# Building Two Decade of Green Economy Research Theme Map for Sustainability Using a Bibliometric Approach

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## Abstract

In the economic concept, the term green economy is known which gives a deeper focus on uniting poverty alleviation with environmental and natural conservation. The green economy is defined as a concept that results in human well-being and social equity, while also significantly reducing the risk of environmental damage and ecological scarcity. This study aims to present a comprehensive knowledge map about the green economy around the world based on Scopus database data. The analysis was carried out in the last 20 years, namely in 2000 – 2020. Based on data mining, it was found that 657 academic documents will be reviewed in terms of annual publications, publication sources, author productivity, affiliations, countries, research subject areas, research collaborations, and a map of research themes on green business. This research contributes to the mapping of Green Economy research themes based on knowledge development based on the Circular Economy, Green Economy, Sustainable Development, and Environment, hereinafter abbreviated as CGSE.

## Keywords
author network, bibliometric, green economy, research themes

## 1. Introduction

Sustainability is one of the most interesting focuses of research, both nationally and globally for now and in the future (D'Amato et al., 2017). From an economic point of view, sustainability as a force in growth is often based on the exploitation of resources which leads to scarcity (Rosenberg et al., 2018). Based on the unfavorable impact on sustainability, the concept of sustainability began to be reviewed, both in terms of definition, policymaking, to governance for a better balance. (Lamptey et al., 2021).

In the economic concept, the term green economy is known which gives a deeper focus on uniting poverty alleviation with environmental and nature conservation (AlNuaimi et al., 2020). The green economy is defined as a concept that results in human well-being and social equity, while also significantly reducing the risk of environmental damage and ecological scarcity (Sehnem et al., 2021). From this definition, the need for green production and consumption is undeniably very important (Khan et al., 2021).

Green economy and sustainability are two things that are interrelated and interesting to study (Yacob et al., 2019). A good economy is shown by equitable welfare in the community (Tang et al., 2018). The green economy concept adds that welfare also has an impact on the preservation of nature and the environment (Raub & Martin-Rios, 2019).

Sustainable economic growth by paying attention to the balance of nature is also in line with the objectives of the Sustainable Development Goals (SDGs) where development should maintain a sustainable increase in the economic welfare of the community, maintain the quality of the environment, and ensure the implementation of justice and the implementation of good governance that can maintain the improvement of the quality of life from generation to generation (Guarini et al., 2021).

Research on the green economy for sustainability has been conducted and developed at an international level. However, no one has yet provided a large-picture map that is visualized on a global scale using data from many published studies. So far, there have been no publications that directly discuss the impact of scientific research and the mutually beneficial interactions between researchers on the topic of a green economy in sustainability.

The bibliometric method is used to see the relevance of the research. Where is a method for measuring and analyzing references, analyzing scientific references with a combination of statistical and mathematical methods (Purnomo et al., 2020). Bibliometrics is a statistical technique used to analyze bibliometric publication data such as reports, reviews, books, peer-reviewed articles, magazines, conference proceedings, and publications. Bibliometric methods are used to present the relationship between quantitative methods and the research domain (*IGI Global*, 2022).

The question raised in this research is how to map research themes and researcher relationships based on the keywords green economy and sustainability globally in the last 2 decades? Based on a bibliometric approach, this research aims to study and form a map of research themes visually and to show the relationship between researchers in green economy research and global sustainability in the last 2 decades, namely 2000 – 2020.

This scientific article is organized into several parts, namely: the first part is an introduction that discusses the background of the research, questions, and research objectives, the second part is a research method that explains the scientific approach used in research, the third part is the results and discussion that explains the research findings. and the fourth section summarizes the essence and implications of the research. At the end of the article is accompanied by an acknowledgment and reference.

### 1.1 Objectives

Based on a bibliometric approach, penelitian ini membangun peta tema penelitian secara visual serta menunjukkan keterhubungan antar peneliti dalam tema penelitian ekonomi hijau dan keberlanjutan secara global selama 2 dekade terakhir, yakni 2000 – 2020.

## 2. Methods

This study maps the status of green and sustainable economic research visually at the international level indexed by Scopus in the last two decades, namely 2000 – 2020. Research with a bibliometric approach is carried out with data from the document search service feature on the Scopus Database. (Purnomo et al., 2020; Pratama et al., 2021; Maulana et al., 2021).

