Exploring the Resilience of Natural Disasters: A Comprehensive Bibliometric Analysis

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Abstract

The study's objective is to provide an outline of disaster resilience through bibliometric methods. The study delves into the disaster resilience literature spanning the last 20 years to gain a more profound understanding of the related literature. A bibliometric analysis of 10 top journals with the most literature using the keyword disaster resilience was conducted, resulting in 1561 articles. The bibliometric network was also visualized using the VOSviewer software tool. This study shows that disaster resilience has recently had a significant increase in research activity. Additionally, the study found that the Covid-19 epidemic increased the number of resilience research published between 2020 and 2022. The theoretical framework of the authors was scrutinized, identifying 12 keyword clusters, with the primary focus areas being disaster types, numerical analysis, disaster management, and community and social perspectives. Scholars emphasized resilience, risk reduction, vulnerability reduction, climate change, and disaster management in the literature. This study highlights the current state of disaster resilience research while forecasting the field's future growth and development.

Keywords: Disaster resilience, disaster management, bibliometric analysis, Covid-19.

Doğal Afetlerin Direncini Keşfetmek: Bibliyometrik Bir Analiz

Öz

Bu çalışmanın amacı, bibliyometrik yöntemlerle afet dayanıklılığının ana hatlarını ortaya koymaktır. Çalışma, ilgili literatür hakkında daha derin bir anlayış kazanmak için son 20 yılı kapsayan afete dayanıklılık literatürünü derinlemesine incelemektedir. Çalışmada afet direnci anahtar kelimesini kullanan en çok literatüre sahip en iyi 10 derginin bibliyometrik analizi gerçekleştirilmiştir ve toplamda konuyla ilgili yapılmış 1561 makale incelemiştir. Çalışmada Bibliyometrik ağ, VOSviewer yazılım aracı kullanılarak da analiz görselleştirilmiştir. Bu çalışma, afet direncinin son zamanlarda araştırma faaliyetlerinde önemli bir artışa sahip olduğunu göstermektedir. Ek olarak, çalışmada, Covid-19 salgınının 2020 ile 2022 arasında yayınlanan dayanıklılık araştırmalarının sayısını artırdığı tespit edilmiştir. Yazarların teorik çerçevesi, afet türleri, sayısal analiz, afet yönetimi, yönetim, topluluk ve sosyal perspektifler gibi birincil odak alanları olmak üzere 12 anahtar kelime kümesi belirlenerek irdelenmiştir. Akademisyenlerin genel olarak literatürde dayanıklılık, risk azaltma, kırılganlık azaltma, iklim değişikliği ve afet yönetimi üzerinde durduğu gözlemlenmiştir. Bu çalışma, konuyla ilgili alanın gelecekteki büyümesini ve gelişimini tahmin ederken, afete dayanıklılık araştırmasının mevcut durumunu vurgulamaktadır.

Anahtar kelimeler: Afete dayanıklılık, afet yönetimi, bibliyometrik analiz, Covid-19.

1. Introduction

In recent years, the concept of durability has captured the attention of scholars across various academic disciplines, including ecology, engineering, geography, psychology, and disaster studies (Rodriques et al., 2022; Heinkel et al., 2022; Aksha & Emrich, 2020). The term "durability" has a fascinating history, with roots in the Latin word "resilience," which means to rebound. It refers to the capacity to bounce back from difficult situations or changes (Aksha & Emrich, 2020). Despite its widespread usage, there needs to be more consensus in the academic literature regarding the definition of durability. A comprehensive review of the literature on durability between 1996 and 2013 identified 60 different definitions, highlighting the need for a clear and widely accepted understanding of the term (Aksha & Emrich, 2020). Helgeson and O'Fallon (2021) characterized resilience as the supportive infrastructure that enables growth in a rapidly evolving world. On the other hand, Graveline and Germain (2022) conducted a study that presented 25 distinct definitions of resilience.

The relationship between resilience and the evolving risks caused by different scenarios is influential in forming different definitions (Mavhura et al., 2021). In this context, resilience is evaluated based on different subcategories, such as individual, societal, and ecologically based (Boon et al., 2012; Boon, 2014). Individual resilience is adapting to a situation after encountering any adverse event (Islam et al., 2022). Norris et al. (2008) define societal resilience as a community's ability to withstand any potential threat (Boon, 2014). According to Stallins and Corenblit, ecological resilience is the magnitude of variability a system can absorb without changing its structure by altering the variables and processes that control its behavior (Blake et al., 2019).

