

Disaster Preparedness and Management Practices in Academic Libraries in Context

Josiline Chigwada^{1*}, and Patrick Ngulube¹

¹School of Interdisciplinary Research and Graduate Studies, University of South Africa, South Africa

*Corresponding author: chigwaj@unisa.ac.za

Received 09 August 2024; Received in Revised Form 05 December 2024; Accepted 05 December 2024

Abstract

Academic libraries are faced with natural and man-made disasters that can affect service delivery and loss of life to staff and patrons. The study was done to discuss the disaster preparedness and management practices to be observed by academic libraries and identify the enabling and disabling factors towards the successful management of the experienced disasters. The study was conducted as a systematic literature review where articles were retrieved using relevant keywords from Emerald, Sage, Scopus, Web of Science, and Google Scholar where 8753 articles were identified, and 39 articles were reviewed after screening. Using the content analysis approach, the practices that should be factored in disaster preparedness and management plans were analysed. The findings showed that academic libraries were affected by fires, floods, digital disasters, earthquakes, cyclones, typhoons, storms, tornadoes, COVID-19, pest infestation, vandalism, theft, unstable electric power, war, and bomb threats. The disaster preparedness and management practices employed included risk assessment, emergency response planning, staff training, collection protection, digital preservation, backup and recovery, communication and outreach, and collaboration and partnerships. The enabling and disabling factors were funding, awareness, infrastructure, staffing, and collaboration. The authors recommend that academic libraries should have disaster preparedness plans, collaborate and establish partnerships, invest in technology and infrastructure, train both staff and users on dealing with disasters, and insure the library buildings and collections. The study would inform academic library administrators, policymakers, and disaster management professionals in academic institutions about effective strategies that can be used to deal with disasters.

Keywords: emergency preparedness; emergency management; emergency response; pandemic preparedness; disasters and academic libraries

Introduction

A disaster is regarded as a sudden accident or a natural catastrophe that causes great damage or loss of life (United Nations Office for Disaster Risk Reduction, 2024). Disasters, whether natural or man-made, pose significant threats to institutions worldwide including academic libraries, and COVID-19 is considered a disaster due to its significant impact on the way information was managed, shared, and disseminated during the pandemic period (Ansari et al., 2024; Rachman, 2020). Like other disasters, COVID-19 led to the sudden loss of access to information resources because of the closure of academic institutions and their libraries. Academic libraries, as repositories of knowledge and cultural heritage are vulnerable to a variety of hazards such as earthquakes, floods, fires, and human-induced events (Wardekker et al., 2023). Preserving academic resources and maintaining library services during and after such events are critical for sustaining educational and research activities. This systematic review aims to synthesize existing literature on disaster preparedness and management practices in academic libraries, providing a comprehensive overview of strategies employed to mitigate risks, protect collections, and ensure operational resilience.

Academic libraries serve as pivotal centres for learning, research, and knowledge dissemination (Committee of Higher Education Libraries of South Africa, 2021). Their collections which include books, journals, and digital



resources are invaluable assets that require safeguarding against potential disasters. Effective disaster preparedness and management practices are essential to minimise damage and ensure a rapid recovery (Abulnour, 2014; McEntire, 2022; Senevitne et al., 2011). Despite the recognised importance of these measures, there is a need for a consolidated understanding of the various approaches and best practices implemented across different academic libraries. This review systematically examines the existing body of research on disaster preparedness and management in academic libraries, and by analysing studies from diverse geographical and institutional contexts, it seeks to identify common challenges, innovative solutions, and gaps in current practices. The findings would inform library administrators, policymakers, and disaster management professionals about effective strategies and areas needing further attention. Through this comprehensive analysis, the review contributes to enhancing the resilience and sustainability of academic libraries in the face of potential disasters. The following research questions guided the review:

1. What are the disaster preparedness and management practices used in academic libraries?
2. What are the disasters experienced by the libraries in the 10 years between 2013 and 2023?
3. What are the enabling and disabling factors toward the successful management of disasters in the future?

Why Academic Libraries?

Academic libraries play a unique role in acquiring, preserving, and conserving a variety of information resources including books, journals, theses and dissertations, and newspapers in both print and electronic formats. They cater to higher education institutions to fulfill their information needs by providing access to these resources (Akinola, 2022). In academic libraries, preserving intellectual assets such as rare manuscripts, research data, and digital repositories is paramount, necessitating a robust framework for continuity of access and service during a crisis (Abidin et al., 2023). Emphasising both preventive and rapid recovery ensure that the academic library's role as a critical academic resource remains resilient in the face of disasters (Kostagiolas et al., 2011).

Disaster preparedness and management practices in academic libraries involve proactive measures and structured responses aimed at protecting library resources, ensuring service continuity, and minimising disruptions during crises (Wijayasundara, 2021). This encompasses a strategic and comprehensive approach to safeguarding collections, infrastructure, and personnel from potential hazards such as fire, floods, cyberattacks, and pandemics (Abidin et al., 2024). These practices typically include conducting regular risk assessments to identify potential hazards such as natural disasters, technological failures, and human-induced threats (Kostagiolas et al., 2011). Libraries develop and maintain comprehensive disaster management plans that outline preventive actions, emergency procedures, and recovery strategies tailored to their institutional needs, and the library's unique context (Wijayasundara, 2021). Key practices include staff training, the adoption of technology-driven solutions like digital backups and automated monitoring systems, and the establishment of collaborative networks with disaster response organisations, and institutional risk management teams.

Methodology

The systematic review is presented according to the Preferred Reporting Items for Systematic Reviews (PRISMA) 2009 checklist as shown in Appendix A (Moher et al., 2009). The developed protocol was registered on the Open Science Framework according to standard practice in systematic reviews (Chigwada & Ngulube, 2024).

Search Strategy

A comprehensive search strategy was conducted in Emerald, Sage, Scopus, Web of Science, and Google Scholar according to a search strategy that was developed by an academic librarian. These databases were selected as they document papers in library and information science including academic librarianship. The search was

structured around three main concepts which are academic library, disaster management and disaster preparedness. These concepts were represented using search terms such as (1) academic library, university library college library, (2) disaster preparedness, disaster planning, emergency preparedness, and (3) disaster management, disaster response, and emergency response. The searches were done in June 2024 and the main search string for this study was “*Academic librar* OR University librar* OR College librar* AND Disaster preparedness OR Emergency preparedness OR Disaster planning AND Disaster management OR Emergency response OR Disaster response*”.

