

A Bibliometric study on the Sustainable Economic growth

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Abstract

Economic growth plays a vital role in climate change which can be negatively affecting the climate by depleting the natural resources continuously and increasing the greenhouse gas emissions, it can be turned into a positive effect by applying sustainability in the different Economic practices in order to save our natural resources, decrease the amount of waste and decrease the greenhouse gas emissions. Sustainable Economic growth can stop the environmental issues which affect the Economic itself in the present and in the future in a way that ensures economic growth with environmentally friendly practices by changing the macroeconomic policies to imply that the growth can be maintained for the long term. There's a need to study and discover the research work in the area of Economic growth in more depth to get a better insight about how this term has been studied and developed and what the researchers have achieved in this area to define the research gaps and to open up the field for future studies.

1. Introduction

The club of Rome which is an international organization composed of industrialists, politicians, and academics have mentioned in their report “the limits to growth” in 1972 that the current population, economic development, and resource depletion patterns would result in humanity's extinction in less than a century [1]. Different countries attend to accelerate their economic growth; this economic growth acquires a high use of raw materials with low environmental performance, since the turn of the century, economic growth has had an outsized role in hastening climate change. This is primarily due to the consequences of industrialization, which frequently relies on the usage of harmful fossil fuels like coal. From here there was the need to reduce the negative effects of economic development on the environment by sustainably developing the economy as the key to resolving environmental crises is to achieve Sustainable Economic growth [2]. Referring to the sustainable development goals, economic growth is fundamental for the process as without economic growth, it is impossible for a developing country to improve the quality of life of its increasing people [3]. Making an investment in the environment in a way that drive sustainable economic growth is required, green Growth plans should strive to stop the vicious loop of environmental degradation and unsustainable economic growth—poverty—and replace it with a virtuous cycle of quality growth, environmental improvement, and social inclusion [4]. Economic growth is made compatible with environmental protection through a partnership between businesses, the government, and civil society to investigate technological, economic, and institutional alternatives for reducing poverty, social injustice, and inequality while not harming the environment [5]. The aim of this paper is to measure and evaluate the research progress in the field of sustainable economic growth by analyzing the academic literature quantitatively through a bibliometric analysis to give a comprehensive overview of the topic and to highlight the significant areas of research to identify the gaps in the research to refine and define the research question.

2. Literature Review

The term Sustainability has shown up as a systematic approach that aims to eliminate the waste and to use the resources continuously by recycling, remanufacturing, reusing, repairing, and refurbishing in a way that increases the lifetime of the products, and makes them a new resource for another process [6]. Sustainability ensures the health of the planet by reducing the pressure on the environment and the natural resources and benefits the economy by increasing competitiveness, innovation, and profit. The current inefficient use of resources calculated to cost European industry 600 billion euros annually, these can be translated into substantial gains by increasing the resource efficiency in manufacturing [7]. Organizations cannot ignore environmental issues if they want to survive in the global market, as the government regulations and stronger public awareness in environment protection increase, the integration of environment, economic and social performances to achieve sustainable development is a major business challenge for the new century [8]. Sustainable development is a concept which aims to meet the needs of the present without affecting future generations to get their needs [9], the term is referred to the UN conference on the environment which was held in Rio de Janeiro in 1992 (Earth summit). Sustainable development was defined in the conference as: "alignment of economic growth on the one hand and the rational use of natural resources on the other hand" [10]. Therefore, sustainable development is organizing the society so that it can exist for long-term by keeping the sufficient goods and services which are needed to maintain a well-functioning society. Another two pillars of sustainable development are environmental and economic. All three pillars are useful starting points for identifying difficulties and establishing green economic policy [11]. Environmentally, the natural resources should not be depleted, and the renewable resources should not be over-exploited. Economically, the economic growth should consider distributional equity, health, education, and political accountability [12]. Because it is the primary source of income, economic growth has an impact on the environment. Today's economic progress must ensure that future generations are not worse off than current ones. Or, to put it another way, per capita welfare should not be diminishing with time, as some economists have phrased it [13].

