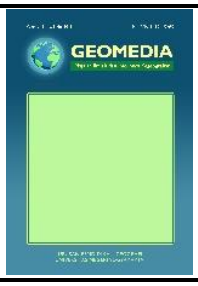

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Economic Resilience to Disasters in 1999–2022: A Bibliometric Literature Review with Future Research Direction Amid the Global COVID-19 Pandemic

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A B S T R A K

Tinjauan literatur ini mengkaji tren terkini publikasi tentang ketahanan ekonomi (KE) sebagai bagian dari uapaya untuk pengurangan risiko bencana dari tahun 1999 hingga 2022 menggunakan bibliometrik. Tujuannya adalah untuk mengisi kesenjangan pengetahuan dan menyarankan arah penelitian di masa depan di bidang ini, terutama setelah dampak global dari pandemi COVID-19. Pencarian database *Scopus* menggunakan kata kunci sesuai tujuan penelitian, menghasilkan 309 dokumen yang ditulis oleh 340 akademisi dari 41 negara dan diterbitkan dalam 86 dokumen digital. Penyaringan akhir dengan pemilihan kriteria tertentu, menghasilkan 128 dokumen. Analisis bibliometrik terdiri dari identifikasi tiga aliran penelitian utama untuk memahami evolusi penelitian, analisis kutipan bersama dan kopling bibliometrik (pengelompokan), dan identifikasi kesenjangan pengetahuan untuk menemukan orientasi masa depan studi KE. Tiga temuan utama dari tinjauan ini adalah sebagai berikut. Pertama, bidang KE berkembang dalam tiga tahap: kemunculan (1999–2006), pengakuan (mendapatkan perhatian sarjana, 2006–2014), dan pertumbuhan cepat (2014–2022). Kedua, teori KE yang mempengaruhi sebagian besar karya adalah dari Rose (2004), Holling (1973), dan Mileti (1999), dengan Rose sebagai yang paling banyak dikutip dalam *Natural Hazards, Advances in Spatial Science*, dan *International Journal of Disaster and Risk Reduction*. Menurut negara, Amerika Serikat dan Cina adalah kontributor terbesar untuk publikasi ilmiah di KE. Ketiga, kemungkinan penelitian di masa depan akan dipusatkan pada ketahanan ekonomi terhadap pandemi COVID-19. Studi ini adalah bagian dari aliran penelitian yang ada dan yang sedang berkembang yang juga memberikan arah penelitian KE potensial untuk pengurangan bencana di masa depan.

Keywords:
Economic Resilience
COVID-19
Bibliometric
VOSviewer

A B S T R A C T

This literature review examines the current trend of academic papers on economic resilience (ER) as part of disaster risk reduction from 1999 to 2022 using bibliometrics. The purpose is to fill the knowledge gaps and suggest future research direction in this field, especially after the global impact of the COVID-19 pandemic. The Scopus database's search using pertinent keywords produced 309 documents written by 340 academics from 41 countries and issued in 86 digital documents. Using the inclusion and exclusion criteria, further screening resulted in 128 documents. The bibliometric analyses comprised the identification of three major research streams to understand the research evolution, co-citation analysis and bibliometric coupling (clustering), and identification of the knowledge

gaps to discover the future orientation of ER studies. The three main findings of this review are as follows. First, the ER field evolved in three stages: emergence (1999–2006), acknowledgment (gaining scholars' attention, 2006–2014), and rapid growth (2014–2022). Second, ER theories that influence most of the works are those of Rose (2004), Holling (1973), and Mileti (1999), with Rose as the most cited in Natural Hazards, Advances in Spatial Science, and International Journal of Disaster and Risk Reduction. By country, the United States and China are the largest contributors to scholarly publications on ER. Third, it is likely that future research will be centered around economic resilience to the COVID-19 pandemic. This study is part of the existing and emerging research streams that also provides potential research direction of ER for disaster risk reduction in the future.

Introduction

More academic papers are published on economic resilience (ER) in the context of disaster management in response to global environmental changes and dynamics (Abid *et al.*, 2021). Natural and human-made disastrous events, including global warming, climate change, epidemics, and pandemics, continue to pose challenges to human lives and their livelihoods (Loebach, 2019; Butler *et al.*, 2021; Hankin *et al.*, 2021). ER is a principal goal of the Sendai Framework for Disaster Risk Reduction and a focus of the Sustainable Development Goals programs. Moreover, because of its dynamics, ER has been attracting the attention of academics and policymakers worldwide (Dharmawan, 2021). This literature review is intended to look into the recent trend of scientific documents of ER studies in disaster risk reduction curated in a database from 1999 until 2022. VOSviewer and several bibliometric analyses are used to gather, build, and display networks of connectedness between the documents (van Eck and Waltman, 2010). Further, the research flows and gaps of knowledge observed from the derived networks provide the base for identifying the tendency of ER research in the future.