Eligibility Criteria and Study Selection

To be included in the review, English-language peer-reviewed articles, books, or book chapters published between 2013 and 2023 anywhere in the world were considered as shown in Table 1. The 10 years was selected to capture the most relevant, recent, and contextually appropriate findings in this evolving field. The past decade has seen significant developments in disaster management strategies due to advancements in digital technologies, changes in climate-related risks, and the growing importance of data preservation and use in academic settings. This period also encompasses major global disruptions such as COVID-19 pandemic which have reshaped institutional approaches to disaster preparedness and highlighted the importance of resilience planning in academic libraries. The studies needed to include disaster preparedness, disaster management, and academic libraries. Zotero reference management software was used to remove duplicates and Cadima, a systematic review management tool was used to complete the study screening. All article titles and abstracts were screened independently by two reviewers, and conflicts were resolved by a third reviewer. After the articles were screened using the date of publication and language, an additional 1934 articles were excluded during the abstract, title, and keyword screening leaving 57 papers. The 57 papers were reviewed to determine the eligibility of articles and 20 were removed as they were not university related. A total of 39 articles met the inclusion and exclusion criteria and were included in this systematic review as shown in Figure 1.

Table 1. Summary of inclusion and exclusion criteria

Selection criteria	Inclusion criteria	Exclusion criteria
<i>Publication characteristics</i>		
Language	English	All languages except English
Publication Type	Peer-reviewed articles, books, book chapters.	Reference sources, popular and trade sources, grey literature
Publication date	2013 - 2023	2012 and below
Study design	Quantitative, Qualitative, and Mixed methods	No study design
<i>Study characteristics</i>		
Issue	Disaster preparedness and management	No disaster management
Population	Academic libraries	Other libraries or organisations.
Intervention	Disaster management in academic libraries	Disaster management in other libraries
	Disaster preparedness in academic libraries	Disaster preparedness in other libraries

	Enabling and disabling factors for disaster management	Other factors
	Disasters experienced in academic libraries	Disasters experienced in other libraries
Outcome	A comprehensive overview of disaster preparedness and management in academic libraries.	No comprehensive overview of disaster management in academic libraries.

Data Extraction and Analyses

The data extraction template was pilot-tested, and two reviewers independently performed data extraction for the included articles. The 37 included articles were read in full and served as data for the study. A data extraction table was used to extract data and categorize key findings. The data extraction template captured the following items: author, disaster preparedness and management practices, disasters experienced in the past 10 years, enabling and disabling factors, country, methodology, and theory. To deal with the risk of bias, two independent authors did the data extraction process using the same data extraction table. Conflicts in data extraction were resolved by a third party. Publication bias was dealt with by choosing articles with a clear research methodology applied.

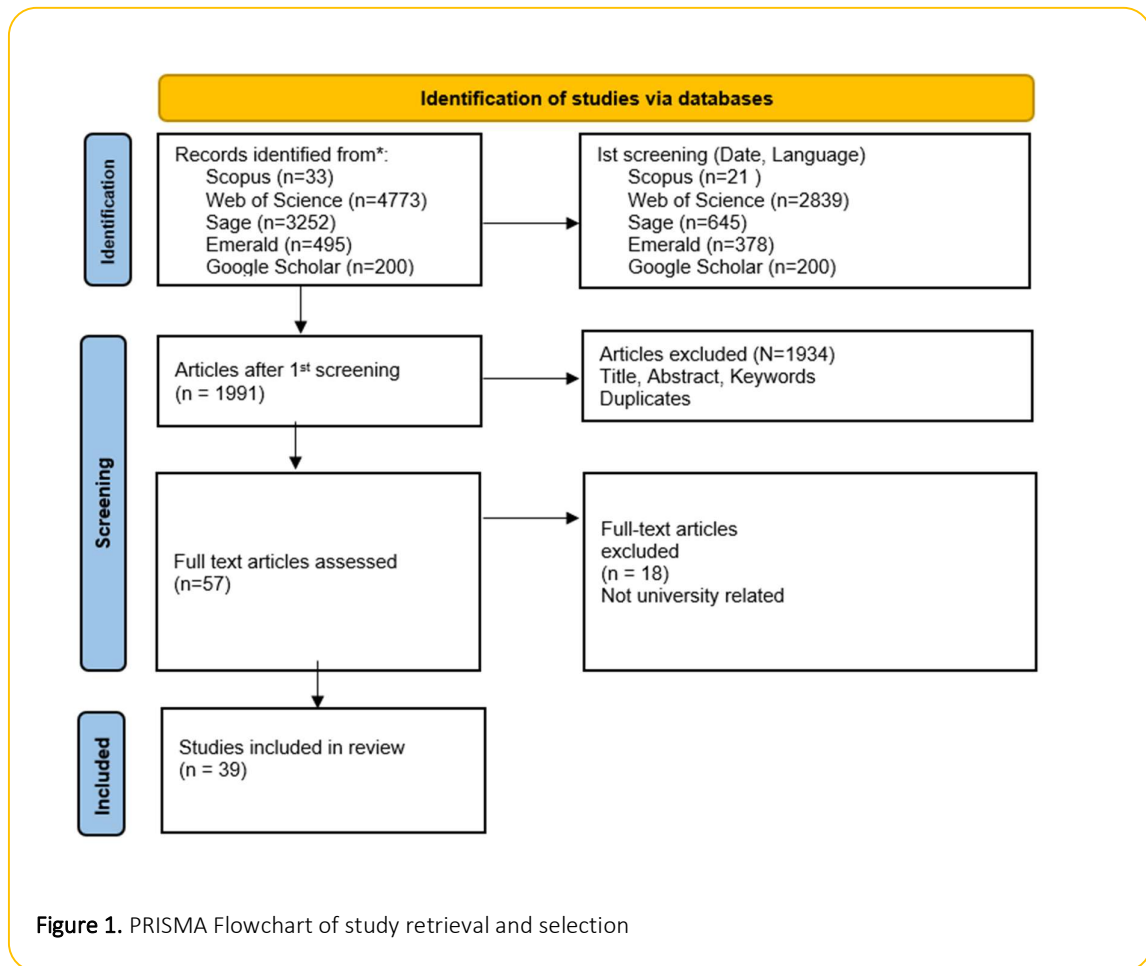


Figure 1. PRISMA Flowchart of study retrieval and selection

Results and Discussion

From the databases that were searched, 39 studies met the inclusion criteria, and their data were extracted. The authors reached a consensus on the eligibility of all the included studies.

