



Bibliometric analysis of climate crisis and climate change research

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Abstract

Climate change is a worldwide issue that can influence the way of life of all living beings. This study aims to perform a bibliometric analysis of climate crisis and climate change scientific studies. Bibliometric analyses give an in-depth assessment of the literature's publications on the subject, the identification of scientific research trends on the subject, the evaluation of researcher collaboration, and the evaluation of significant issues. The study is qualitative research, and a bibliometric research method was used. The research data was first accessed on 04 August 2022 (Time: 14:34) from the "Web of Science" database as an online search. However, some data were revised on 18 July 2023 (Time: 15:00) using the same database in order to include up-to-date data in the study. The obtained data were transferred to VOSviewer software and analyzed. According to the survey, climate-related articles most used keywords include climate change, climate crisis, sustainability, environment, climate justice, and Anthropocene. Most of the studied papers are from many disciplines, such as environmental sciences, meteorology atmospheric studies, ecology, geosciences multidisciplinary, and environmental studies. When the publications on climate catastrophe are examined by country, the most cited countries are England, Canada, United States, Sweden, and Norway. As a result, international scientific collaboration and data exchange are critical for a successful battle against climate change and the climate crisis. Collaboration and information exchange between disciplines can result in more effective and inclusive solutions. Encouraging studies in other languages and knowing common terminology can help to promote global collaboration. The examination and assessment of scientific findings are vital in enhancing societal awareness and resilience, as well as in developing long-term policy.

Keywords: Disaster, Bibliometric analysis, Climate change, Climate crisis, Sustainability

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İklim krizi ve iklim değişikliği araştırmalarının bibliyometrik analizi

Özet

İklim değişikliği tüm canlıların yaşam şekillerini etkileyebilecek küresel bir sorun olarak görünmektedir. Çalışmada, iklim krizi ve iklim değişikliği alanında yapılan bilimsel çalışmaların bibliyometrik analizinin gerçekleştirilmesi amaçlanmıştır. Bibliyometrik analizler, literatürdeki konuya ilişkin yayınların derinlemesine incelenmesini, konuya ilişkin bilimsel araştırma eğilimlerinin belirlenmesini, araştırmacılar arasındaki iş birliğinin ve ön plana çıkan konuların değerlendirilmesini sağlar. Çalışma nitel bir araştırma olup bibliyometrik araştırma yönteminden yararlanılmıştır. Araştırma verilerine ilk olarak 04 Ağustos 2022 (Saat: 14:34) tarihinde "Web of Science" veri tabanından çevrimiçi tarama şeklinde ulaşılmıştır. Ancak güncel verilerin çalışmaya dahil edilebilmesi için bazı veriler 18 Temmuz 2023 tarihinde (Saat: 15:00) aynı veri tabanı kullanılarak revize edilmiştir. Elde edilen veriler VOSviewer yazılımına aktararak analiz edilmiştir. Çalışmada, iklim krizi ile ilgili yayınlarda en sık kullanılan anahtar kelimelerin iklim değişikliği, iklim krizi, sürdürülebilirlik, çevre, iklim adaleti ve antroposen olduğu belirlenmiştir. Analiz edilen yayınların çoğunluğunu çevre bilimleri, meteoroloji, atmosfer bilimleri, ekoloji, multidisipliner yer bilimleri ve çevre çalışmaları

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olmak üzere farklı disiplinlere ait çalışmaların oluşturduğu tespit edilmiştir. İklim krizi ile ilgili yayınların ülkelere göre değerlendirilmesi yapıldığında, en fazla atıf alan ülkelerin İngiltere, Kanada, Amerika Birleşik Devletleri, İsveç ve Norveç olduğu tespit edilmiştir. Sonuç olarak iklim değişikliği ve iklim krizi ile etkili mücadele için ülkeler arasında bilimsel iş birliği ve veri paylaşımı önemlidir. Farklı disiplinler arasında iş birliği ve bilgi paylaşımını teşvik ederek daha etkili ve kapsayıcı çözümler üretilebilir. Aynı zamanda, farklı dillerde yapılan çalışmaların teşvik edilmesi ve ortak terminolojiye hakim olunması, küresel işbirliğini güçlendirebilir. Toplumsal farkındalığın ve dirençliliğin artırılmasında, sürdürülebilir politikaların oluşturulmasında bilimsel çalışmaların analiz edilmesinin ve değerlendirilmesinin önemli olduğu düşünülmektedir.

Anahtar kelimeler: Afet, Bibliyometrik analiz, İklim değişikliği, İklim krizi, Sürdürülebilirlik

1. Introduction

Climate change is a worldwide issue that threatens the planet and can potentially impact the way of life of all living beings [1]. It can be stated that climate change has become a global problem. As a result of changing climatic conditions, temperatures are increasing, glaciers are melting, and sea levels are rising. Therefore, this situation worries societies and states [2]. It is important to know the negative consequences of climate change and to develop plans in this direction. Efforts to reduce greenhouse gases can be an important step towards reducing the negative effects of climate change [3].

The rural and urban populations are essential in climate change action plans and research. Over half of the world's population (55%) lives in cities, which is expected to rise in the future years. It is estimated that urban activities account for around 70% of greenhouse gas emissions at the global warming point [4]. Carbon dioxide emissions are predicted to rise as the consumption of coal, oil, and other fossil fuels rises, resulting in higher greenhouse gas emissions [5]. Many variables, such as greenhouse gas emissions, can be assessed as contributing to global warming. Situations that contribute to global warming include the usage of fossil fuels, environmental deterioration, unplanned urbanization, and unregulated industry. These circumstances might be viewed as variables that exacerbate the detrimental effects of climate change on a global scale [6, 7]. In order to combat climate change, it is vital to reduce the impacts of elements that contribute to climate change and raise climate change awareness [8]. Measuring climate change awareness is a critical step in planning and implementing successful climate change mitigation strategies [9]. Because climate change is a global issue, nations have chosen to adopt a series of measures or design programs that incorporate international policy as well as their own. Climate change action plans are being produced, governments are paying more attention to climate change in their own development goals, climate change adaptation strategies are being developed, and human and institutional capacity is being sought to be built. Specific pledges to address climate change are being executed [10]. States have acknowledged climate change as a public catastrophe and an urgent need for governance and have taken steps to address it. They design strategies to reduce greenhouse gas emissions and manage climate-related hazards [11]. Government institutions must finance technical advancements in the battle against global warming and climate change. Technological advancements can lead to developing of solutions that are less detrimental to the environment and based on renewable energy sources [12].

