

Evidence of Open Science Principles in Library Disaster Management: The Malaysian Academic Library Experience

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ABSTRACT

Many institutions struggle to create effective preparedness, response, recovery, and mitigation plans despite the significance of disaster management in libraries. Open science offers potential solutions to these issues by providing libraries with access to real-time data, information, and best practices, as well as collaboration and knowledge-sharing opportunities. However, it is necessary to investigate how open science can be incorporated into library disaster management practices and to identify the potential benefits and obstacles of this approach. This paper explores how open science principles can be used to improve library disaster management. This paper presents qualitative findings from multiple case studies of academic libraries in Malaysia. Individual semi-structured interviews with library leaders and focus group discussions with librarians were used to collect empirical data from a targeted sample of respondents. Afterwards, the data were analyzed using thematic analysis. Academic libraries in Malaysia are perceived to have a strategy and their own plans to respond to a disaster crisis, but they lack a formal disaster management plan. The data findings also demonstrate how open science can assist libraries in gaining access to real-time data and information about disasters, in sharing their experiences with others, and in responding effectively to emergencies. The result of the study will be a greater understanding of how open science has been utilized in library disaster management, as well as recommendations for how libraries can integrate open science principles into their disaster management practices.

Keywords: Library Disaster Management, Open Science, Library Services, Library Policy

INTRODUCTION

Library Disaster Management

An unexpected event or incident can be defined as a disaster if it happens either suddenly or gradually, resulting in undesirable repercussions. These unpleasant consequences can include the loss of life and substantial detrimental effects on people, the environment, and property. Natural occurrences such as earthquakes, floods, droughts, storms, volcanic eruptions, and

human activity such as industrial accidents, wars, armed conflicts, and pollution can all be potential causes of natural disasters (Alajmi 2016; Braman, Suarez, and van Aalst 2010; Galbusera, Cardarilli, and Giannopoulos 2021; Harris 2021; Ilo, Nwachukwu, and Izuagbe 2020; Welsh and Higgins 2009; Winston and Quinn 2005). A disruptive event that impacts the operations of the community and the affairs of the state is meant to be understood as a disaster, as stated by the definition supplied by the National Security Council Directive (NSC) No. 20 (Majlis Keselamatan Negara 1997) . It entails the loss of lives, the destruction and damage to property, economic setbacks, and ecological devastation that are more than the community's power to cope, necessitating enormous efforts to mobilize resources. This is because the community's capacity to cope is exceeded.

From the library's perspective, the term "disaster" refers to any occurrence or incident that impedes or threatens to bring to a halt the activities and services provided by a library (Braman, Suarez, and van Aalst 2010; Ghosh 2013). These kinds of occurrences can take many forms, such as fires, floods, earthquakes, the theft of information resources, attacks over the internet (computer hacking), among others. The continuity of library services can be negatively impacted, library functions can be disrupted, operations can be suspended, considerable damage can be caused to the infrastructure of the library, collections can be destroyed, and facilities can be rendered inoperable when disasters strike (Cowell 2020; Galbusera, Cardarilli, and Giannopoulos 2021; Koscieljew 2020; Cervone 2006; Fani and Subriadi 2019). For example, the COVID-19 pandemic that occurred in the year 2020 caused the loss of millions of lives (Alabdulmonem, Shariq, and Rasheed 2020; Shah et al. 2020) and forced libraries to totally cease their physical operations, which caused chaos in the field of library services (International Federation of Librarians and Institutions (IFLA) 2020). In a similar vein, a significant flood struck multiple states in Malaysia on 20 December 2021 due to heavy rain pour (Media Mulia 2021), which caused operational difficulties for the country's libraries. In these trying times, it is absolutely essential for libraries to evolve and look for different ways to serve their patrons in order to remain relevant. In order to better prepare for, respond to, recover from, and mitigate the consequences of disasters, libraries need to develop comprehensive and holistic disaster management plans. These plans should include methods for preparedness, response, recovery, and mitigation (Clark and Guiffault 2018; Drabek 1985; Mulia and Programme 2004; Sylves 1994). However, the design of disaster management policies is made more difficult by the restricted access to recent research on disaster management and the poor knowledge within libraries regarding the significance of producing disaster management documentation. The participation of libraries in the idea of open science presents a potential solution to this problem. By giving libraries access to real-time data, information, and best practices, as well as chances for collaboration and the exchange of knowledge between libraries and academics, open science presents a potential answer to this problem. This highlights the essential requirement for teamwork, transparency, and the free exchange of scientific knowledge in order to effectively solve such situations.