Countries

The 39 articles that were included in this study focused on any country in the world, and 36 articles were specific about the countries where the studies were done as shown in Table 2.

Table 2. Countries that experienced disasters in academic libraries

Country	Articles	Authors
Nigeria	7	Chiderah and Iroeze, 2021; Ilo et al., 2018; Ilo et al., 2019; Ilo et al., 2020; Ilo et al., 2020a; Ishola, 2017; Oluwole, 2019
USA	7	Galloup, 2016; Kapucu & Khosa, 2013; Kehnemuyi, 2021; Korber, 2022; Mehta & Wang, 2020; Nixon, 2016; Verplaetse et al., 2016
India	4	Ansari & PM, 2023; Nongrang & Khongtim, 2021; Wani & Ganaie, 2017; Zarevi, 2015
Philippines	3	Balbin and Lascano, 2023; Superio et al., 2019; Superio, 2019a
Indonesia	2	Rachman, 2020a; Rachman 2021
Jamaica	2	Harris, 2021; Harris, 2021a
Mexico	2	Pierard et al, 2016; Wilkinson, 2015
Australia	1	Garnett et al., 2018
China	1	Guo et al., 2021
Ghana	1	Ayoung et al., 2016
Iran	1	Sohrabizadeh et al., 2019
Kashmir	1	Hussain, 2019
Malaysia	1	Jaradat, 2015
South Africa	1	Chisita and Chizoma, 2021
Sri Lanka	1	Wijayasundara, 2021
Zimbabwe	1	Tsekea and Chigwada, 2020

Types of Disasters Experienced between 2013 and 2023

The findings showed that 17 disasters were experienced between 2013 and 2023 in academic libraries as shown in Table 3.

Table 3. Disasters experienced between 2003 and 2013 in academic libraries

Disaster	Articles	Authors
Fire	22	Ayoung et al, 2016; Chiderah & Iroeze, 2021; Galloup, 2016; Garnett 2021; Garnett et al., 2018; Hussain, 2019; Ilo et al., 2019; Ilo et al., 2018; Ilo et al, 2020; Ishola, 2017; Jaradat, 2015; Kapucu and Khosa, 2013; Kehnemuyi, 2021; Korber, 2022; Koscieljew, (2021); Nongrang & Khongtim, 2021; Oluwole, 2019; Pierard et al, 2016; Superio et al., 2019; Verplaetse et al., 2016; Wijayasundara, 2021; Wilkinson, 2015
COVID 19	12	Ansari & PM, 2023; Ashiq et al, 2022; Balbin & Lascano, 2023; Chisita & Chizoma, 2021; Guo et al., 2021; Harris, 2021; Harris, 2021a; Kehnemuyi, 2021; Koscieljew, 2021; Mehta & Wang, 2020; Tsekea & Chigwada, 2020; Wijayasundara, 2021.
Flooding	12	Chiderah & Iroeze, 2021; Garnett, 2021; Garnett et al., 2018; Hussain, 2019; Ishola, 2017; Jaradat, 2015; Kehnemuyi, 2021; Oluwole, 2019; Pierard et al, 2016; Superio et al., 2019; Wani & Ganaie, 2017; Verplaetse et al., 2016
Digital disasters (Server crash, software loss, data corruption, virus)	8	Ayoung et al, 2016; Garnett et al., 2018; Kehnemuyi, 2021; Oluwole, 2019; Ilo et al, 2020; Nongrang & Khongtim, 2021; Rachman, 2020a; Zarevi, 2015
Earthquakes	7	Garnett, 2021; Garnett et al., 2018; Jaradat, 2015; Kehnemuyi, 2021; Oluwole, 2019; Sohrabizadeh et al., 2019; Superio et al., 2019
Theft	5	Ayoung et al, 2016; Garnett, 2021; Ishola, 2017; Nongrang & Khongtim, 2021; Oluwole, 2019
Hurricane	3	Garnett, 2021; Jaradat, 2015; Kehnemuyi, 2021
Pest infestation	3	Hussain, 2019; Nongrang & Khongtim, 2021; Oluwole, 2019
Tornadoes	3	Galloup, 2016; Jaradat, 2015; Kehnemuyi, 2021
Shooting/bomb threat	2	Kehnemuyi, 2021; Nixon, 2016
Storm	2	Jaradat, 2015; Oluwole, 2019
Vandalism	2	Ishola, 2017; Oluwole, 2019
War/ Civil unrest	2	Garnett, 2021; Superio et al., 2019
Cyclones	1	Oluwole, 2019
Typhoon	1	Superio, 2019a
Unstable electrical power	1	Rachman, 2020a
Waves	1	Ishola, 2017

It was noted that academic libraries were vulnerable to various types of disasters, both natural and man-made, that disrupted operations, damaged collections, and jeopardised the safety of staff and patrons. In Nigeria, for example, more disasters were experienced as shown in Table 2. Fires that were experienced were caused by electrical faults, arson, or wildfires, and this destroyed physical materials, damaged the infrastructure, and loss of

rare and irreplaceable items. Floods were caused by heavy rainfall, river overflow, hurricanes, or broken pipes, and the water damaged books, electronic equipment, and infrastructure. Mold growth can further damage materials if not promptly addressed. Earthquakes caused structural damage to buildings and potential loss or damage to collections as well as disrupting services due to safety concerns in Indonesia, Sri Lanka, and Malaysia (Oluwole, 2019; Sohrabizadeh et al., 2019; Superio et al., 2019). Storms and hurricanes were caused by severe weather conditions, and they caused physical damage to buildings and collections, flooding, power outages, and disruption to services (Oluwole, 2019). Tornadoes caused structural damage, destruction of collections, and possible injury to staff and patrons in USA, Indonesia and Malaysia (Galloup, 2016). Other natural disasters included cyclones, typhoons, and COVID-19. Pandemics were caused by widespread disease outbreaks, and they caused temporary closure of libraries, restrictions on in-person services, increased reliance on digital resources, and implementation of health and safety protocols in Zimbabwe and beyond (Tseke & Chigwada, 2020).

