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Natural Disaster Education in School: A Bibliometric Analysis with a Detailed Future Insight Overview

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Abstract: In some places of the world, disasters occur virtually every day. If disasters are not properly foreseen, they may result in many fatalities. This research aims to examine the growth and pattern of literature on natural disaster education in schools. This analytical strategy combines quantitative and statistical methods to discover trends, assess quality, and track development. A total of 216 documents were chosen from the 403 documents collected. Following 2015, there was a considerable increase in four-year publications. Authors from the United States contributed to 45 papers with 37% citations and ranked first, followed by authors from Japan (31 documents; 15% citations) and Indonesia (31 documents) with rankings citations below the top 10. Most publications were published in the International Journal of Disaster Risk Reduction (12 docs; Q1 Scimago Journal Rank 1.1 (SJR 1.1)). The Journal of Child Psychology and Psychiatry and Allied Disciplines had the most citations (100; Q1 SJR 3.6) and was ranked first in its discipline. The existing core literature on school education on natural disasters demonstrates that this topic is developing rapidly, but with insufficient international research collaboration. Research cooperation in this area must be strengthened to better the global response to natural disaster mitigation, which should begin in schools worldwide. There is a need to widen the scope of study in this field to include natural disaster preparedness education in the school curriculum, assessments, learning media, disaster response education, and instructional designs. Finally, disaster education in schools must be addressed as soon as possible to contribute to disaster preparedness.

Keywords: *Bibliometric analysis; natural disaster; natural disaster education; natural disaster literacy.*

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Introduction

Natural disasters (Parwanto & Oyama, 2014; Ritchie & Roser, 2019), nuclear leaks (Carless et al., 2021; Imanaka, 2020; Kimura et al., 2015; Onda et al., 2020), biological warfare (Hays, 2007; Powell, 2019; Wu, 2021), epidemic and pandemic diseases (Karim & Mishra, 2022; Lu et al., 2020; Ma et al., 2022; Mika, 2020; Vardoulakis et al., 2021), and other disasters directly threaten the survival and development of mankind (Tavakoli et al., 2013; Zhou et al., 2019). In recent years, disasters have occurred virtually every day in various regions of the world (Ritchie & Roser, 2019). Pesantez (2018) estimates that by 2050, 68% of the world's population will be concentrated in places at high risk of disasters, such as metropolitan areas, which are also significantly at risk of causing numerous fatalities if not well foreseen. However, disasters must be anticipated even in locations with fewer populations, particularly in residential areas along the shore, near volcanoes, landslide-prone areas, flood-prone areas, and areas prone to other natural forces. Environmental degradation, mining that ignores environmental implications, and enormous housing complexes all lead to an increased risk of humans being exposed to natural and human-caused disasters, resulting in an increase in victims following the disaster (Pepe et al., 2006).

Haiti earthquake (Blanc et al., 2020; Cénat et al., 2020; Daniels, 2021; Fath et al., 2020; Mika, 2020), Palu earthquake (Ho et al., 2021; Koul & Mulchandani, 2021; Rohit et al., 2021; Zhao, 2021), Nepal earthquake (He et al., 2018; Lay et al.,

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2017; Sharma et al., 2021; Spoon et al., 2020; Valagussa et al., 2021), Padang West Sumatra earthquake (Bothara et al., 2010; Chian et al., 2019; Lay et al., 2017; Muhammad et al., 2017; Rosyidi et al., 2011), and Aceh earthquake (Chanson, 2007; Hagan et al., 2007; Rusydy et al., 2020; Sørensen et al., 2007; Sufri et al., 2019) took many lives. The disasters present a significant challenge in developing appropriate disaster mitigation management models. The 2010 Haiti earthquake was one of the most devastating disasters in the last 15 years, killing over 230,000 people. The main cause of death was the earthquake, which struck the densely populated residential areas of the capital and was exacerbated by the construction of buildings, most of which were unable to withstand a high-magnitude earthquake, resulting in many residents being crushed by settlement rubble (Kim, 2010). Efforts to mitigate the impact of disasters immediately generate ideas for disaster education. Additionally, the necessity of mapping disaster education has been examined in some detail to develop an adequate model of disaster education to mitigate disasters since school. However, its implementation in the field requires additional evaluation.

Numerous research trends exist about disaster mapping using bibliometric analysis, including the disasters from the perspective of medicine (Hao et al., 2019; Zhou et al., 2019), health analysis (Lin et al., 2020; Sweileh, 2019), emergency evacuation pattern (Liu et al., 2020), social media and ICT (Sahil & Sood, 2021; Tang et al., 2021), elements of disaster preparedness and adaptation to climate change (Lima & Bonetti, 2020; Rana, 2020), community-based early warning systems (Zhang et al., 2020), remote imaging's diagnostic capabilities in disasters (Gong et al., 2018), international relationship and technology (Fan et al., 2020), economy (Tan et al., 2020), and natural disaster management policies in general (Barnes et al., 2019; Zhang et al., 2018). However, there are relatively few studies published in credible publications that explore the meta-analysis of natural disaster policy in education. There is yet to be a bibliometric analysis of the term "natural disaster education in schools."

By offering thorough information on bibliometric analysis connected to disasters in the field of education in schools, this study seeks to cover research gaps and contribute to the research field and serve as a platform for primary probabilistic research. The bibliometrically examined papers are obtained from the Scopus.com database, processed, and classified based on authors' distribution and affiliations. This analysis can see the typology, geographic distribution, history, main general sources, alphabetic journal main sources, authors and relevant publications, and maps with the main term natural disaster education in school. The research topic can be the main variable for research to be conducted by providing recommendations for further research.

Methodology

Research Design

In this research, bibliometrics was utilized as the method. The initial focus was on utilizing bibliometrics to assess academic productivity regarding the number of articles and citations generated by certain academics or institutions (Lima & Bonetti, 2020; Singh et al., 2022). However, it has recently been widely used to characterize the pattern and structure of research developments in numerous domains of science based on the appearance of research variables/content by many researchers from various countries (Collins et al., 2021; Houlden et al., 2021; Luo et al., 2022; Xiong et al., 2021).

Data Collection and Analysis Techniques

The data for the bibliometric study came from scientific papers published in journals and proceedings indexed by Scopus. Documents that can be scientifically justified and kept up to date are used as references. Figure 1 depicts the data collection and analysis technique used in this investigation, which was carried out in several stages (Hudha et al., 2020; Lima & Bonetti, 2020; Xiong et al., 2021).

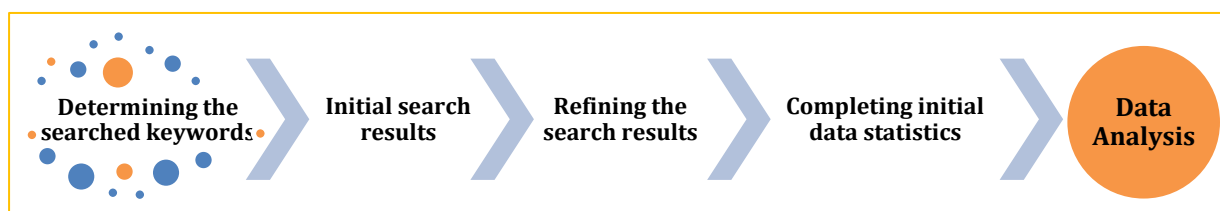


Figure 1. Five Steps of Bibliometric Analysis

To define search keywords before analyzing a topic, one must first decide on the search keywords utilized as the subject of discussion. Paying attention to the issues that are the topic of research in the field under study might help choose search terms. This study's metadata search was conducted in December 2021 using keywords selected by the author, namely "natural disaster education in school." The Scopus database search is used to collect metadata.

Initial search results are obtained from the first keyword search. The initial search results show the number of articles with the required keywords. This research employed article metadata based on the article's title to get more accurate

search results by including the keyword "Natural Disaster Education in School". Therefore, the initial data search from the Scopus indexing database found 403 documents within the parameters of "source type - journal articles, conference proceedings, review articles, books and book chapters" and "Language - English".