Enhancing Open Science principles in Library

The term "open science" refers to a movement that is focused at increasing the accessibility, transparency, and reproducibility of scientific research and data. Open science, which

promotes unrestricted access to scientific information, open data, and the results of research (Camkin et al. 2022; Frederick 2016; Gallagher et al. 2019; Ignat and Ayris 2021), is an essential component in ensuring prompt and well-coordinated responses in the event of a any kind of disaster. Even under the most trying of circumstances, libraries, which are bastions of knowledge and information, continue to serve an essential role in assisting individuals, researchers, and students. Libraries, researchers, governments, and communities can collaborate to lessen the effects of disasters and improve their level of preparedness by adhering to the tenets of open science and embracing its guiding principles (Camkin et al. 2022). The United Nations Educational, Scientific, and Cultural Organisation (UNESCO) issued a recommendation on open science in November 2021. According to the diagram below, this recommendation establishes a universal notion of open science together with established standards and a recognized set of values and principles.

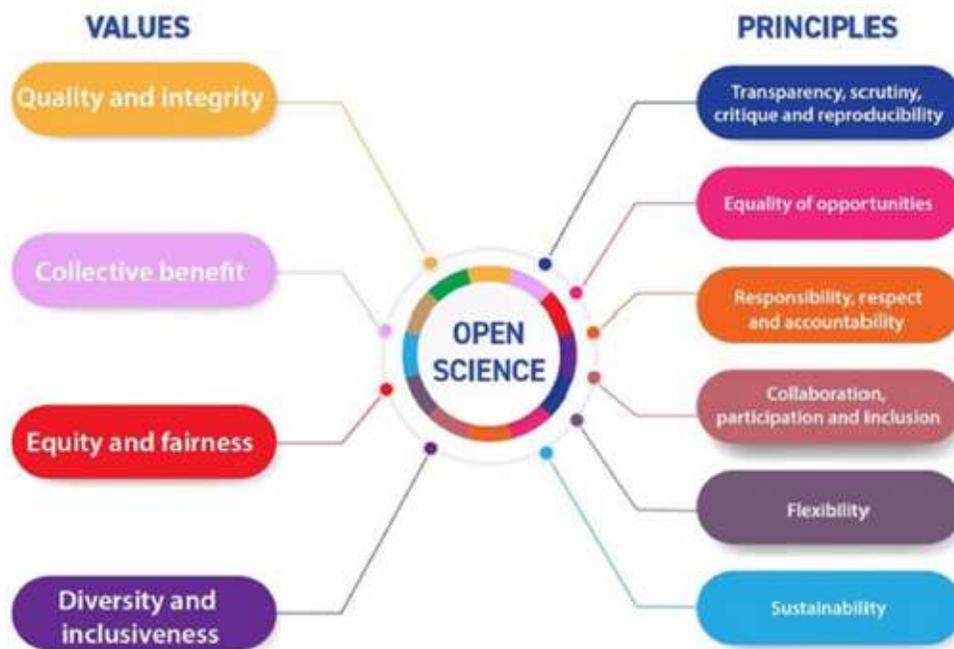


Figure 1: Values and Principles of Open Science (Sources : UNESCO (2022))

Open science principles can be applied to library disaster management to enhance the quality and accessibility of research and information, as recommended by UNESCO (2022). Here are some examples of how principles of open science can be applied: (1) Open Access: Making research publications and data freely available to the public without restrictions (SAMHSA 2022). (2.) Open Data: Sharing research data in a standardized format to enable other researchers to reproduce and build upon findings (Jillson et al. 2019). (3) Open Source: Sharing research software and tools, as well as the underlying source code, to enable others to modify and improve them (Jillson et al. 2019). (4). Open Education: Sharing educational resources and materials to improve access to scientific knowledge and skills(Santos-Hermosa and Atenas 2022). (5.) Open Reproducibility: Making research results and findings easily reproducible and replicable by other researchers (Edition 2014). (6.) Open Collaboration:

Encouraging collaboration and knowledge sharing among researchers, institutions, and organizations to accelerate scientific progress (Kennedy and Ruttenberg 2017) (7.) Open Access to Research Infrastructure: Making research infrastructure, such as scientific equipment, software tools, and data repositories, openly accessible and available for use by the scientific community (Karlstrøm and Heggland 2018).

