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EXPLORING GLOBAL RESEARCH TRENDS ON FLOOD DISASTER RISK MANAGEMENT

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Abstract:

Flood disasters remain one of the most critical global challenges, causing severe human, economic, and environmental losses while testing the capacity of risk management systems. In recent decades, research on flood disaster risk management has expanded significantly, reflecting the urgent need to strengthen mitigation, preparedness, and resilience strategies. However, despite the rapid growth of scholarship,

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systematic evaluations of the research landscape remain limited. This study aims to provide a comprehensive bibliometric analysis of flood disaster risk management to identify major trends, influential contributions, and emerging research directions. Data were collected through Scopus using advanced search queries with the keywords "disaster," "flood," "management," and "risk," resulting in a dataset of 1,259 documents. The dataset was processed and harmonized using OpenRefine, while Scopus Analyzer was employed to examine statistical indicators and generate trend-based graphs. VOSviewer software was then applied to construct network visualizations, including keyword co-occurrence, co-authorship collaboration, and citation patterns. The results reveal a steady increase in publications, with notable peaks in the last five years, indicating growing scholarly and policy interest in the field. The most cited works predominantly focus on integrated risk management, climate change adaptation, and resilience-based approaches, highlighting the interdisciplinary nature of the research. Geographically, the United Kingdom, United States, China, and Germany emerge as the leading contributors, reflecting strong collaboration and global knowledge exchange. Keyword analysis further demonstrates the prominence of "risk assessment," "disaster risk management," "climate change," and "resilience" as central themes, while newer terms such as "machine learning" and "nature-based solutions" signal evolving research frontiers. Overall, this bibliometric study enriches the understanding of flood disaster risk management by mapping its intellectual structure, highlighting critical contributions, and offering insights into future research directions for academics, policymakers, and practitioners.

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Keyword:

Bibliometric Analysis, Flood Disaster Risk Management, Resilience, Research Trends

Introduction

Flood disasters are among the most frequent and devastating natural hazards globally, causing significant loss of life, property damage, and economic disruption. The increasing frequency and severity of flood events, exacerbated by climate change and rapid urbanization, necessitate effective flood disaster risk management (FDRM) strategies. FDRM encompasses a range of activities aimed at reducing the adverse impacts of floods through preparedness, mitigation, response, and recovery efforts. This introduction provides an overview of the importance of FDRM, the challenges faced, and the evolving approaches to managing flood risks. Historically, flood management focused primarily on flood control through structural measures such as dams, levees, and floodwalls. However, this approach has shifted towards a more comprehensive flood risk management (FRM) paradigm that integrates both structural and non-

structural measures. This shift recognizes that absolute flood protection is neither technically feasible nor economically viable(Evers, 2018)(Serra-Llobet et al., 2018). Modern FRM strategies emphasize the importance of understanding and managing flood risks by considering hazard characteristics, exposure, and vulnerability (Paswan & Pathak, 2024)(Penning-Rowsell, 2025).The transition from flood control to FRM involves a holistic approach that includes risk assessment, early warning systems, land-use planning, and community engagement (Dieperink et al., 2016)(Kelly & Garvin, 2007).

Effective FRM involves several key components, including risk assessment, mitigation, preparedness, response, and recovery. Risk assessment is the foundation of FRM, involving the identification and analysis of flood hazards, exposure, and vulnerabilities to prioritize areas for intervention (Morin et al., 2025)(Liu et al., 2014). Mitigation measures aim to reduce the likelihood and impact of floods through structural and non-structural approaches, such as the construction of flood defenses and the implementation of land-use regulations (Mohammed-Ali & Khairallah, 2022)(Murase, 2016). Preparedness activities include the development of early warning systems, emergency response plans, and public education campaigns to enhance community resilience (Anisah et al., 2022)(Fatmah, 2025). Response efforts focus on immediate actions during a flood event to protect lives and property, while recovery involves restoring affected areas and supporting communities in rebuilding (Slomp & de Vries, 2017)(Driessen et al., 2018).

Community involvement is crucial in FDRM, as it enhances local resilience and ensures that risk reduction measures are tailored to the specific needs and capacities of communities (Iglesias, 2011)(Iglesias, 2013)(Khudri et al., 2024). Engaging communities in the decision-making process fosters a sense of ownership and commitment to disaster risk management goals, leading to more effective and sustainable outcomes (Puzyreva et al., 2022)(Marpaung et al., 2025). Governance plays a significant role in FRM, requiring coordination and collaboration among various stakeholders, including government agencies, non-governmental organizations, and the private sector(Dieperink et al., 2016) . Effective governance strategies involve aligning flood risk management approaches, ensuring adequate resources, and adopting flexible policies that can adapt to changing conditions (Murase, 2016).