The increasing frequency and severe impact of disasters have brought the topic of disaster resilience to the forefront of research (Chester et al., 2021). Disaster resilience is defined as the ability of a system to maintain a functioning and established structure and continue to adapt and evolve in the face of danger (Mavhura et al., 2021). Disasters can take various forms, such as tropical storms, floods, hurricanes, droughts related to climate change (Bayrak, 2020), earthquakes caused by tectonic plate movements, and pandemics resulting from technological advancements in the health sector. According to AON's 2021 Global Natural Disasters Report, natural disasters globally resulted in a total economic loss of 343 billion US dollars (Wu et al., 2022). To minimize these losses, disaster resilience is crucial in guiding preparation before disaster strikes, intervention, and recovery efforts (Parsons et al., 2021). To ensure that disaster crisis management is effectively carried out for all stakeholders, assessments must be made from a disaster resilience perspective.

Academic literature frequently uses the concept of "disaster resilience". It encompasses many types of catastrophe resistance and enables a multifaceted assessment of disasters. Numerous researchers have conducted extensive research on the subject. In contrast, Chester et al. (2021) used qualitative methods to examine infrastructure resilience following a disaster and provided a conceptual piece. Multi-criteria decision methods such as the Delphi were applied by Rodriquez et al. to evaluate catastrophic resilience at the national level (Rodriques et al., 2022). The ability to withstand and recover from disasters, or disaster resilience, is a widely researched topic. He proposed a joint resilience approach suitable for disaster risk reduction and climate change adaptation. Based on numerical data and specific indices. On a smaller scale, Ner et al. (2022) used content analysis to investigate resilience integration in 11 cities. Parsons et al. (2021) examined disaster resilience's strong and weak aspects in various communities using resilience indexes. The disaster response system was tested against COVID-19 using a dynamic network system (Guo et al., 2021). While Heinkel et al. (2022) used a quantitative approach to examine social resilience in the face of disasters, Islam et al. (2022) and Bayrak, (2020) combined quantitative and qualitative methods to measure the post-disaster social resilience of locals. Demiroz & Haase (2020) found through bibliometric analysis of literature, that disaster resilience was divided into three main categories: environmental and ecological problems, emergency and disaster management, and public policy and administration. The Covid-19 outbreak has affected various aspects of disaster resilience.

This study aims to provide a comprehensive overview of disaster resilience and its effects, focusing on the impact of Covid-19, through the lens of bibliometric analysis. We examined how the disaster

resilience concept has developed over time, and how the current global pandemic has influenced it in the literature. We conducted an bibliometric analysis of relevant literature past two decades to gain a better understanding of this field.

2. Material and Method

The bibliometric analysis method employs statistical analysis to determine and quantify the impact and influence of publications, authors, journals, and institutions in a specific field. This technique helps recognize trends and patterns in scientific communication and evaluate various entities' productivity, collaboration, and citation impact. Accessing different databases, like the Web of Science, helps provide indices of journals, author citations, and keywords. Insights obtained from the bibliometric analysis can provide valuable information regarding the research field and aid in evaluating research performance.

The study aims to conduct a bibliometric analysis to understand the disaster resilience literature. By analyzing the most productive journals, authors, and institutions, we aim to identify the key players and their contributions to advancing knowledge in disaster resilience. Examining author citations and keyword clustering offered an opportunity to assess the impact and influence of different publications and identify emerging trends in the field. We used statistical methods to recognize trends and patterns in scientific communication and evaluate different entities' productivity, collaboration, and citation impact. To conduct the bibliometric analysis, we selected the Web of Science database due to its accessibility to journal indexes and ability to analyze data by year, author citations, and keywords. We prioritized the keyword "disaster resilience" to cover twenty years of multidisciplinary studies in the field with a general scope. We limited the results of the Web of Science database search to the top ten journals with the highest number of publications using disaster resilience keywords. The list of these journals and their number of studies are presented in Table 1. The total number of disaster resilience articles was determined to be 1561 after the limitations were applied. In this study, we analyzed articles about disaster resilience using the VOSviewer software tool. Vosviewer is a digital instrument utilized to create and present bibliometric networks. This analysis aimed to establish a conceptual framework for resilience articles by identifying frequently used keywords.

Table 1. The list of top ten journals

	Web of Science Categories	Record Count	% of 1.561
1	International Journal Of Disaster Risk Reduction	368	23.575%
2	Sustainability	344	22.037%
3	Journal Of Disaster Research	177	11.339%
4	International Journal Of Environmental Research And Public Health	163	10.442%
5	International Journal Of Disaster Risk Science	134	8.584%
6	Water	86	5.509%
7	Natural Hazards	76	4.869%
8	Earth Planets And Space	71	4.548%
9	Jamba Journal Of Disaster Risk Studies	71	4.548%
10	Progress in Disaster Science	71	4.548%

3. Findings and Discussion

Table 1 lists the top 10 disaster resilience journals based on publication frequency in Web of Science, including each journal's name, record count (number of published articles), and percentage of the total (1,561 articles). The International Journal of Disaster Risk Reduction had the highest number of published articles (368), accounting for 23.57% of the total. The Sustainability journal came in second

with 344 published articles (22.04% of the total). The Journal of Disaster Research had the third-highest number of published articles (177 or 11.34% of the total).