The objective of this study is to examine disaster management in academic libraries and the applicability of open science principles to disaster management. This study focuses on the library disaster management cycle and the application of open science principles in disaster management by Malaysian academic libraries.

LITERATURE REVIEW

Disaster Management in Libraries

Academic literature contains a variety of definitions of disasters, each of which can be understood to mean something slightly different. The concept of cause and effect underpins each of these concepts. According to research conducted by the United Nations Office for Disaster Risk Reduction (UNISDR 2009), natural disasters are brought on by the simultaneous occurrence of a number of elements, the most important of which are exposure to hazards, susceptibility to damage, and a lack of preparedness for potential outcomes. Whereas a plan for dealing with and managing the consequences of a disaster is outlined in a document known as a Disaster Management Plan. The development of this document has been made possible via the combined efforts of many government and non-government organizations. The primary purpose is to decrease the number of lives lost in the impacted area by bringing relief supplies to those in need as quickly as possible. The overall objective of disaster management is to reduce the detrimental effects that natural catastrophes have on individuals and the communities in which they live (Chiderah and Iroeze 2021; Matthews and Eden 1996; Wong and Green 2007). Although there are many studies on disaster management plans or emergency plans in various fields of social sciences that have been conducted around the world, only a few studies that have been published in the literature address disaster management in libraries.

It was evident that libraries did not have access to all of the essential resources, especially in the event of a disaster such as a pandemic crisis; the transition from the physical to the online delivery of information services faced a number of critical barriers that needed to be overcome (Rafiq et al. 2021). Studies conducted by Wang & Lund, (2020) discovered that disaster response planning tends to be extremely advantageous in quick reaction enactment. These findings imply that the efforts made by libraries in preparing for emergencies are an important component of disaster management. The study investigates the collaboration that takes place between public libraries and governmental organizations. It highlights the potential for public libraries to play an important part in the emergency response teams that are located within their respective communities. Libraries and the librarians play an important part in the prevention and reduction of damage caused by disasters because of the responsibilities they play as institutional supporters, collection managers, information

disseminators, and internal planners. According to (Chisita 2020), libraries serve vital roles in society by acting as partners with the government, advocates for the community, educators, trainers, and promoters of the information community. In addition, the importance of libraries and librarians in times of crisis was emphasized, as was the role of librarians in promoting the distribution of high-quality reading material, preventing the spread of inaccurate information, and encouraging people to read when they are by themselves (Rafiq et al. 2021). The chat reference services and online infrastructure enables libraries to continue instruction and dissemination of factual information during pandemic closures, providing a feeling of normalcy and community to those who have been impacted by the pandemic (Wang and Lund 2020). It turns out that planning for disaster response can be quite useful when it comes to the execution of swift reaction, which shows that the efforts made by libraries in planning for disaster are an important component of disaster management.

As a country with a low rate of natural disasters, Malaysia must now be more vigilant against all types of disasters that can permanently disrupt library services. It is common knowledge that the library is a repository of knowledge and a resource for all information and references in any field. When a significant disaster, such as the Covid-19 pandemic, occurs, the physical operation of library services is completely shut down, rendering various services inaccessible to users. For instance, book loans, research consultations in person, reference services, and information literacy programs cannot be implemented. There have been many different views addressing the role of libraries in providing information and online support services during pandemic crises in literature (Ali and Gatiti 2020; Chisita 2020; Wang and Lund 2020; Rafiq et al. 2021). In response to the closure of physical libraries, digital libraries have become increasingly active in the provision of online information and support services to their user base in order to facilitate learning. According to Chisita (2020), public libraries have the potential to play an essential part by increasing their capacity to distribute knowledge to the general public, which in turn enables citizens to adopt preventative actions against COVID-19. Libraries raise people's awareness of health issues by producing new information and disseminating it to local communities through the use of their social media platforms, webinar programs, and a dedicated section of their websites devoted to the pandemic problem.

