature. Identifying classic literature is crucial for establishing solid research foundations and analyzing research history. This research investigates the influence of COVID-19 on Sustainable Development Goals. Table 3 is a list of the top ten most-cited works.

Table 3. Information of Highly Cited Literature (Top 10)

Serial number	Citations	Centrality	Years	Literature name
1	170	0.03	2021	A critical analysis of the impacts of COVID-19 on the global economy and ecosystems and opportunities for circular economy strategies
2	107	0.05	2020	Sustainability and development after COVID-19
3	90	0.17	2020	Impact of COVID-19 pandemic on the mental health of children in Bangladesh: A cross-sectional study

Serial number	Citations	Centrality	Years	Literature name
4	81	0.02	2021	Introducing the "15-Minute City": Sustainability, Resilience and Place Identity in Future Post-Pandemic Cities
5	79	0.01	2020	COVID-19 and the UN Sustainable Development Goals: Threat to Solidarity or an Opportunity?
6	74	0.09	2020	COVID-19 is expanding global consciousness and the sustainability of travel and tourism
7	68	0.05	2021	COVID-19 and Optimal Portfolio Selection for Investment in Sustainable Development Goals
8	67	0.02	2020	Strategic assessment of COVID-19 pandemic in Bangladesh: comparative lockdown scenario analysis, public perception, and management for sustainability
9	63	0.16	2020	From fighting the COVID-19 pandemic to tackling sustainable development goals: An opportunity for responsible information systems research
10	60	0.07	2020	A post-COVID future: tourism community re-imagined and enabled

The journal article with the most citations is "A critical evaluation of the implications of COVID-19 on the global economy and ecosystems and potential circular economy solutions" by T. Ibn-Mohammed et al., which has 170 citations. In 2021, Resources Conservation and Recycling published this article. This essay provides views on how the pandemic could be used to develop a better, more resilient low-carbon economy and critically appraise the epidemic's positive and negative effects. The report recognized the danger of depending on pandemic-driven advantages to accomplishing sustainable development objectives. It emphasized the need for a radical, fundamental structural adjustment.

"Sustainability and development following COVID-19" by Barbier, EB of Colorado State University, is the second most cited with 107 citations. This article argues that developing nations must discover new policy instruments to accomplish cost-effective sustainability and development goals.

4.7. Research hotspot analysis

Since the appearance of the COVID-19 outbreak, the article's keywords serve as a high-level summary of its content, allowing readers to swiftly and readily identify the hotspots for research and development trends in the field of Sustainable Development Goals. The keyword co-occurrence knowledge graph (as shown in Figure 5).
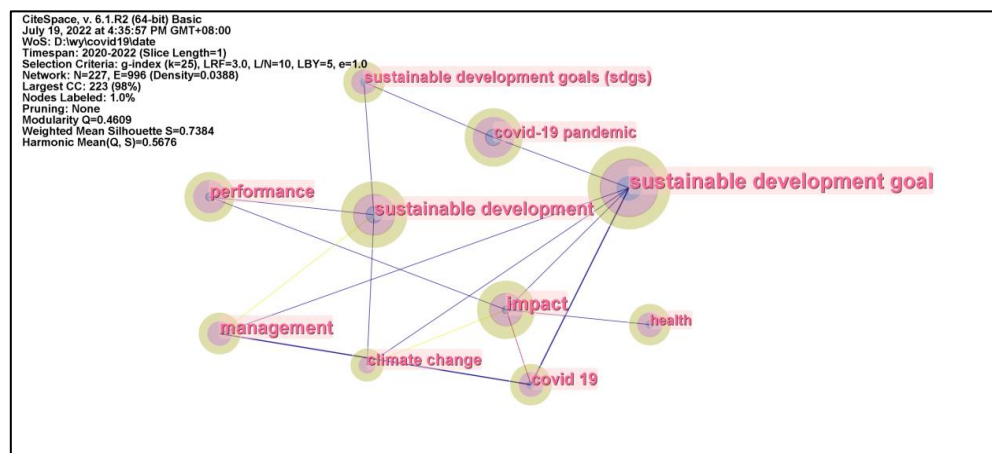