3.1. Steps of disaster resilience literature

In another analysis, we can explore the distribution of studies in terms of years within three distinct periods. The first group comprises studies between 2002 and 2009, where the average number of studies was 0.42. Despite the occurrence of various disasters worldwide during these years, disaster resilience did not receive significant attention. The second group encompasses studies from 2010 to 2016, where an increase in resilience studies was observed due to the 8.8 magnitude earthquake in Chile in 2010 and the Great Japan Earthquake in 2011. During these years, 191 (average 27.28) articles were published. The third group covers the years between 2017 and 2019 and has a balance within itself. Disaster resilience became increasingly important in 2017 due to the Kumamoto earthquake in 2016 and the Cape Town drought between 2015 and 2017. The fourth group includes studies published from 2020 to 2022, where a total of 943 articles were published (an average of 314.33 articles per year). The significant increase in resilience studies during these years can be attributed to the COVID-19 virus outbreak that started in Wenchuan, China in 2020. The trend of resilience has been on the rise over the years, as seen in Figure 1.
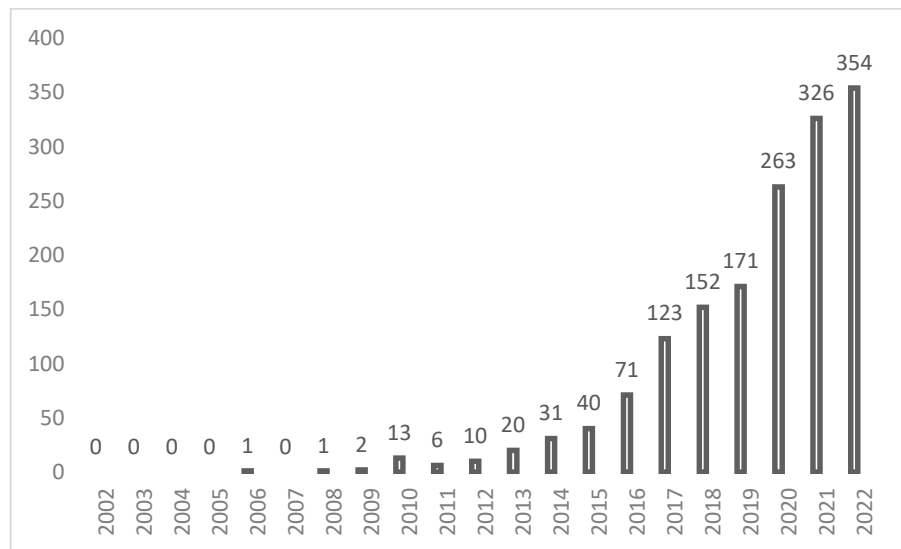

Figure 1. The trend of resilience over the years

3.2. Keyword conceptual boundaries

Our goal for our bibliometric analysis is to create a conceptual framework for articles on resilience using specific keywords. We uploaded 1561 articles to the VOSviewer software tool and examined the keyword relationships. Figure 2 depicts these relationships. The application revealed a network of relationships between keywords employed by authors across the corpus of articles, with 12 distinct clusters being identified.

The first cluster, containing 23 keywords, relates to specific types of disasters and includes terms such as climate change, drought, flood, and cyclone.

The second cluster, consisting of 22 keywords, pertains to bibliometric analysis, decision-making, and simulation, which are used in numerical methods for analyzing disaster resilience.

The third cluster, comprising 21 keywords, focuses on disaster management and encompasses terms such as crisis management, disaster management, and emergency management.