Environmental degradation and climate change have occurred, impacting everyone on the planet [14]. Since then, the economic growth has been the primary target of the sustainable development process [15]. Policymakers in nations like Denmark, Germany, Norway, and France have used the phrase "green economy" to push policy objectives, the European green economy is being promoted by the Organization of Economic Cooperation and Development (OECD) and the UN as a new paradigm to enable the economic growth while enhancing sustainability [16]. Energy markets, natural resource development, clean and sustainable production, environmental innovation, and further development of services industries are all examples of green economies [17]. To achieve the SD goals, green economies and economic growth must work together, as the economic growth is one of the key indicators of a thriving economy. The benefits of traditional economic development, on the other hand, are not evenly dispersed, which can rise to wealth disparity and social conflicts [18]. According to Hartwick (1977), the path of the sustainable economic development is governed by different principles. First, Environmental, and natural resources must be managed effectively to reduce welfare losses from environmental degradation and to

maximize resource rents gained after "internalizing" environmental externalities. Second, the rents generated by natural capital depletion must be invested in other productive economic assets [19].

The engagement of each pillar is included in the execution of GE. As a result of these interactions, three common borders will emerge: eco-economic, socio-environmental, and socio-economic. In the context of SD, GE reflection would appropriately give policymaking chances for achieving SD goals. The GE conscript serves as a catalyst for reforming the grey economy and enacting sustainable development goals in national and international legislation [20].

In September 2015, international leaders at the United Nations (UN) endorsed the 2030 Agenda for Sustainable Development (UN, 2015), The Agenda of 2030 sets down 17 sustainable development goals (SDGs), which are increasingly being referred to as global objectives because they apply to all governments in the world [21], the 8th goal promotes the sustainable economic growth [22]. Despite some criticism, the agenda has received widespread support, and global expectations for the SDGs are high [23]. The SDGs rely on three main factors which are the environment, society and economy, each factor of them in recent years, has played a significant role in attempts to promote innovation, funding, and global development [24]. The SDGs are a gift to businesses since the financial benefits for meeting the requirements specified in the SDGs are substantial. According to the Business and Sustainable Development Commission, offering solutions to the SDGs may generate up to 380 million new employments by 2030, with a potential economic payoff of at least \$12 trillion per year in market opportunities [25]. Some of the most important variables in the economic field which helped in enhancing the competitiveness and furthering market and business development Entrepreneurial entries, innovation, knowledge economy development, and digitalization [26]. Sustainable economy relies on the usage of the resources flow and the value of externalities being created [27], sustainable economic growth reveals the key to solving the ecological disasters, weather changing, economic and social issues that affect most of the people around the globe [28]. According to reports, a country's economic growth and development are intimately linked to environmental and natural resource protection [29]. Economic growth occurs in a succession of lengthy waves, each lasting 40–60 years and coupled with a specific technical discovery that pushes the economy and gradually shifts the current techno-economic paradigm [30], which makes technology one of the key drivers for economic growth. Various researchers have emphasized the fundamental notion of energy and resource rational utilization, which may be done by reproducing, altering the kind of durable goods, disseminating appropriate Eco compatible technology, and implementing advanced forms of industrial ecology among businesses [31]. The economic growth is being measured based on the GDP, while sustainable economic growth carries the idea of measuring the economic growth in more realistic way handling the economic growth in all its physical, social, and mental stats. Sustainable economic growth must be fueled by energy systems that are increasingly more efficient, less expensive, and cleaner to increase economic productivity and competitiveness [32]. In this century the environmental issues will play an essential role in determining the characteristics and options for economic development since the environmental problems are not only affecting the natural ecosystems, but the economic activity as well [33]. Sustainable economic growth donates continuity without making any fluctuations in the rate of economic growth and keep the main aim that future

generations don't suffer from depleting the natural resources. The economic growth is also enhanced with higher income reflected by the GDP which affects per capita income and makes the living standards and living better [34].