Refinement of search results is a step taken to retrieve data with more accurate results needed by the researcher. In this research, the initial search results found 283 documents in the Scopus database based on journal articles, conference proceedings, review articles, books and book chapters. These articles were searched by restricting their search specifically to "Type of Source - journal articles, conference proceedings, review articles" and "Language - English". Thus, 216 documents were obtained by narrowing down the search results in 1991-2021. These documents were downloaded in CSV & RIS format to collect all article titles, authors, cities, references, and keywords.

Completing initial data statistics is a step taken to complete incomplete information in an article, such as the title, year, volume, page, author, issue, citation, author's country of origin, publisher, and abstract. In this research, the obtained RIS and CSV data formats were imported into Mendeley and VOSViewer to complete the data that was not filled in properly because it will be used as a reference. The CSV format on VOSViewer was used to see the distribution of articles in terms of keywords, countries, years, and authors.

Data analysis can be done if all the required data is complete. The analysis is carried out to break down a topic into parts to make it easier to understand. Descriptively, the purpose of this research is to present a bibliometric analysis with the keywords "Natural Disaster Education in School" from a trusted source, namely Scopus.com. All metadata that has been selected and analyzed using VOSViewer were visualized or mapped through overlay visualization and map visualization to be more detailed.

Findings

The data for the bibliometric review was obtained from the Scopus.com database. Mendeley software was used to ensure the completeness of the metadata. Following that, the most commonly occurring terms could be easily examined. The following step was utilizing VOSviewer software. The VOSviewer was used to display a bibliometric map of the updated metadata. Network visualization and density visualization were the outcomes of bibliometric mapping using the VOSviewer software.

Typology

The first Indicator to be examined was the document type. The data were obtained from the scopus.com database and were sorted. The researchers discovered at least five publications based on the phrase "Natural Disaster Education in School," including journal articles, books, book chapters, and proceedings (article conference). Figure 2 depicts the number and percentage of each sort of document.

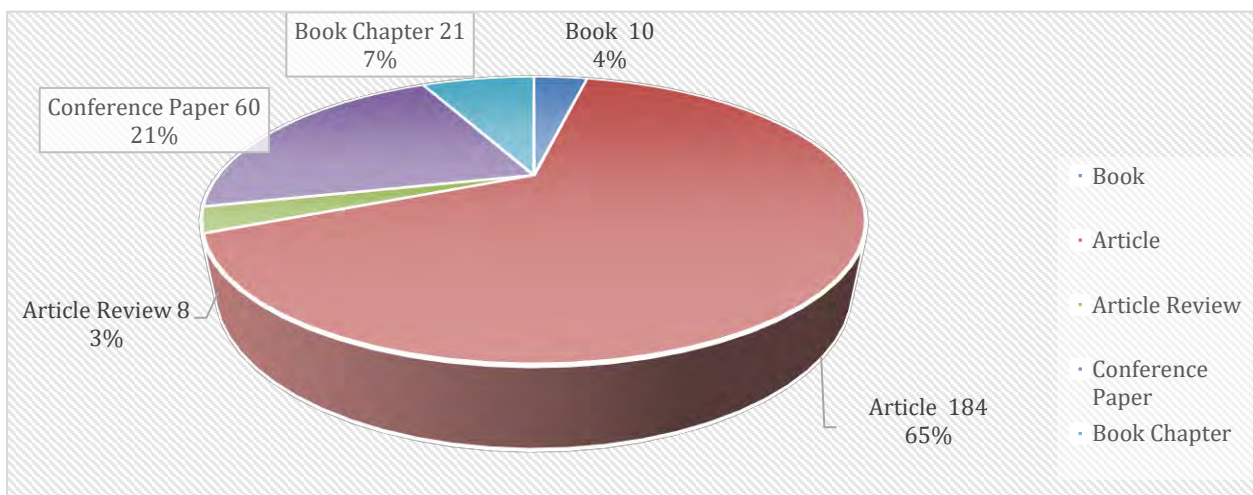


Figure 2. The Distribution of Data Sources by Document Type

History

The development of source documents related to the keywords was the second Indicator presented and analyzed. The oldest document with the keyword "Natural Disaster Education in School" was published in 1991 on a disaster framework for research and learning. (Alexander, 1991). Then, the number increases with various backgrounds in the frame of disaster education from time to time. The number of documents related to keywords was growing and consistently increasing until December 2021. The growth within four years time frame can be seen in Figure 3.

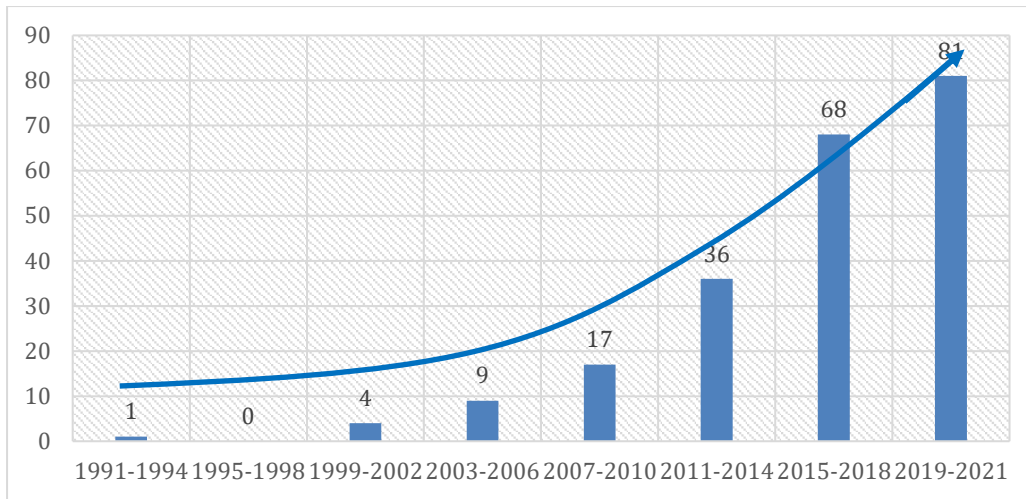


Figure 3. The Number of Quarterly Documents Related to The Keyword "Natural Disaster Education in School" From The Scopus Database (Taken on December 16, 2021)

Geographic Distribution

The geographic distribution analysis represents the countries where the authors of the articles are located. The calculation only considered the country of origin of the document. Even if more than one author is from the same country, this is counted only once. This calculation makes it possible to increase the orientation of each country in publishing articles related to "Natural Disaster Education in School". The countries of origin of the authors described are ranked in the top 10 in the number of publications, as shown in Figure 4.

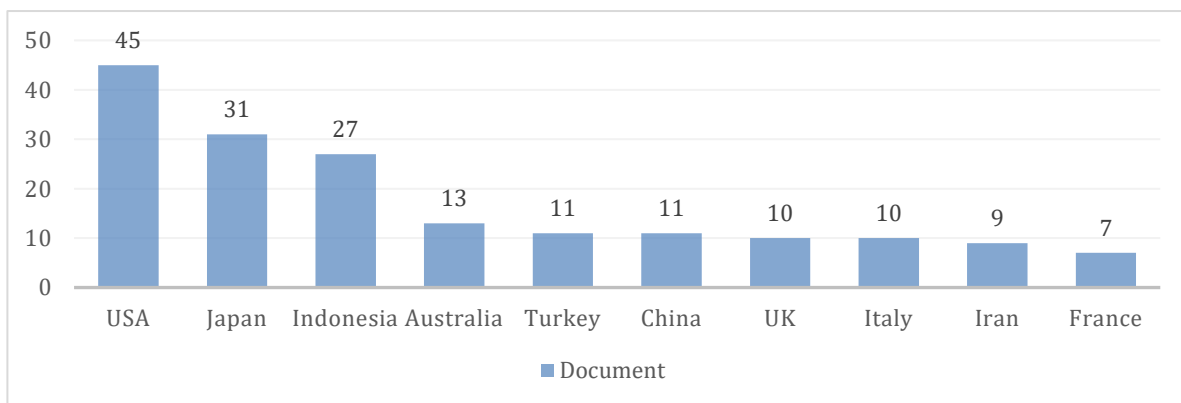


Figure 4. Scopus Data for Ten Countries With The Most Documents Regarding Natural Disaster Education in School

Based on Figure 4, the USA occupies the first position ahead of 68 other countries with the highest number of article publications, which amounted to 45 articles. Next, the number of document citations from the country of origin can be seen in Figure 5.