The fourth cluster, consisting of 21 keywords, deals with the social and community aspects of disaster resilience and includes keywords such as social learning, social network, social resilience, and community resilience. The remaining clusters include 16, 15, 12, 11, 10, 9, and 3 items.
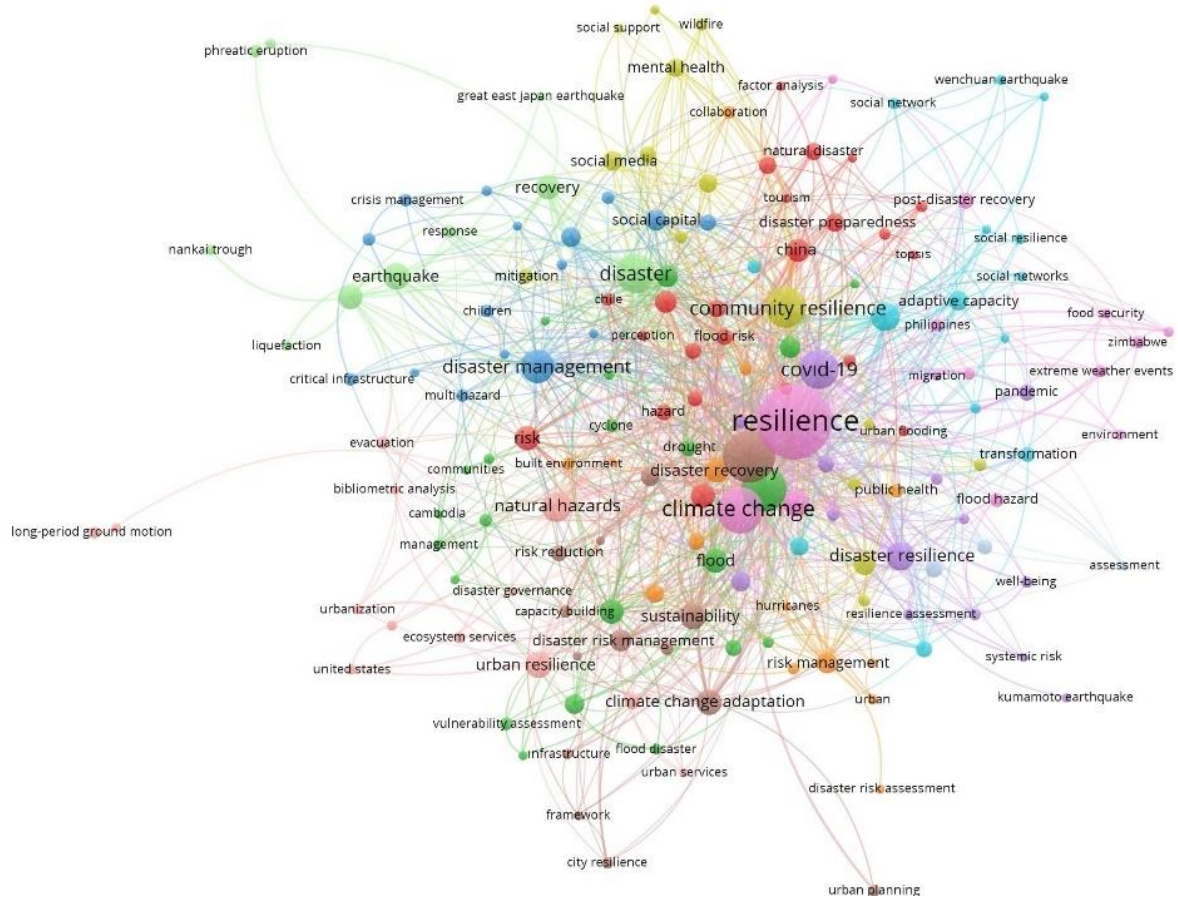
Figure 2. The relationship diagram of keywords used in disaster resilience articles in the Web of Science search engine between 2002-2022

The analysis of keywords can be found in Table 2, with the 20 most frequently used keywords. According to the table, the most frequent keywords are resilience (321), disaster risk reduction (143), vulnerability (138), climate change (133), and community resilience (74), in decreasing order. When the keywords are grouped thematically, several different groups can be obtained. For example, based on the type of disaster, climate change (133), covid 19 (51), earthquake (45), flood (40), and tsunami (25) can be grouped.

Another thematic group encompasses keywords related to disaster management, such as vulnerability (138), disaster management (59), community resilience (74), community (57), disaster risk management (38), and social vulnerability (34). Keywords frequently used during the disaster process, such as adaptation (64), recovery (49), sustainability (49), and preparedness (30), can be defined as a group.

Table 2. Analysis of the most frequently used keywords in articles on disaster resilience published between 2002 and 2022

Rank	Keyword	Occurrence	Rank	Keyword	Occurrence
1	Resilience	321	11	Covid 19	51
2	Disaster risk reduction	143	12	recovery	49
3	Vulnerability	138	13	sustainability	49
4	Climate change	133	14	earthquake	45
5	Disaster	122	15	flood	40
6	Community resilience	74	16	Disaster risk management	38
7	Adaptation	64	17	Social vulnerability	34

8	Disaster management	59	18	Urban resilience	34
9	Natural hazards	59	19	preparedness	30
10	Community	57	20	tsunami	25

3.3. Historical development by categories

According to disaster resilience, categorization has been made into three subgroups between 1992-2010, 2011-2019, and 2020-2022. This categorization was created to analyze changes in disaster resilience due to the COVID-19 pandemic after 2020.