Despite advancements in FRM, several challenges remain. These include the need for improved risk assessment tools, better integration of structural and non-structural measures, and enhanced coordination among stakeholders (Shah et al., 2018)(Rosmadi et al., 2023). Climate change and socio-economic developments further complicate flood risk management, necessitating adaptive and resilient strategies that can cope with uncertainties and changing risk profiles(De Bruijn, 2004)(van den Homberg & Trogrlić, 2023). Future directions in FRM should focus on leveraging technological innovations, such as remote sensing and Geographic Information Systems (GIS), to improve risk assessment and early warning capabilities (Paswan & Pathak, 2024). Additionally, promoting nature-based solutions and sustainable land-use practices can enhance the resilience of communities and ecosystems to flood hazards (Hartmann et al., 2019)(Bozorgy & Yazdandoost, 2011).

International Journal of Innovation and Industrial Revolution
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Volume: 8 Issue: 24 (March 2026) PP. 96-114

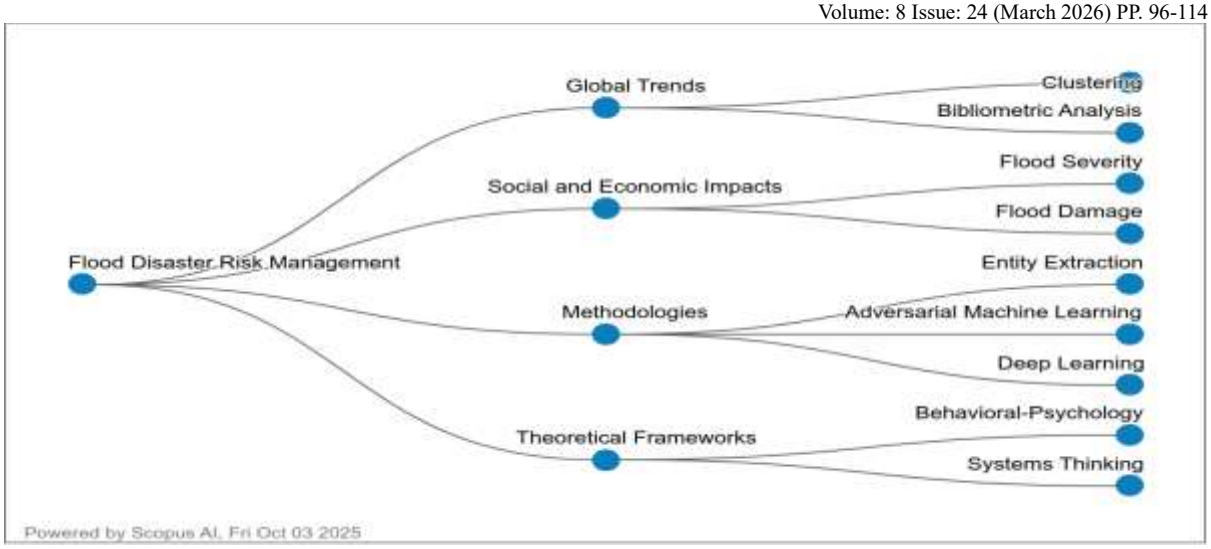

Figure 1: Concept Map Of Key Components Flood Disaster Risk Management

The concept map in Figure 1 illustrates the key dimensions of Flood Disaster Risk Management, highlighting its multidisciplinary nature and interconnected approaches. At a global level, research trends emphasize bibliometric analysis and clustering to track scholarly progress, while the social and economic impacts of flood disasters are assessed through studies on flood severity and damage, supported by advanced techniques such as entity extraction. Methodological advancements feature strongly, with deep learning and adversarial machine learning providing innovative tools for risk prediction, assessment, and decision-making. In parallel, theoretical frameworks such as behavioral psychology and systems thinking underscore the importance of human behavior and holistic strategies in disaster preparedness and resilience building. Together, these thematic directions demonstrate that flood disaster risk management requires a balance of data-driven methodologies, theoretical perspectives, and socio-economic considerations to effectively reduce vulnerability and enhance adaptive capacity. This comprehensive integration highlights the evolution of the field towards combining advanced technologies with human-centered approaches for sustainable disaster resilience.