Nowadays governments tend to encourage sustainable economic growth to reduce unemployment, poverty, and inequality, P. Eko Prastery and N. Rahayu Kistani (2020) used primary data on entrepreneurship and SMEs in the provinces of Central Java and Yogyakarta in Indonesia to explain the four pillars of growth and development (human capital, social capital, institutional economies, and entrepreneurship) as the main drivers for equality and sustainable economic growth. The recursive model path analysis was used as an analytical method to conclude that there is a very strong correlation, significant, and positive influence between human capital and quality economic growth and that human capital is the primary and first key to promoting quality, high, and long-term economic growth. Second, entrepreneurship is a critical aspect in achieving long-term economic progress. The importance of repairing social capital is the third factor to consider. Fourth, institutions are fostering economic growth quality and durability through the characteristics of new economic quality. Fifth, it appears that greater economic freedom is required to increase the quality of existing institutions, human capital capability, and productive entrepreneurship competitiveness, as well as the other way around. It was also found that if the strategy of fostering sustainable economic growth is effective, then economic growth will be able to eliminate unemployment, poverty, and inequality to a greater extent [35]. The performance of the stock markets is additionally counted as an essential parameter to measure the country's economic growth, using an economic study, Henry Okodua and O. Olabanji Ewetan (2013) investigated the link between stock market performance and economic development in Nigeria to discover that the Nigerian economy's long-term development is too susceptible to interest rate fluctuations. This shows that macroeconomic variables in Nigeria are currently more beneficial in influencing the country's long-term economic orientation [36]. Environmental regulations may have some impact on long-term economic growth. Jorgenson and Wilcoxon (1990) investigated the impact of environmental regulations on long-term economic growth in the United States by building a detailed model of the economy that included the determinants of long-term growth and analyzing the interaction between industries to capture the full ramifications of environmental regulations. The cost of emission restrictions was estimated to be more than 10% of the overall cost of government procurement of goods and services [37]. Environmental regulations have a negative effect on economic growth in different urban agglomerations, according to Chong, Z., Qin, C., and Ye, X. (2016), who investigated the influence of environmental regulations on sustainable economic growth in China. Cities with more lenient environmental regulations had a higher growth rate. The long-term impact of environmental restrictions on long-term economic growth was also investigated, with the conclusion that there is insufficient evidence in the surveyed locations [38].

3. Methods

The bibliometric systematic technique is used to measure and evaluate the scientific advancement of individuals and organizations by quantitatively analyzing written academic literature and identifying research features based on the number of published papers and their citation effect [39]. Experts who are

looking to analyze scientific activities can benefit from this sort of analysis [40], as bibliometric analysis can assist in identifying publishing patterns and hotspots for new research subjects [41]. Bibliometrics is defined in a variety of ways, it is described as a collection of methodologies for studying or measuring texts and information, particularly in the form of large datasets [42]. It employs a variety of approaches to investigate the evolution and trends in a research area, as well as to estimate the relative value of publications in a certain field [43]. For three motives, bibliometric analysis is used in this study. To begin with, bibliometric analysis is easier and more reliable to handle hundreds of articles than other text analysis approaches such as content analysis. Second, a bibliometric analysis may dig deep into the links between publications, citations, co-citations, and keywords, yielding complete findings in our field of study. Finally, the high visualization capacity for bibliometric analysis aids readers in quickly and clearly identifying their future study interests in the topic.

3.1. Data Sources

Scopus database was chosen to carry out this study since a comparison of Scopus and Web of Science revealed that Scopus had more journal coverage than WoS [44]. Elsevier Co. produces the Scopus database, which is an abstract and indexing database. With 14,000 STM and social science titles from 4000 publishers, this database is the biggest single abstract and indexing database ever constructed, offering access to STM journal articles and the references included in those articles [45]. Furthermore, the Scopus database combines the features of both Web of Science and PubMed, making it more useful for both medical and academic research [46]. As a result, it was chosen to give unique data for this study. Scopus was used to find papers about sustainable economic growth, and the title search included the phrase "sustainable economic growth." The search timespan is from 1990 to the year 2020, After removing the extraneous documents, only research papers were left for further analysis, yielding a total of 969 articles for bibliometric analysis.

3.2. Bibliometric mapping

VOSviewer is a computer application for creating, viewing, and studying bibliometric maps. It displays big bibliometric maps in an easy-to-understand format, with a focus on the maps' graphical representation [47]. VOSviewer may be used to investigate various relationships in bibliometric network data, such as co-authorship and citation relationships between researchers, organizations, and nations [48]. Bibliometric mapping is used to investigate the structure and dynamics of the field using various forms of bibliometric maps to gain better knowledge and important insights regarding sustainable economic growth.

4. Results And Discussion

4.1. Descriptive statistics

Since the year 1990 to 2020 the number of research articles were published was 969 documents, the number of annual publications were fluctuating with a very low number in the first two-third of the time span. During the last third, there has been a notable increase in the number of scholarly publications

published on sustainable economic growth (2010 to 2020). According to the Scopus database, 187 papers were published in 2020, demonstrating how the relevance of sustainable economic growth has grown in recent years and how this topic still needs more study and research. The first sustainable economic growth-related article was published in 1990 by Kats, Georgy H. titled “Slowing global warming and sustaining development. The promise of energy efficiency” [49]. In order to assess the propagation of scholarly publications on the topic of sustainable economic growth, 969 articles were obtained using the Scopus database over that time period. The number of publications published over the period under consideration is depicted in Figure 1.