The Scopus website provides analysis functions that display bibliometric information. This study took data on the Scopus website with the identification of the keywords Green Economy and Sustainability starting from January 2000 to December 2020. There were 657 academic documents published. The command that is applied when mining data on Scopus is (TITLE-ABS-KEY ("Green Economy") AND TITLE-ABS-KEY ("Sustainability")) AND PUBYEAR > 1999 AND PUBYEAR < 2021. Analysis services taken from the Scopus web are visualization of annual publications, publications by sources, individual researchers, affiliates, publications by country, and subject areas of green economy for sustainability research.

Furthermore, scientific literature analysis was carried out using the scientometric method using the VOSviewer application version 1.6.16 in the analysis of co-occurrence and co-authors. Co-authorship analysis was conducted to obtain information on international collaborative research networks on the topic of a green economy in sustainability research. The study also conducted an in-depth co-occurrence analysis of keyword relationships to generate a mapped network. research theme (Van Eck & Waltman, 2019; Boyack et al., 2018).

## 3. Results and Discussion

This section describes the search results and data processing consisting of data from annual publication, publication by sources, individual researcher, affiliation, publication by country, and subject area of green economy for sustainability research (2000-2020).

### 3.1 Green Economy for Sustainability Research Annual Publication

The trend of green economy publications in sustainability has increased from year to year. This can be seen from the graph presented in figure 1. In the last five years, the data shows as many as 66 documents in 2016, 80 documents in 2017, 98 documents in 2018, 88 documents in 2019 and peaked in 2020 with 101 publications. Research on green economics in sustainability is an interesting thing to study because it is closely related to the goals of the SDGs (The 17 Goals SDGs, 2022). In addition, this also proves that there is awareness about the importance of economic growth by paying attention to the balance of nature and the environment (Loiseau et al., 2016).

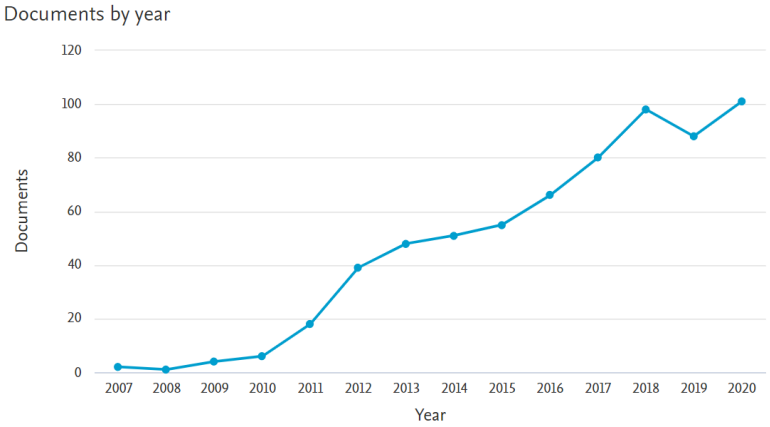


Figure 1. Green Economy for Sustainability Research Annual Publication

### 3.2 Green Economy for Sustainability Research Publication by Sources

The most productive sources of publications based on the Scopus database for green economy research in sustainability can be seen in Figure 2. Business Strategy and The Environment with 13 publication documents, Journal of Cleaner Production with 18 documents, and the source with the most publications is Sustainability Switzerland with 75 documents.