Mohd Khalid and Dol, (2015) revealed that 47.1% of Malaysia's academic libraries do not have a library disaster management plan and 58.8% do not have allocation for library disaster planning. They suggested for further research that can be done by other researchers is on: (i) the issues of developing disaster management plan policy, (ii) why academic libraries do not have written disaster management plan and (iii) the need to discover library disaster response and recovery among academic libraries in Malaysia. It is therefore considered timely to investigate Malaysian academic libraries preparedness, response, recovery, and mitigation plans in handling a disaster, no matter what type. The literature reviewed reveals that there are not many scholarly articles on disaster management among academic libraries. There is a need to develop formal policies or guidelines and identify open science practices among academic libraries which are scarce and limit access to scientific information, data and research results that can assist in dealing with any future disaster.

Application of Open Science in library disaster management

The principles of open science defined by UNESCO(2022) can be used as a foundation for the holistic and sustainable development or provision of disaster management in libraries. The movement towards openly accessible research data presents a transformative opportunity for libraries to significantly enhance their role in the academic environment. Moreover, in the realm of disaster management, libraries can play a crucial role by serving as invaluable informational hubs. By leveraging their resources and expertise, libraries can provide essential data for disaster prediction, response, and recovery efforts (Frederick 2016). For example, according to a study by Ozcan & Saritas (2022), during Hurricane Sandy in 2012, social media platforms were used to support traditional disaster response mechanisms. Geotagged Instagram photos, for instance, helped understand the location and severity of the disaster, aiding disaster response agencies in coordinating their relief efforts. The authors highlight how digital communities, social media, and mobile technologies can deliver real-time, lifesaving information, helping to develop a deeper understanding of requirements, which results in more efficient responses. The paper also delves into the role of big data analytics in disaster management, collecting crucial information and intelligence, and helping prioritize and optimize responses.

Through big data analysis that uses an open data approach and an open-source approach, libraries can encourage collective collaboration in the creation and sharing of data, which ultimately contributes to disaster management operations (Giustini et al. 2021). In order to extend their repository collection to the general public in the event of a disaster or calamity, libraries can incorporate open access policies into their disaster management plans. This will allow the general public to access the most recent information and data regarding a disaster via the library database or library repository. Libraries provide useful resources and guidance to help academics make their scholarly products open access and freely accessible to a wider audience. By providing a wide range of support services and programmes aimed at increasing awareness and encouraging active engagement among researchers, libraries play a crucial role in enabling open science. These services cover a variety of open science-related topics, including scholarly communications, open access, and open data (Borghi et al., n.d.).

Most libraries provide their patrons with a wide range of research facilities, as well as subscriptions to various types of research software, for their convenience. There is a possibility that non-members will be allowed access to these facilities in the event of a natural disaster. It is available for usage by researchers as well as anyone else who requires the utilization of software or research tools for the purpose of conducting research or modifying and improving an existing study. In times of crisis, libraries serve as vital information hubs, offering refuge and access to real-time data. They can collaborate with disaster response agencies, government organizations, and community stakeholders to disseminate up-to-date information about evacuation routes, emergency shelters, medical services, and other critical resources. Libraries can leverage their infrastructure to provide internet access, charging stations, and communication facilities, ensuring that affected individuals can stay connected and informed (Young 2018).

RESEARCH DESIGN

Population and Sample

The study's population under consideration are all public university libraries in Malaysia. An initial investigation into the practices and involvement of university libraries in disaster management, the sample was limited to five libraries that were actively involved in disaster management and who had agreed to participate. The informants under study are library managers who have the power in decision making and are involved in developing library policies related to risk management or disaster management. After designing the research questionnaire and considering the geographical location of each academic library in Malaysia, five (5) academic libraries were selected to participate in this study. These five universities libraries are Universiti Kebangsaan Malaysia (UKM); Universiti Sains Malaysia (USM), Universiti Teknikal Malaysia (UTeM), Universiti Teknologi MARA Malaysia (UiTM) and Universiti Malaysia Kelantan (UMK). All five university libraries are involved in projects focusing on their experience in related disasters, development of policy and guidelines; role and awareness of the importance of having disaster management plans. The study adopts a qualitative approach using an interview method to collect data from library managers at all five Malaysian public academic libraries.