4.2. Co-authorship analysis

Figure 2 shows a bibliometric map of co-authorship network by country based on Scopus data; the size of the nodes represents the number of articles published by each country, the thickness of the lines represents the number of collaborations, and the various colors represent the clusters that can be separated in the co-authorship network.

Three European nations are among the top ten leading countries in research in the subject of sustainable economic growth, according to the bibliometric map. Over 100 countries contributed to the publications, with China leading the way with (13%, N= 126) of the total published documents, followed by the United States (10%, N=100), Malaysia (5.5%, N=54), the United Kingdom (5.3%, N=52), Romania (4.4%, N=43), and Pakistan (4.3%, N=42). Table 1 lists the top ten nations with the most publications about sustainable economic growth.

Table 1. Top ten countries in the highest publications in sustainable economic growth

Country	Documents	Citations
China	126	1076
USA	100	971
Russia	77	475
Malaysia	54	390
UK	52	713
Romania	43	272
Pakistan	42	586
India	40	697
Turkey	36	279
Spain	35	391

The bibliometric for the co-authorship network by authors is shown in Figure 3. A significant number of authors have produced or contributed to the publication of scholarly publications connected to long-term

economic growth. The size of the nodes indicates the number of publications published, while the colors indicate the research groups.

Pardhan, Rudra Prakash (Indian Institute of Technology Kharagpur) has the highest number of publications in the field of sustainable economic growth with 8 documents published on Scopus, and Shahbaz, Muhammad (Beijing Institute of Technology) with 8 documents as well, Hao, Yu (Beijing Institute of Technology, Beijing) with 5 documents. The highest citations were for Shahbaz, Muhammad with 256 citations in total. Table 2 shows the top ten authors in the field of Sustainable economic growth.

Table 2
Top ten authors in sustainable economic growth area

Author	Documents	Citations
Pradhan R.P.	8	161
Shahbaz M.	8	256
Hao Y.	5	165
Zhang Y.	5	31
Liu J.	5	14
Azam M.	4	152
López R.E.	4	48
Wang L.	4	40
Taghizadeh-hesary F.	4	29
Arvin M.B.	4	27

Figure 4 shows the bibliometric map for the co-authorship network by the organization, with blue indicating organizations that published in 2018 or before and yellow indicating organizations that published in recent years. With 5 documents for Beijing’s key lab of energy economics and environmental management, and the Centre for energy and environmental policy research, Beijing Institute of Technology, Chinese organizations showed the most interest in producing Sustainable Economic Growth-related publications. Six Chinese companies were among the top 10 companies in the field. The top 10 institutions that produce circular economy-related papers are shown in Table 3.

Table 3
Top ten organizations in Sustainable Economic growth area

Organization	Documents	Citations
“Beijing key lab of energy economics and environmental management”	5	165
“Center for energy and environmental policy research, Beijing institute of technology”	5	165
“Collaborative innovation center of electric vehicles in Beijing”	5	165
“Sustainable development research institute for economy and society of Beijing”	5	165
“Montpellier business school, Montpellier, France”	4	55
“School of management and economics, Beijing institute of technology”	4	162
“Faculty of economics administrative and social sciences, Istanbul gelisim university, Istanbul, Turkey”	3	10
“Plekhanov Russian university of economics, Moscow, Russian federation”	3	16
“School of management, shanghai university, Shanghai, China”	3	5
“Vinod gupta school of management, Indian institute of technology, Kharagpur, India”	3	23

Since 1990 until 2020 an average of 262 keywords were used from 969 articles retrieved from the Scopus database. The color of the nodes gives an insight about the most frequently used keywords in the mentioned period of time, the keywords ‘economic growth’, ‘sustainable development’, ‘sustainability’, ‘sustainable economic growth’, ‘environmental economics’, ‘innovation’, ‘gross domestic product’, ‘developing countries’, ‘economic analysis’, ‘renewable energy’, ‘climate change’, were the most commonly used terms in the retrieved publications, which provide insight into the most critical subjects that the writers attempted to research during that time period.