Man-made disasters that affected academic libraries between 2013 and 2023 include vandalism, theft, bomb threats, shooting, war, and accidental damages such as human error and equipment failure causing digital disasters, pest and virus infections (Oluwole, 2019; Nongrang & Khongtim, 2021; Rachman, 2021; Superio et al., 2019). Vandalism and theft were caused by inadequate security leading to damage or loss of materials and disruption of services in Nigeria, Indonesia and Sri Lanka (Ilo et al., 2020; Oluwole, 2019; Rachman, 2020; Zarevi, 2015). These disasters caused damage to collections from mishandling, spills, improper storage, or damage to electronic resources due to power surges (Kehnemuyi, 2021, Nongrang & Khongtim, 2021, Rachman, 2021). In addition, technological disasters were in the form of cyber-attacks or power outages. Cyber-attacks were caused by hackers, malware, or phishing attacks that compromised digital collections, data breaches, disruptions to digital services, and access to electronic resources in Nigeria and Indonesia (Rachman, 2021). Power outages were caused by grid failures, severe weather, or accidents leading to loss of access to electronic systems, potential data loss, and disruption of climate control systems necessary for preserving collections in Ghana and Indonesia (Oluwole, 2019; Promise et al, 2020; Rachman, 2021; Zarevi, 2015). Furthermore, pest infestations were caused by insects and rodents, and this caused damage to paper-based collections, including books and archival materials due to contamination and other health hazards (Oluwole, 2019). Mold and mildew were caused by high humidity and water damage leading to degradation of paper and other organic materials, and health risks to staff and patrons. Moreover, civil unrest such as political protests and riots caused damage to buildings and collections, disruption to services, and safety concerns for staff and patrons (Superio et al., 2019).

Disaster Preparedness and Management Practices

The results indicated that the disaster preparedness and management practices used by academic libraries varied depending on the type of disaster experienced as shown in Table 4.

Table 4. Disaster preparedness and management practices in academic libraries

Practice	Articles	Authors
Disaster risk management plan/ Disaster response plan	23	Ayoung et al., 2016; Balbin & Lascano, 2023, Chiderah & Iroeze, 2021; Galloup, 2016; Garnett et al., 2018; Garnett, 2021; Harris, 2021; Harris, 2021a; Ilo et al., 2020; Jaradat, 2015; Kapucu & Khosa, 2013; Kehnemuyi, 2021; Korber, 2022; Nixon, 2016; Nongrang & Khongtim, 2021; Pierard et al., 2016; Rachman, 2020a; Sohrabizadeh et al., 2019; Superio et al., 2019; Superio, 2019a; Verplaetse et al., 2016; Wajayasundara, 2021; Wani & Ganaie, 2017;

Provision of fire extinguishers	10	Ayoung et al, 2016; Chiderah & Iroeze, 2021; Hussain, 2019; Ilo et al., 2020a; Ilo et al., 2018; Nongrang & Khongtim, 2021; Oluwole, 2019; Rachman, 2020; Rachman, 2020a; Sohrabizadeh et al., 2019;
Virtual library services	7	Ashiq et al., 2022; Chisita & Chizoma, 2021; Guo et al., 2021; Kehnemuyi, 2021; Kosciejew, 2021; Mehta & Wang, 2020; Wajayasundara, 2021;
Library insurance coverage	7	Ayoung et al, 2016; Garnett et al., 2018; Oluwole, 2019; Rachman, 2020a; Superio et al., 2019; Superio, 2019a; Wani & Ganaie, 2017
Digital data disaster management (Antivirus, hardware maintenance, upgrading hardware and software, firewalls, physical cleaning of computers, store backup offsite)	7	Ilo et al., 2018; Ilo et al., 2020a; Nongrang & Khongtim, 2021; Rachman, 2020a; Sohrabizadeh et al., 2019; Wani & Ganaie, 2017; Zarevi, 2015
Library disaster response team	5	Chiderah & Iroeze, 2021; Galloup, 2016; Nongrang & Khongtim, 2021; Pierard et al, 2016; Verplaetse et al., 2016
Good housekeeping practices	5	Ilo et al, 2020a; Ishola, 2017; Rachman, 2020; Rachman, 2020a; Superio et al., 2019
Education and training services	5	Ayoung et al, 2016; Garnett et al., 2018; Guo et al., 2021; Superio et al., 2019; Wani & Ganaie, 2017
UPS	4	Oluwole, 2019; Rachman, 2020; Rachman, 2020a; Zarevi, 2015
Unimpeded emergency exit routes	4	Ayoung et al, 2016; Ilo et al., 2018; Nongrang & Khongtim, 2021; Oluwole, 2019
Remote access to resources	4	Ansari & PM, 2023; Ashiq et al, 2022; Chisita & Chizoma, 2021; Tsekea and Chigwada, 2020
Regular maintenance of electrical circuits and equipment	4	Oluwole, 2019; Rachman, 2020; Rachman, 2020a; Zarevi, 2015
Provision for data backup	4	Ilo et al, 2020; Rachman, 2020; Rachman, 2020a; Zarevi, 2015
Installation of fire alarm systems	4	Chiderah and Iroeze, 2021; Ilo et al, 2020a; Oluwole, 2019; Nongrang & Khongtim, 2021;
Fire drills and exercises	4	Ayoung et al, 2016; Ilo et al., 2019; Nongrang & Khongtim, 2021; Wajayasundara, 2021;
Thermal detector system	3	Chiderah & Iroeze, 2021; Ilo et al., 2018; Oluwole, 2019
Remote working	3	Ashiq et al, 2022; Harris, 2021; Kosciejew, 2021
Migration and emulation	3	Kosciejew, 2021; Ilo et al, 2020a; Wani & Ganaie, 2017

Installation of smoke detectors	3	Ayoung et al, 2016; Chiderah & Iroeze, 2021; Ilo et al, 2020
Deployment of CCTV	3	Ilo et al, 2020a; Nongrang & Khongtim, 2021; Sohrabizadeh et al., 2019;
Closure of libraries	3	Ashiq et al, 2022; Harris, 2021; Kehnemuyi, 2021;
Use of 3M technology	2	Ilo et al, 2020a; Ilo et al., 2018
Upgrading hardware and software	2	Rachman, 2020; Zarevi, 2015
Transformation of library services	2	Ashiq et al, 2022; Guo et al., 2021
Surge protectors	2	Oluwole, 2019; Zarevi, 2015
Social distance	2	Chisita and Chizoma, 2021; Harris, 2021
Security personnel	2	Oluwole, 2019; Rachman, 2020a;
Risk assessment	2	Rachman, 2020a; Sohrabizadeh et al., 2019;
Fumigants	2	Oluwole, 2019; Wajayasundara, 2021;
Digitization and launching online educational resources	2	Ashiq et al, 2022; Hussain, 2019;
Changing regulations and access policies	2	Ashiq et al, 2022; Chisita & Chizoma, 2021
Air conditioning	2	Garnett, 2021; Oluwole, 2019
Uploading research outputs on institutional repository	1	Ilo et al, 2020a
Split the building into sectors using fire division walls	1	Oluwole, 2019
Security policy	1	Ayoung et al, 2016;
Reorganising library websites	1	Ashiq et al, 2022
Radio-frequency identification (RFID) system	1	Zarevi, 2015
Publishers provided free resources	1	Guo et al., 2021
Provision of water hose	1	Ilo et al, 2020
Making video tutorials	1	Ashiq et al, 2022