Ethical consideration

Data collection was from March 2023 – April 2023 using a face to face interview method. The interview protocols and form was designed to collect informant's consent. A total of five (5) interview sessions were conducted. Thematic coding was used to analyze qualitative data. To protect the identity, subsequently each university library will be labeled as Lib1, Lib2, Lib3, Lib4 and Lib5 respectively whereas for the informant it will be labeled as INF1, INF2, INF3, INF4 and INF5.

Instrument

This study's interview protocol was devised and implemented to collect information and insights regarding the library's disaster management guidelines, policies, services and applying open science initiatives. The objective is to acquire a thorough understanding of how the library responds to emergencies and disasters, as well as how it extends its services to patrons during such occurrences. During the interview, participants were first asked whether they had personally experienced or encountered a library emergency or disaster, then the researcher expanded the question to open science practices practiced or implemented by the library.

RESULTS

Malaysian AL preparedness , response, recovery and mitigation in events of a disaster

In-depth interviews with AL managers to obtain information on how libraries prepare in the face of any disaster revealed various interesting findings. Library managers in Malaysian academic library shared their experiences in dealing with disasters such as major floods (Lib5),

Fire (Lib1), fungus / fungus attacks (Lib1, Lib2, Lib3, Lib4, Lib5), electronic interference (Lib3 and Lib4), library roof leakage (L Lib2, Lib3,) and health disaster (pandemic covid-19) (Lib1, Lib2, Lib3, Lib4, Lib5). Although leakage on the library roof (Lib2 and Lib5) is not suitable to be defined as a disaster, however, if it is not repaired and timely appropriate action is taken, it can become a major disaster such as damage to the library's furniture, equipment and collection and harm people if the roof collapses.

Table 1: Malaysian Public Academic Library with disaster experience

Library/Type of Disaster	Lib 1	Lib 2	Lib 3	Lib 4	Lib 5
Floods					√
Fire /	√				
Earthquakes					
Fungus / fungus attacks		√	√		
Electronic interference	√		√		
Library roof leakage		√			√
Pandemic Covid-19	√	√	√	√	√

Through interviews, it was determined that academic libraries in Malaysia follow four fundamental cycles (preparedness, response, recovery and mitigation) when dealing with a disaster, despite the fact that almost all academic libraries lack disaster management guidelines. As mentioned by INF1, Lib1 does not yet have a disaster management policy, but risks such as fire and other risks are placed under the risk management policy. The management plans to make a disaster management plan in the future, especially in the event of a landslide, to determine the actions that need to be taken. For pandemic disasters, it was placed under risk management policy. Same like Lib4, the library has policies related to Library Risk Management and also adheres to ISO (International Organization for Standardization) compliance documents, but there is no specific policy for disaster management. While for Lib2, they do not have a specific policy, but focuses more on collection policies and library services. Meanwhile Lib3 does not have a risk management plan or disaster management in general, but has a risk policy on book loss and related to library services. For disasters such as fire, the library merely follows the University's OSHA (Occupational Safety and Health Administration Committee) guidelines.

Disaster Management Cycle

(a) AL Preparedness

Preparedness in the face of a disaster is very important for libraries to reduce the risk of damage to their collections, facilities, and services. To prepare for the possibility of a fire catastrophe, Lib1 has planned at least two fire drills per year. According to INF1, in the event of a fire, a level-appropriate incident officer will instruct users to adhere to the predetermined instructions to prevent accidents, injuries, or fatalities. The Information Technology Office provides staff and students with guidance and information regarding the risk of cyber-attacks through the distribution of posters, emails, etc. in the event of disasters such as cyber-attacks.

While for Lib2, the library uses the medium of email to inform users of the guidelines that need to be followed throughout the pandemic crisis, the guidelines are also pasted in the elevator, toilets, notice boards, and other places that are easily seen by staff and other users.

According to INF2, *"If the risk suddenly comes back, we are already aware of it. I think if COVID comes, the procedure is ready, and we won't be surprised anymore, right?"*. Likewise, with Lib4 and Lib5, they use SOPs that have been re-adjusted based on the University's master SOPs to deal with the Covid-19 pandemic. According to INF4 *"...we have never announced that our services are closed (during covid-19), because we are ready with digital library services"*. Likewise with INF5, he stated *"It's just a coincidence that people say that in this library there are some things that we have done before the MCO, for example we are used to doing it online so we don't feel very strange (to provide services online when the library need to shut down the physical services)... (then) in 2021 we have released another procedure which is that we will quarantine all books whether they arrive by hand or by post"*. As for flood disasters, Lib. 5 has a disaster management policy. According to INF 5, *"in October and November the library's response team will be activated, so we will have 1 group that does cover that thing, to provide information at all times, whether it rains, the water rises or not... we will raise books, electrical equipment, we will turn off all the lower ones, stored... in October we will remove 2 or 3 lower shelves and we will keep them"*.