The Emergency Event Database (EM-DAT) reported that, globally, 432 natural disasters occurred in 2021, indicating a dramatic increase from the 1980s. In addition, after the first case of infection was reported in late December 2019, the person-to-person transmissible COVID-19 was soon declared a pandemic, causing a global disaster (Sheek-Hussein, Abu-Zidan and Stip, 2021). Disasters can affect people directly, such as through injuries or losses of life or property, or indirectly by disrupting socioecological and economic systems (Kanji & Agrawal, 2020). Quantifying losses that potentially affect the sustainability of human life, such as physical damages, can aid in detecting the economic impacts of an adverse event(Ratnasari and Afianita, 2022). For instance, in 2021, disasters accounted for 10,492 deaths, affected 101.8 million people, and caused approximately USD252.1 billion in economic losses (Centre for Research on the Epidemiology of Disasters, 2021). Meanwhile, in 2020, the COVID-19 pandemic in 2020 costed the global economy about USD84.54 trillion, reducing the economic growth to -4.5% (Kassegn and Endris, 2021). For these reasons, at-risk societies need to develop ER to withstand increasingly uncertain situations such as disasters.

In general, resilience itself is a complex concept that requires systematic and multidisciplinary perspectives to understand and analyze. It encompasses the ways in which a territory can resist, return, and adapt to shocks. Economic resilience (ER) is a component of overall resilience (enhancing the former likely improves the latter) that defines a state in which an impacted territory rebounds after a sudden or slow-onset disruption (Shibusawa and Irimoto, 2020; Tufekci-Enginar, Suzen and Yalciner, 2021). The National Association of Counties (NACO) describes ER as how a community can foresee, adapt to shocks, and use persistently changing conditions to its advantage (Pintilescu & Viorică, 2019). Disaster impacts may vary depending on socio-economic and political situations (Ji & Lee, 2021; Suherningtyas *et al.*, 2021). Therefore, improving ER can reduce a community's risks of being adversely affected by disasters—which is the ultimate goal of incorporating ER into DRR.

Disaster Risk Reduction (DRR) is a program that should be integrated as a priority into the agendas of local authorities worldwide. ER studies

can bring science-based solutions to decision-makers before a disaster occurs to evaluate the goal achievement of DRR programs (Uchiyama, Ismail and Stevenson, 2021). ER implementation is aligned with the Sendai Framework for DRR and SDGs, which factor in the ER concept (Parvin *et al.*, 2016; Marome and Shaw, 2021; Orchard, 2021). The Sendai Framework blueprint that focuses on ER encourages various aspects of new risk prevention, existing risk reduction, and residual risk management through integrated and multi-sectoral interactions (Nakum *et al.*, 2022). From the perspective of the 2030 agenda for SDGs, ER is defined as a component of poverty eradication (Goal 1) and the realization of sustainable cities and communities (Goal 11).

A myriad of studies employing literature review have been conducted to support the continuity and progression of DRR programs. For instance, different terms of disaster informatics across countries were analyzed using Google Scholar database as a source of scientific works (Ogie and Verstaevel, 2020). A review of responses and policies in dealing with the COVID-19 pandemic in Indonesia inventoried relevant media contents from reports, warnings, and notices issued by the governments on social and mass media platforms (Djalante *et al.*, 2020). Community engagement in disaster early warning systems was conceptualized through a review of literature in Google Advanced and Google Scholar databases to determine more effective disaster responses (Sufri *et al.*, 2020). The current study has been designed to close the gap of knowledge on economic resilience (ER) to disasters. Through a literature review on the Scopus database, it analyzes the development of ER research within the DRR context by interpreting a bibliographic map—a cartographic visualization of data distribution—generated in VOSviewer program. This methodology has not been found in previous studies in the same field.

From 1999 to 2022, there were 128 scientific works on ER in the Scopus database. Reviewing these literature pieces is necessary to realize the Sendai Framework priorities and achieve the SDGs in DRR. This paper examines the research trend of ER in disaster studies and determines its future direction with bibliometric analyses, which can be broken down into (1) identifying three primary streams of ER research to understand its theoretical and practical development, (2) analyzing co-citations and bibliometric coupling (clustering), and (3) determining the knowledge gaps. This study contributes to both current and new research streams while also offering possible directions of ER research for DRR programs in the future.

Methods

This descriptive, literature-based study employed bibliometric techniques. The first step was to select documents of different types from the Scopus database whose main research questions were related to economic resilience (ER) to disasters. Then, to qualitatively review the screened documents, the topics or subjects they discussed were analyzed in VOSviewer to generate bibliometric maps. VOSviewer is a computer program that simplifies bibliometric data and, thus, allows quick interpretation (Van Eck & Waltman, 2010). As illustrated in Figure 1, this research was divided into three main stages: (1) formulating the research questions, (2) creating the research design and screening settings, and (3) analyzing the results and interpreting the findings.