Flood disaster risk management is a complex and evolving field that requires a multidisciplinary approach to address the diverse challenges posed by flood hazards. By integrating structural and non-structural measures, engaging communities, and fostering effective governance, FRM can significantly reduce the adverse impacts of floods. Continued research and innovation are essential to develop adaptive and resilient strategies that can respond to the dynamic nature of flood risks in the context of climate change and urbanization.

Research Question (5 RQ)

RQ1: What are the research trends in flood disaster risk management studies when analyzed by year of publication?
RQ2: Which articles represent the most highly cited contributions in this field?
RQ3: Which countries rank among the top ten in terms of publication output on flood disaster risk management?
RQ4: What are the most frequently occurring and influential keywords associated with flood disaster risk management research?
RQ5: What are the patterns of co-authorship and collaboration among countries?

International Journal of Innovation and Industrial Revolution
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Methodology

Bibliometrics serves as a rigorous methodological approach for collecting, structuring, and analyzing bibliographic data derived from scientific publications (Alves et al., 2021; Assyakur & Rosa, 2022; Verbeek et al., 2002). While traditional bibliometric analyses often emphasize descriptive indicators such as publication outlets, temporal distribution, and author productivity (Wu & Wu, 2017), more advanced techniques—including document co-citation analysis—enable deeper insights into the intellectual structure and knowledge evolution of a research field. Conducting a robust literature review necessitates an iterative and systematic process, beginning with the identification of appropriate keywords, followed by comprehensive database searches, and culminating in detailed analysis. This methodological rigor facilitates the construction of a comprehensive and reliable bibliography while ensuring valid outcomes (Fahimnia et al., 2015). In this study, emphasis was placed on high-impact publications, as these works offer critical perspectives and theoretical contributions that shape scholarly discourse. To enhance reliability and validity, Scopus was selected as the primary data source, given its extensive coverage and reputation for accuracy (Al-Khoury et al., 2022; di Stefano et al., 2010; Khiste & Paithankar, 2017). To maintain scholarly quality, only peer-reviewed journal articles were included, with books and lecture notes deliberately excluded (Gu et al., 2019). Publications indexed between 2020, and October 2025 were systematically retrieved and analyzed using Elsevier's Scopus database.

Data Search Strategy

The data collection process in this study was strategically conducted using the Scopus database, recognized for its extensive coverage of high-quality peer-reviewed literature. To ensure precision and relevance, an advanced search was performed with the string TITLE ((disaster OR flood) AND management AND risk) AND PUBYEAR > 2019 AND PUBYEAR < 2026 AND (LIMIT-TO (LANGUAGE , "English")) which specifically retrieved articles containing the targeted terms in their titles. By limiting the search to the title field, the process focused on studies directly addressing the intersection of disaster, flood, management, and risk rather than those mentioning these terms only peripherally. To capture the most current discourse, the publication year filter was set between 2020 and 2025, thereby excluding outdated literature that may not reflect recent trends, policies, or methodological advancements in disaster risk management. Additionally, the search was restricted to English-language publications, ensuring accessibility for analysis and eliminating potential inconsistencies caused by translation. A strict inclusion and exclusion framework was also applied to refine the dataset: only peer-reviewed journal articles were considered, while conference proceedings, books, and review papers were excluded to maintain methodological consistency and empirical reliability. Other subject categories were excluded on the grounds of limited relevance to the central research focus. Following this rigorous filtering and screening process, conducted up to October 2025, the final dataset comprised 1259 journal articles. This sizable body of literature reflects the growing global research attention to disaster and flood risk management in recent years, particularly in light of climate change, urbanization, and increasing vulnerability of communities and infrastructures. By adopting a structured search strategy with well-defined criteria, the dataset ensures both comprehensiveness and relevance, providing a robust foundation for further bibliometric and systematic analysis aimed at identifying research trends, gaps, and interdisciplinary insights in disaster risk and flood management.