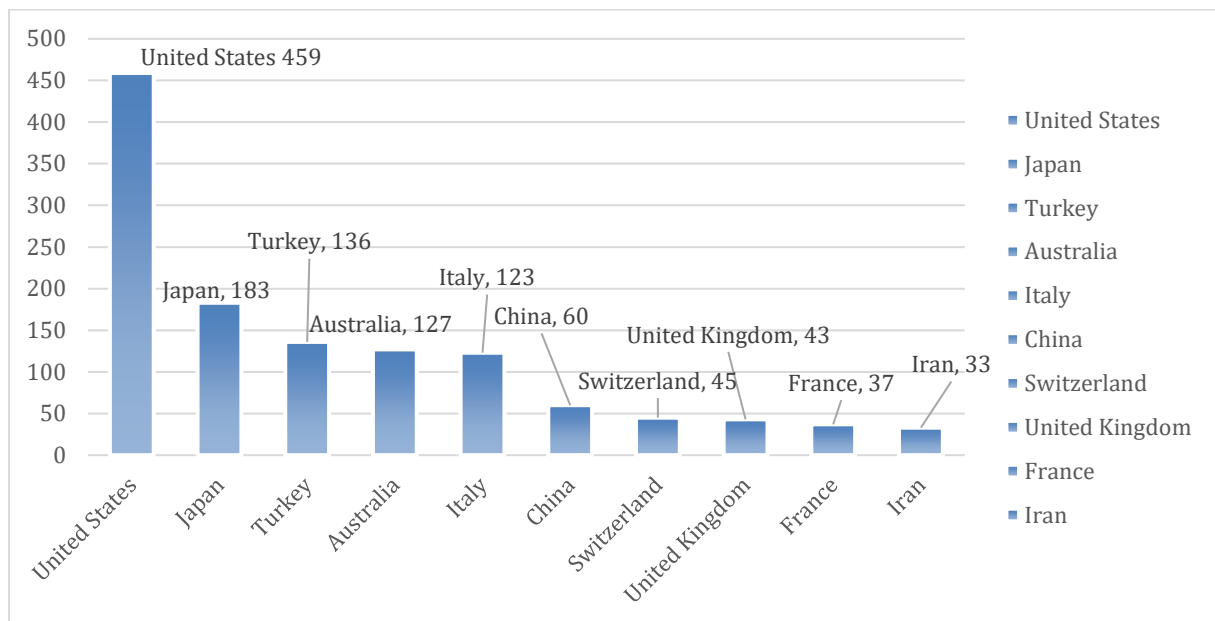


Figure 5. Scopus Data for Ten Countries With the Most Citations Related to Natural Disaster Education in School

Citation from a document indicates its visibility and significance as reference material in academia, as documents with more citations are thought to be more prominent in a given topic (Zupic & Čater, 2015). Figure 6 displays the distribution of articles related to keywords in all countries and their citation network.

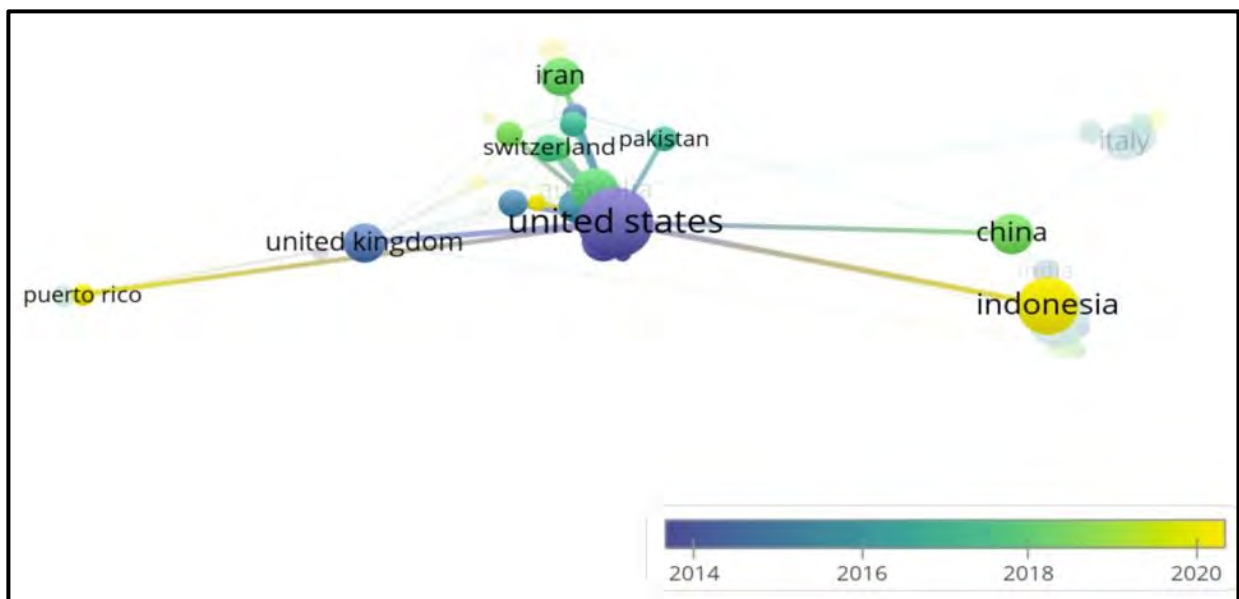


Figure 6. The Relationship Between Countries Seen From the Number of Documents and the Distribution of Citations Related to Keywords

Main Sources

The article documents are sourced from 158 journals and 19 different proceedings. Journal article is the focus of discussion in the main source section. Most of these sources are journals with the scope of natural disasters from various scientific fields, including environmental science, pure science, geography, public health, medicine, education, social science, psychology, and so on. The ten journals that publish the most related articles on Natural Disaster Education in School are shown in Table 1.

Table 1. Ten Journals With the Most Published Documents (Natural Disaster Education in School)

Journals	SJR index (Scimagojr 2021)	Number of Document
International Journal of Disaster Risk Reduction	1,1 (Q1)	12
Natural Hazards	0,7 (Q1)	7
Journal of Disaster Research	0,3 (Q2)	6
International Research in Geographical and Environmental Education	0,5 (Q2)	3
Sustainability (Switzerland)	0,6 (Q1)	3
American Journal of the Medical Sciences	0,6 (Q2)	3
Disaster Medicine and Public Health Preparedness	0,4 (Q3)	2
World Development	2,39 (Q1)	2
Jamba: Journal of Disaster Risk Studies	0,4 (Q2)	2
Bulletin of Earthquake Engineering	1,2 (Q1)	2

The bibliographic database based on journal sources in Table 1 reveals that the World Development journal is not the journal with the most documents that publish natural disaster education articles. However, it has an SJR value of 2.39. It is the highest among other journals that publish articles with the same keywords. The classification of journals based on the number of citations can be seen in Table 2.

Table 2. Ten Journals With the Most Citations (Natural Disaster Education in School)

Journals	SJR index (Scimagojr 2021)	Number of Citation
Journal of Child Psychology and Psychiatry and Allied Disciplines	3,6 (Q1)	100
Natural Hazards	0,7 (Q1)	98
International Journal of Disaster Risk Reduction	1,1 (Q1)	85
Disaster	0,7 (Q1)	65
Nursing Education Perspectives	0,6 (Q2)	56
Bulletin of Earthquake Engineering	1,2 (Q1)	38
Nurse Education in Practice	0,9 (Q1)	37
Computers in human behaviour	2,1 (Q1)	32
Natural Hazards and Earth System Sciences	1,1 (Q1)	31
World Development	2,39 (Q1)	31

The journal displayed in Table 2 are a reference source of international repute and are very worthy of being the main reference source in relevant research. Journals that are not ranked in the top 10 based on the number of documents related to the keyword natural disaster education, along with the SJR, can be seen in Table 3.