(b) AL Response

When a disaster occurs, libraries must respond effectively and swiftly. It is to minimize damage, expedite the recovery process, and ensure library services are restored as soon as possible in order to effectively serve the community. According to interviews conducted at five academic libraries, the average library has a response activity plan to deal with disasters such as fire, flood, the Covid-19 pandemic, and other events caused by human error. For instance, when there is a flood in Lib5, the response team will be activated automatically. This response team will always provide information, whether it rains, the water rises or not and so on.

According to INF5, *"We continue to work, no off duty ... in a disaster situation we come to work to clean the building, we come to clear what we can save, we save first. Three to four staff will be on standby, we want to see how bad the condition of water level is because of floods because we are worried about other things, the important things are still there"*. The staff who came to the library continued to take immediate action by rescuing equipment such as computers, TVs, and other equipment that were on level one and taken to level two. That is the most immediate initial step that staff can take to reduce destruction. The fire disaster that occurred in Lib1 did not result in extensive destruction and damage because fire-extinguishing equipment, such as water sprinklers, functioned properly and put out the blaze. In contrast, Lib1 officers promptly reported the incident to the university's risk and security unit and filed a police report.

In response to the COVID-19 pandemic, the National Security Council has ordered the closure of all non essential services. Some libraries quickly offer and consolidate online or digital library services following the discontinuation of physical services. According to INF2, *"at the*

time of MCO (Covid-19), our first action was to close the library. And then all our services were done online; book loans were through the staff, so if a student wanted to borrow a book, they had to fill out an online form so the staff would search, and then we would call the student to come and pick it up...". The same goes for Lib5, according to INF5, *We follow the instructions from the government ... so we take caution and issue an advance notice to all the students that we will shut down (physical services). For the time of the pandemic, we have a machine to make face shields, which can contribute to society. Combine several faculties; there is a faculty to make sanitizer and a face shield with PPE".* While in Lib1 during the beginning of the COVID-19 outbreak, the situation was a bit chaotic, and most of the officers were a bit nervous with the situation where there was still no determination to continue operations or close down physical operations.

According to INF 1, *"when the university management ordered all departments to close physical operations, only then did the library management think about how to work..., how to provide services for outsiders, so we asked the management. Go to work as scheduled, get materials, and return. Finally, we also created a postal service, and the service has run until now".* Slightly different from the response from Lib3 to face the Covid-19 pandemic disaster. Lib3 is a little slow to respond in making sure they service their users (during pandemic crisis). According to INF3, *"When there's a lockdown, we really don't have any preparations, things are sudden, right... We close for 2 weeks (lockdown/MCO). So, after 2 weeks, it's continued and continued, we follow. We will follow university SOP or guidelines. At that time there was a university crisis committee that was authorized to conduct adjustments to deal with this pandemic, so we joined the committee. (if) They issued a circular saying that students can enter (into the campus)..we will let them in..if the committee doesn't allow..we won't let them in. I think the library acted after that.. almost a month or so. Only then do we act before we think about our service".*

(c) AL Recovery

In the aftermath of the flood disaster, one of the things that academic libraries do to begin the process of recovery is to carry out cleaning operations and determine the degree to which the library building can once again be utilized without risk. According to INF5, when the water had subsided and it was safe to enter the library building, the condition inside the library was very poor and severe because the library floor was filled with thick mud in addition to a lot of waste. The condition inside the library was very bad and harsh because the library floor was filled with thick mud and a lot of junk. As a first step in the recovery process following the flood disaster, a community work crew was assigned to the library's cleaning duties. In terms of services, when a flood occurs that prevents users from coming to the library, Lib5 activates fully online services and carries out aggressive promotions so that library users can continue to use the various services that have been provided online, such as access to electronic resources (e-books, online databases, etc.), as well as consulting and reference services. This allows users to continue to make use of the library's extensive collection of resources that have been made available online.