The bibliometric map revealed seven distinct groups: (red) associated with the phrases ‘economic growth’, ‘GDP’, ‘developing world’, and ‘foreign direct investment’. (yellow) connected to the terms ‘sustainable economic growth’, ‘energy consumption’, ‘investments’, and ‘economic analyses. (green) connected to the terms ‘sustainable development’, ‘economic development’, ‘sustainability’ and ‘innovation’. (Dark blue) connected to the terms ‘economics’, ‘environmental protection’, ‘biodiversity’ and ‘water management’. (Light blue) connected to the terms ‘Public policy’, ‘environmental quality’, ‘developing country’, ‘population’ and ‘population growth’. (orange) connected to the terms ‘investment’, ‘CO2 emission’, ‘energy intensity’, and ‘GDP’. (purple) connected to the terms ‘environmental economics’, ‘climate change’, ‘emission control’, ‘energy conservation’ and ‘industrial economies’. The larger the nodes in each group reflect the most relevant terms in the group, and the larger nodes in each group represent the greater connections keywords. Figure 5 depicts the most frequently searched terms in the retrieved articles.

4.3 Most cited articles published in the period of 1990-2020

Citation analysis is one of the most effective methods for determining the validity of a scientific claim since it considers the number of times a scientific work has been mentioned [50]. Citations are also useful for tracking the effect of research and identifying research benefits, it also allows tracking of the documented flow over time until reaching identifying the linkage of downstream products [51].

According to the Scopus database, the number of citations for the retrieved publications in the study field ranges from 0 to 331. According to Table No. 4 which shows the top ten cited articles, the work with the title "CO2 emissions, energy consumption, and economic development nexus in MENA countries: Evidence from simultaneous equations models" by Omri Anis, which was published in 2013, had the most citations.

Table 4
most cited articles in sustainable economic growth from 1990 to 2020

	Author (s)	Title	Year	Cited by
1.	Omri Anis.	"CO2 emissions, energy consumption and economic growth nexus in MENA countries: Evidence from simultaneous equations models"	2013	331
2.	Pradhan R.P.	"Effect of transportation infrastructure on economic growth in India: the VECM approach"	2013	112
3.	Paramati S.R.	"The effect of foreign direct investment and stock market growth on clean energy use across a panel of emerging market economies"	2016	109
4.	Shahbaz M.	"Time-varying of CO2 emissions, energy consumption and economic growth nexus: Statistical experience in next 11 countries"	2016	81
5.	Lu Z.-N.	"The dynamic relationship between environmental pollution, economic development and public health: Evidence from china"	2017	70
6.	Azam M.	"Effect of tourism on environmental pollution: Further evidence from Malaysia, Singapore and Thailand"	2018	67
7.	Shahbaz M.	"Dynamics of electricity consumption, oil price and economic growth: Global perspective"	2017	63
8.	Hao Y.	"How harmful is air pollution to economic development? New evidence from PM _{2.5} concentration of Chinese cities"	2018	57
9.	Saint Akadiri S.	"Renewable energy consumption in EU-28 countries: Policy toward pollution mitigation and economic sustainability"	2019	54
10.	Armeanu D.S.	"Empirical study towards the drivers of sustainable economic growth in EU-28 countries"	2017	54

5. Conclusion

The findings were based on the total number of articles found in the Scopus database for Sustainable Economic Growth. The data was analyzed and bibliometric maps of scholarly papers in sustainable economic growth were created using the VOSviewer tool. VOSviewer may be used to perform a variety of analyses, including collaboration between organizations and authors, journal citation relationships, and co-occurrence relationships. In the period 1990 to 2020, a total of 969 scientific papers were published, with a substantial increase in publishing after 2010, reaching a peak in 2020 with 187 publications in the domain of sustainable economic growth. There are a total of 2206 writers that have published articles in this field, with the biggest number of publications coming from China. Three European nations produced many publications, with the United Kingdom contributing the most (5.3%, N= 52) of the total published documents. China comes in first place with (13%, N=126). With eight publications on the topic of sustainable economic growth published on Scopus, Pardhan, Rudra Prakash (Indian Institute of Technology Kharagpur) and Shahbaz, Muhammad (Beijing Institute of Technology) were the most productive writers. The most frequently used keywords in the retrieved papers were 'economic growth, "sustainable development, "sustainability,' sustainable economic growth,' and 'environmental economics.' This research aids in identifying research trends in sustainable economic growth during the previous two decades, as well as highlighting the field's most active and prolific nations, authors, and organizations

Declarations

Availability of data and materials: All data generated or analyzed during this study are included in this published article and its supplementary information files.

Competing interests: The authors declare that they have no competing interests.