Table 3. Alphabetic Main Sources Scopus Journal (Natural Disaster Education in School)

Journals	SJR index (Scimagojr 2020)
American Journal of the Medical Sciences	0,6 (Q2)
Australian Journal of Emergency Management	0,2 (Q2)
Australian Journal of Environmental Education	0,4 (Q2)
BMC Public Health	1,23 (Q1)
Bulletin of Earthquake Engineering	1,2 (Q1)
Child Development	3,1 (Q1)
Computer Applications in Engineering Education	0,4 (Q2)
Computers in Human Behavior	2,1 (Q1)
Disaster	0,7 (Q1)
Disaster Medicine and Public Health Preparedness	0,4 (Q3)
E-Learning and Digital Media	-
Education Sciences	0,4 (Q2)
Eurasian Journal of Educational Research	-
Future of Children	2,1 (Q1)
Geomatics, Natural Hazards and Risk	0,9 (Q1)
Global Health Action	1,3 (Q1)
History of Education Review	0,2 (Q1)
Humans and Nature	0,1 (Q4)
International Journal of Continuing Engineering Education and Life-Long Learning	0,2 (Q3)

Table 3. Continued

Journals	SJR index (Scimagojr 2020)
International Journal of Disaster Risk Reduction	1,1 (Q1)
International Journal of Educational Management	0,4 (Q2)
International Journal of Educational Research	0,9 (Q2)
International Journal of Instruction	0,5 (Q2)
International Research in Geographical and Environmental Education	0,5 (Q2)
International Review of Research in Open and Distance Learning	1,4 (Q1)
Jamba: Journal of Disaster Risk Studies	0,4 (Q2)
Journal of Child Psychology and Psychiatry and Allied Disciplines	3,6 (Q1)
Journal of Disaster Research	0,3 (Q2)
Journal of Education and Health Promotion	0,3 (Q3)
Journal of Education Policy	2,2 (Q1)
Journal of Geography	0,5 (Q2)
Journal of Geoscience Education	0,5 (Q2)
Journal of Policy and Practice in Intellectual Disabilities	0,6 (Q2)
Journal of Psychologists and Counsellors in Schools	0,3 (Q3)
Natural Hazards	0,7 (Q1)
Natural Hazards and Earth System Sciences	1,1 (Q1)
Polish Journal of Environmental Studies	0,3 (Q3)
Research in Science and Technological Education	0,6 (Q1)
Research in Social Psychology	0,1 (Q4)
Revista Electronica Educare	0,2 (Q3)
Science of the Total Environment	1,8 (Q1)
Social Service Review	0,1 (Q1)
Stress and Health	1,0 (Q1)
Sustainability (Switzerland)	0,6 (Q1)
World Development	2,39 (Q1)

Relevant Authors and Publications

The meta-analysis of documents on natural disaster education in school based on the authors revealed that 720 authors had published papers related to this topic based on the Scopus database. Documents with more than one author are categorized in a separate entity. Thus, each author has the right to several articles whose names are also considered. Thirty-seven authors published a minimum of two documents, and 15 of them published at least three documents. The data is displayed in Figure 7.

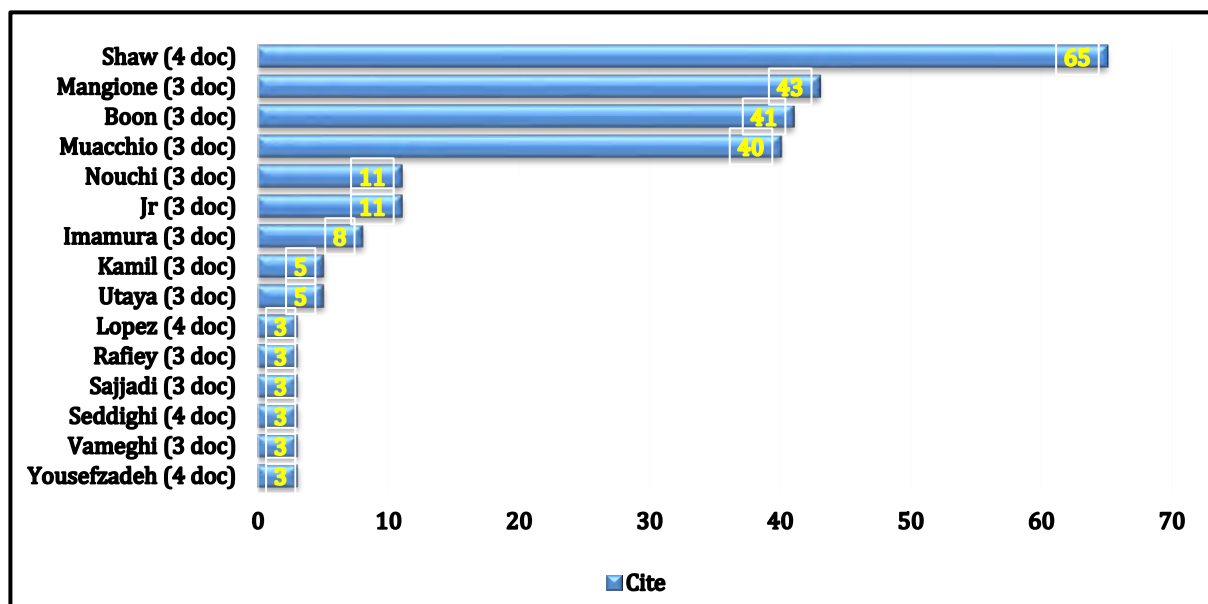


Figure 7. Fifteen Most Cited Authors and Documents

Figure 7 shows the author's focus on publications according to natural disasters in education. The four most prolific writers on this topic are Shaw, Lopez, Seddighi, and Yousefzadeh. Each of these authors published four documents, with

Table 4. The Most Frequently Related Variables on Natural Disaster Education

No	Variable	Occurrences
1.	Education	48
2.	Natural disaster	35
3.	Students	34
4.	Earthquakes	22
5.	Teaching	17
6.	Disaster preparedness	13
7.	Organization and management	11
8.	Disaster Planning	10
9.	Risk assessment	9
10.	Learning system	9
11.	Disaster risk reductions	8
12.	Geographic education	7
13.	Risk factor	6
14.	Curriculum	5
15.	Risk education	5
16.	Environmental education	5
17.	School health service	4
18.	Academic achievement	4
19.	GIS	4
20.	Disaster mitigation	4
21.	Stress disorders, post-traumatic	2
22.	Disaster resilience	2
23.	Disaster management education	2
24.	Instructional designs	2
25.	Disaster response	2
26.	Development model	2
27.	Conceptual framework	2
28.	Adaptive learning	2
29.	Integrated learning	2
30.	Project based learning	2
31.	Spatial thinking	2
32.	STEM	2
33.	Digital storytelling	2
34.	Disaster reduction education	2
35.	Safety education	2
36.	Evacuation drill	2
37.	Attitude	2
38.	Educational attainment	2

Discussion

The data in Figure 2 is necessary to provide so that readers may access complete data from the scopus.com database on the number and percentage of the keyword "Natural Disaster Education in School," based on "document type." However, to avoid bias in the information reported in this research, only article reviews, proceedings, and journal articles were chosen as document data to be examined using VOSviewer. This finding is in line with research by Lima and Bonetti (2020), that by filtering the search results based on the keywords, more relevant documents. The overall analysis produced from these three categories of papers can provide larger information about bibliometrics with the keywords "Natural Disaster Education in School." Based on the type of content, three metadata sources discovered 216 documents that are truly related to the researchers' keywords.

The oldest relevant articles related to the keyword "natural disaster education in school" were published between 1991 and 2000 (see Figure 3), one document published during this period can be considered a pioneer in studying natural disaster education in schools. Significant growth in publications is seen starting in 2015 to 2018, with 68 documents. There was a significant increase in the number of published documents from then onwards. 2019 to 2021 was a very productive year since the produced documents reached 81 articles. It means that from year to year, the research related to natural disaster education in schools continues to grow and has the opportunity to continue to be researched and explored for its novelty.