There are a total of 17 publications from the years 1992-2010. The number of studies increased to 1394 between the years 2011-2019. The total number of studies between 2020-2022 is 2535. The significant increase is mainly due to the impact of disasters and pandemics over these years. Additionally, the increasing accumulation of knowledge on disaster resilience and the recognition of this topic as scientifically valuable worldwide influence authors' preference for research topics.

Between 1992 and 2010, only two categories of study were carried out, specifically Geosciences, multidisciplinary (14), and Social sciences, interdisciplinary (3). This was the only research conducted during that time.

In the following years, between 2011 and 2019, eight categories of research were introduced, including Geosciences, multidisciplinary (404), Water resources (259), Meteorology Atmospheric Science (238), Environmental Science (187), Environmental Studies (108), Green Sustainable Science Tech. (100), Public Environmental Occupational Health (58), and Social sciences, interdisciplinary (40).

These categories remained popular even from 2020 to 2022, although their importance was reordered. They are currently ranked as Geosciences, multidisciplinary (488), Environmental Science (479), Meteorology Atmospheric Science (406), Water resources (402), Environmental Studies (308), and Green Sustainable Science Tech. (247), Public Environmental Occupational Health (175), and Social sciences, interdisciplinary (30) (Table 3).

From 2011 to 2019, a variety of subjects were covered in the studies conducted. The disasters studied included Hurricane Katrina in 2005 (McConnell & Bertolin, 2019), the Great Sichuan Earthquake in China in May 2008 (Guo, 2012; Jiang, 2013; Peng et al., 2014; Li et al., 2016), Chinese flooding risks from 2010 (Han & Kasperson, 2021), the Chilean earthquake and tsunami in 2010 (Engel, 2016; Lara et al., 2017), the Great East Japan Earthquake and Tsunami in 2011 (Mulyasari et al., 2013), the M(w)7.8 earthquake near Kaikoura, New Zealand in 2016 (Blake et al., 2019), and the societal impact of drought (Udmale et al., 2015; Opiyo et al., 2015).

Studies on the responses of governments, organizations, and society to the COVID-19 pandemic that began in 2020 have increased the importance of disaster resilience in the last three years (Djalante et al., 2020; Kimhi et al., 2020; Ferreira et al., 2020; Kaim et al., 2020). The most referenced studies during this period relate to the COVID-19 pandemic (Djalante et al., 2020; Barua et al., 2020; Djalante et al., 2020).

Even though there was no major disaster in these years compared to previous years, scenarios for disaster resilience were created and causes and measures against recurrent disasters were emphasized (French et al., 2020). Additionally, under disaster resilience, the effects of floods were extensively studied and widely used in conjunction with multi-criteria decision-making methods (Rafiei-Sardooi et al., 2021; Kittipongvises et al., 2020).

Table 3. The categories of discipline (as categorized by Web of Science)

Year	1992-2010		2011-2019		2020-2022	
	Category	No. of Publications	Category	No. of Publications	Category	No. of Publications
Disaster resilience	Geosciences, multidisciplinary	14	Geosciences, multidisciplinary	404	Geosciences, multidisciplinary	488
	Social sciences, interdisciplinary	3	Water resources	259	Environmental Science	479
			Meteorology Atmospheric Science	238	Meteorology Atmospheric Science	406
			Environmental Science	187	Water resources	402
			Environmental Studies	108	Environmental Studies	308
			Green Sustainable Science Tech.	100	Green Sustainable Science Tech.	247
			Public Environmental Occupational Health	58	Public Environmental Occupational Health	175
			Social sciences, interdisciplinary	40	Social sciences, interdisciplinary	30

3.4. Analysis by countries and institutions

According to the analysis by countries and institutions, the research competence on regional disaster resilience is revealed. When Table 4 is examined, 2040 institutions have conducted studies on disaster resilience. The National Research Institute for Earth Science Disaster Resilience is the best research institution in the field, with 157 publications (9.855%). The University of Tokyo follows this with 68 publications (4.268%) and the University of London (3.703% in total. It's worth noting that the top institutions in the field of disaster resilience research are largely based in Japan.

However, it's also encouraging to see institutions from other countries making the list, such as the United Kingdom, New Zealand, and the United Arab Emirates. When looking at each country's disaster resilience research, 110 countries have conducted related studies. The table provides a list of the top 20 countries that have published the most articles on disaster resilience.

According to the analysis, Japan has the highest percentage of publications (22.787%), followed by the United States (16.509%) and the United Kingdom (12.554%). These countries are the most active in researching disaster resilience. Both data sets indicate that the analysis study is consistent when considering institutions and their countries.