Climate change should not be regarded just as a rise in temperature. Various occurrences may occur due to climate change, putting animals, plants, communities, and ecosystems in danger. Droughts, intense hurricanes, floods, melting glaciers, increasing sea levels, and other crises are examples of occurrences within this scope [13, 14]. Therefore, one of the significant impacts of climate change is catastrophes connected to climate and extreme weather conditions. It is well known that the frequency of climate-related disasters rises as the planet warms and climatic circumstances change. Heat waves, droughts, and typhoons that inflict major worldwide devastation may be said to occur in practically every part of the world, causing substantial harm to the global economy and dragging millions of people into poverty. Most disasters are related to climate change [15]. As a result, humans bear significant responsibilities in preventing environmental degradation. Because the preservation of biodiversity and environmental integrity is critical for human and animal health [16]. Concerns such as climate change, biodiversity loss, and environmental contamination, must be thoroughly investigated with global involvement [17]. It has been underlined that studies are conducted to establish probable future circumstances using climatic data and that these scientific outputs play an essential role in the appraisal of conceivable situations that may arise in biological diversity [18]. This global change has also caused some concepts to be pronounced differently over time. In this context, it has been observed that the global climate has altered; this phenomenon was once referred to as global warming before being superseded by the phrase global climate change. Today, considering the current conditions, it has been seen that climate activists or experts have started to use the terms climate crisis or climate emergency to describe the situation [19]. The climate crisis is a notion that calls attention to serious issues such as global warming and climate change. The climate crisis can refer to various phenomena such as flooding, drought, desertification, and glacier melting [20]. The climate problem may be viewed as a worldwide threat that needs urgent and long-term remedies. As a result, planning for good disaster and emergency management gives a massive potential for societal reform that also considers the climate problem [21]. In this context, national plans, commitments and financial management should include strategies to strengthen the fight against the climate crisis [22]. It is critical to be socially

conscious of the climate catastrophe and to promote awareness. The active engagement and knowledge of many elements of society are critical in the battle against the climate problem [23, 24]. To summarize, the climate problem is a critical issue that must be handled in the short and long term by all segments of society. In this perspective, it may be agreed that the implementation of social awareness and transformational policies, as well as their scientific debate, play a key role in combating the climate crisis.

This research aims to conduct a bibliometric analysis of scholarly papers on the climate crisis and climate change. This sort of study examines publications in the literature in depth, identifies scientific research trends on the subject, evaluates researcher collaboration, and examines significant concerns. Therefore, it is acknowledged that this study will make an essential contribution to the literature by assessing the present state of research on the climate crisis and climate change and laying the groundwork for future researchers. It is also accepted as a separate value that the research results will provide valuable information to the relevant stakeholders, policymakers, and researchers, and that they will enable potential cooperation opportunities as a result of determining the trends in the literature. The research question created in this direction is as follows:

How do the publishing categories, nation distribution, citation density, author distribution, and distribution by years compare in the bibliometric study of academic works on climate change and climate crisis?

2. Materials and methods

The study is developed as a qualitative study. The bibliometric research approach is preference for the investigation [25, 26]. Bibliometric research can assist in determining trends in a certain on the subject by quantifying investigations and analysing the results [27]. Bibliometric analysis helps review current publications, analyzing publications, and summarizing scientific trends in a particular field. This analysis provides an essential resource for trending publications, tracking scientific progress and understanding research outputs [28]. The study's goal is to review and bibliometrically assess works on "Climate Crisis and Climate Change" published between 1997 and 2023 in the "Web of Science" database, which has a significant international presence.

The research data was first accessed on 04 August 2022 (Time: 14:34) from the "Web of Science" database as an online search. However, some data were revised on 18 July 2023 (Time: 15:00) using the same database in order to include up-to-date data in the study. Combining and evaluating disparate datasets may provide particular challenges in bibliometric analysis investigations. These difficulties might include discrepancies in indexing algorithms and data formats [29]. Therefore, the "Web of Science" database, which is used as a vital publication search tool, was preferred in this study.

In the study, data scanning according to keywords was carried out in two stages. In the first stage, a large-scale scanning was conducted to construct an overall profile of climate change. In this context, "Climate Change" was written in the search section and scans were carried out under this title. In the initial scan results, you may see categories, publishers, years, journals, and so on. Because there were no limits for "Articles, Papers, Book Chapters, etc." from 1980 and 2023, all publications are available. The generic search yielded 446473 studies on "Climate Change" in the "Web of Science Core Collection" database. Since too many publications are in the climate change category, a year restriction has been applied. In this context, it was decided to evaluate the publications between the years 1997-2023 to evaluate the climate crisis category equally. In this way, it is planned to gain a holistic perspective. After the year restriction, 441380 publications were evaluated.

When the second keyword, "Climate Crisis" is scanned, it is seen that 2681 studies were recorded between 1997 and 2023 without any restrictions. In 1997, it was seen that a study was carried out on the climate crisis (Climate Crisis). It has been determined that there was no study on the subject between 1998-2001. In this context, since no restriction criteria were created, all data were transferred to the VOSviewer program and evaluated. Within the scope of the study, it is planned to evaluate the publications from a holistic perspective. For this reason, all publications containing related keywords (climate crisis-climate change) were included in the study.

The export method takes the data is taken from the "Web of Science" website. The data file was downloaded in "Tab Delimited File" format. Since all publications accessed from the Web of Science Core Collection database cannot be downloaded as a single file, they have been downloaded in parts. Each record contains information such as "Author(s), Title, Source, Abstract, Document Type, Keywords, Cited References, Hot Paper, WoS Categories". The obtained data files were transferred to the VOSviewer software (<https://www.vosviewer.com>). This software has been used to do bibliographic matching of texts, bibliographic matching of authors, co-citation analysis of authors, citation analysis between institutions, publication analysis by nation, and author word analysis. VOSviewer is an analytical tool for building and displaying network-based maps. It enables us to uncover correlations in datasets such as scientific journals, publishing networks, researchers, nations, research institutes, and keywords using network analysis [30]. In the analysis of other data, the Excel program, and the automatic analysis system of the "Web of Science" database were used.

The fact that the study data was obtained from the "Web of Science" database allows researchers to access the same data set and obtain the same results. This is important for the validity and reliability of the study. "Web of Science"

is an internationally accepted data access base and is known as a data source based on detailed classification criteria. Since the study data were obtained from an open-access database, it was accepted as valid and reliable.

The fact that the study data were not obtained from a single database can be considered as a limitation. This may cause the publications to include only the publications indexed in the "Web of Science" database and not include the publications in other databases. This may affect the generalization and content validity of the results of the study.

The data of the study were accessed from the Web of Science database, which is open access. Therefore, ethics committee approval was not required. Data usage, confidentiality and security measures were complied with to conduct the study in according to scientific ethical rules.

3. Results

The findings of the data accessible on the "Climate Crisis" and "Climate Change" databases from the "Web of Science" database are presented in this section of the research. The findings connected to the climate crisis are presented in the first section, and the findings related to climate change are presented in the second section.

3.1. Findings on the Climate Crisis

On 18.07.2023, 2681 data were obtained by searching Web of Science with the term "Climate Crisis" and choosing "all fields." Publications from numerous fields were identified when the data was sorted by year, with the earliest publication dating back to 1997 and the most recent in 2023. These publications include 1975 articles, 260 editorial materials, 183 review articles, 171 book chapters, 170 early access, 130 book reviews, 81 proceeding papers, 24 letters, 13 news items, ten books, eight meeting abstracts, two corrections, and one poetry (Figure 1). After categorizing the papers, it was concluded that the bulk of the publications (478 publications), environmental sciences (376 publications), green sustainable scientific technology (184 publications), geography (137 publications), energy fuels (123 publications), and political science (122 publications).