International Journal of Innovation and Industrial Revolution
EISSN: 2637-0972 IJIREV
Volume: 8 Issue: 24 (March 2026) PP. 96-114

Table 1: The Search String

Scopus	**TITLE ((disaster OR flood) AND management AND risk) AND PUBYEAR > 2019 AND PUBYEAR < 2025 AND (LIMIT-TO (LANGUAGE , "English"))**

Table 2: The Selection Criterion Is Searching

Criterion	Inclusion	Exclusion
Language	English	Non-English
Time line	2020 – 2025	< 2020

Data Analysis

VOSviewer, a user-friendly bibliometric software developed by Nees Jan van Eck and Ludo Waltman at Leiden University, Netherlands, has become one of the most widely adopted tools for bibliometric mapping and visualization (van Eck & Waltman, 2010, 2017). Renowned for its ability to generate intuitive network visualizations, cluster related items, and create density maps, the software offers researchers a powerful platform to explore and analyze scientific literature. Its versatility extends across multiple applications, including the examination of co-authorship structures, co-citation patterns, and keyword co-occurrence networks, thereby providing a comprehensive understanding of research landscapes. The software's interactive interface and continuous development ensure that users can dynamically and efficiently engage with large datasets.

A distinctive strength of VOS viewer lies in its ability to transform complex bibliometric datasets into visually interpretable maps and charts. With its strong emphasis on network visualization, the software excels in clustering related items, detecting keyword co-occurrence trends, and producing density-based maps. Its accessibility makes it suitable for both novice and experienced researchers, while its customizable visualizations and robust metric computations further enhance scholarly inquiry. The software's adaptability to diverse bibliometric data sources—spanning co-authorship, citation, and keyword networks—solidifies its role as an indispensable tool in bibliometric research.

For this study, datasets containing information such as publication year, title, author, journal, citation counts, and keywords were retrieved in PlainText format from the Scopus database, covering the period from 2020 to October 2025. These datasets were analyzed using VOSviewer version 1.6.20, with clustering and mapping techniques employed to generate bibliometric maps. Unlike traditional Multidimensional Scaling (MDS), VOS viewer situates items within low-dimensional spaces where the distance between items accurately represents their relatedness and similarity (van Eck & Waltman, 2010). While sharing conceptual similarities with MDS (Appio et al., 2014). VOSviewer diverges by adopting a more effective

International Journal of Innovation and Industrial Revolution
EISSN: 2637-0972 IJIREV
Volume: 8 Issue: 24 (March 2026) PP. 96-114

normalization method for co-occurrence frequencies. Specifically, it applies the association strength (ASij), defined as:

$$AS_{ij} = \frac{C_{ij}}{w_i w_j}$$

where CijC_{ij}Cij represents the observed co-occurrences of items *i* and *j*, and wiw_iwi and wjw_jwj denote their respective occurrence frequencies. This measure reflects "the ratio between the observed number of co-occurrences of *i* and *j* and the expected number of co-occurrences under the assumption of statistical independence(Van Eck & Waltman, 2007). By employing this approach, VOSviewer ensures that the generated maps accurately capture the underlying structure of research domains, reinforcing its position as a leading tool in bibliometric and scientometric analysis.

Findings And Discussion

RQ1: What Are the Research Trends in Flood Disaster Risk Management Studies When Analysed by Year of Publication?