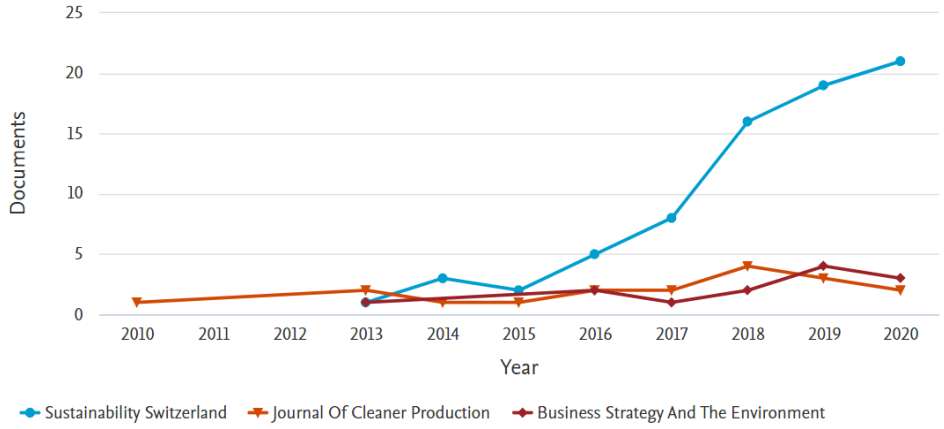


Figure 2. Green Economy for Sustainability Research Publication by Sources

### 3.3 The Most Productive Researcher in Green Economy for Sustainability Theme

Of the 657 documents presented in the Scopus database, 159 authors were found with the theme of green economy in sustainability. The ten most prolific writers over the last 2 decades can be seen in table 1 and figure 3.

Table 1. The The Most Productive Author in Green Economy for Sustainability Theme

| No | Author | Documents |
|---|---|---|
| 1 | Hake J.F. | 7 |
| 2 | Schlör H. | 7 |
| 3 | Tsai S.B. | 6 |
| 4 | Gibbs D. | 5 |
| 5 | Nhamo G. | 5 |
| 6 | Droste N. | 4 |
| 7 | Mohamed N. | 4 |
| 8 | O'Neill K. | 4 |
| 9 | Aigbavboa C. | 3 |
| 10 | D'Amato D. | 3 |

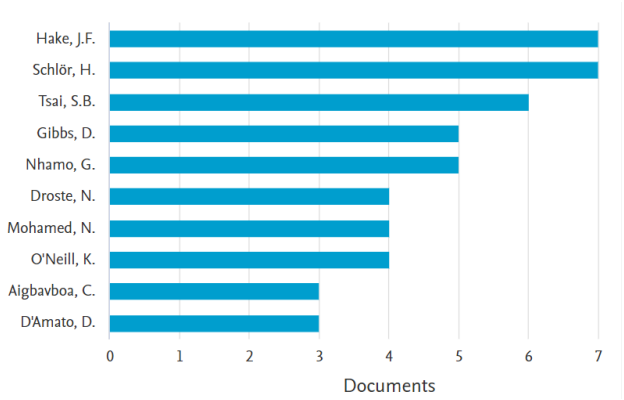


Figure 3. The Most Productive Author in Green Economy for Sustainability Theme

In the five most prolific researchers of the last two centuries, Hake and Schlor from Germany are prolific authors on the theme of green economy research in sustainability with 7 documents. Furthermore, Tsai from China became the third most productive researcher with 6 documents. Gibbs from United Kingdom and Nhamo from South Africa became productive researchers as well with 5 published documents. Researchers from Germany show their productivity in green economy research in sustainability, this is in line with various studies that show Germany has a special concern for the application of a green economy such as policies that lead to the use of natural resources, the impact of environmental damage, natural capital, and the quality of environmental life. (Ringel et al., 2016; Lutz et al., 2017)

### 3.4 The Most Productive Affiliation on Green Economy for Sustainability Research

The ten most prolific affiliations in green economy research on sustainability over the past two decades from the Scopus database can be seen in Figure 4.

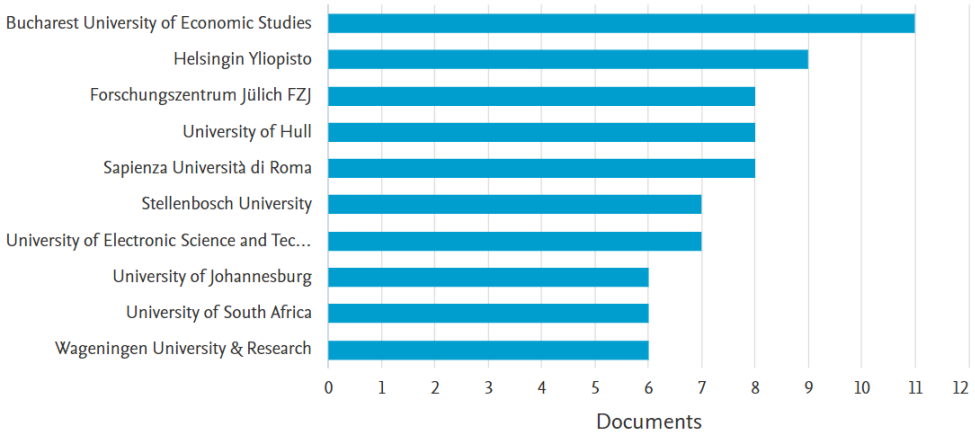


Figure 4. The Most Productive Affiliation on Green Economy for Sustainability Research