Based on Figure 4, the USA occupies the first position ahead of 68 other countries with the highest number of article publications, which amounted to 45 articles. Search by Geographic distribution helps in finding the most distribution of

publications in a country (Emmer et al., 2019; Emmer, 2018). The citation from a document indicates its visibility and significance as reference material in academia, as documents with more citations are thought to be more prominent in a given topic (Gong et al., 2018; Zupic & Čater, 2015). Figure 5 demonstrates that authors from the United States have 37% of the citations, continually outnumbering the number of papers and citations. Another intriguing fact is that Switzerland, previously not included in the top ten based on the number of documents, now has a citation rate of 3% and is ranked seventh among countries with the greatest citations. Meanwhile, Indonesia does not appear in the ten countries with the most citations. It should be noted that the number of citations is not always precisely proportionate to the number of documents from a given country. This is because not all documents in a country are mentioned by other researchers. The bulk of publications from Indonesia is conference papers published in the IOP Conference Series, as evidenced by the document type.

The concentration of several authors in the USA has different citations. The total citations owned are 459, and 275 are from 5 documents (Wolmer et al., 2005) have 100 citations. This article is a collaborated work by researchers from Israel, Turkey, and the USA; (Alexander, 1991) with 65 citations; (Weiner, 2005) with 56 citations; (Gitter & Barham, 2007) with 28 citations; and (Alfred et al., 2015) with 26 citations. The other 40 documents were cited less than 21 times.

The number of citations by Indonesian authors are 31 citations sourced from 27 documents. The distribution of citations is not balanced, with around 2.5% of all citations in all countries (31 of 1262 citations), distributed in 12 documents, including (Hall et al., 2017) with 14 citations (Kamil et al., 2020) with two citations, (Winarni et al., 2021) with two citations, (Fathoni et al., 2019) with two citations. The rest are less than two citations. The majority of documents from Indonesia are published in the proceeding formats.

The distribution of the bibliographic network seen from the number of documents and the distribution of citations is constructed based on the author's affiliation. Figure 6 shows that the larger the node circle, the more the number of documents of a country according to keywords. The thickness of the connecting line indicates the number of countries citing the linked country. Likewise, concerning the length of the color of the connecting line, it can be seen that the yellow line from the circle of nodes of the Indonesian state is longer than the connecting line of the United States of America. It shows that the greater the relationship between countries that involve citations, with Indonesia mostly citing the USA, and the citations in Indonesian documents are mostly quoted by Indonesian authors. The pioneering documents from various countries on the subject are dark purple, namely the USA, UK, and Japan, which published the first document in 1991. Meanwhile, the latest published documents are yellow, namely Indonesia, Spain, the Netherlands, Australia, Uganda, and Puerto Rico.

The bibliographic database based on journal sources in Table 1 reveals that the World Development journal is not the journal with the most documents that publish natural disaster education articles. However, it has an SJR value of 2.39. It is the highest among other journals that publish articles with the same keywords. This parameter provides data on the number of times articles are cited compared to published papers. The journal with the 3rd highest SJR 1.1 is the Bulletin of Earthquake Engineering. It is also the journal with the highest number of documents. Knowing how central the scientific impact is in a particular journal is important. It can be used as the main reference source in future research

Table 2 shows that J. Child Psychol. Allied Discipline Psychiatry, in the first position with 100 citations originating from 1 document with SJR 3.6 (Q1)(Wolmer et al., 2005). It is interesting to review, considering that only one published document is related to keywords. This journal has the most citations, beating the International Journal of Disaster Risk Reduction, which issued 12 documents. The paper published in the journal is a pioneering document according to the keywords. Three other journals only publish one document but are ranked in the top 10 journals with the most citations related to keywords. The journals are Disaster Journal on the fourth rank (Alexander, 1991), Nursing Education Perspectives on the fifth rank (Gaeta et al., 2014; Weiner et al., 2005), and Computer in Human Behavior on the eighth rank. Then, the International Journal of Disaster Risk Reduction is the journal with the most documents with the third-largest number of citations. The articles published in journals with the most citations are reference journals from other research publications in various countries. The journal level, which is the main reference related to the keywords in this research, is 90% of the Q1 level. In other words, the documents displayed in Table 1 are a reference source of international repute and are very worthy of being the main reference source in relevant research.

Table 3 presents statistics for journals that are part of the main source but do not rank in the top ten based on the number of documents. The researcher believes that this data is valuable enough to assist future researchers who wish to publish additional research with a relevant scope related to school natural disaster education. Up to the date, this data was collected (December 2021), the researchers believe that the Scopus database continues to index these journals. Journals that do not yet have an SJR score indicate that they were only indexed in Scopus in the recent one or two years.

Figure 7 shows the author's focus on publications according to natural disasters in education. The four most prolific writers on this topic are Shaw, Lopez, Seddighi, and Yousefzadeh. Each of these authors published four documents, with Shaw having the highest citation. (Zhou et al., 2019). The impact factor visualization overlay between authors appears to be divided into three clusters, as seen in Figure 8. The first cluster (Seddighi cluster) is made up of seven authors

who are all related, the second cluster (Ferreira cluster) is made up of three authors, and the third cluster (Boon cluster) is made up of three authors. The colour represents the author's impact factor. The Ferreira cluster appears to have the largest impact factor among the other clusters. The first cluster has the lowest impact factor since most documents published in this cluster were published during the recent 1-2 years.

Figure 9 illustrates a network of keywords with the minimum occurrences in two keywords connected to natural disaster education in schools. Visualization overlay analysis and density visualization were utilized to identify the key themes in every study or knowledge domain. These analyses were done by measuring the co-occurrence of the keyword's pairs (Liu et al., 2015). The results of the VOSviewer analysis are critical to review, especially when it comes to relevant keywords for future study prospects. Table 4 displays the most frequently occurring data connected to this topic and the natural disaster education research network, beginning with the strongest. The high number of publications on "natural disaster in education" owned by various countries reveals bibliometric studies related to the importance of disaster mitigation. The geographical location of a territory (country) may be one of the awareness variables in disaster mitigation research. However, this assumption needs to be investigated further to establish evidence of a correlation between a country's geographical position and the development of natural disaster research in education. Furthermore, the growth of natural disaster education in various schools might be a very beneficial study in the future, particularly in society 5.0, in which every human being is directed to enhance social activities in partnership.

Conclusion

This study examines metadata from the literature on natural disaster education in schools, providing future studies. The material reviewed focuses mostly on natural disaster education in schools. As a result, there is an urgent need to increase the scope of study in this sector regarding natural disaster preparedness education in the school curriculum, assessment, learning media, disaster management education, and instructional designs. Finally, disaster education in schools must be addressed as soon as possible to contribute to disaster preparedness. The current study reveals a lack of worldwide research on research collaboration on this subject. It is critical to establish a global research network on this topic among developing, developed, and developing countries. A network like this would assist disaster-prone and low-income countries improve their research agendas and readiness for natural disasters. This collaboration will also create a global platform for researchers, teachers, and natural disaster experts to exchange information and develop curricula, assessment tools, learning models, learning approaches, learning methods, learning strategies, and learning media for disaster education from elementary school to college levels.

Recommendations

The existing core literature on school education on natural disasters demonstrates that this topic is developing rapidly, but with insufficient international research collaboration, particularly at the elementary, secondary, and high school levels. Research cooperation in this area must be strengthened to better the global response to natural disaster mitigation, which should begin in schools worldwide. There is a need to widen the scope of study in this field to include natural disaster preparedness education in the school curriculum, assessments, learning media, disaster response education, and instructional designs. Finally, disaster education in schools must be addressed as soon as possible to contribute to disaster preparedness. Articles studied in this study are limited to those indexed in the Scopus database. Future research can replicate our study in other databases with some keywords.

Limitation

This study has limitations at least only five publications based on the phrase "Natural Disaster Education in School," including journal articles, books, book chapters, conference papers, and Article reviews. Second, although this study uses formal software as tools (PoP software, VOSviewer, Mendeley, Microsoft Excel, and CSV.), the subjective assessments of the author occur and still possibly lead to errors.