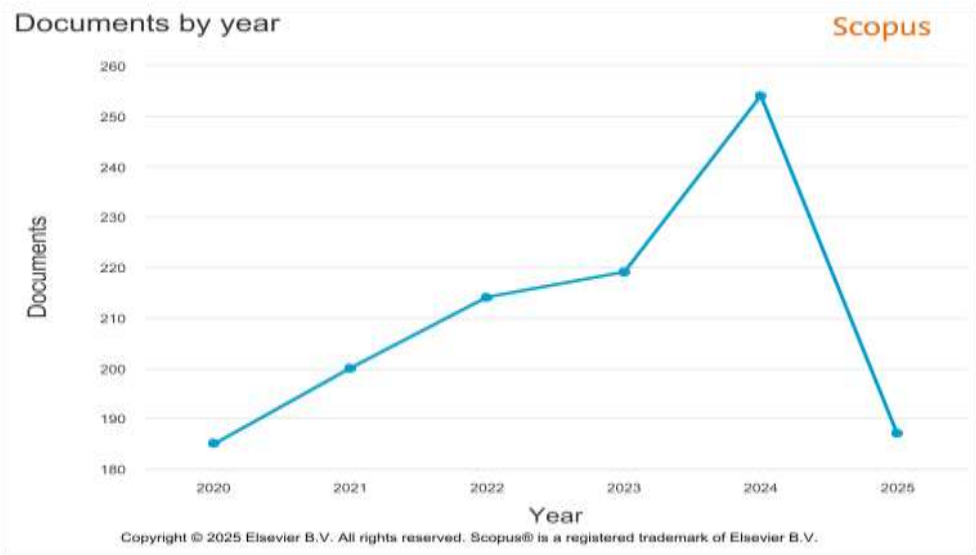

Figure 2: Number Of Documents Based on Year Publication

The publication trend on flood disaster risk management between 2020 and 2025 demonstrates a clear upward trajectory, albeit with fluctuations across the years. Starting from 185 publications in 2020, the output gradually increased in 2021 (200) and 2022 (214), reflecting growing academic and policy interest in disaster preparedness and resilience, particularly as climate change impacts intensified worldwide. A notable surge occurred in 2023, reaching 219 publications, and peaked in 2024 with 254 publications. This spike could be attributed to heightened global research attention following severe flood events in Asia, Europe, and Africa during this period, as well as the increased international funding and collaboration focusing on climate-related disaster management. The expansion of interdisciplinary studies integrating risk reduction, urban resilience, and vulnerable population protection also likely contributed to this surge.

International Journal of Innovation and Industrial Revolution
EISSN: 2637-0972 IJIREV
Volume: 8 Issue: 24 (March 2026) PP. 96-114

However, a decline is observed in 2025, with the number of publications dropping to 187. This decrease may not necessarily indicate reduced research interest but could result from publication cycles, indexing delays, or shifting research priorities toward broader themes such as climate adaptation, sustainability, and resilience frameworks beyond flood-specific contexts. Additionally, research fatigue following the intense publication burst in 2024 and funding redistribution towards emerging risks, such as heatwaves and wildfire management, might have contributed to the temporary decline. Overall, the trend signifies that flood disaster risk management remains a vital and expanding research area, with peaks corresponding to major global flood crises and funding priorities, while temporary decreases are reflective of normal cyclical variations in academic output rather than diminishing significance.

RQ2: Which Articles Represent the Most Highly Cited Contributions in This Field?

The analysis of the top 10 cited articles reveals a strong emphasis on flood disaster risk management, climate change adaptation, and innovative approaches to resilience. The most cited paper, published in *Nature* (2022) with 315 citations, addresses the challenge of managing unprecedented floods and droughts, reflecting global concern over the intensifying impacts of climate change. Similarly, highly cited review papers such as Nkwunonwo et al. (2020) in *Scientific African* (250 citations) and Cea & Costabile (2022) in *Hydrology* (175 citations) highlight the importance of urban flood risk modelling and adaptation strategies. These studies gain traction because they provide comprehensive overviews, practical frameworks, and insights relevant to both developed and developing countries, making them widely referenced in both academic and policy-oriented contexts. Meanwhile, Kuhlicke et al. (2020) emphasize the behavioral dimension of flood risk management, which has gained visibility as disaster resilience increasingly recognizes the role of human perception and adaptive behavior. Collectively, these highly cited works demonstrate a shift from purely technical models to integrated approaches combining environmental, technological, and social dimensions of flood risk.

Interestingly, several articles also link disaster risk with health crises and emerging technologies, showing the interdisciplinary expansion of the field. Hartmann-Boyce et al. (2020) in *Diabetes Care* (156 citations) and Chan et al. (2020) in *IJERPH* (120 citations) focus on how disasters like COVID-19 interact with health risk management, indicating the growing overlap between public health and disaster preparedness. Other influential studies explore machine learning applications (Chen et al., 2021), nature-based solutions (Huang et al., 2020), disruptive technologies (Munawar et al., 2022), and green infrastructure (Green et al., 2021), reflecting the trend towards innovative, sustainable, and technology-driven strategies. These papers are widely cited because they address urgent global challenges—climate extremes, pandemics, and urbanization—while proposing solutions with both academic value and real-world application. The citation patterns suggest that highly impactful research in flood disaster risk management is not limited to hydrological modelling but extends to behavioral science, health systems, and sustainable infrastructure, demonstrating the multidimensional nature of resilience in the face of 21st-century risks.