Table 4. The top twenty institutions publishing on resilience

#	Name of the institution	Number of publications	% of 1561
1	National Research Institute for Earth Science Disaster Resilience	157	%9.855
2	University of Tokyo	68	%4.268
3	University of London	59	%3.703
4	University College London	44	%2.762
5	Kyoto University	42	%2.636
6	Tohoku University	41	%2.573
7	University of California System	24	%1.506
8	Massey University	23	%1.443
9	Keio University	21	%1.318
10	Rabdan Acad	20	%1.255
11	University of Auckland	20	%1.255
12	Texas A M University System	19	%1.192
13	Beijing Normal University	18	%1.129
14	Northwest University South Africa	18	%1.129
15	Texas A M University-College Station	18	%1.129
16	University of Washington	16	%1.004
17	University of Washington Seattle	16	%1.004
18	Delft University of Technology	15	%0.941
19	Gns Science New Zealand	15	%0.941
20	State University System of Florida	14	%0.878
Total institutions = 2040			

Table 5. The top twenty countries publishing on resilience

|	Countries/ Regions	Record Count	% of 1561
1	Japan	363	22.787%
2	USA	263	16.509%
3	England	200	12.554%
4	China	191	11.989%
5	Australia	113	7.093%
6	Germany	80	5.021%
7	Italy	72	4.519%
8	New Zeland	69	4.331%
9	Netherlands	61	3.829%
10	South Africa	58	3.640%
11	Canada	53	3.327%
12	Bangladesh	44	2.762%
13	Indonesia	40	2.510%
14	South Korea	38	2.385%
15	Taiwan	38	2.385%
16	Switzerland	37	2.322%
17	India	36	2.259%
18	Sweden	36	2.259%
19	Spain	34	2.134%
20	Thailand	33	2.071%
Total countries = 110			
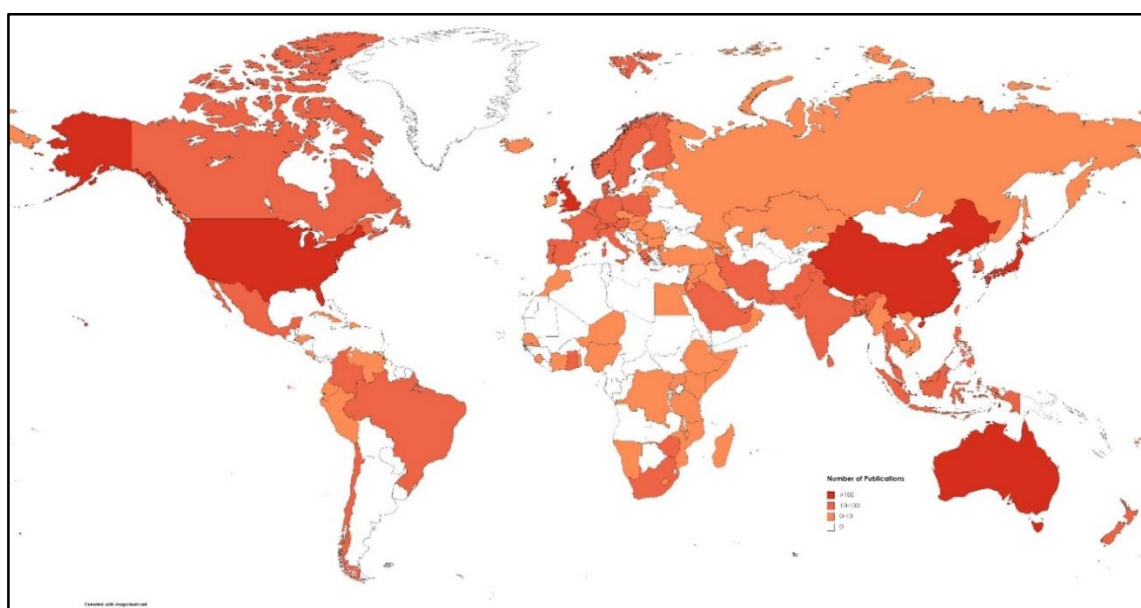
Figure 3. Publications on disaster resilience (1992–2022)