Authorship Contribution Statement

Saregar: Drafting the manuscript, and critical revision of the manuscript; Sunyono: Concept and design; Haenilah: Supervision, and final approval; Hariri: Data acquisition; Umam: Data interpretation; Putra: Drafting manuscript, and critical revision, Diani: Securing funding; Misbah: Technical or material support.

References

- Alexander, D. (1991). Natural disasters: A framework for research and teaching. *Disasters*, 15(3), 209–226. <https://doi.org/10.1111/J.1467-7717.1991.TB00455.X>
- Alfred, D., Chilton, J., Connor, D., Deal, B., Fountain, R., Hensarling, J., & Klotz, L. (2015). Preparing for disasters: Education and management strategies explored. *Nurse Education in Practice*, 15(1), 82–89. <https://doi.org/10.1016/J.NEPR.2014.08.001>

- Barnes, B., Dunn, S., & Wilkinson, S. (2019). Natural hazards, disaster management and simulation: A bibliometric analysis of keyword searches. *Natural Hazards*, 97(2), 813–840. <https://doi.org/10.1007/s11069-019-03677-2>
- Blanc, J., Eugene, D., Louis, E. F., Cadichon, J. M., Joseph, J., Pierre, A., Laine, R., Alexandre, M., & Huang, K. Y. (2020). Mental health among children older than 10 years exposed to the Haiti 2010 earthquake: A critical review. *Current Psychiatry Reports*, 22(11), Article 57. <https://doi.org/10.1007/s11920-020-01178-9>
- Bothara, J., Beetham, D., Brunson, D., Stannard, M., Brown, R., Hyland, C., Lewis, W., Miller, S., Sanders, R., & Sulistio, Y. (2010). General observations of effects of the 30th September 2009 Padang earthquake, Indonesia. *Bulletin of the New Zealand Society for Earthquake Engineering*, 43(3), 143–173. <https://doi.org/10.5459/BNZSEE.43.3.143-173>
- Carless, T. S., Redus, K., & Dryden, R. (2021). Estimating nuclear proliferation and security risks in emerging markets using Bayesian belief networks. *Energy Policy*, 159, Article 112549. <https://doi.org/10.1016/j.enpol.2021.112549>
- Cénat, J. M., McIntee, S. E., & Blais-Rochette, C. (2020). Symptoms of posttraumatic stress disorder, depression, anxiety and other mental health problems following the 2010 earthquake in Haiti: A systematic review and meta-analysis. *Journal of Affective Disorders*, 273(8), 55–85. <https://doi.org/10.1016/j.jad.2020.04.046>
- Chanson, H. (2007). Le tsunami du 26 Décembre 2004: Un phénomène hydraulique d'ampleur internationale. premiers constats [The tsunami of December 26, 2004: A hydraulic phenomenon of international magnitude. First observations]. *The White Coal/ La Houille Blanche*, 91(2), 25–32. <https://doi.org/10.1051/LHB:200502001>
- Chian, S. C., Wilkinson, S. M., Whittle, J. K., Mulyani, R., Alarcon, J. E., Pomonis, A., Saito, K., Fraser, S., Goda, K., Macabuag, J., Offord, M., Hunt-Raby, A. C., Sammonds, P., Franco, G., Stone, H., Ahmed, B., Hughes, F. E., Jirouskova, N. K., Kaminski, S., & Lopez, J. (2019). Lessons learnt from the 2009 Padang Indonesia, 2011 Tōhoku Japan and 2016 Ecuador earthquakes. *Frontiers in Built Environment*, 5, Article 73. <https://doi.org/10.3389/fbuil.2019.00073>
- Collins, C. S., Singh, N. P., Ananthasekar, S., Boyd, C. J., Brabston, E., & King, T. W. (2021). The correlation between altimetric score and traditional bibliometrics in orthopaedic literature. *Journal of Surgical Research*, 268, 705–711. <https://doi.org/10.1016/j.jss.2021.07.025>
- Daniels, J. P. (2021). Earthquake compounds Haiti's health challenges. *The Lancet*, 398(10304), 944–945. [https://doi.org/10.1016/S0140-6736\(21\)02009-2](https://doi.org/10.1016/S0140-6736(21)02009-2)
- Emmer, A. (2018). Geographies and scientometrics of research on natural hazards. *Geoscience*, 8(10), Article 382. <https://doi.org/10.3390/geosciences8100382>
- Emmer, A., Vilímek, V., Wang, F., & Dai, Z. (2019). Authors, geographies and the content of papers published in Geoenvironmental Disasters (2014–2018). *Geoenvironmental Disasters*, 6, Article 15. <https://doi.org/10.1186/s40677-019-0136-6>
- Fan, J.-L., Shen, S., Wang, J.-D., Wei, S.-J., Zhang, X., Zhong, P., & Wang, H. (2020). Scientific and technological power and international cooperation in the field of natural hazards: A bibliometric analysis. *Natural Hazards*, 102(3), 807–827. <https://doi.org/10.1007/s11069-020-03919-8>
- Fath, A. R., Aglan, A., Platt, J., Yaron, J. R., Varkoly, K. S., Beladi, R. N., Gorgas, D., Jean, J. T., Dasni, P., Eldaly, A. S., Juby, M., & Lucas, A. R. (2020). Chronological impact of earthquakes on blood pressure: A literature review and retrospective study of hypertension in Haiti before and after the 2010 earthquake. *Frontiers in Public Health*, 8, Article 600157. <https://doi.org/10.3389/fpubh.2020.600157>
- Fathoni, M., Yusuf, A., & Sumartono, C. (2019). The relationship of the role of teachers in the implemented curriculum of school-based disaster preparedness in vulnerability in school teachers with disabilities in Malang city, Indonesia. *Indian Journal of Public Health Research and Development*, 10(8), Article 2762. <https://doi.org/10.5958/0976-5506.2019.02289.7>
- Gaeta, M., Loia, V., Mangione, G. R., Orcioli, F., Ritrovato, P., & Salerno, S. (2014). A methodology and an authoring tool for creating complex learning objects to support interactive storytelling. *Computers in Human Behavior*, 31(1), 620–637. <https://doi.org/10.1016/j.chb.2013.07.011>
- Gitter, S. R., & Barham, B. L. (2007). Credit, natural disasters, coffee, and educational attainment in rural Honduras. *World Development*, 35(3), 498–511. <https://doi.org/10.1016/j.worlddev.2006.03.007>
- Gong, B., Mohammed, M. F., Nicolaou, S., Nasrullah, M., Forster, B. B., & Khosa, F. (2018). Diagnostic imaging in disasters: A bibliometric analysis. *Disaster Medicine and Public Health Preparedness*, 12(2), 265–277. <https://doi.org/10.1017/dmp.2017.52>