International Journal of Innovation and Industrial Revolution
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Table 3: Most Cited Author

No.	Authors	Title	Year	Source title	Cited by
1	(Kreibich et al., 2022)	The challenge of unprecedented floods and droughts in risk management	2022	Nature	315
2	(Nkwunonwo et al., 2020)	A review of the current status of flood modelling for urban flood risk management in the developing countries	2020	Scientific African	250
3	(Cea & Costabile, 2022)	Flood Risk in Urban Areas: Modelling, Management and Adaptation to Climate Change: A Review	2022	Hydrology	175
4	(Hartmann-Boyce et al., 2020)	Diabetes and COVID-19: Risks, management, and learnings from other national disasters	2020	Diabetes Care	156
5	(Kuhlicke et al., 2020)	The behavioral turn in flood risk management, its assumptions and potential implications	2020	Wiley Interdisciplinary Reviews: Water	151
6	(Chen et al., 2021)	Towards better flood risk management: Assessing flood risk and investigating the potential mechanism based on machine learning models	2021	Journal of Environmental Management	146
7	(Huang et al., 2020)	Nature-based solutions for urban pluvial flood risk management	2020	Wiley Interdisciplinary Reviews: Water	133
8	(Munawar et al., 2022)	Disruptive technologies as a solution for disaster risk management: A review	2022	Science of the Total Environment	120

International Journal of Innovation and Industrial Revolution
EISSN: 2637-0972
IJIREV
Volume: 8 Issue: 24 (March 2026) PP. 96-114

9	(Chan et al., 2020)	Sociodemographic predictors of health risk perception, attitude and behavior practices associated with health-emergency disaster risk management for biological hazards: The case of COVID-19 pandemic in Hong Kong, SAR China	2020	International Journal of Environmental Research and Public Health	120
10	(Green et al., 2021)	Green infrastructure: The future of urban flood risk management?	2021	Wiley Interdisciplinary Reviews: Water	118

RQ3: Which Countries Rank Among the Top Ten in Terms of Publication Output on Flood Disaster Risk Management?

Figure 3: Country Mapping Based on Number Of Publications

The data presented shows that the United Kingdom (187 publications) and the United States (137 publications) are the leading contributors in research output related to disaster and flood risk management, followed by China (96), Germany (90), and the Netherlands (87). These countries are traditionally strong in academic research, with well-established funding mechanisms, robust institutional capacities, and a history of international collaboration on environmental and disaster-related issues. Their leadership reflects not only their academic infrastructure but also policy priorities, as both the UK and US have invested heavily in climate change, resilience, and disaster risk reduction studies due to increasing global concerns over natural hazards. The strong presence of European countries such as Germany, the Netherlands,

International Journal of Innovation and Industrial Revolution
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Volume: 8 Issue: 24 (March 2026) PP. 96-114

and Italy also indicates a continental emphasis on resilience and sustainability, particularly in response to climate change impacts, frequent flooding, and the European Union's disaster management policies that encourage cross-border research collaboration.

Meanwhile, the presence of Japan (78), India (74), Australia (59), and Indonesia (57) highlights the role of nations that are geographically vulnerable to climate-induced and natural disasters, particularly floods, earthquakes, and typhoons. Japan's strong research performance stems from its long history of earthquake and tsunami preparedness, supported by advanced technologies and government prioritization of disaster resilience. India and Indonesia, despite being developing economies, demonstrate significant scholarly engagement due to their high exposure to monsoons, floods, and other hazards, which have made disaster management an urgent research and policy priority. Australia's inclusion reflects its susceptibility to bushfires, cyclones, and floods, while also benefiting from strong academic infrastructure. These results collectively suggest that countries with both strong research capacities (e.g., the UK, US, Germany) and high disaster vulnerability (e.g., Japan, India, Indonesia) are driving global scholarship in this field, indicating a dual motivation: academic leadership and practical necessity in addressing disaster risk and resilience

RQ4: What Are the Most Frequently Occurring and Influential Keywords Associated with Flood Disaster Risk Management Research?