Table 6. The top ten most cited publications

#	Journal	TC	Title	Author/s	Year	C/Y
1	NH	492	"Framing vulnerability, risk, and societal responses: the MOVE framework"	Birkmann et al.(2013)	2013	44,73
2	IJDRS	205	"The Sendai Framework for Disaster Risk Reduction: Renewing the Global Commitment to People's Resilience, Health, and Well-being"	Aitsi-Selmi et al.(2015)	2015	22,78
3	PDS	196	"Review and analysis of current responses to COVID-19 in Indonesia: Period of January to March 2020"	Djalante et al.(2020)	2020	49
4	S	195	"General Resilience to Cope with Extreme Events"	Carpenter et al. (2012)	2012	16,25
5	NH	164	"Critical infrastructure, panarchies and the vulnerability paths of cascading disasters"	Pescaroli& Alexander (2016)	2016	20,5
6	IJDRR	153	"An economic framework for the development of a resilience index for business recovery"	Rose& Krausmann (2013)	2013	13,91
7	IJDRS	147	"Climate Change's Role in Disaster Risk Reduction's Future: Beyond Vulnerability and Resilience"	Kelman et al. (2015)	2015	16,33
8	IJDRR	144	"Process for integrating local and indigenous knowledge with science for hydro-meteorological disaster risk reduction and climate change adaptation in coastal and small island communities"	Hiwasaki et al. (2014)	2014	14,4
9	IJDRS	141	"Measuring Social Vulnerability to Natural Hazards in the Yangtze River Delta Region, China"	Chen et al. (2013)	2013	12,82
10	IJDRS	141	"Adaptive Governance and Managing Resilience to Natural Hazards"	Djalante et al. (2011)	2011	10,85

Note(s): TC: total citations; C/Y: citations per year; NH: Natural Hazards; IJDRS: International Journal of Disaster Risk Sience; PDS: Progress in Disaster Science; S: Sustainability; IJDRR: International Journaş of Disaster Risk Reduction

The analysis of studies by country and institution highlights the research expertise in disaster resilience in the region. When we look at Table 4, we can see that a total of 2,040 institutions have researched disaster resilience. The National Research Institute for Earth Science Disaster Resilience is the institution that has done the best research on this topic with 157 publications, which accounts for 9.855% of the total. The University of Tokyo follows with 68 publications (4.268% of the total), and the University of London comes third with 3.703% of the total. When we look at countries' specific contributions to disaster resilience, a total of 110 countries have conducted relevant research. Table 5 shows the top twenty countries with the most publications. Based on the bibliometric analysis, Japan has been the most active country in conducting research on disaster resilience with a total of 22.787% publications, followed by the United States with 16.509% and the United Kingdom with 12.554%. When we examine both sets of data, we can say that the analysis study is consistent regarding the institutions and the countries in which they are located. A worldwide view of research on disaster resilience is shown in Figure 3.

Table 6 lists the most cited publications. We can see that the International Journal of Disaster Risk Reduction, International Journal of Disaster Risk Science, and Natural Hazards journals are among the most cited publications in multiple citation rankings. The most cited publication was published in 2013 and received 44.73 citations per year. The total number of citations in the table is 492 over nine years,

while Djalante et al. (2020) received 196 citations in two years. This indicates that current issues in disaster resilience are attracting more attention, and research potential is focused on new findings. The same table shows that studies related to disaster resilience aim to understand the strategies that can be used to reduce disaster risk. When it comes to disaster resilience, there is a need to combine the resilience of society. The table also shows that 90% of the most cited publications were published between 2011 and 2019. Additionally, the role of the COVID-19 pandemic in disaster resilience is evident in the top three most cited publications, all of which focus on the COVID-19 pandemic and were published in 2020. Based on this table, we can make three main observations in the literature:

(1) the need to consider the concept of vulnerability, risk management, and adaptation along with disaster resilience (Birkmann et al., 2013; Aitsi-Selmi et al., 2015; Kelman et al., 2015).

(2) the need for disaster resilience programs that are supported by the community and the government for faster, more effective, and more comprehensive interventions (Djalante et al., 2020; Carpenter et al., 2012; Hiwasaki et al., 2014).

(3) the development of a resilience index taking into account the nature of social and economic vulnerability in disaster resilience (Kelman et al., 2015; Chen et al., 2013).

4. Discussion

The realm of disaster resilience has recently become a significant field of study that has attracted the attention of scholars. In the current inquiry, the disaster resilience literature in the Web of Science database underwent analysis to provide insightful information about the present state of the research field. The outcomes of this inquiry suggest that disaster resilience has encountered substantial research activity in recent years, as observed by numerous articles published in top-tier journals. This trend indicates that disaster management, preparedness, and resilience are emerging as essential concerns, and researchers are zealous about developing efficient strategies and solutions to tackle these challenges.

The International Journal of Disaster Risk Reduction has established itself as the leading journal in this field, followed closely by the Journal of Sustainability and the Journal of Disaster Research, which cumulatively accounts for over 57% of all articles published in disaster resilience. This information proposes considerable interest among researchers in disaster resilience. The abundance of published articles illustrates the importance of this field in addressing the difficulties of both natural and man made disasters. The prevalence of multiple high-quality journals is evidence that disaster resilience research is well-established and holds robust institutional support, providing a positive outlook for its future growth and development.