Formulating the research questions

This study aimed to address three main research questions (RQs):

RQ1: How has economic resilience evolved (current research trend)?

RQ2: What are the research streams of economic resilience?

RQ3: In what direction will scientific publications on economic resilience develop?

Creating the research design and screening settings

Bibliometric coupling was employed to gather and process the data. As shown in Table 1, a predefined set of criteria were used to select scientific works from the Scopus database using the keywords related to ER and disasters, namely "economic", "resilience", "resiliency", and "disaster". Afterward, the total screened documents in this stage were then filtered using these inclusion and exclusion criteria: the documents should focus and extensively discuss ER in the face of disasters and be published in English between 1999 and 2022 in fields other

than earth and planetary sciences, economics, environmental sciences, and social sciences.

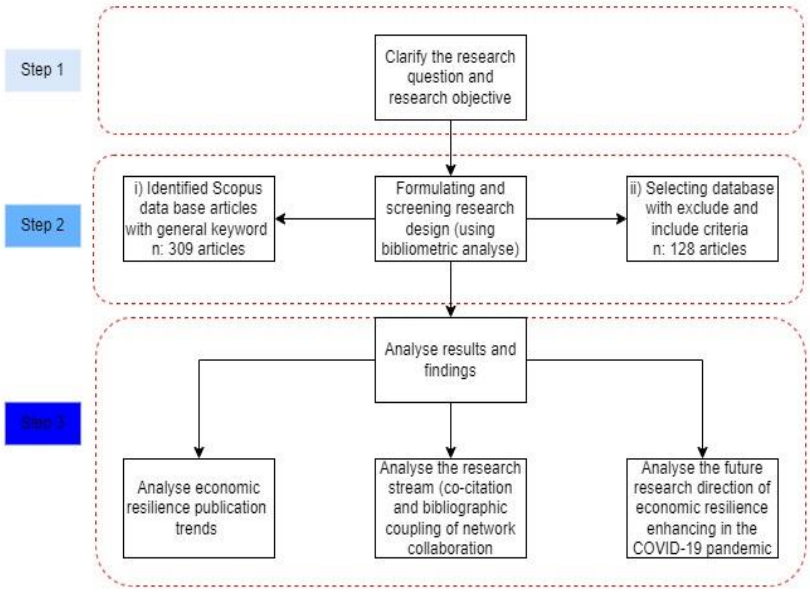

Figure 1. Research methods employed in the review of scientific works on economic resilience in relation to disasters

Table 1. Screening and selection criteria of academic works published in the Scopus database

Keywords and filters	Combination	Total screened documents	Keywords and filters	Combination	Total screened documents
Keywords	economic AND resilience OR resiliency AND economy AND disaster	309	Language	English	309
Search filters	Title, abstract, keywords	309	Publication types	All types (book chapters, books, conference papers, conference reviews, journal articles, and review articles)	309
Publication years	1999–2022	309	Categories	Social sciences Economics, econometrics, and finance Environmental sciences Earth and planetary sciences	128

Source: Primary data analysis (August 11, 2022)

Using the above keywords, the first search generated 309 documents of different types, which were reduced to 128 after further screening. The VOSviewer program compiled the documents' bibliometric data in maps, which were visible for the analysis and interpretation of ER research development in disaster studies and identification of the knowledge gap(s). From 1999 to 2022, the first screened document in 1999 was Small states development: A Commonwealth Vulnerability Index by C. Easter (Easter, 1999), and the latest one in 2022 was Prioritising well-being and resilience to 'build back better': Insights from a Dominican small-scale fishing community by J. Forster, C. Shelton, C. S. White, A. Dupeyron, and A. Mizinova (Forster et al., 2022).

Analyzing the results and interpreting the findings

To address the research questions, the visualized bibliometric data were further analyzed. First, the development of ER theories from 1999 to 2022 was observed. Second, from the map generated with VOSviewer, co-citation and bibliometric coupling were determined to conclude how ER studies had evolved and which of those contributed the most to shaping scientific works in the ER field. Finally, these data were used to identify the future direction of the ER research, particularly amid the COVID-19 pandemic.

Results and Discussion

Descriptive analysis results

In this study, 128 academic documents in 86 journals from 1999 to 2022 were screened and reviewed. Table 2 describes them by the number of authors and publication types. These works were written by 390 authors, most of which were multiple-authored (92%, 357 scholars), and a few were single-authored (8%, 33 scholars). Based on the type, the majority was journal articles (71.9%), and the rest was book chapters (16.4%), conference papers (5.5%), review articles (4.7%), books (0.8%), and conference reviews (0.8%).