Implementation of interlibrary loan	1	Ashiq et al, 2022
Deployment of trained personnel	1	Ilo et al, 2020a
Dehumidifiers	1	Oluwole, 2019
Creating awareness	1	Ashiq et al, 2022
Countering mis/disinformation	1	Kosciejew, 2021
Collaborations with public health agencies	1	Kosciejew, 2021
Binding, photocopying, and good shelving	1	Ilo et al, 2020a

From the extracted data, disaster preparedness and management practices that emerged were risk assessment, emergency response planning, staff training, collection protection, digital preservation, backup and recovery, collaboration and partnerships, and communication and outreach. In Nigeria, Philippines and the USA, libraries conducted comprehensive risk assessments to identify hazards and vulnerabilities (Balbin & Lascano, 2023, Chiderah & Iroeze, 2021; Galloup, 2016; Harris, 2021a; Ilo et al, 2020; Wani & Ganaie, 2017; Korber, 2022; Nixon, 2016; Pierard et al, 2016; Superio et al., 2019; Superio, 2019a; Verplaetse et al., 2016). This included evaluating the building structure, environmental factors, and the collection itself. Risk assessment helped libraries develop appropriate strategies to mitigate risks and prioritise preparedness efforts.

Emergency response planning was done when libraries develop detailed emergency response plans that outline specific actions to be taken during different types of disasters in Australia, Malaysia, Iran, Jamaica, USA and Nigeria (Chiderah & Iroeze, 2021; Galloup, 2016; Pierard et al, 2016; Verplaetse et al., 2016). Academic libraries have library response teams who are knowledgeable about the steps to be taken in the event of a disaster. These plans typically included procedures for evacuation, communication protocols, identifying emergency contacts, and establishing command structures. In addition, staff training was done to ensure that all the library staff received regular training on emergency response procedures and disaster management techniques in China, Ghana, India, Indonesia, and Nigeria (Guo et al., 2021; Promise et al, 2020, Wani & Ganaie, 2017). This training included familiarizing staff with evacuation routines, handling emergency equipment, and understanding the roles and responsibilities of each staff member during a crisis.

Academic libraries implemented measures to protect their collections from damage or loss. They utilised disaster-resistant storage solutions, such as fireproof cabinets or shelving, and implemented climate control systems in Nigeria, Philippines, USA and Indonesia (Promise et al, 2020; Rachman, 2021; Superio et al., 2019) to maintain optimal environmental conditions for preserving materials (Oluwole, 2019). Digital preservation was important since many academic libraries had digitisation initiatives to create digital copies of valuable or fragile materials (Ashiq et al, 2022). By digitising resources, the library ensured their long-term accessibility and mitigate the risk of physical damage or loss during a disaster in South Africa, and the Philippines (Ashiq et al, 2022; Chisita & Chizoma, 2021; Guo et al., 2021; Kosciejew, 2021; Mehta & Wang, 2020) when digital disaster management practices were put into place (Rachman, 2021; Zarevi, 2015). This was accomplished through regular backup of digital resources and critical data to off-site locations to safeguard against data loss in India, Nigeria and Indonesia (Promise et al, 2020; Rachman, 2021; Zarevi, 2015). Libraries developed recovery plans to restore services and

resources in the aftermath of a disaster. Above all, academic libraries insured their collections just in case a disaster struck (Oluwole, 2019; Superio et al., 2019; Wani & Ganaie, 2017).

It emerged that collaboration and partnership were important in disaster preparedness and management (Kosciejew, 2021). Academic libraries collaborated with local emergency management agencies, and library consortia to share resources, knowledge, and expertise about disasters. This collaboration enhanced the collective response capabilities and facilitated resource-sharing during emergencies. As a result, libraries established effective communication channels to disseminate emergency information and instruction to library users and staff (Ashiq et al, 2022). This included utilising various communication platforms such as email, websites, social media, and mobile apps, to provide timely updates and instructions during and after the crisis (Ashiq et al, 2022; Guo et al., 2021; Oluwole, 2019). This also called for a need for continuous improvement where there was a need to regularly review, and update disaster preparedness and management plans based on lessons learnt from previous incidents or exercises.

Enabling and Disabling Factors

The findings showed that there were some enabling and disabling factors towards the successful management of the experienced and possible disasters in the future as shown in Table 5. Adequate resources, that is, sufficient financial and human resources were essential for implementing effective disaster management plans. Libraries with adequate funding and staffing were better equipped to invest in preparedness measures, training, equipment, and recovery efforts.

Table 5. Enabling and disabling factors for disaster preparedness and management

Enabling and disabling factors	Articles	Authors
Human capacity building and upskilling	26	Ashiq et al, 2022; Ayoung et al., 2016; Galloup, 2016; Garnett et al., 2018; Garnett, 2021; Harris, 2021a; Hussain, 2019; Ilo et al., 2018; Ilo et al., 2019; Ilo et al, 2020; Ilo et al, 2020a; Ishola, 2017; Jaradat, 2015; Kapucu & Khosa, 2013; Nixon, 2016; Nongrang & Khongtim, 2021; Oluwole, 2019; Rachman, 2020; Rachman, 2020a; Sohrabizadeh et al., 2019; Superio et al., 2019; Tsekea & Chigwada, 2020; Verplaetse, 2016; Wani & Ganaie, 2017; Wijayasundara, 2021; Zarevi, 2015
Absence of pandemic and disaster management plans/ Written plans/ team	21	Ansari & PM, 2023; Ashiq et al, 2022; Balbin & Lascano, 2023; Chiderah & Iroeze, 2021; Galloup, 2016; Garnett et al., 2018; Garnett, 2021; Ilo et al, 2020; Ishola, 2017; Harris, 2021a; Hussain, 2019; Jaradat, 2015; Kapucu & Khosa, 2013; Nongrang & Khongtim, 2021; Pierard et al, 2016; Rachman, 2020a; Sohrabizadeh et al., 2019; Superio et al., 2019; Verplaetse, 2016; Wani & Ganaie, 2017; Wijayasundara, 2021
Funding	20	Ashiq et al, 2022; Ayoung et al., 2016; Balbin & Lascano, 2023; Galloup, 2016; Garnett, 2021; Ilo et al., 2018; Ilo et al., 2019; Ilo et al, 2020; Ilo et al, 2020a; Ishola, 2017; Kehnemuyi, 2021; Kosciejew, 2021; Nongrang & Khongtim, 2021; Oluwole, 2019; Rachman 2020; Rachman, 2020a; Sohrabizadeh et al., 2019; Superio et al., 2019; Superio, 2019a; Wijayasundara, 2021