Figure 5. Keyword visualization graph

Figure 5 shows 277 hot keyword network nodes and 996 connections total, and the network density is 0.0388%. Based on the size of the nodes, the most common terms are sustainable development aim,' 'impact," management,' and 'COVID-19 pandemic,' among others. It demonstrates that these subjects are highly valued in the field. To clarify the presentation of hot research issues in this subject, this study ranks the top 10 co-occurrence terms (As shown in Table 4). For instance, keywords such as sustainable development goal' and 'impact' have a high degree of centrality, indicating that they play an essential role as a bridge in the network structure formed by all hotspots; sustainable development goals,' 'climate Change,' and other co-occurrence frequency and centrality are relatively low; these are related emerging topics that scholars have included in this field in recent years, and the number of related research results will be excessively high.

Table 4. Top 10 keywords of published articles

Serial number	Count	Centrality	keywords
1	153	0.17	sustainable development goal
2	82	0.07	sustainable development
3	75	0.1	impact
4	47	0.05	management
5	47	0.03	COVID-19 pandemic
6	34	0.02	COVID 19
7	33	0.05	performance
8	31	0.02	health
9	30	0.02	climate change
10	29	0.02	sustainable development goals (SDGs)

5. Conclusions and Prospects

5.1. Conclusion

The global epidemic has highlighted the health sector's weaknesses and the need for agenda 2030 and its execution. Sustainable development goals, such as social inequality and health, must be addressed concurrently by all nations. To recover from the pandemic, it is crucial to prioritize the implementation of the SDGs. Governments and academia must establish shared goals and objectives and build a strategy to attain them. These objectives must be related to public health, the economic system, and environmental improvement. The core of all these systems is the availability of data and implementation, as well as the development of policies by the government based on data.

The key to mitigating, managing, and comprehending the effects of a pandemic is the exchange of high-quality data between local and worldwide parties. This information is also crucial for developing and formulating long-term and short-term measures and responses. In contrast, data's global availability and analysis are not optimal. The majority of emerging nations lack economic, social, and health-related information.

This paper evaluates the most recent research on COVID-19 and the SDGs found in the Web of Science database using bibliometric methodologies. Since the COVID-19 outbreak, scholarly interest in the SDGs has gradually increased, according to this paper. As the COVID-19 pandemic spreads internationally and impacts an increasing number of nations, academics are growing interested in how the epidemic may impact sustainable development. Environmental Sciences is the most prevalent research field considering the distribution of disciplines. The research includes inter-disciplinary issues such as Green Sustainable Science Technology, Environmental Studies, Public Environmental Occupational Health, Economics, Management, Business, Energy Fuels, Education, Educational Research, and Business Finance.

Moreover, universities from diverse nations and regions are becoming the key source of research. Researchers have analyzed the pandemic's short- and long-term effects on the SDGs from multiple perspectives. A study team focusing on China, the United States, and the United Kingdom has been formed due to the countries' close cooperation.

This study concludes by elucidating the present research goals and developing trends concerning COVID-19's effects on sustainable development. Frequently, these nations perform research on environmental sustainability. However, affluent nations appear to place a greater emphasis on educational sustainability than developing nations on economic sustainability.

5.2. Research prospects

Future nations should strengthen exchanges and cooperation between their respective scientific research institutions and scholars and keep pace with cutting-edge research and development. Strengthen the research on sustainable development during the COVID-19 pandemic, enhance understanding of sustainable development mechanisms, and promote the integration of disciplines. Strengthen innovation, promote the application of new methods and new technologies in the quantitative research of sustainable development, and provide adequate scientific and technological support and decision-making references for the prediction and early warning, optimal regulation, and optimal population control.

This study contains important limitations that future researchers should address. First, in terms of data selection, specific articles may be omitted due to database selection, which may affect the findings of our final analysis. Second, a few studies in the review may have led to recall and response bias. Thirdly, while the author uses Lotka's rule in the productivity study, SD and other descriptive data are absent. Lastly, the influence of the epidemic on sustainable development is continuously changing over time, and current research does not quickly reflect this shift. Due to a lack of independent quality control, researchers did not use preprints and early versions of scientific journals as the data source, even though they are a quick way to disseminate information. This could influence the results of keyword clustering.

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