Table 2. Number of the screened academic works on economic resilience based on the number of authors and types

No	Description	Results (n)	Results (%)	No	Description	Results (n)	Results (%)
1	Journals	86		3	Publication types		
2	Number of authors				Articles	91	71.9
	Single authors	33	8		Book chapters	21	16.4
	Multiple authors	357	92		Conference papers	7	5.5
	Total authors	390	100		Review articles	6	4.7
					Books	1	0.8
					Conference reviews	1	0.8
					Total documents	128	100

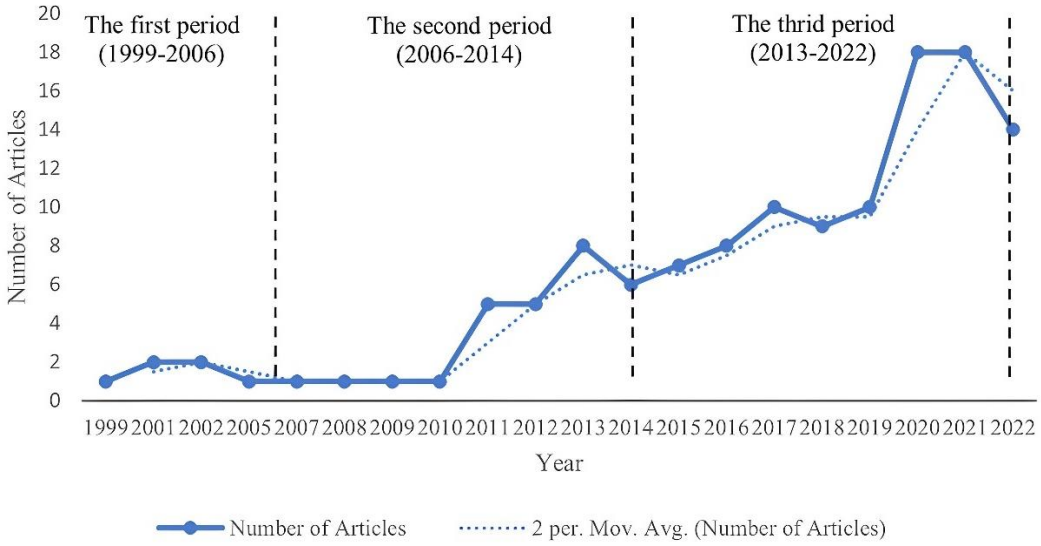

Figure 2. Yearly number of scientific documents on economic resilience in disaster studies and their trends in three periods of development from 1999 to 2022

Figure 2 divides the latest trend of scientific publications on ER between the years 1999 and 2022 into three periods of development: first (1999–2006), second (2006–2014), and third (2014–2022). To start with, very few documents, about one to two, were published yearly in the first period. In other words, ER was at the stage of appearing (emergence) in the academic discussion but still did not garner sufficient scholarly attention because the idea and role of ER in disaster risk reduction was not well understood. Nevertheless, Scopus' efforts to reach more scholars and curate ER research started to bear fruit in 2010, the mid of the second period (acknowledgment). Documents ratcheted up until the end of the period, presumably resulting from climate change and disaster risk reduction issues raised by the Sendai Framework. The Sendai Framework was initiated by the success of the Hyogo Framework for Action (HFA) in early 2005. It serves as an enhanced version of HFA through innovations in the continuous identification of disaster risk management programs. In response to the perpetually echoed slogan Build Back Better, there was a burgeoning number of resilience studies at that time (Ji & Lee, 2021). The increase remained until the third period (2014–2022, rapid growth), where most documents were published, averaging up to 11 documents per year. The primary reason is that disaster awareness and interest in achieving economic resilience rose as more and more disaster events occurred and affected people worldwide. A significant increase in publications was reported in 2020 due to research or exploration of ER amid climate change and its global impact. In addition, the COVID-19 pandemic that devastates the world population on numerous aspects of life promoted more studies on ER and its relation to the disease's spread (Munasinghe et al., 2021).

Research streams

Co-citation analysis results

Co-citation analysis tracks pairs of documents cited together in at least one other paper that is published later. It will show the relatedness between documents based on the proximity or closeness of the subjects discussed. In this study, a reference should have a minimum of three citations. With this setting, 6,560 cited references that met the screening and selection criteria (six thresholds) were identified, forming one cluster with three main network points (Figure 3). Point 1 refers to Holling's work published in 1973 on the resilience and stability of ecological systems (Holling, 1973), Point 2 is Rose's research article about defining and measuring economic resilience to disasters (Rose, 2004), and Point 3 is Mileti's reassessment of natural hazards in the United States (Mileti, 1999). It can be concluded that this cluster greatly influences other references in ER studies.