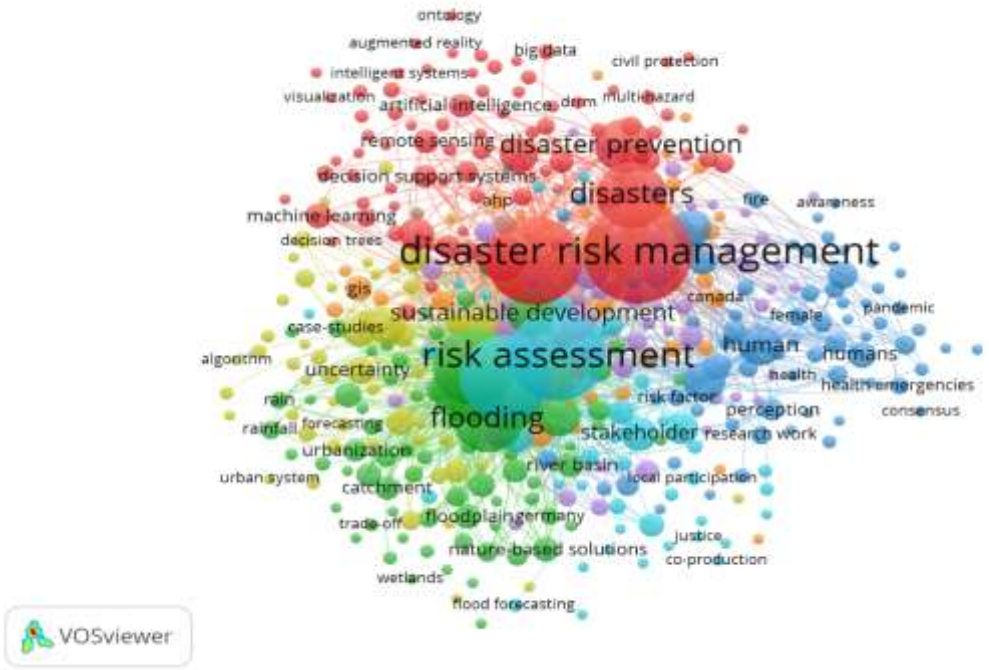

Figure 4: Keywords Associated with Flood Disaster Risk Management Research

Co-occurrence analysis of author keywords in VOSviewer is a bibliometric method used to identify how frequently keywords appear together in the same publications, thereby mapping relationships between research topics and themes. By analyzing these connections, researchers can visualize intellectual structures and thematic clusters within a field. In this case, the full counting method was applied, meaning each co-occurrence of a keyword pair was given equal weight. A minimum threshold of five occurrences was set, which filtered out less frequently used keywords. Out of 431 unique author keywords, 315 met the threshold, and with a

International Journal of Innovation and Industrial Revolution
EISSN: 2637-0972
IJIREV
Volume: 8 Issue: 24 (March 2026) PP. 96-114

minimum cluster size of five, eight clusters were generated. This clustering groups closely related concepts such as "risk assessment," "flood risk management," and "climate change," allowing the visualization of how these topics interconnect within the broader domain of flood and disaster risk management. The findings from this co-occurrence mapping contribute significantly to the body of knowledge by highlighting dominant research themes and emerging areas of interest. The strongest keywords such as “disaster risk management” (460 occurrences), “risk assessment” (372), and “risk management” (350) reveal the core focus of the field, while keywords like “climate change,” “resilience,” and “machine learning” indicate evolving directions that integrate sustainability and technology. The clustering further demonstrates how traditional approaches such as flood control and hazard management are increasingly linked with governance, policy, and innovative tools like artificial intelligence. This synthesis provides a structured overview of the research landscape, enabling scholars and policymakers to identify knowledge gaps, prioritize future research agendas, and strengthen multidisciplinary approaches in disaster and flood risk management.

RQ5: What Are the Patterns of Co-Authorship and Collaboration Among Countries?