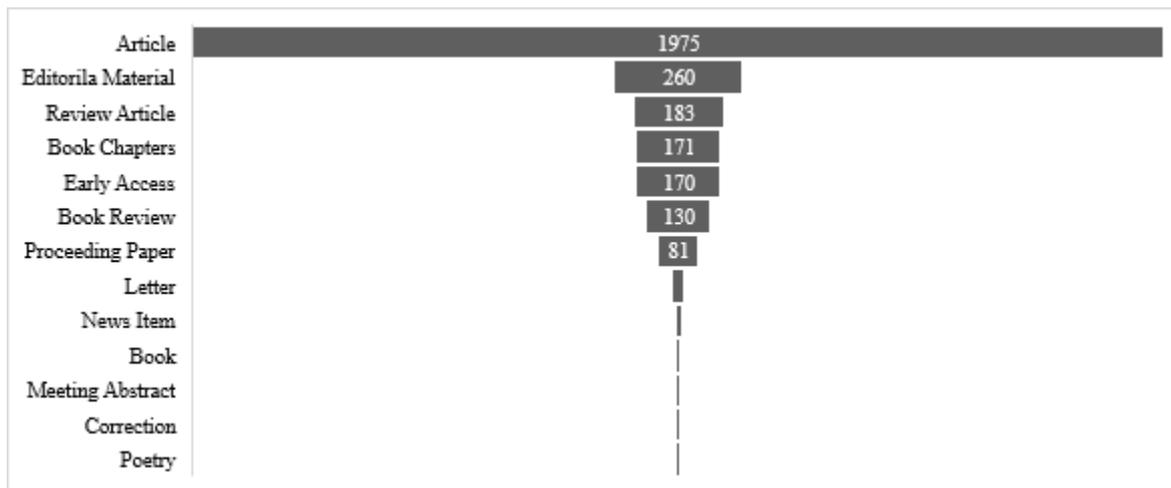


Figure 1. Evaluation by document types (climate crisis)

When the distribution of publications on the topic of climate crisis is investigated in the study, it is discovered that the number of publications has gradually grown. It is seen that there are 827 publications in 2022, 566 publications in 2021, 416 publications in 2020, 129 publications in 2019 and 96 publications in 2018. It has been determined that the number of publications in 2020 is relatively high compared to the previous year (2019). Although the 2023 calendar year has yet to be completed, it is seen that it has a very high publication rate (Figure 2).

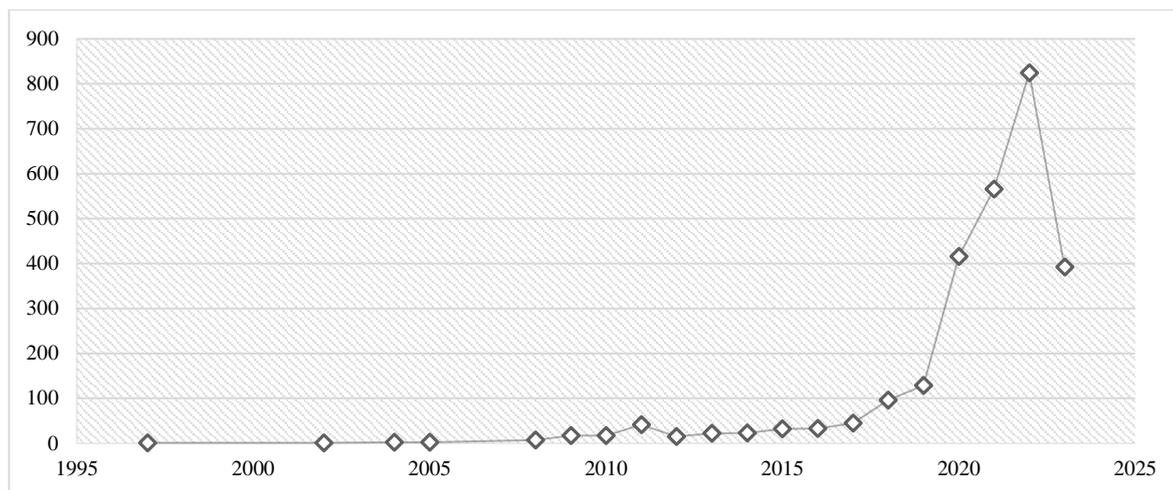


Figure 2. Distribution of publications by years (climate crisis)

In the study, keyword analysis related to the climate crisis was made. A total of 3473 keywords were identified based on documents. In the analysis phase, it was determined that at least two words should be familiar as a criterion. In this case, 493 data with at least two words in common were obtained. Climate change (272 keywords), climate crisis (82 keywords), sustainability (47 keywords), environment (32 keywords), climate justice (31 keywords) and Anthropocene (26 keywords) are the most used terms in climate-related articles. Climate change, climate crisis, environment, climate justice and sustainability have created the most potent expressions regarding total connection power. According to the findings of the research, there were 47 clusters and 473 items. It was discovered that the first cluster included 47 things, the second cluster contained 37 items, and the third cluster contained 27 items. Furthermore, 2202 connections and 2798 total connection strengths were calculated (Figure 3).

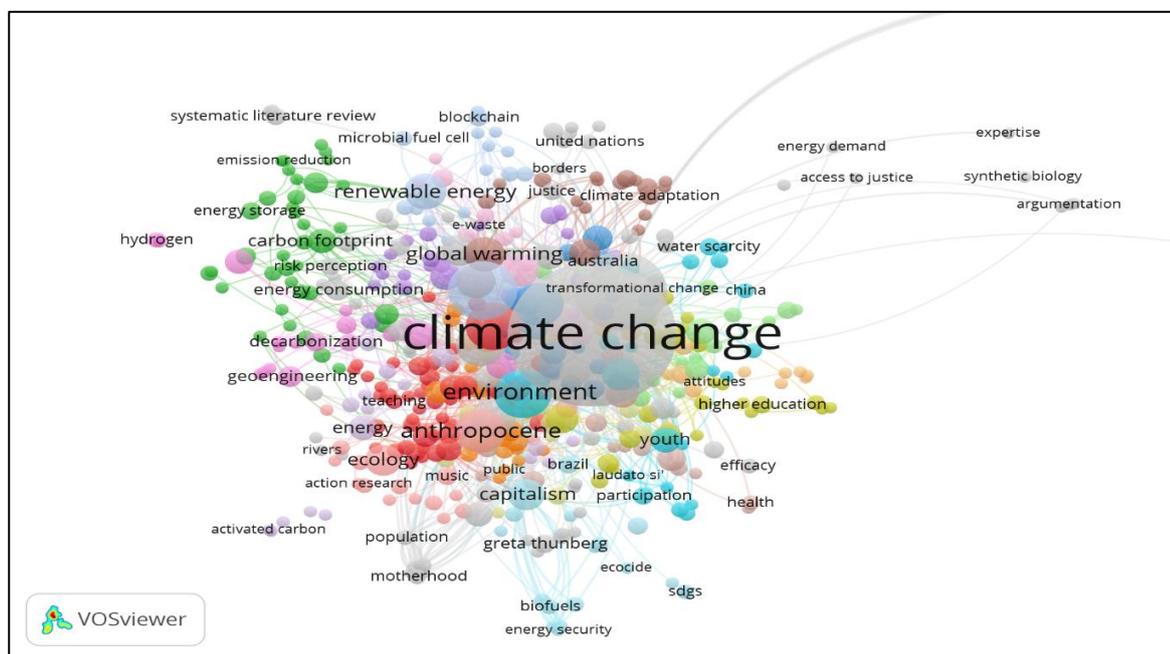


Figure 3. Most frequently used keyword links (climate crisis)