Procurement of relevant disaster equipment	12	Chiderah & Iroeze, 2021; Hussain, 2019; Ilo et al., 2018; Ilo et al., 2019; Ilo et al, 2020; Ilo et al, 2020a; Ishola, 2017; Nixon, 2016; Nongrang & Khongtim, 2021; Oluwole, 2019; Wani & Ganaie, 2017; Wijayasundara, 2021
Improve disaster management planning	11	Ashiq et al, 2022; Ayoung et al., 2016; Chiderah & Iroeze, 2021; Hussain, 2019; Nixon, 2016; Ilo et al, 2020; Ishola, 2017; Superio et al., 2019; Verplaetse, 2016; Wani & Ganaie, 2017; Wijayasundara, 2021
Collaboration with disaster management agencies like police and fire brigade	10	Ayoung et al., 2016; Chisita & Chizoma, 2021; Harris 2021; Harris, 2021a; Koscieljew, 2021; Oluwole, 2019; Sohrabizadeh et al., 2019; Superio, 2019a; Verplaetse, 2016; Wilkinson, 2015
Collaboration and public-private partnership	9	Ashiq et al, 2022; Garnett et al., 2018; Harris, 2021a; Jaradat, 2015; Kapucu & Khosa, 2013; Nixon, 2016; Sohrabizadeh et al., 2019; Superio, 2019a; Verplaetse, 2016
Risk assessment and evaluation	9	Ilo et al., 2018; Ilo et al., 2019; Ilo et al., 2020; Jaradat, 2015; Oluwole, 2019; Rachman, 2020a; Pierard et al, 2016; Sohrabizadeh et al., 2019; Verplaetse, 2016
Inadequate disaster facilities	8	Balbin & Lascano, 2023; Hussain, 2019; Ilo et al., 2019; Ishola, 2017; Nongrang & Khongtim, 2021; Superio, 2019a; Wani & Ganaie, 2017; Wijayasundara, 2021
Lack of support from administrators/ support from administrators	8	Ayoung et al., 2016; Jaradat, 2015; Kapucu & Khosa, 2013; Superio et al., 2019; Superio, 2019a; Verplaetse, 2016; Wani & Ganaie, 2017; Wilkinson, 2015
Being disaster conscious	7	Hussain, 2019; Ilo et al, 2020; Ilo et al, 2020a; Oluwole, 2019; Pierard et al, 2016; Wijayasundara, 2021; Zarevi, 2015
Digitisation and digital library strategies	7	Ansari & PM, 2023; Ashiq et al, 2022; Chisita & Chizoma, 2021; Guo et al., 2021; Koscieljew, 2021; Mehta & Wang, 2020; Tsekea & Chigwada, 2020
Awareness creation	6	Harris, 2021a; Ilo et al, 2020; Jaradat, 2015; Oluwole, 2019; Superio, 2019a; Wijayasundara, 2021
Business continuity plans	6	Chisita & Chizoma, 2021; Garnett, 2021; Garnett et al., 2018; Harris, 2021a; Kapucu & Khosa, 2013; Oluwole, 2019
Disaster management practices such as maintenance of an updated telephone tree, keeping of emergency kits including flashlights and fire extinguishers	6	Garnett et al., 2018; Ishola, 2017; Superio et al., 2019; Superio, 2019a; Wani & Ganaie, 2017; Wijayasundara, 2021
Human and infrastructural challenges	6	Ashiq et al, 2022; Harris, 2021a; Ishola, 2017; Kehnemuyi, 2021; Wani & Ganaie, 2017; Wijayasundara, 2021
Insurance	6	Hussain, 2019; Ishola, 2017; Oluwole, 2019; Rachman, 2020a; Superio, 2019a; Zarevi, 2015

Lack of ICT skills and resources	5	Balbin & Lascano, 2023; Chisita & Chizoma, 2021; Mehta & Wang, 2020; Tsekea & Chigwada, 2020; Zarevi, 2015
Leadership and planning	5	Ashiq et al, 2022; Galloup, 2016; Garnett et al., 2018; Ilo et al., 2019; Oluwole, 2019
Preparedness to deal with the disaster	5	Ayoung et al., 2016; Harris, 2021a; Wani & Ganaie, 2017; Wijayasundara, 2021; Zarevi, 2015
Communication or miscommunication	4	Harris, 2021a; Verplaetse, 2016; Wani & Ganaie, 2017; Wilkinson, 2015
Lack of interest among librarians	4	Ilo et al., 2019; Ilo et al, 2020a; Ishola, 2017; Oluwole, 2019;
Plan for restoration	4	Korber, 2022; Nixon, 2016; Superio, 2019a; Zarevi, 2015
Standard operating procedures	4	Chisita & Chizoma, 2021; Ilo et al, 2020; Rachman, 2020a; Tsekea & Chigwada, 2020
Include library staff in the disaster management matrix	3	Chiderah & Iroeze, 2021; Chisita & Chizoma, 2021; Zarevi, 2015
Library and its environment (Physical structure, location prone to disasters, knowledge of disasters likely to occur	3	Superio et al., 2019; Superio, 2019a; Wijayasundara, 2021
Social media presence and functional websites	3	Ashiq et al, 2022; Guo et al., 2021; Oluwole, 2019
Community support	2	Jaradat, 2015; Korber, 2022
Documentation of disasters	2	Nixon, 2016; Harris, 2021a
Offsite storage to store backup copies	2	Rachman, 2020a; Zarevi, 2015
Preservation and conservation of information resources	2	Ilo et al, 2020; Ilo et al., 2020a
Technical challenges	2	Ilo et al, 2020; Tsekea & Chigwada, 2020
Acts of negligence	1	Oluwole, 2019
Being proactive (Change of public access policies)	1	Korber, 2022
Digital data protection policy	1	Zarevi, 2015
Facilitating outreach programmes for library staff	1	Oluwole, 2019
Infodemic and changed information-seeking behaviour	1	Ashiq et al, 2022
Information technology Disaster response/ recovery plan	1	Zarevi, 2015
Lacking basic knowledge of disaster response and recovery measures	1	Wani & Ganaie, 2017