Bucharest University of Economic Studies in Romania became the most productive affiliate with a total of 11 published documents. Furthermore, Helsingin Yliopisto in Finland is in second place with 9 documents. Then there are Forschungszentrum Jülich FZJ in Germany, the University of Hull in the United Kingdom, and Sapienza Università in Rome in Italy with 8 publication documents each. Based on the Scopus database, Romania is the country that focuses on research on green economy in sustainability. This is indicated by the increasing number of published scientific articles with a focus on discussion on waste management, reduction of carbon emissions, effective use of natural resources, and the use of environmentally friendly energy. (Sirbu et al., 2015; Mihai et al., 2021)

### 3.5 The Most Productive Country in Green Economy for Sustainability Research

Dari 657 dokumen pada Scopus database, sepuluh Negara paling produktif pada penelitian ekonomi hijau dalam keberlanjutan dapat dilihat pada gambar 5. United States menjadi Negara paling produktif dengan 85 dokumen publikasi. Hal ini selaras dengan the Low Carbon and Environmental Goods and Services Sector (LCEGSS) dataset, yang menunjukkan bahwa estimasi US green economy is represent $1.3 trillion in annual sales revenue and to employ nearly 9.5 million workers; both of which have grown by over 20% between 2012/13 and 2015/16. Comparison with China, OECD members and the G20 countries suggests that the US is estimated to have a greater proportion of the working age population employed (4%) and higher sales revenue per capita in the green economy (Georgeson & Maslin, 2019). Negara paling produktif kedua adalah United Kingdom dengan 76 dokumen. Selanjutnya Italy dengan 72 dokmen. China dengan 65 dokumen publikasi dan Germany dengan 53 publikasi.

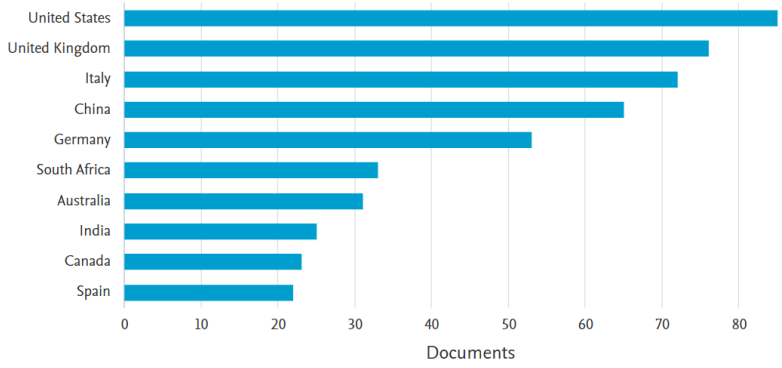


Figure 5. The Most Productive Country in Green Economy for Sustainability Research

Details of the ten most productive countries in research on green economy in sustainability over the last two decades based on the Scopus database can be seen in table 2.

Table 2. Top 10 Country/ Territory in Green Economy for Sustainability Research

| No | Country/ Territory | Documents |
|---|---|---|

| | | |
|---|---|---|
| 1 | United States | 85 |
| 2 | United Kingdom | 76 |
| 3 | Italy | 72 |
| 4 | China | 65 |
| 5 | Germany | 53 |
| 6 | South Africa | 33 |
| 7 | Australia | 31 |
| 8 | India | 25 |
| 9 | Canada | 23 |
| 10 | Spain | 22 |

### 3.6 The Subject Area That Most Researches Green Economy for Sustainability Theme

Data mining on the Scopus database shows more than 23 subject areas in green economy research on sustainability. The five subject areas with the most published documents are presented in table 3 and the pie chart of all subject areas is presented in Figure 6.