In the study, publishing at least one work and getting one citation were chosen as the criteria for mapping the citations received by the publications by country. In this context, 77 out of 88 countries is found to meet this value. It has been determined that the most cited countries are England (2919 citations), Canada (2366 citations), USA (2273 citations), Sweden (2109 citations) and Norway (1998 citations). England, Canada, the United States, and Norway are the top four countries in total connection strength. When evaluated in terms of the number of works, they are listed as the USA (273 publications), England 156 publications), Germany (91 publications), Australia (84 publications), Canada (75

publications) and Spain (54 publications). In addition, 10 clusters of 83 connections and 149 total connection strengths were determined (Figure 4).

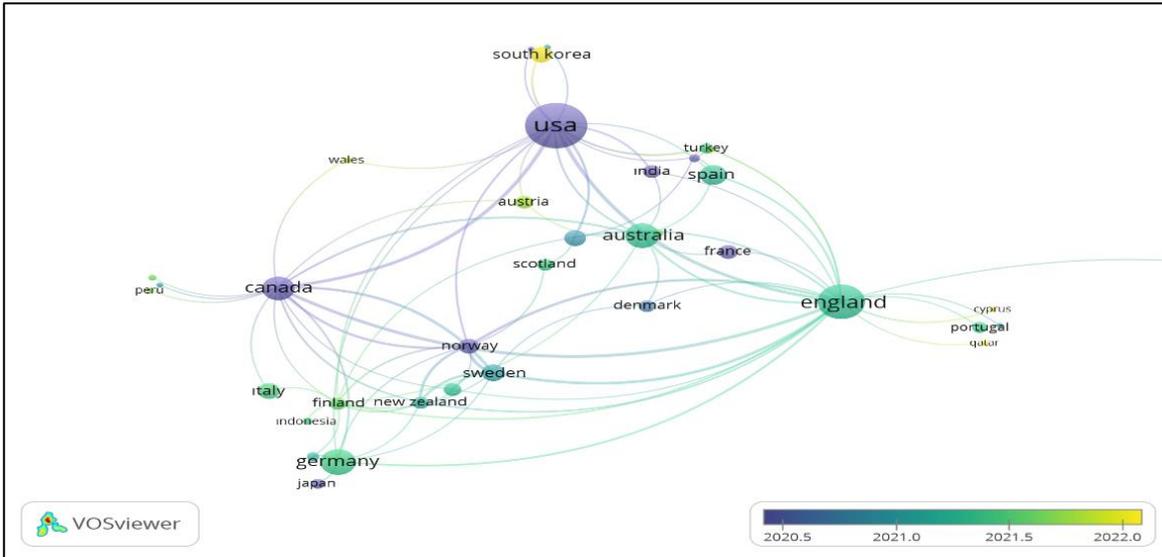


Figure 4. Citation network analysis of countries (climate crisis)

The study selected publishing at least one work and getting one citation as criteria for mapping inter-institutional citations. In this context, it was determined that 905 out of 1324 institutions met the threshold value. As a result of the analysis, a total of 14 clusters, 219 connections and 230 total connection strengths were determined. The institutions of the most cited publications were determined as Lund University (1999 citations), University Surrey (1890 citations), University Waterloo (1836 citations), Linnaeus University (1821 citations). In terms of work, it has been identified as University Sydney (17 publications), University Oxford (17 publications), University Cambridge (15 publications), University British Columbia (13 publications). In terms of total connection strength, it was determined as Linnaeus University (connection strength 26), Lund University (connection strength 22), Western Norway Research Institute (connection strength 22) (Figure 5).

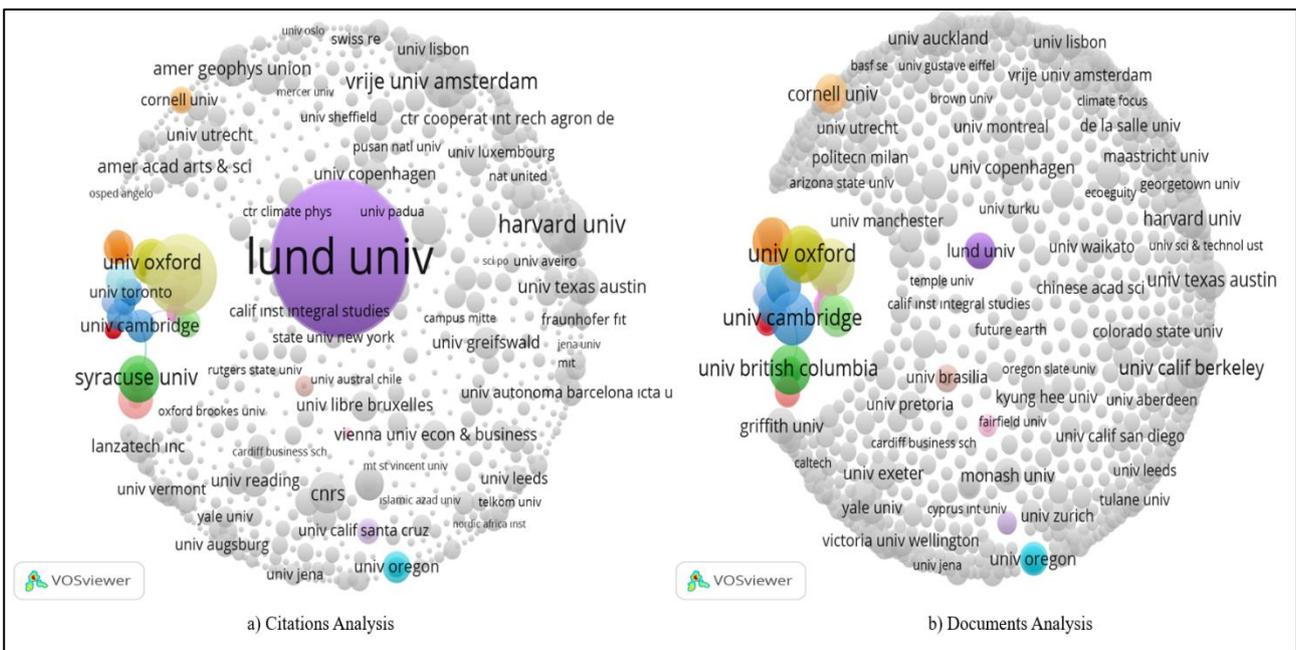


Figure 5. Organizations citations (a) and documents (b) analysis (climate crisis)

In the study, the evaluation was made by choosing a minimum of 10 citations in mapping the authors' co-citation analysis. In this context, it was seen that 244 out of 39522 authors met the determined value. As a result of the analysis, it was determined that the most cited authors were IPCC (157 citations), European Commission (91 citations), United Nations (66 citations). The data analysis determined 10 clusters, 5371 connections and 17300 total connection strengths (Figure 6).