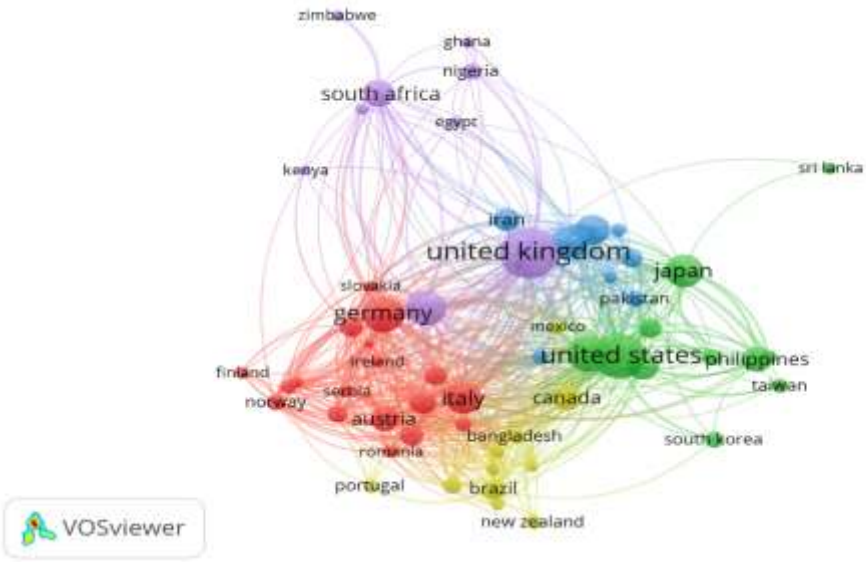

Figure 5: Co-Occurrence Analysis of Countries

Co-occurrence analysis of countries in VOSviewer is a bibliometric approach that examines how often countries appear together in the same body of research, usually through co-authorship networks, to visualize patterns of international collaboration and scientific influence. This method helps reveal not only which countries are the most active contributors in a research field but also how they are interconnected through partnerships. In this study, the full counting method was applied, where each country’s appearance in a paper is counted equally, regardless of the number of co-authors. A minimum occurrence threshold of 5 was set, and from 116 countries, 63 met this criterion. With a minimum cluster size of 5, the analysis generated 5 distinct clusters, each representing groups of countries that collaborate closely in disaster risk and flood management research. The findings indicate that research leadership is concentrated in countries such as the United Kingdom, United States, Germany, China, and the Netherlands, which show high document output, citation impact, and strong total link strength, reflecting their central positions in global research networks. Meanwhile, emerging contributors such as India, Indonesia, South Africa, and Bangladesh also appear significantly, highlighting the importance of collaboration between developed and developing nations,

especially given their varying levels of disaster risk exposure and resources. The clustering of countries underscores regional collaboration trends, where European nations dominate one cluster, Asian countries form another, and cross-regional links strengthen global knowledge exchange. This not only enriches the field by integrating diverse geographical perspectives but also enhances the development of more inclusive and context-sensitive disaster risk management strategies that bridge the gap between high-resource and high-risk regions.

Conclusion

This study set out to examine global research patterns in flood disaster risk management by applying bibliometric techniques to a large dataset of publications. The purpose was to identify major trends, highly cited works, leading contributing countries, dominant keywords, and patterns of international collaboration. The analysis addressed these questions by combining statistical examination with network visualization, providing a structured overview of the research landscape. The findings reveal several key insights. Research output has steadily increased between 2020 and 2025, reflecting growing scholarly and policy attention to flood resilience, climate change, and disaster preparedness. Highly cited works emphasize integrated flood risk management, climate adaptation, and resilience-based approaches, underscoring the interdisciplinary nature of the field. The United Kingdom, United States, China, Germany, and the Netherlands emerged as leading contributors, with other countries such as India, Japan, and Indonesia also showing significant engagement due to their vulnerability to climate hazards. Keyword mapping confirmed “disaster risk management,” “risk assessment,” and “climate change” as core themes, while emerging topics such as “machine learning” and “nature-based solutions” point towards technological innovation and sustainability as new research frontiers. Co-authorship analysis demonstrated strong regional clustering and collaboration, suggesting that global partnerships remain central to advancing knowledge and practical solutions in this field.

This analysis contributes to the field by consolidating fragmented research into a coherent picture of its intellectual structure and evolution. It highlights both established themes and emerging areas, offering guidance for future studies. The findings also have practical implications, as they can inform policy design, institutional strategies, and community-based approaches to disaster risk reduction. Nevertheless, limitations should be acknowledged, including reliance on a single database and the exclusion of non-English publications, which may have overlooked relevant contributions. Future research could expand the dataset, integrate other databases, and explore thematic content in greater depth through systematic review approaches.

In summary, the study confirms that flood disaster risk management is an expanding and increasingly interdisciplinary domain, driven by urgent global challenges and shaped by both academic leadership and regional necessity. Bibliometric analysis proves valuable in tracing these developments, offering insights into collaboration patterns, thematic priorities, and knowledge gaps. Understanding these dynamics is essential for guiding future scholarship and for developing more adaptive, inclusive, and resilient strategies to address the growing risks associated with floods worldwide.

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Ethics Statement: This study did not involve any human participants, animals, or sensitive data requiring ethical approval. The authors confirm that the research was conducted in accordance with accepted academic integrity and ethical publishing standards.

Author Contribution Statement: All authors contributed significantly to the development of this manuscript. Siti Nurhafizah Saleeza Ramlee was responsible for the conceptualization, methodology, and overall supervision of the study. Megat Azman Megat Mokhtar, Siti Humaira Ramli, and Zarina Kassim handled data collection, analysis, and interpretation of results. Victor Feizal Knight and Noor Azmi Mohd Zainol[3]contributed to the literature review, drafting, and critical revision of the manuscript. All authors read and approved the final version of the manuscript prior to submission.

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