Tabel 3. Top 5 Subject Area in Green Economy for Sustainability Research

| No | Subject Area | Documents |
|---|---|---|
| 1 | Environmental Science | 355 |
| 2 | Social Sciences | 332 |
| 3 | Energy | 166 |
| 4 | Business, Management and Accounting | 148 |
| 5 | Economics, Econometrics and Finance | 129 |

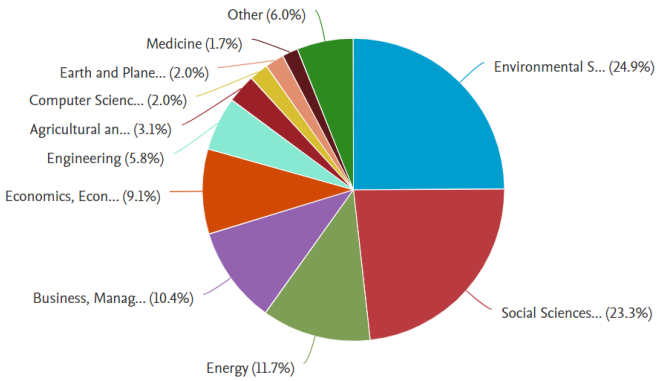


Figure 6. Subject area that most researches green economy for sustainability

Research on green economy in sustainability is very closely related to the balance between economic growth and natural sustainability. A green economy results in human welfare and social equity and reduces poverty, while also significantly reducing the risk of environmental degradation and ecological scarcity (Georgeson & Maslin, 2019). This explains that published documents in the Environmental Science and Social Science subject areas are the most productive in green economy research for sustainability.

### 3.7 Global Research Network on Green Economy for Sustainability

The topic of Green Economy for Sustainability has been investigated by several research groups. Author network map built with VOSviewer software. The criteria used for the formation of the network is a minimum of 5 documents publication. From 657 documents, the results of a network formed from 5 researchers, namely Nhamo, G from the University of South Africa, South Africa. Schlör, H and Hake, J from Forschungszentrum Jülich (FZJ), Jülich, Germany with one of the publication titles “How sustainable is the German energy system? Introducing the indicator for sustainable development (ISD) as a new measuring concept” in 2008. Gibbs, D from the University of Hull, Hull, United Kingdom. Tsai, Sangbing from Wuyi University, Wuyishan, China, whose several works collaborated with Wang, J with one of his research titled "An empirical study on green innovation efficiency in the green institutional

environment" in 2018. The map of the most productive research network on two decades of green economy for sustainability (2000 – 2020) is presented in Figure 7.

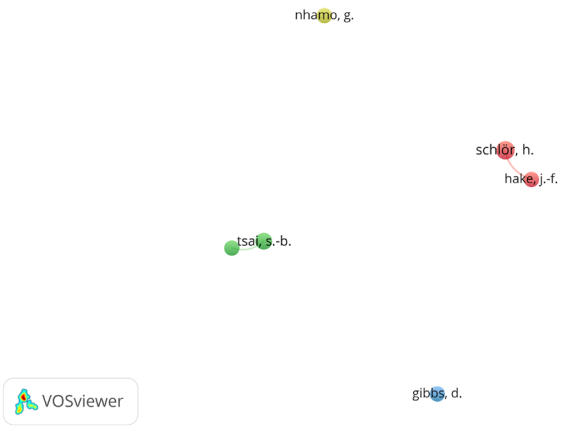


Figure 7. Global Research Network on Green Economy for Sustainability

### 3.8 Global Research Theme Map on Green Economy for Sustainability

The evaluation and visualization process related to the Green Economy for Sustainability research theme map was constructed using the VOS Viewer software. A review of the Green Economy for Sustainability research theme map was identified by keyword linkages between publications. The criteria for the number of keywords in a published document is 10 repetitions so a threshold of 78 interrelated keywords is found in 657 publication documents. A map of the Green Economy for Sustainability research network over the last two decades is shown in Figure 8.