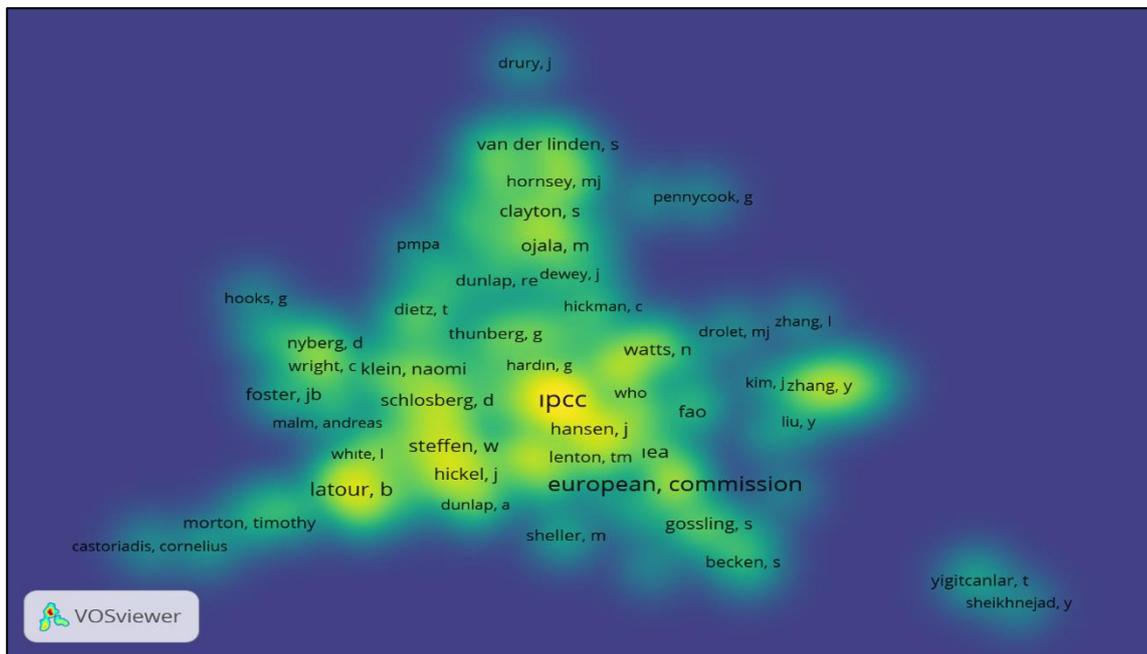


Figure 6. Citation analysis by authors (climate crisis)

In the study, evaluation was made by choosing the criteria of having at least one study published and one cited in mapping the bibliographic match analysis of the authors. In this context, it was seen that 1829 out of 4989 authors met the determined value. The writers with the greatest bibliographic matches were identified to be Gossling Stefan (1783 citations), Scott Daniel (1783 citations), and Hall C. Michael (1780 citations) as a result of the investigation. The data analysis determined 41 clusters, 26116 connections and 243517 total connection strengths (Figure 7).

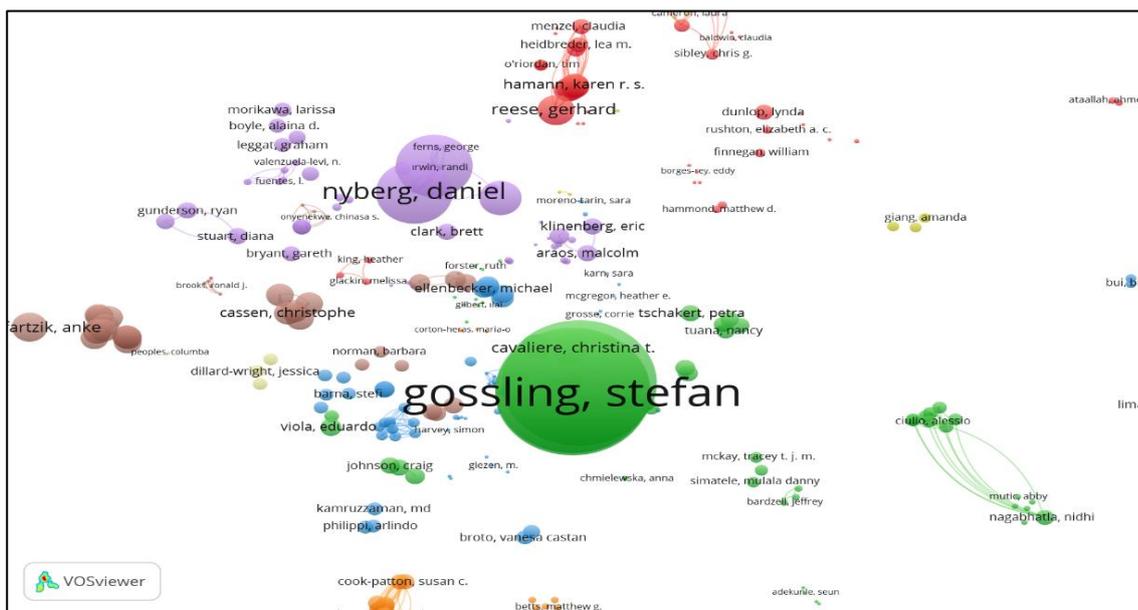


Figure 7. Authors' bibliographic match analysis (climate crisis)

In the study, evaluation was made by choosing at least one citation criterion in the mapping of the bibliographic match analysis of the texts. In this context, it was seen that 634 out of 1730 documents met the specified value. The publications with the most citations were Gossling (2021), Wright (2017), Pattberg (2008), Wright (2012), and Manzanedo (2020). As a result of the analysis, a total of 21 clusters, 5368 connections and 6939 total connection strengths were determined (Figure 8).

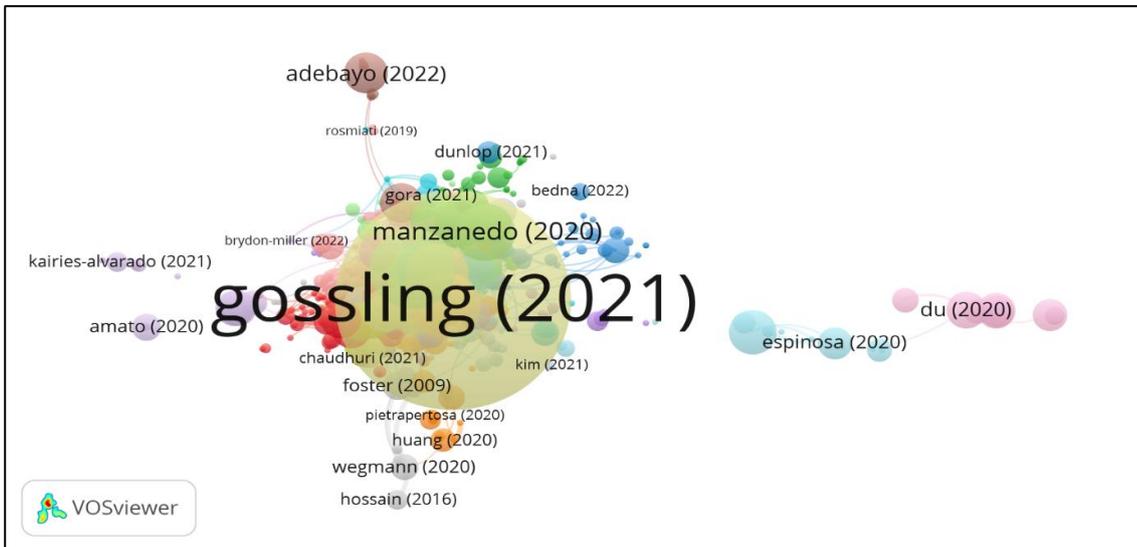


Figure 8. Bibliographic analysis of texts (climate crisis)