Author Contributions: Conceptualization, O.M. and P.L., methodology, P.L., software, O.M., validation, P.L., O.M., formal analysis, P.L., investigation, O.M., resources, O.M., data curation, P.L., writing—original draft preparation, O.M., writing—review and editing, P.L., visualization, P.L., supervision, X.X., project administration, X.X., funding acquisition, Y.Y. All authors have read and agreed to the published version of the manuscript.

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Figures

Documents by year

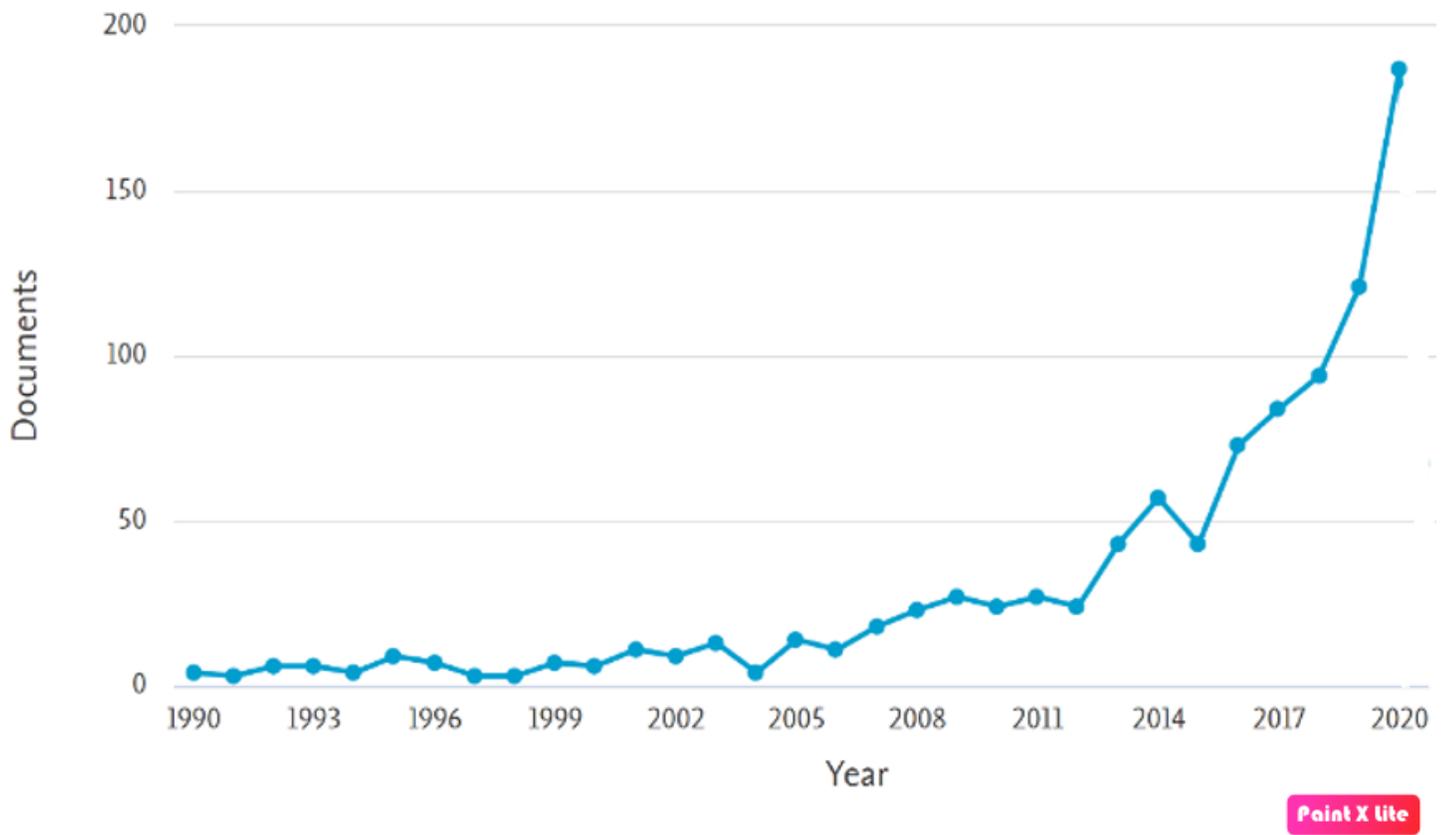


Figure 1

The number of published articles in the examined period

Figure 3

Co-authorship network by authors



Figure 4

Co-authorship network by organization