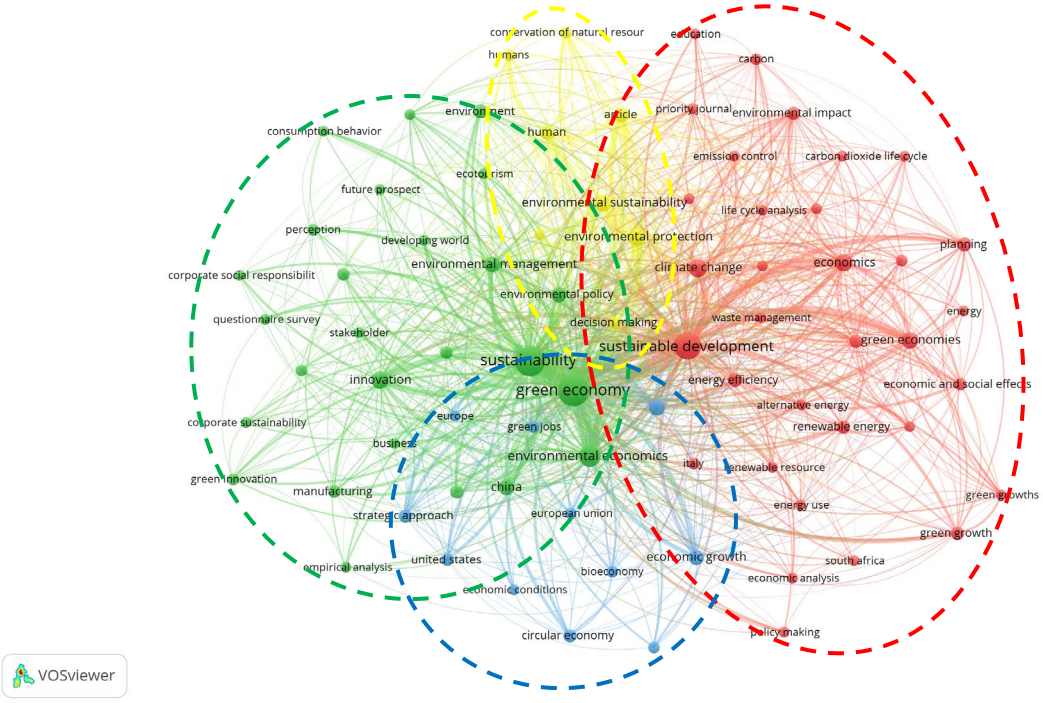


Figure 8. Global Research Theme Map on Green Economy for Sustainability

From Figure 8, four clusters are formed on the research theme Green Economy for Sustainability, the grouping of themes focuses on keyword studies. The four clusters consist of, Circular Economy, Green Economy, Sustainable Development, and Environment, hereinafter abbreviated as CGSE.

1. Circular Economy (Blue): The keywords in this cluster are green jobs, economic development, economic conditions, urban development, and economic growth.
2. Green Economy (Green): The keywords in this cluster are a green business, green innovation, sustainability, ecotourism, and consumption behavior.
3. Sustainable Development (Red): The keywords in this cluster are green growth, environmental impact, economic analysis, renewable resource, dan waste management.
4. Environment (Yellow): The keywords in this cluster are decision making, environmental protection, environmental sustainability, conservation, nature resources, and humans

## 4. Conclusion

This study shows the visualization of research maps and the relationship between researchers on the theme of the green economy in sustainability around the world based on data from the Scopus database. The results of data mining show as many as 657 publication documents in the last two decades, namely 2000 - 2020. The results of data processing show an annual publication graph that tends to increase from year to year. Most publications occurred in 2020 with 101 documents. The growth of publications shows the alignment between research awareness and SDGs goals where economic growth should also pay attention to ecological balance and sustainability. The most prolific publisher for green economy research documents in sustainability is Sustainability Switzerland with 75 documents. The most productive researchers in this research theme are Hake, J, and Schlor, H from Germany who both have 7 publication documents. Bucharest University of Economic Studies in Romania became the most productive affiliate with a total of 11 published documents. While the most productive country is the United States with a total of 85 published documents. The subject area with the most publications is Environmental Science with 355 documents, which is 24.9% of the total 657 publications during the two decades of 2000-2020. A total of 5 researchers showed a very strong collaboration network with a threshold of 5 publication documents, namely Nhamo, G; Schlor, H; Hake, J; Gibbs, D; Tsai, S.

The implications of this research are theoretical and practical contributions. In theory, this study shows a visualization of the research theme map which consists of 4 clusters of results from processing the Scopus database in the last two decades (2000-2020), namely: Sustainable Development, Green Economy, Circular Economy, and Humans. Practically, the results of this research theme map can be used as a basis for making policies that refer to a green economy to achieve sustainability and ecological balance. Further researchers can develop research using other data sources such as the Web of Science, this is considering the limitations of this research data from the Scopus database.

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