Over the years, the analysis of disaster resilience research accurately reflects how the field has evolved. In the early stages of 2002 and 2009, relatively fewer studies were conducted, averaging 0.42. However, from 2010 to 2016, resilience studies showed a noticeable increase, driven by the disastrous earthquakes in Chile and Japan. This trend continued between 2017 and 2019, with a significant surge in publications, which can be attributed to other calamities like the Kumamoto earthquake and the Cape Town drought. Between 2020 and 2022, resilience studies increased significantly, with an average of 314.33 articles published annually. This spike can primarily be attributed to the Covid-19 virus outbreak in 2020.

Understanding the field's present condition is essential, and exploring the conceptual framework of the authors' works is a valuable method to accomplish this. Categorizing keywords into 12 clusters can help identify the primary focus areas in disaster resilience research. These clusters encompass a range of topics, including disaster types, numerical analysis, disaster management, community and social perspectives, and more. To gain a better understanding, scholars in the literature have been divided into four keyword clusters, each highlighting a different aspect of resilience.

The first cluster focuses on identifying the various threats and vulnerabilities communities face. The second cluster of related topics prioritizes using empirical evidence and data analysis to improve disaster resilience. On the other hand, the third cluster delves into the importance of crisis

management in mitigating the impact of disasters. Based on the analysis, it is clear that the authors place significant importance on the concept of resilience, which appears 321 times in their work. They also explore related themes such as reducing the risk of disasters and vulnerability, frequently mentioned with 143 and 138 occurrences, respectively. Furthermore, the authors demonstrate a keen interest in how disaster resilience and climate change are connected, as evidenced by the keyword "climate change," which appears 133 times. Another significant aspect the authors delve into is disaster management, as seen by the high occurrence of keywords like "disaster management" and "community resilience." This underscores the importance of these concepts in their research. In particular, the frequency of keywords related to disaster management, such as "vulnerability" and "disaster risk management," highlights the authors' focus on these aspects of disaster resilience. In addition, the researchers exhibit a keen fascination with disaster resilience, ranging from preparedness and adaptation to sustainability and recovery. It is clear that the authors' focus on critical concepts such as "adaptation," "recovery," "sustainability," and "preparedness" is reflected. These results imply that the scholars are curious about comprehending and examining every facet of disaster resilience, starting from the early stages of preparation and adaptation to the long-term goals of sustainability and recovery. To truly comprehend the various hazards that communities and societies face, it is essential to analyze disaster resilience. Incorporating data-driven and evidence-based techniques in disaster resilience can aid in making informed decisions using cutting-edge technologies and numerical methodologies. The significance of effective crisis management cannot be overstated, as reducing disaster impact and increasing resilience heavily relies on it. Social learning and community resilience are critical in determining a community's ability to recover from a disaster. The disaster resilience process, including preparation, adaptation, recovery, and sustainability, needs to be studied, considering different actors' roles. Interdisciplinary collaboration is necessary to gain a profound understanding of disaster resilience's social and community dimensions understanding human behavior during disasters can be enriched by the multidisciplinary perspectives of psychology, sociology, and anthropology. Additionally, channeling resources towards the development of cutting-edge tools and technologies to bolster disaster resilience such as sophisticated early warning systems, efficient evacuation procedures, and robust post-disaster recovery plans is recommended. These investments will undoubtedly enhance preparedness and enable superior disaster management in the years ahead.

5. Conclusion

We present a bibliometric analysis of the disaster resilience literature indexed in the Web of Science database. In this study, we have delivered valuable insights into the current state of research in disaster resilience, demonstrating the growing importance of this area of inquiry. Through our analysis of keywords utilized in the relevant literature, we have highlighted the central role of resilience, vulnerability, and climate change in disaster resilience research, paving the way for future research and informing policies to enhance disaster resilience. Furthermore, our study provides an exhaustive overview of major topics and focus areas in disaster resilience research, enabling us as researchers and practitioners to gain a more in-depth understanding of the field and identify areas that require further investigation. The results of our study can be employed to design effective strategies and programs to improve community resilience and minimize the impact of natural disasters. Moreover, the geographical analysis of authorship and publication underscores the significance of international cooperation in addressing the global nature of disaster impacts. We emphasize the importance of knowledge and expertise-sharing between countries to create a more comprehensive and practical approach to disaster resilience and risk reduction.

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Author Contribution and Conflict of Interest Declaration Information

All authors contributed equally to the article. There is no conflict of interest.

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