Misinformation and user's lack of awareness	1	Balbin & Lascano, 2023
Non-inclusion of disaster management in LIS schools	1	Ilo et al, 2020a
Personal safety and emergency protocols	1	Nixon, 2016
Strict requirements on physical setup for pandemic compliance	1	Balbin & Lascano, 2023
Telecommuting	1	Mehta & Wang, 2020
Use of modern gadgets and processes for recovery	1	Wani & Ganaie, 2017
Workplace anxiety and stress	1	Ashiq et al, 2022

Robust infrastructure in the form of well-maintained and disaster-resistant infrastructure including buildings, shelving, storage systems, and fire suppression systems was needed to successfully manage disasters like what was done in India, Nigeria and Philippines (Balbin & Lascano, 2023; Ilo et al., 2019; Superio, 2019a; Wani & Ganaie, 2017). Libraries that conducted thorough risk assessments were able to identify potential hazards and vulnerabilities, enabling them to develop targeted mitigation strategies and prioritise preparedness efforts (Oluwole, 2019; Rachman, 2021; Pierard et al, 2016; Verplaetse et al., 2016). It was also noted that having a well-developed and regularly updated disaster preparedness plan was crucial in academic libraries. The plan included clear procedures, roles, and responsibilities for staff during emergencies, as well as communication protocols and evacuation strategies. In the Philippines for example, they practice disaster management practices such as maintenance of a telephone tree, keeping emergency kits, and alarm systems, and establish contacts with other departments and disaster management agencies (Superio et al., 2019). Training and education were essential in dealing with disasters in academic libraries (Balbin & Lascano, 2023; Chisita & Chizoma, 2021; Mehta & Wang, 2020; Tsekea & Chigwada, 2020; Zarevi, 2015). In addition, regular training programmes that educate library staff on emergency response procedures, disaster management techniques, and the use of specialised equipment enhanced the library's ability to effectively respond to and manage disasters. Furthermore, collaboration and partnerships with external entities, such as emergency management emergencies like fire brigade helped in preparing and dealing with disasters in South Africa, Jamaica, USA, and Nigeria (Ashiq et al, 2022; Chisita & Chizoma, 2021; Harris, 2021a; Koscieljew, 2021; Nixon, 2016; Oluwole, 2019; Superio, 2019a; Verplaetse et al., 2016), and working with other libraries fostered resource-sharing, knowledge exchange, and mutual support before and during emergencies.

However, there were also disabling factors that hampered the efforts in dealing with disasters in academic libraries (Balbin & Lascano, 2023; Ilo et al., 2019; Superio, 2019a; Wani & Ganaie, 2017). If the institution did not have enough funding, limited financial resources hindered the implementation of comprehensive disaster management plans and the acquisition of necessary equipment and resources (Ashiq et al, 2022; Balbin & Lascano, 2023; Galloup, 2016; Ilo et al., 2019; Ilo et al, 2020; Koscieljew, 2021; Oluwole, 2019; Promise et al, 2020; Rachman, 2021; Superio et al., 2019; Superio, 2019a). Aging infrastructure in the form of outdated or poorly maintained infrastructure was more susceptible to damage during disasters, limiting their ability to protect collections and ensure the safety of staff and users (Chiderah & Iroeze, 2021; Ilo et al, 2020; Nixon, 2016; Oluwole, 2019; Promise et al, 2020; Wani and Ganaie, 2017). In addition, libraries with a shortage of staff struggled to effectively respond to emergencies, implement preparedness measures, and conduct necessary pieces of training and drills (Ashiq et al, 2022; Harris, 2021; Harris, 2021a; Wani & Ganaie, 2017). Lack of training and awareness

about disaster management practices and inadequate training in emergency response procedures, impeded effective disaster management (Harris, 2021a; Ilo et al, 2020; Oluwole, 2019; Superio, 2019a). Moreover, limited access to information and expertise, that is, libraries that lacked access to up-to-date information, guidance, and expert advice on disaster management faced challenges in developing and implementing effective preparedness and response strategies (Balbin & Lascano, 2023; Wani & Ganaie, 2017; Zarevi, 2015). In the event of poor coordination between different departments and stakeholders in large academic institutions, effective disaster management, communication, and resource allocation were hindered (Chisita & Chizoma, 2021; Harris, 2021a; Koscieljew, 2021; Oluwole, 2019; Superio, 2019a; Wani & Ganaie, 2017). In the USA, for example, they had a disaster planning committee that raised awareness of the library and its collection and maintained an active involvement from key departments (Verplaetse et al., 2016). Libraries need to address these disabling factors by advocating for adequate resources, investing in staff training, maintaining infrastructure, fostering collaboration, and staying informed about best practices in disaster preparedness and management.

Lessons Learnt from Disasters in Academic Libraries

Disasters experienced by academic libraries underscore the critical need for comprehensive disaster management strategies to protect valuable collections and ensure the continuity of services (Feather, 2022). The following lessons were learnt from the disasters that were identified in this study:

Importance of Disaster Preparedness and Management Plans

The disasters experienced in this study highlight the necessity of having robust disaster preparedness and response plans in place. Academic libraries house valuable resources including books, manuscripts, digital media, and archives. A disaster preparedness and management plan help to protect these collections from potential threats such as fires, floods, earthquakes, or other emergencies (Najar & Wani, 2021; Tosun & Bostan, 2021). In addition, libraries provide essential services to students, faculty, and researchers, and a well-prepared disaster plan certifies that these services can continue with minimal disruption, even during and after a disaster (Ansari et al., 2024; Superio et al., 2024). The safety of library staff and patrons is paramount, and a disaster preparedness and management plan include protocols for evacuation, sheltering, and emergency response that protect individuals during a crisis (Ansari et al., 2024). In addition, disasters can result in significant financial loss due to damage to facilities, collections, and equipment. Preparedness plans can mitigate these losses through preventive measures and efficient response strategies (Rouhanizadeh et al., 2020). Furthermore, some institutions and regions have regulations and requirements for disaster preparedness and management and having a plan in place confirms compliance with these rules, which can be crucial for receiving funding and maintaining accreditation (Sawalha, 2020). Moreover, developing and maintaining a disaster preparedness plan involves training staff and raising awareness about potential risks and appropriate responses which is a proactive approach to enhance the library's overall readiness to handle emergencies (Shah et al, 2020). These plans should be regularly updated and tested through drills (McEntire, 2022).