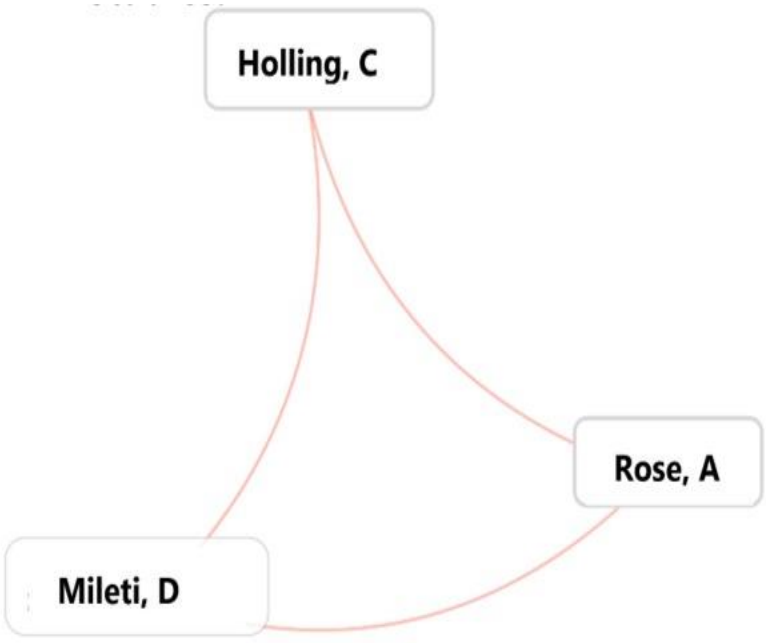

Figure 3. Co-citation map of the researched authors

Collaboration networks

The number and distribution trend of authors in a research theme that are obtained using statistical analyses indicate the extent of innovation, productivity, and the strength of collaboration between researchers (references on the meaning of statistical data in bibliometric reviews). ER documents screened from the Scopus database (n=128) were processed in VOSviewer to see the relatedness between their authors (n=340). Through authors with a minimum of two published works, the co-citation analysis found the top three with high connectedness in the ER field, and the collaboration networks produced a map with four main clusters (Figure 4). On the map, circles of the same color represent authors with strong connectivity and positive relationship, while lines indicate the strength of connections between the researched authors. The first cluster of red circles represents the most collaborations between seven authors: John A. Cross, Susan L. Cutter, Robert T. Greenbaum, Hyun Kim, David W. Marcouiller, Adam Rose, and Yu Xiao. The second one (colored green) is a cluster of four authors: Robert Bierkandt, Andres Levermann, Leonie Wenz, and Sven N. Willner, and the third one (blue) is also of four authors: Aijun Hu, Hongwei Li, Zhenghua Wu, and Wie Xie. Finally, the fourth cluster (yellow) shows connectedness between Xu and Zhang.

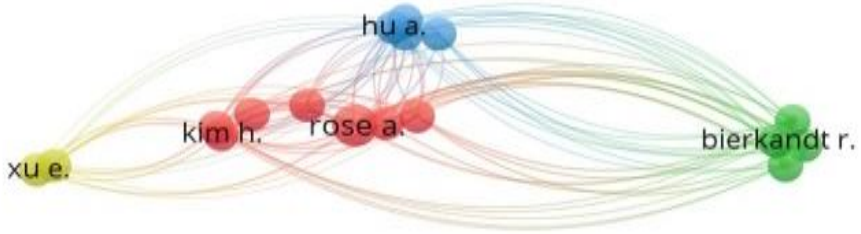

Figure 4. Map of the authors and their collaboration networks

The top three collaborating authors with the highest number of documents and citations were Rose, Cross, and Xiao. Based on the authors' performance summarized in Table 3, Adam Rose at the University of Southern California Los Angeles (US) was the most frequently cited author in ER studies. Three of Rose's published works were mentioned in 525 documents, with a total link strength of 135. Interesting connections between authors were detected from Bierkandt, Wenz, Levermann, and Willner; each had two articles with 53 citations but a total link strength of 325. In another case, two of Cross' pieces were cited in 138 works, but the total link strength was only 6. From these data, it can be inferred that the number of published documents does not necessarily determine how frequently they are cited by other scholars or that producing more scientific works does not guarantee more citations. To some extent, the usefulness or visibility of scientific work depends on its accessibility when published. For instance, open-access journals can disseminate documents more widely than their closed-access counterparts, thus allowing the public to reach the authors' works. Nevertheless, authors should strive to improve their research quality and quantity for the development of science.