- Hagan, A. B., Foster, R., Perera, N., Gunawan, C. A., Silaban, I., Yaha, Y., Manuputty, Y., Hazam, I., & Hodgson, G. (2007). Tsunami impacts in Aceh Province and north Sumatra, Indonesia. *Atoll Research Bulletin*, 544(2), 37–54. <https://core.ac.uk/download/pdf/6084935.pdf>
- Hall, S., Pettersson, J., Meservy, W., Harris, R., Agustinawati, D., Olson, J., & McFarlane, A. (2017). Awareness of tsunami natural warning signs and intended evacuation behaviors in Java, Indonesia. *Natural Hazards*, 89(1), 473–496. <https://doi.org/10.1007/s11069-017-2975-3>
- Hao, X., Liu, Y., Li, X., & Zheng, J. (2019). Visualizing the history and perspectives of disaster medicine: A bibliometric analysis. *Disaster Medicine and Public Health Preparedness*, 13(5–6), 966–973. <https://doi.org/10.1017/dmp.2019.31>
- Hays, J. N. (2007). Myron Echenberg. Plague ports: The global urban impact of bubonic plague, 1894–1901. *The American Historical Review*, 112(4), 1143–1143. <https://doi.org/10.1086/AHR.112.4.1143>
- He, L., Aitchison, J. C., Hussey, K., Wei, Y., & Lo, A. (2018). Accumulation of vulnerabilities in the aftermath of the 2015 Nepal earthquake: Household displacement, livelihood changes and recovery challenges. *International Journal of Disaster Risk Reduction*, 31, 68–75. <https://doi.org/10.1016/J.IJDRR.2018.04.017>
- Ho, T. C., Satake, K., Watada, S., Hsieh, M. C., Chuang, R. Y., Aoki, Y., Mulia, I. E., Gusman, A. R., & Lu, C. H. (2021). Tsunami induced by the strike-slip fault of the 2018 Palu earthquake (Mw = 7.5), Sulawesi Island, Indonesia. *Earth and Space Science*, 8(6), Article e2020EA001400. <https://doi.org/10.1029/2020EA001400>
- Houlden, V., Jani, A., & Hong, A. (2021). Is biodiversity of greenspace important for human health and wellbeing? A bibliometric analysis and systematic literature review. *Urban Forestry & Urban Greening*, 66(1), Article 127385. <https://doi.org/10.1016/j.ufug.2021.127385>
- Hudha, M. N., Hamidah, I., Permanasari, A., Abdullah, A. G., Rachman, I., & Matsumoto, T. (2020). Low carbon education: A review and bibliometric analysis. *European Journal of Educational Research*, 9(1), 319–329. <https://doi.org/10.12973/eu-jer.9.1.319>
- Imanaka, T. (2020). *Comparison of radioactivity release and contamination from the Fukushima and Chernobyl nuclear power plant accidents*. Springer. https://doi.org/10.1007/978-981-13-8218-5_20
- Kamil, P. A., Utaya, S., Sumarmi, & Utomo, D. H. (2020). Strengthen disaster preparedness for effective response on young people through geography education: A case study at school in the tsunami affected area of Banda Aceh City, Indonesia. *IOP Conference Series: Earth and Environmental Science*, 412(1), Article 012016. <https://doi.org/10.1088/1755-1315/412/1/012016>
- Karim, A. M., & Mishra, A. (2022). Novel COVID-19 Recognition Framework Based on Conic Functions Classifier. In L. Garg, C. Chakraborty, S. Mahmoudi, V. S. Sohmen (Eds.), *Healthcare Informatics for Fighting COVID-19 and Future Epidemics*. EAI/Springer Innovations in Communication and Computing (pp. 1–10). Springer. https://doi.org/10.1007/978-3-030-72752-9_1
- Kim, H.-J. (2010). The Haiti earthquakes in 2010 and its implications in Nepal. In P. K. Singh (Ed.), *Focus* (1st ed., Vol. 5). World Health Organization: Regional Office for South East Asia.
- Kimura, H., Watanabe, R., Yokoyama, A., Uesugi, M., Muneda, A., & Nakanishi, T. (2015). The situation of Ag and Pu radioisotopes in soil released from Fukushima Daiichi nuclear power plants. *Journal of Radioanalytical and Nuclear Chemistry*, 303(2), 1469–1471. <https://doi.org/10.1007/s10967-014-3587-y>
- Koul, S., & Mulchandani, H. (2021). Building performance and geotechnical failures in 7.5m Palu earthquake and tsunami 28 September 2018. In T. G. Sitharam, R. Jakka & L. Govindaraju (Eds.), *Lecture Notes in Civil Engineering* (Vol.117, 335–343). Springer. https://doi.org/10.1007/978-981-15-9984-2_29
- Lay, T., Ye, L., Koper, K. D., & Kanamori, H. (2017). Assessment of teleseismically-determined source parameters for the April 25, 2015 MW 7.9 Gorkha, Nepal earthquake and the May 12, 2015 MW 7.2 aftershock. *Tectonophysics*, 714–715(9), 4–20. <https://doi.org/10.1016/J.TECTO.2016.05.023>
- Lima, C. O., & Bonetti, J. (2020). Bibliometric analysis of the scientific production on coastal communities' social vulnerability to climate change and to the impact of extreme events. *Natural Hazards*, 102(3) 1589–1610. <https://doi.org/10.1007/s11069-020-03974-1>
- Lin, T., Qiu, Y., Peng, W., & Peng, L. (2020). Global research on public health emergency preparedness from 1997 to 2019: A bibliometric analysis. *Disaster Medicine and Public Health Preparedness*, 16(1), 153–162. <https://doi.org/10.1017/dmp.2020.206>
- Liu, H., Chen, H., Hong, R., Liu, H., & You, W. (2020). Mapping knowledge structure and research trends of emergency evacuation studies. *Safety Science*, 121(1), 348–361. <https://doi.org/10.1016/j.ssci.2019.09.020>

- Liu, Z., Yin, Y., Liu, W., & Dunford, M. (2015). Visualizing the intellectual structure and evolution of innovation systems research: A bibliometric analysis. *Scientometrics*, 103(1), 135–158. <https://doi.org/10.1007/s11192-014-1517-y>
- Lu, R., Zhao, X., Li, J., Niu, P., Yang, B., Wu, H., Wang, W., Song, H., Huang, B., Zhu, N., Bi, Y., Ma, X., Zhan, F., Wang, L., Hu, T., Zhou, H., Hu, Z., Zhou, W., Zhao, L., ... Tan, W. (2020). Genomic characterisation and epidemiology of 2019 novel coronavirus: Implications for virus origins and receptor binding. *The Lancet*, 395(10224), 565–574. [https://doi.org/10.1016/S0140-6736\(20\)30251-8](https://doi.org/10.1016/S0140-6736(20)30251-8)
- Luo, F., Li, R. Y. M., Crabbe, M. J. C., & Pu, R. (2022). Economic development and construction safety research: A bibliometrics approach. *Safety Science*, 145, Article 105519. <https://doi.org/10.1016/J.SSCI.2021.105519>
- Ma, J. Y., Li, M. Y., Qi, Z. Z., Fu, M., Sun, T. F., Elsheikha, H. M., & Cong, W. (2022). Waterborne protozoan outbreaks: An update on the global, regional, and national prevalence from 2017 to 2020 and sources of contamination. *Science of The Total Environment*, 806(2), Article 150562. <https://doi.org/10.1016/J.SCITOTENV.2021.150562>
- Mika, K. (2020). Documenting hurt: UN, epistemic injustice, and the political ecology of the 2010 cholera epidemic in Haiti. *Modern & Contemporary France*, 29(2), 209–226. <https://doi.org/10.1080/09639489.2020.1810646>
- Muhammad, A., Goda, K., Alexander, N. A., Kongko, W., & Muhari, A. (2017). Tsunami evacuation plans for future megathrust earthquakes in Padang, Indonesia, considering stochastic earthquake scenarios. *Natural Hazards and Earth System Sciences*, 17(12), 2245–2270. <https://doi.org/10.5194/NHESS-17-2245-2017>
- Onda, Y., Taniguchi, K., Yoshimura, K., Kato, H., Takahashi, J., Wakiyama, Y., Coppin, F., & Smith, H. (2020). Radionuclides from the Fukushima Daiichi nuclear power plant in terrestrial systems. *Nature Reviews Earth & Environment*, 1(12), 644–660. <https://doi.org/10.1038/s43017-020-0099-x>
- Parwanto, N. B., & Oyama, T. (2014). A statistical analysis and comparison of historical earthquake and tsunami disasters in Japan and Indonesia. *International Journal of Disaster Risk Reduction*, 7(1), 122–141. <https://doi.org/10.1016/J.IJDRR.2013.10.003>
- Pepe, P. E., Rinnert, K. J., & Wigginton, J. G. (2006). Disaster medicine. *Update in Intensive Care and Emergency Medicine*, 43(1), 257–270. https://doi.org/10.1007/3-540-29730-8_19
- Pesantez, G. (2018). 68% of the world population projected to live in urban areas by 2050, says UN | UN DESA | United Nations Department of Economic and Social Affairs. Department of Economic and Social Affairs (UN DESA) of The United Nations. <https://bit.ly/3LUBKfi>
- Powell, T. (2019). Biological warfare in Korea: A review of the literature. *Socialism and Democracy*, 33(2), 67–107. <https://doi.org/10.1080/08854300.2019.1644588>
- Rana, I. A. (2020). Disaster and climate change resilience: A bibliometric analysis. In *International Journal of Disaster Risk Reduction*, 50, Article 101839. <https://doi.org/10.1016/j.ijdr.2020.101839>
- Ritchie, H., & Roser, M. (2019). *Natural disasters*. Our World in Data. <https://ourworldindata.org/natural-disasters>
- Rohit, D., Hazarika, H., Maeda, T., Sumartini, W. O., Kokusho, T., Manafi Khajeh Pasha, S., & Nurdin, S. (2021). Forensic investigation of flowslides triggered by the 2018 Sulawesi earthquake. *Progress in Earth and Planetary Science*, 8(1), 1–20. <https://doi.org/10.1186/S40645-021-00452-5>
- Rosyidi, S. A., Jamaluddin, T. A., Lim, C.-S., & Taha, M. (2011). Kesan gempa 7.6 mw Padang Indonesia, 30 September 2009 [Earthquake impacts of the mw 7.6, Padang, Indonesia, 30 September 2009]. *Sains Malaysiana*, 40(12), 1393–1405. <https://cutt.ly/nNWbcQE>
- Rusydy, I., Idris, Y., Mulkal, Muksin, U., Cummins, P., Akram, M. N., & Syamsidik. (2020). Shallow crustal earthquake models, damage, and loss predictions in Banda Aceh, Indonesia. *Geoenvironmental Disasters*, 7(1), Article 8. <https://doi.org/10.1186/s40677-020-0145-5>
- Sahil, & Sood, S. K. (2021). Bibliometric monitoring of research performance in ICT-based disaster management literature. *Quality and Quantity*, 55(1), 103–132. <https://doi.org/10.1007/s11135-020-00991-x>
- Sharma, V., Levin, B. L., Rahill, G. J., Baldwin, J. A., Luitel, A., & Marhefka, S. L. (2021). Post-earthquake self-reported depressive symptoms and post-traumatic stress disorder and their correlates among college-youths in Kathmandu, Nepal. *The Psychiatric Quarterly*, 92(4), 1595–1609. <https://doi.org/10.1007/S11126-021-09928-5>
- Singh, A., Kumar, J., Jha, A., & Purbey, S. (2022). Bibliometric analysis of home health and internet of health things (IoHT). *Lecture Notes in Electrical Engineering*, 776(1), 75–88. https://doi.org/10.1007/978-981-16-2911-2_9
- Sørensen, M. B., Atakan, K., & Pulido, N. (2007). Simulated strong ground motions for the great M 9.3 Sumatra–Andaman earthquake of 26 December 2004. *Bulletin of the Seismological Society of America*, 97(1A), S139–S151. <https://doi.org/10.1785/0120050608>