3.2. Findings on Climate Change

In the study, 446473 data were reached by selecting "all fields" in Web of Science with the keyword "Climate Change". When analyzed by years, it was seen that the oldest publication was in 1980 (8 publications), and the newest publication was in 2023 (23338 publications) from various disciplines. Because the study reviewed papers from 1997 to 2023, other years were included in the scope, resulting in 441380 climate change-related publications being evaluated. Five of the first lines of these publications were found to be articles, with 368845 articles, 29380 proceeding papers, 27785 review articles, 18404 book chapters, and 13131 editorial materials (Figure 9). 335457 of the publications are scanned as Science Citation Index Expanded (SCI-EXPANDED), 83671 as Social Sciences Citation Index (SSCI) and 30810 as Emerging Sources Citation Index (ESCI).

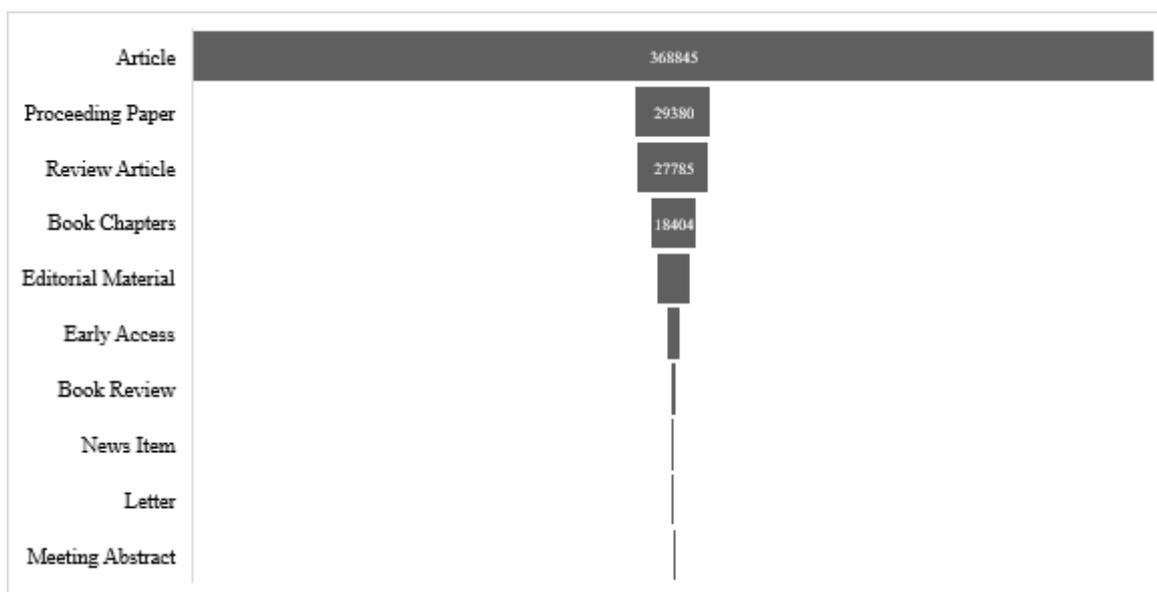


Figure 9. Evaluation by document types (climate change)

In the study, when the distribution of publications in the field of climate change is examined, it has been determined that the number of publications has increased gradually. It is seen that there are 49108 publications in 2022, 47153 publications in 2021, 42188 publications in 2020, 36820 publications in 2019 and 32250 publications in 2018. It has yet to be determined that the number of publications in 2020 is relatively high compared to the previous year (2019). Although the 2023 calendar year has yet to be completed, it is seen that it has a very high publication rate (23338 publications) (Figure 10).

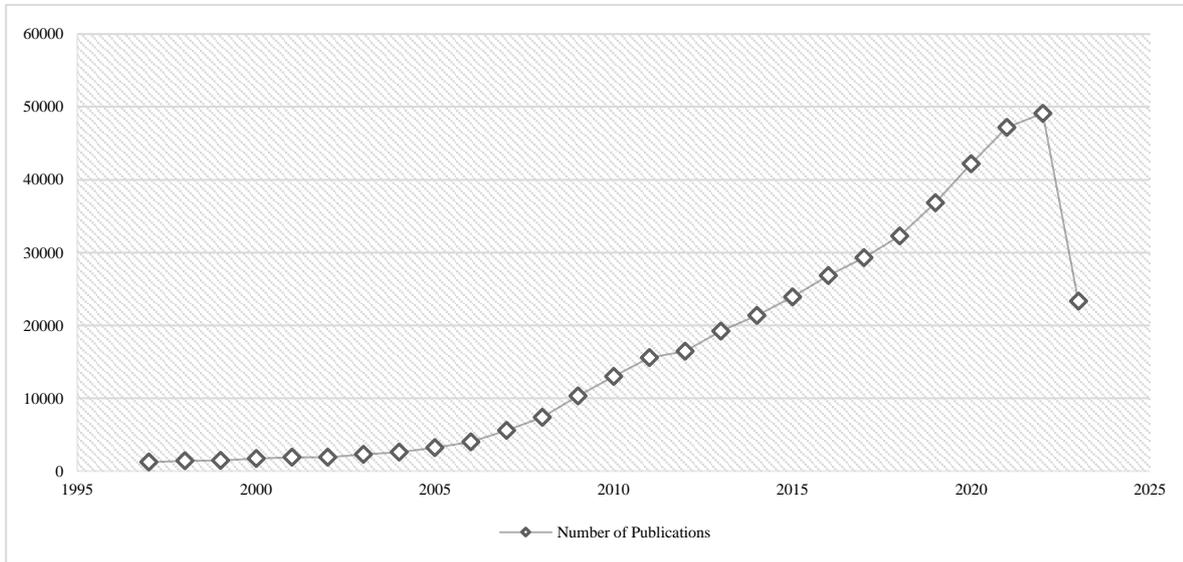


Figure 10. Analysis of publications by years (climate change)

When evaluated in terms of language, English (434542 publications), Spanish (2235 publications), German (1150 publications), French (783 publications), and Chinese (505 publications) are in the top five (Figure 11).

When examined in terms of disciplines, it has been determined that most of the publications are environmental sciences (118090 publications), meteorology atmospheric sciences (52795 publications), ecology (48632 publications), environmental studies (46779 publications) and geosciences multidisciplinary (46645 publications) (Figure 11).