Table 3. Author profiles in the field of economic resilience to disasters

Authors	Total Documents	Total Citations	Total Link Strength
Adam Rose	3	525	135
John A. Cross	2	138	6
Yu Xiao	2	87	50
Hyun Kim	2	70	224
David W. Marcouiller	2	70	224
Xue Yaosuo	2	1	106
Dayong Zhang	2	6	121
Susan L. Cutter	2	16	77
Ji-dong Wu	2	16	91
Greenbaum	2	23	81
Robert Bierkandt	2	53	325
Andres Levermann	2	53	325
Leonie Wenz	2	53	325

Authors	Total Documents	Total Citations	Total Link Strength
Sven N. Willner	2	53	325
Ning Li	2	42	161
Aijun Hu	2	42	161
Wei Xie	2	42	161

Bibliographic mapping also shows the rank of active journals where ER research is published. The bibliographic coupling processed 86 source journals publishing a minimum of three ER documents and met seven thresholds. The thresholds formed two clusters: red and green (Figure 5), which marked the collaborations between the top three journals with high connectedness, namely Natural Hazards, Advances in Spatial Science, and International Journal of Disaster Risk Reduction. Their profiles are presented in detail in Table 4. Natural Hazards published the most ER studies amounting to 14 documents and had a relatively high Scopus ranking, i.e., 29 of 128 journals in the subject areas Earth and Planetary Sciences, Water Science and Technology, and Atmospheric Sciences in the Scopus database.

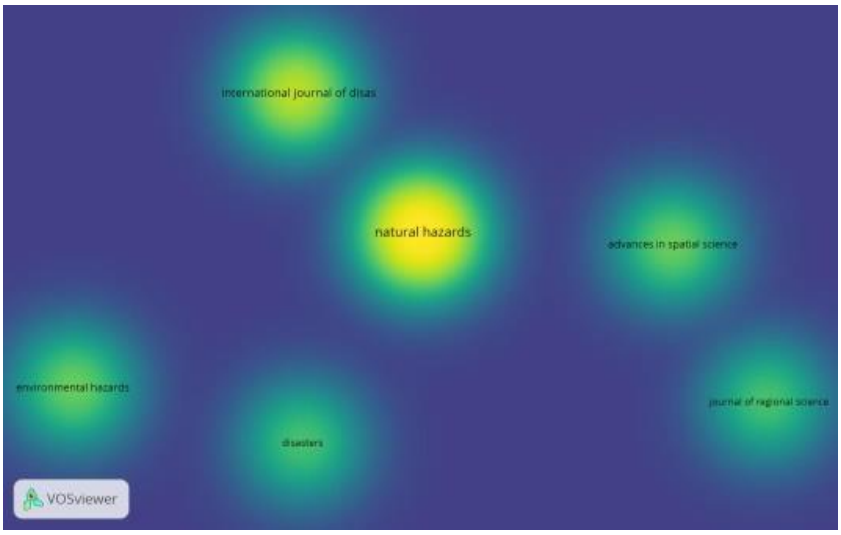

Figure 5. Visualization of density in bibliographic coupling by source

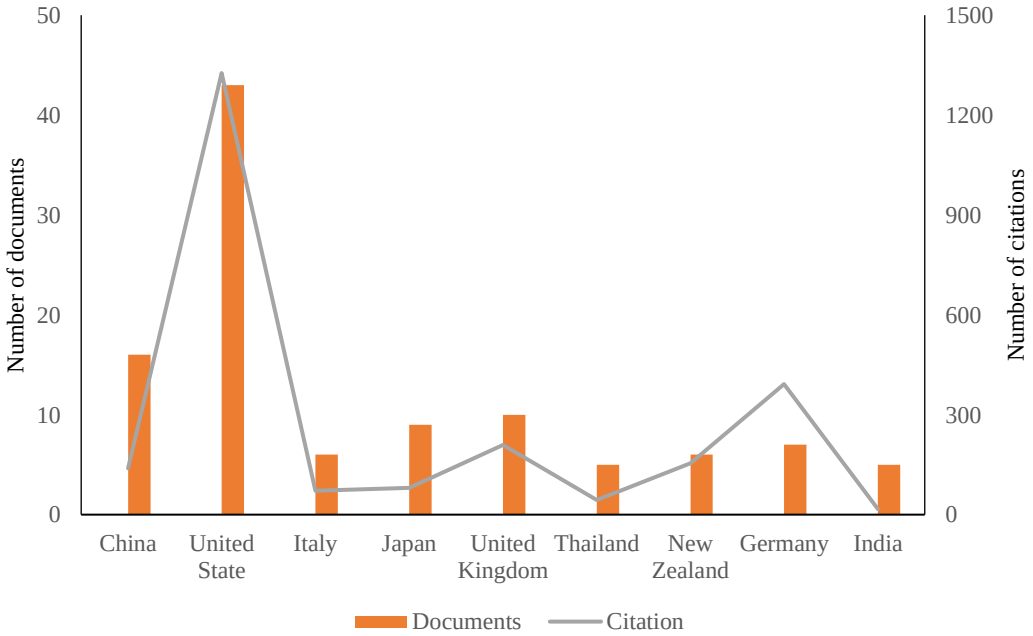

Figure 6. Total scientific documents and their citations in the field of economic resilience to disasters by country from 1999 to 2022