- Spoon, J., Hunter, C. E., Gerkey, D., Chhetri, R. B., Rai, A., Basnet, U., & Dewan, A. (2020). Anatomy of disaster recoveries: Tangible and intangible short-term recovery dynamics following the 2015 Nepal earthquakes. *International Journal of Disaster Risk Reduction*, 51(1), Article 101879. <https://doi.org/10.1016/j.ijdr.2020.101879>
- Sufri, S., Dwirahmadi, F., Phung, D., & Rutherford, S. (2019). Progress in the early warning system in Aceh province, Indonesia since the 2004 earthquake-tsunami. *Environmental Hazards*, 19(5), 463–487. <https://doi.org/10.1080/17477891.2019.1653816>
- Sweileh, W. M. (2019). A bibliometric analysis of health-related literature on natural disasters from 1900 to 2017. *Sweileh Health Research Policy and Systems*, 17, Article 18. <https://doi.org/10.1186/s12961-019-0418-1>
- Tan, L., Yao, W., Chen, F., & Li, L. (2020). Economic loss assessment of tropical cyclones based on bibliometric data analysis. *Tropical Conservation Science*, 13, 1-16. <https://doi.org/10.1177/1940082920978955>
- Tang, J., Yang, S., & Wang, W. (2021). Social media-based disaster research: Development, trends, and obstacles. *International Journal of Disaster Risk Reduction*, 55, Article 102095. <https://doi.org/10.1016/j.ijdr.2021.102095>
- Tavakoli, N., Fooladvand, M., & Jahanbakhsh, M. (2013). Developing health information documentation in disaster. *International Journal of Health System and Disaster Management*, 1(1), 11-15. <https://doi.org/10.4103/2347-9019.122426>
- Valagussa, A., Frattini, P., Valbuzzi, E., & Crosta, G. B. (2021). Role of landslides on the volume balance of the Nepal 2015 earthquake sequence. *Scientific Reports*, 11, Article 3434. <https://doi.org/10.1038/s41598-021-83037-y>
- Vardoulakis, S., Espinoza Oyarce, D. A., & Donner, E. (2021). Transmission of COVID-19 and other infectious diseases in public washrooms: A systematic review. *The Science of The Total Environment*, 803, Article 149932. <https://doi.org/10.1016/j.scitotenv.2021.149932>
- Weiner, E. (2005). Emergency preparedness curriculum in nursing schools in the United States. *Nursing Education Perspectives*, 26(6), 334–339. <https://cutt.ly/4Nxatgj>
- Weiner, E., Irwin, M., Trangenstein, P., & Gordon, J. (2005). Emergency preparedness curriculum in nursing schools in the United States. *Nursing Education Perspectives*, 26(6), 334–339. <https://doi.org/10.1017/S1049023X0001267X>
- Winarni, E. W., Purwandari, E. P., & Wachidi, W. (2021). The effect of android-based earthquake game toward Bengkulu City elementary school student's knowledge about earthquake disaster preparedness. *Journal of Physics: Conference Series*, 1731, Article 012090. <https://doi.org/10.1088/1742-6596/1731/1/012090>
- Wolmer, L., Laor, N., Dedeoglu, C., Siev, J., & Yazgan, Y. (2005). Teacher-mediated intervention after disaster: A controlled three-year follow-up of children's functioning. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, 46(11), 1161–1168. <https://doi.org/10.1111/J.1469-7610.2005.00416.X>
- Wu, A. (2021). Cities and fears of biological warfare during the early Cold War. T.-K. Hon (Ed.), *Cold War Cities* (pp. 121–134). Routledge. <https://doi.org/10.4324/9780429058844-12>
- Xiong, J., Qi, W., Liu, J., Zhang, Z., Wang, Z., Bao, J., Wu, C., & Liang, F. (2021). Research progress of ferroptosis: A bibliometrics and visual analysis study. *Journal of Healthcare Engineering*, 2021, Article 2178281. <https://doi.org/10.1155/2021/2178281>
- Zhang, Q., Lu, Q., Zhong, D., & Ye, X. (2018). The pattern of policy change on disaster management in China: A bibliometric analysis of policy documents, 1949–2016. *International Journal of Disaster Risk Science*, 9, 55–73. <https://doi.org/10.1007/s13753-018-0164-y>
- Zhang, X., Zhong, Q., Zhang, R., & Zhang, M. (2020). People-centered early warning systems in China: A bibliometric analysis of policy documents. *International Journal of Disaster Risk Reduction*, 51(12), 1-13. <https://doi.org/10.1016/j.ijdr.2020.101877>
- Zhao, B. (2021). Landslides triggered by the 2018 Mw 7.5 Palu supershear earthquake in Indonesia. *Engineering Geology*, 294(12), Article 106406. <https://doi.org/10.1016/j.enggeo.2021.106406>
- Zhou, L., Zhang, P., Zhang, Z., Fan, L., Tang, S., Hu, K., Xiao, N., & Li, S. (2019). A bibliometric profile of disaster medicine research from 2008 to 2017: A scientometric analysis. *Disaster Medicine and Public Health Preparedness*, 13(2), 165–172. <https://doi.org/10.1017/dmp.2018.11>
- Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational Research Methods*, 18(3), 429–472. <https://doi.org/10.1177/1094428114562629>