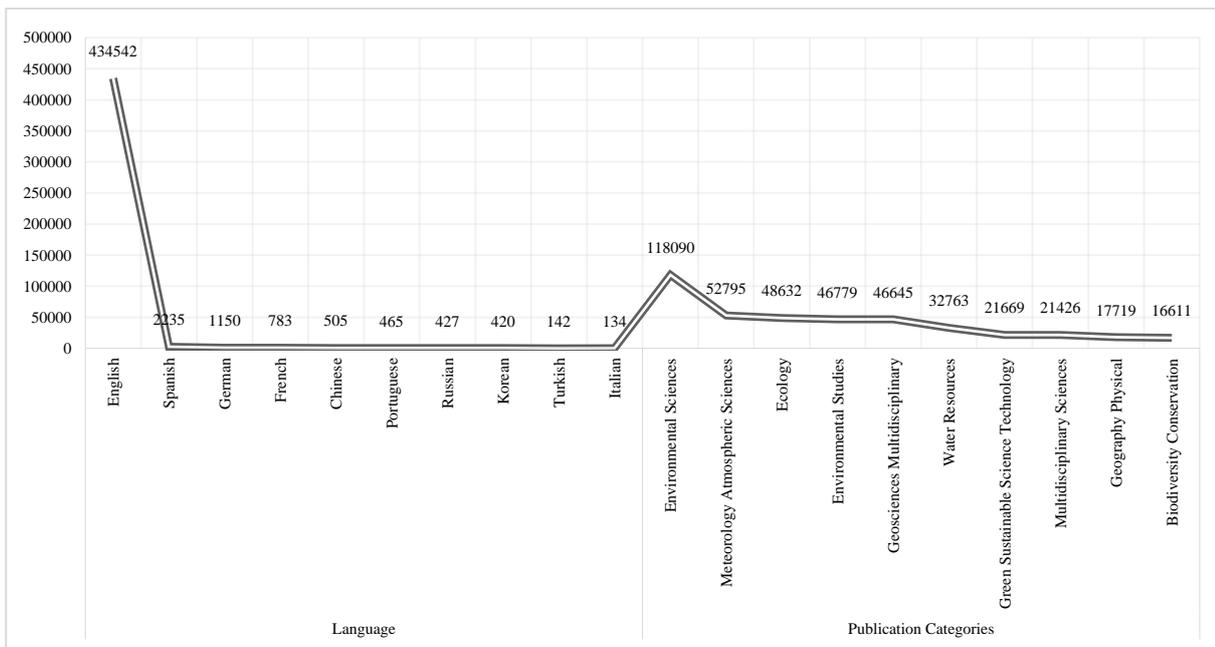


Figure 11. Analysis of publications by categories and publication languages (climate change)

When evaluated in terms of countries, USA (122032 publications), China (64354 publications), England (48523 publications), Australia (38559 publications), and Germany (38321 publications) are in the top five (Figure 12).

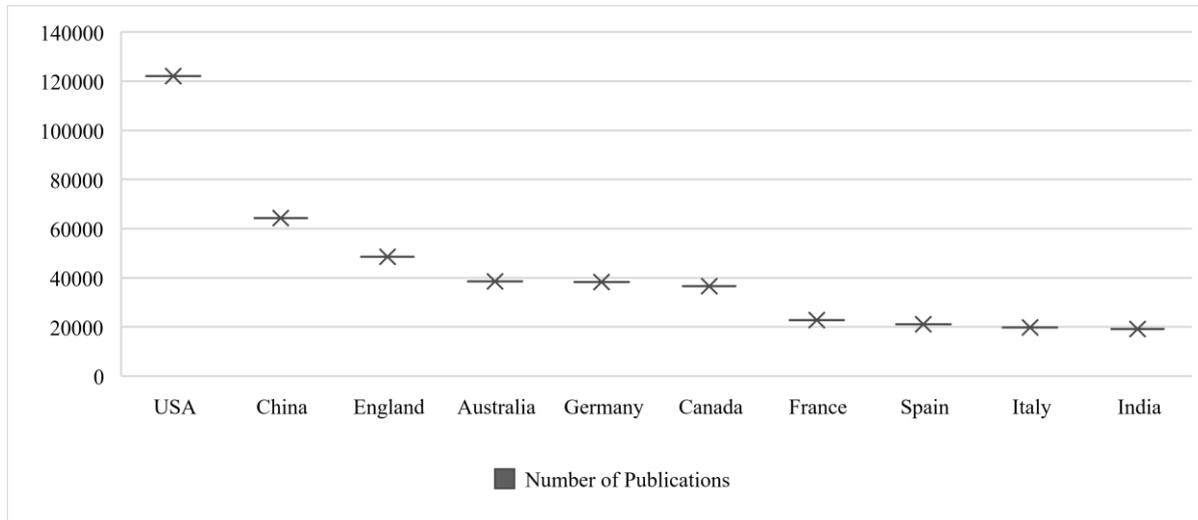


Figure 12. Analysis of publications by country (climate change)

4. Conclusion and discussion

Climate-related issues are a worldwide danger to all living beings. Countries create numerous policies and strive to execute various action plans to mitigate the harmful consequences of climate change. The strategies established to address climate issues must be scientifically sound and practical. This study's bibliometric analysis was performed to acquire a comprehensive perspective on the climate crisis and climate change. As a result, this section of the research includes a discussion of the studied data.

This study, it was determined that the most frequently used keywords in publications related to climate crisis are climate change, climate crisis, sustainability, environment, climate justice and Anthropocene. Climate change, climate crisis, environment, climate justice and sustainability have created the most vital expressions regarding total connection power. Wang et al. [31], it has been mentioned that keywords such as adaptation, vulnerability, agriculture, sustainability, climate change, ecosystem, and vulnerability are concentrated. The phrase climate change was prevalent in a study on climate change and food security, followed by phrases like food security, drought, adaptation, agriculture, and water scarcity [32]. One of the most well-known notions is climate change. In addition, it is seen that words such as impact, adaptation, greenhouse gas, technology, policy, and cost are common [33]. According to a climate research, terms like temperature, precipitation, reduction, sensitivity, sanitation, food system, sustainable usage, organization, interaction, and authority came to the fore in various groups [34]. According to another survey, phrases like global warming, climate modeling, climate influence, and hot were commonly utilized [35]. X. Li et al. [36], stated that words such as drinking water, shallow lake and climate are trending. Regarding word cloud, the study's data may have comparable contents to the literature. Furthermore, given that keywords are the emphasis and representation of academic research, consideration is given to keyword selection in terms of inclusivity and substance in the publications included in the study.