Collaboration and Support Networks

Collaboration and support networks play a vital role in disaster preparedness and management in academic libraries. The networks enhance the effectiveness of preparedness efforts, response actions, and recovery processes (Ryan et al, 2020). The libraries can benefit from partnerships with other institutions, which can provide support and resources during recovery efforts. Academic libraries can share resources such as collections, backup facilities, and technical expertise to support each other during and after a disaster (Rachman, 2020; Rachman, 2020). This can be done by establishing formal agreements for mutual assistance ensuring that libraries can rely on each other for support in times of need, such as sharing staff, equipment, and space. Professional associations and consortia also provide best practices and guidelines for preparing for and managing disasters (Sawalha, 2020). They also offer training programmes, workshops, and webinars on disaster preparedness, response, and recovery,

helping academic libraries build their capacity. Academic libraries can also collaborate with emergency services such as fire departments, police, and emergency management agencies in efforts to be integrated into broader disaster response efforts (Yang & Ju, 2021). Therefore, collaboration improves the resilience of academic libraries by pooling resources, expertise, and efforts across multiple organisations and sectors. The networks facilitate disaster preparedness and management guaranteeing that libraries can effectively protect their collections, maintain services, and support their communities during and after a disaster.

Investment in Technology and Infrastructure

Investment in technology and infrastructure is crucial for enhancing disaster preparedness and management in academic libraries (Pribadi et al., 2021). Such investments help to protect valuable resources, and maintain the continuity of services, and the safety of patrons and staff. Ensuring buildings are equipped to handle disasters, e.g., fire suppression systems, and waterproofing, and investing in cybersecurity measures can mitigate the impact of both physical and digital threats. Investing in digital collections and securing off-site backups preserve important resources that can also be restored quickly in case of physical damage (Taylor, 2021). The use of cloud storage solutions for digital records and collections can provide an additional layer of security and accessibility even if local servers are compromised. In addition, investing in partnerships with data recovery specialists guarantees that critical data can be retrieved quickly in case of system failures or cyber-attacks (Beattie & Shandrowski, 2021). Implementing redundant servers and backup power supplies can also help maintain operations during power outages or hardware failures. Installing sensors to detect water leaks, smoke, and other environmental hazards can enable prompt response and mitigate damage (Lv et al., 2020). Moreover, ensuring adequate insurance coverage for physical and digital assets can provide financial protection and support recovery efforts (Mosteanu et al., 2020).

Training and Awareness on Disaster Preparedness and Management

Training and awareness are critical components of disaster preparedness and management in academic libraries. Regular training staff on disaster preparedness and response procedures and raising awareness about potential risks can improve the effectiveness of the initial response and minimize damage (Kong et al., 2020; Shah et al., 2020). Training programmes ensure that library staff, patrons, and stakeholders are well-prepared to respond to emergencies. Regular workshops and drills assist staff and patrons in familiarising themselves with emergency procedures, evacuation routes, and the use of emergency equipment. The library can also offer specialised training sessions on disaster-specific topics such as fire safety, flood response, handling hazardous materials, use of technology, and tools related to disaster management (Rosen et al., 2023). Experts from emergency services may be invited to facilitate these workshops. Patrons may be taught during the orientation sessions where tours of emergency exit, assembly points, and location of emergency equipment like fire extinguishers and first aid kits are done. Educational materials such as brochures, posters, and digital content that highlight emergency procedures, contact information, and tips for staying safe during different types of disasters may be developed and distributed (Ferrere & Maniscalco, 2023). In addition, there should be a feedback mechanism to gather input from staff and patrons after drills, training sessions, and actual emergencies to identify areas for improvement and update the disaster preparedness and management plan (Flaherty, 2023). It is also important to update the plan based on changes in the library's infrastructure, new technology, and evolving best practices (Pribadi et al., 2021). Leadership commitment to disaster preparedness can be shown through participating in training and awareness programmes and allocating resources and support for ongoing training and preparedness initiatives.

Limitations of the Study

The study concentrated on disasters experienced in academic libraries only and other libraries might have experienced disasters but were not part of this study. Also, only five databases were used for this study, and other useful studies might be available in databases that were not consulted. Due to the language barriers, the authors

only used articles written in the English language, and articles in other languages might be relevant but could not be used in this study.

Conclusion and Implications for Further Research

The systematic review was done to document the disaster preparedness and management practices employed by academic libraries in different parts of the world. A search string was used to guide the searches from Emerald, Sage, Scopus, Web of Science, and Google Scholar. The findings revealed that academic libraries around the world face various types of disasters including fire, floods, earthquakes, pandemics, and other man-made incidents, which emphasize the need for robust disaster preparedness and management practices. It was noted that the key elements of disaster preparedness and management include risk assessment, emergency response planning, staff training, collection protection, digital preservation, backup and recovery, collaboration and partnerships, and communication and outreach. These practices are crucial for safeguarding valuable resources and ensuring the continuity of library services in the event of natural or man-made disasters. Academic libraries should protect their collections, ensure the safety of staff, and minimize disruptions to services in the face of disasters by implementing disaster preparedness and management practices. There is a need to implement comprehensive disaster preparedness and management strategies to address the diverse disasters that are experienced by academic libraries. Risk assessment would help to regularly assess potential hazards and vulnerabilities. Therefore, academic libraries should be intentional in preparing for and managing disasters by developing and maintaining a detailed disaster preparedness and response plan that is up to date. In addition, training should be taken seriously where library staff and users are trained on emergency procedures and conduct drills. Infrastructure improvements would ensure that buildings are well protected with appropriate safety and security systems in place. Emergency supplies should always be available by maintaining a stock of protective materials for collections. Academic libraries with digital collections should regularly back up digital collections and data. Finally, collaboration and establishing partnerships with local emergency services, other libraries, and professional organisations for support and resource sharing would minimize the effects of disasters in academic libraries. More studies can be done on how academic libraries are preparing for disasters and how they have been managing the disasters that they experienced. It is also important to study if library and information science (LIS) schools are offering modules on disaster preparedness and management to educate LIS learners who are in the workforce who would work in academic libraries.

Acknowledgments

This paper is an output from the writing retreat organized by the College of Graduate Studies (22-26 July 2024) at the University of South Africa.

Funding Sources

The research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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Appendix A. PRISMA Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	1-2
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	2
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	2
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	3; Table 1
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	3
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	2
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	3
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	3
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	3
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	3; Appendix B
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	N/A
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	4