Table 4. Profiles of top three active journals publishing economic resilience studies

Journals	Documents	Citations	Total Link Strength	Relative Ranking 2021 (Percentile)	CiteScore Scopus 2021
Natural Hazards	14	162	176	29/128 In subject areas: Earth and Planetary Sciences; Water Science and Technology; Atmospheric Sciences	4.9
Advances in Spatial Science	4	7	123	459/747 In subject areas: Geography, Planning and Development; Economics, Econometrics and Finance	1.1
International Journal of Disaster Risk Reduction	7	76	108	6/95 In subject areas: Safety Research; Geology; Building and Construction; Geotechnical Engineering and Engineering Geology	6.5

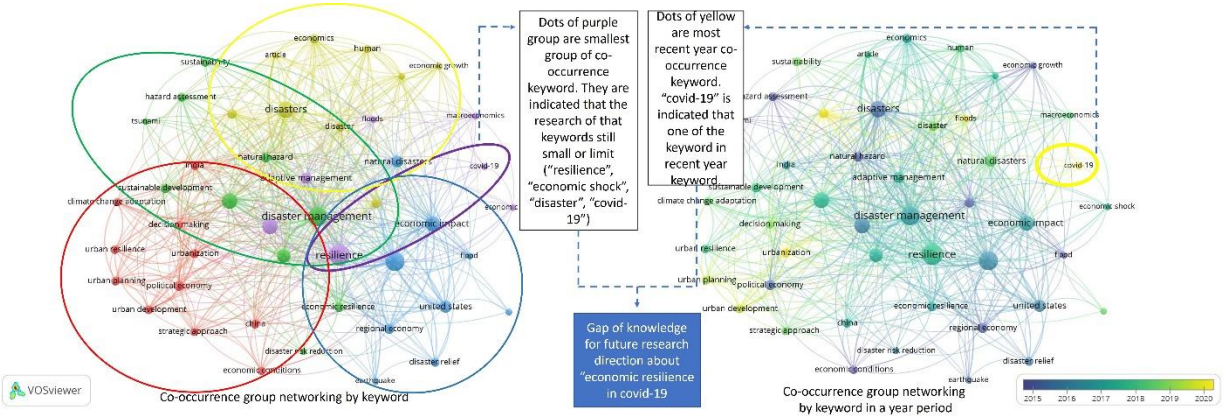

Figure 7. Co-occurrence network map of keywords in the economic resilience documents from 1999 to 2022. The knowledge gap indicates potential research direction in the future, that is, economic resilience to the COVID-19 pandemic.

In addition to source, the ER research trend was also analyzed by country (Figure 6). China and the United States were the most influencing and contributing countries to ER works worldwide from 1999 to 2022, amounting to 16 documents with 139 citations and 43 documents with 1,326 citations, respectively. In addition, based on the trend analysis results, other countries in the Asian (India, Japan, Thailand), European (United Kingdom, Italy, Germany), and Asia-Pacific regions (New Zealand) also contributed to the list of ER studies. However, other countries like Indonesia that are susceptible to multiple disasters due to their complex tectonic and geographic conditions are not represented yet in these studies. Advancements in education and technology can raise the profile of a country's contribution to the scholarly effort of ER enhancement as part of DRR for the world population. Moreover, networks of cooperation formed between countries in publishing ER works in different types and journals suggest that ER has quickly expanded in ER discussion and recognized in DRR. Climate change, environmental regime shifts, and disaster-related problems are on the agendas and initiatives of many nations. Also, as outlined in the Sendai Framework and SDGs, being economically resilient is a step closer to sustainable regional development.

Future research direction

Figure 7 shows maps of networks formed as the keywords (shown as nodes) of all the screened documents cooccurred. These maps immediately offer information on hotspots and frontiers in a specified field. The line on the map connects keywords that are used together, and the node size is proportionate to the frequency of cooccurrences. From the 128 documents obtained in the search-by-keyword and screening process from the Scopus database with VOSviewer, there were 804 keywords identified, 34 of which co-occurred in at least five papers.

The different node and line colors on the maps show red, green, yellow, blue, and purple clusters of the keywords discussed in ER research. The first cluster, colored red, contained eleven keywords related to climate change adaptation, decision-making, economic conditions, urban planning, urban resilience, urbanization, and urban development. From these terms, it can be inferred that the cluster's theme was urban planning, development, and sustainability. The type of disaster mentioned in this group was indicated by the keyword "climate change". Climate change increases extreme climate-related disasters like heat waves, storms, floods, and droughts.