The distribution of climate-related (climate crisis) publications was investigated in this study. The number of publications is seen to rise with time. While there were 96 papers published in 2018, the number is increased to 129 in 2019, 416 in 2020, 566 in 2021, and 827 in 2022. Furthermore, the distribution of climate change articles was investigated. There has been an upsurge in the number of publications on this subject. While there were 32250 publications in 2018, the number was determined to reach 36820 in 2019, 42188 in 2020, 47153 in 2021, and 49108 in 2022. In 2020, a significant increase was detected in the number of publications compared to the previous year. Although the 2023 calendar year has not been completed, a very high number of publications (23338 publications) has also been made this year. According to climate engineering research, climate engineering publications increased between 1988 and 2011. It is reported that 56% of broadcasts have been carried out since 2008 [37]. According to another research, publications on climate change and food safety have increased from 1981 to 2019 and have received significant traction, particularly after 2008 [32]. The number of articles on climate change was 1582 in 2001, and this number climbed to 2776 in 2006. Similarly, whereas the number of climate change research was 10006 in 2013, it increased to 15311 in 2018 [38]. It has been said that the number of research studying the consequences of ecosystems and species in the face of changing conditions has grown [39]. The number of publications on climate change has grown considerably. The number of publications addressing climate change grew tenfold between 1991 and 2010 [33]. There has been an increase in

publications on global warming and climate change [40]. From 1980 to 2012, the number of scientific publications climbed gradually [41]. The growth rate of the number of scientific publications may be higher than expected [42]. Climate crises and climate change concerns are gaining academic and scientific attention. The rise in the number of publications indicates the growing relevance and understanding of research in this sector. Even though the calendar year has not yet ended, the number of publications in 2023 is significant. This condition might be linked to the fact that researchers and scientists working in the sector continue to conduct study and studies to give more knowledge on relevant concerns.

In this study, 1975 articles about the climate crisis, 260 editorial materials, 183 review articles, 171 book chapters, 170 early access, 130 book reviews, 81 proceeding papers, 24 letters, 13 news items, ten books, eight meetings abstract, two corrections and one poetry type work were reached. Regarding climate change, it was determined that 368845 articles, 29380 proceeding papers, 27785 review articles, 18404 book chapters and 13131 editorial materials took the first five places. In the study conducted by Sweileh [32], it was stated that research articles and review articles rank first, similar to our study. Research and review article types are standard in the climate crisis and climate change publications.

In this study (Climate crisis), the authors with the most cited sources and the most bibliographic matches were evaluated. In this context, the most commonly cited source was the IPCC [43] and the author with the most bibliographic matches was Gossling Stefan. Similar to our findings, Hou and Wang [44] identified that the most often mentioned sources were IPCC. When several of Gossling Stefan's research are evaluated [45-48] it can be stated that he is an interactive scientist.

In this study, when climate change studies were examined in terms of disciplines, it was determined that most of the publications were from different disciplines, including environmental sciences, meteorology, atmospheric sciences, ecology, geosciences multidisciplinary and environmental studies. Most climate crisis studies have been identified as environmental studies, environmental sciences, green sustainable science technology, geography, energy fuels, and political science research. According to a climate change research, environmental sciences were top in terms of publishing, followed by meteorological and atmospheric sciences, ecology, and interdisciplinary earth sciences [49]. According to a research on climate engineering, the first two ranks of the publishing categories were environmental sciences, meteorology, and atmospheric sciences [37]. The relevance of social sciences, natural sciences, and humanities in climate change research was underlined [50]. From a scientific perspective it has been observed in the emergence, development, or loss of usefulness of new scientific disciplines [51]. Another survey indicated that environmental sciences, agriculture and biology, social sciences, and earth sciences were the most popular publishing categories [32]. The formation of new scientific disciplines and interdisciplinary research may be stated to be useful in every subject. Examining climate change research in terms of disciplines reveals that diverse viewpoints and areas of knowledge intersect on this problem. As a result, it is critical to recognize the complexity and multidimensionality of climatic concerns.

In this study, it has been seen that English, Spanish and German are at the forefront in terms of publication language. According to Becerra et al. [52], it was stated that the number of publications in English was relatively high. It can be accepted that the acceptance of English as an academic and international language is reflected in the number of publications at the same rate [53]. According to another study, most publications were written in English. In addition, it can be said that it attracts attention in its publications in Chinese, French and Spanish [32]. It can be said that the data of our study and the literature data are similar in terms of the widespread use of the English language. It can be said that writing the publications in English, which is an academic and international language, is effective in reaching large audiences. However, encouraging publication in different languages on climate change and climate crisis could be an important implication.

This study determined that the most cited publications were Lund University, University Surrey, University Waterloo, and Linnaeus University. Regarding work, it has been determined as University Sydney, University Oxford, University Cambridge, and University British Columbia. Regarding overall connection strength, Linnaeus University is designated Lund University and the Western Norway Research Institute. According to a disaster and climate change resilience study, the University of California System ranked first among universities with 349 publications on climate change resilience [54]. It has been stated that the most prolific universities in the Arab world are King Abdulaziz University, King Saud University, and King Abdullah University of Science and Technology [35]. According to another research, among the universities that produced substantial additions to the literature between 1999 and 2021 were University Queensland, University Sydney, Macquarie University, and University Newcastle [55]. Identifying the institutions that interact the most with the climate issue gives crucial data for understanding collaboration and relationships in academic circles. Identifying institutional organizations is a critical step that may be objectively examined.

In this study, when the publications related to the climate crisis were evaluated according to the countries, it was determined that the most cited countries were England, Canada, USA, Sweden, and Norway. In terms of total connection strength, England, Canada, the USA, and Norway are in the top four places. When evaluated in terms of the number of works, they are listed as USA, England, Germany, Australia, Canada, and Spain. When the climate change related publications are evaluated in terms of countries, the USA, China, England, Australia, and Germany are in the top five. A study on climate change stated that USA, Australia and England have published many publications on climate

change resilience [54]. Another study stated that USA, England and Australia were productive in publications on climate [56]. It has been specified that the United States of America, China, Germany, Canada, England, Sweden, Australia, France, and the Netherlands are fertile in terms of climate problem articles and citations [49]. In a climate-focused study, it was mentioned that USA is a pioneer in terms of publications on climate. It is mentioned that climate studies have gained momentum in countries such as England, Australia, Denmark, Sweden, India, China, France, Kenya, Nigeria, Netherlands and Spain [52]. The United States, the United Kingdom, and China are among the nations that publish on climate change [32]. According to Fu and Waltman [38], the United States of America holds 73% of the total publications on global climate change and is a prolific country. The United States of America has been reported to be the leader in climate change publications, followed by England, Germany, and Canada [33]. Li et al. [57], mentioned that the tendency of countries to produce publications is similar to the literature. When the data from our study and the data from the literature are combined, nations such as the United States, England, Canada, and Australia are more effective in publishing climate research. As a result, other nations should contribute more to such an essential scientific topic. Furthermore, more investment should be done in climate change and associated issues.

As a result, it is critical to fund climate change and climate crisis research in developing and developed countries. More effective and comprehensive policies may be produced with scientific studies on climate change. Increasing university collaboration and the intensity of scientific data is a significant milestone. By building a more robust and more effective global collaboration, more resilient and sustainable solutions to climate change may be identified. Encouraging studies on climate change issues in different languages may be necessary. Fostering collaboration and information exchange across disciplines is critical to generate more effective and inclusive climate change solutions. It is considered essential to master common terminology and practices to provide easy access to studies in the field of climate change and climate crisis and to accelerate the flow of information.

Note: The Web of Science database was used to retrieve the data.

Declarations

Conflict of interest

The author have disclosed that there are no potential conflicts of interest in relation to the research, authorship, and/or publication of this article.

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