The second cluster (green) consisted of ten keywords about disaster management, disaster prevention, economic resilience, hazards, human, and natural hazards. The most used keywords (nodes) were "disaster management" and "disaster". Based on the pattern, this cluster centered on disaster management and resilience to natural hazards. The discussed disaster was shown by the keyword "tsunami". A tsunami is a natural disaster caused by endogenous and exogenous forces from the earth's plate that create a series of potentially destructive waves radiating outward onto land.

The third cluster (blue) included nine keywords related to natural disasters, community resilience, economic impact, and disaster relief. Based on these keywords, the grouped documents were mainly in the field of community resilience to disasters. The keyword "flood" referred to the type of natural disaster discussed in this cluster.

The fourth cluster (yellow) comprised nine keywords, including those of disasters, disaster prevention, economics, economic development, economic growth, and humans. These referred to studies of social-economic impact and economic resilience to disaster. No specific type of disaster was mentioned in this cluster because only the keyword "disaster" appeared.

The fifth cluster (purple) included seven keywords related to adaptive management, COVID-19, economic shocks, macroeconomics, resilience, and vulnerability. From them, it can be concluded that the research theme was economic resilience to the COVID-19 pandemic. COVID-19 was the only pandemic disaster appearing in the keywords of the ER research documents from 1999 to 2022.

A conclusion can be drawn from the network map that the fifth cluster (purple) has the fewest co-occurring keywords. Overall, ER studies have been focusing on climate change, tsunamis, floods (natural disasters), and disease outbreaks, i.e., COVID-19 (non-natural disasters). COVID-19 was mentioned only in the purple cluster. The identified disasters and the least frequently used and co-occurring keywords suggest gaps of knowledge to fill by future studies. Thus, it is recommended that the ER field be focused on developing more investigations into economic resilience to the COVID-19 pandemic. Based on the bibliometric analysis of ER documents during 1999–2022, publishing more scientific works on this theme corresponds with the trend of research keywords appearing in each evolution period. The keyword "COVID-19" first appeared in 2020, as shown in the purple cluster in Figure 7. Also, it co-occurred with the keywords "resilience", "economic shock", and "adaptive management", indicating a connectedness within the context of economic resilience to the COVID-19 pandemic.

Conclusion

This literature review study compiles and examines 128 documents, 804 authors, 86 source journals, and 41 countries as the database processed and visualized in VOSviewer to understand economic resilience

(ER) research development and trends. Bibliometric analyses provide information on total academic works published, the most influential works, networks of collaboration generated between source journals, countries, and authors, and topic hotspots based on cooccurring keywords as indicators of current trends and future direction of ER research. These data revealed that ER in disaster studies from 1999 to 2022 experienced three stages of growth: first (emergence), second (acknowledgment, garnering more scholarly attention), and third (rapid growth). Accordingly, more scholars and scientific pursuits are focusing on ER in the context of disasters every year potentially because of the increased recognition of its importance in reducing disaster risks.

The three most frequently co-cited authors of ER documents are Crawford S. Holling (ecological resilience in 1973), Adam Rose (understanding economic resilience in 2004), and Dennis S. Mileti (the design of natural hazards assessment in 1999). Rose has the most citations, highest productivity, and most frequent collaboration with other authors. Three of Rose's works have 525 citations, with a total strength of links with other researchers at 135. Most ER documents are published in Natural Hazards, Advances in Spatial Science, and International Journal of Disaster and Risk Reduction, and the United States and China contribute the most to these works (i.e., 43 documents with 1,326 citations and 16 documents with 139 citations, respectively).

Analysis of research hotspots through keywords shows future research trends and direction. In clusters 1, 2, 3, and 4, the trend of ER studies from 1999 to 2022 was natural disasters, as evidenced by the keywords "tsunami", "flood", and "climate change". However, the keyword "COVID-19" in cluster 5 suggests several studies of non-natural disasters (i.e., the COVID-19 outbreak and pandemic). The research trend also confirms that ER to disasters still rarely discusses the COVID-19 pandemic because its emergence is relatively new, i.e., 2020 or two years before this bibliometric study. Therefore, future ER studies must investigate economic resilience to the COVID-19 pandemic.

For ER research findings to be further developed and implemented, collaboration between the public and private sectors, scholars, and non-governmental groups is essential. Increasing awareness and knowledge about the necessity of disaster risk reduction, including ER, can decrease the risks associated with climate change and other unforeseeable catastrophes. This bibliometric study is expected to provide a reference for further more-detailed research on ER during the global COVID-19 pandemic.

Finally, there are some limitations to this research. The bibliometric study relies solely on the Scopus database and VOSviewer for visualization and analysis. For comparisons, other databases can be consulted, including Google Scholar, PubMed, Sprint, and Web of Science, using different bibliometric analysis tools, e.g., HiSite and R-Package. Nonetheless, Scopus' collection of journals and scientific documents sufficiently reflect the development of ER research today. In addition, the research findings indicate gaps of knowledge that can be used to further ER studies in the future.

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