For the incident with the leaking roof that resulted in damage being done to the library collection, Lib2 was allocated a special budget to replace the roof, but they were unable to

use it because of other financial reasons. According to INF2, the condition of the roof of the library has severely deteriorated, which has led to an even more serious problem, which is an attack by fungi on the book collection of the library. Because of this, the Infrastructure department has produced a special instrument to control or reduce the damage caused by fungi attack, but it does not function very well. As a direct consequence of this issue, the management was compelled to fork over thousand in order to purchase a substantial humidifier *"we spent some money to put in a sizeable dehumidifier so that there is a special software for the dehumidifier that absorbs it so that it can be controlled the fungi attack"*.

During the recovery activity or process in disaster management due to the COVID-19 pandemic outbreak, all academic libraries involved have the same goal of restoring services or re-operating. This collective action includes various activities aimed at ensuring the safety and well-being of library staff, users, and society. The collective efforts of all libraries in implementing this recovery response play an important role in creating a safe and effective environment for library users. The following are some of the actions that are carried out during recovering process: (1) Sanitizing Equipment and Hardware, (2) Social Distancing Measures, (3) Temperature Check, (4) Face Mask Requirements, (5) Adherence to National Security Council Guidelines, (6) Communication and Public Awareness, (7) Embracing Work from Home and Work from Office practices. Libraries navigated through unprecedented challenges, continuing to serve their communities during difficult times. As the recovery activities unfold, libraries remain committed to balancing the benefits of remote work with the invaluable connections formed through in-person interactions, ensuring that their services are accessible, inclusive, and responsive to the ever-evolving needs of their patrons.

(d) AL Mitigation

All of the libraries in this study have a plan for mitigating disasters in their libraries focused on mitigating their effects and averting their occurrence. This plan includes measures such as regular inspections and maintenance of library buildings to identify and address potential hazards, installing fire suppression systems, implementing proper storage and shelf arrangements to minimize the risk of damage to collections, developing emergency response protocols and training staff on how to respond to different types of disasters, and establishing a disaster communication network to ensure effective communication during emergency situations. According to INF 1, *"Since the fire incident in the library, I, as the chair of the risk committee, have taken action by monitoring electrical items in the library, even though they are not included in the library's risk register. I monitor all units that have this electronic equipment and make sure that the officer in charge closes all of these devices when not in use. (While) Incident officers at each level will periodically check fire extinguishers"*.

Meanwhile, INF2 said, *"In order to avoid damage due to the library's roof leaking onto the library's collection, we cover our shelves with plastic, so that thing becomes like a control. Even though we are not near there, we have already protected our collection. If a wall is damp, for instance, the infrastructure department staff will paint the damp wall to prevent fungus, which we specifically identified for the media section that has microfilm, from attacking the library collection"*.

For the flood disaster that occurred in Lib5, the library already has a mitigation plan to reduce the effects of damage to their collection, furniture and equipment. According to INF5 *"The flood was very big at that time. If we see the initial effects, we know the level of the flood. It is true that half of the building (library) is lost, but the management has taken control and prevention measures to reduce the effects of the flood disaster"*. Since 2007, the territory surrounding the university has experienced flooding, according to the source. Although floods are expected to occur annually, they did not have a significant impact on the library's equipment and collections because the library was prepared and followed the established procedures. Typically, in October of each year, the library will remove three spaces from each shelf and store the affected collection on the upper floor, while the lending of the book collection will be suspended for one to two months, depending on the weather and flood conditions. Regarding electronic equipment, staff will transport all electronic equipment to the second floor of the library building. In addition, Lib3 has changed the flooring from wood to stone to make it more durable and simpler to clean in the event of a flood. Similarly, most of the furniture has been substituted with iron, a resilient material that can be used during natural disasters.

All academic libraries have developed emergency response protocols for pandemic-related disasters based on National Security Council, local government, and university-mandated guidelines and standard operating procedures. According to INF 1, the informant was directly involved in developing guidelines to deal with the Covid-19 pandemic. Every modification based on the most recent directives from MKN will be presented at the department chief meeting. Guidelines and SOPs pertaining to this pandemic are posted inside and outside the library so that staff and patrons are aware of all changes and adhere to the SOPs...*"If it occurs again, we may be able to manage it, as there are phase-by-phase guidelines. Perhaps we simply revise it. We already know what we will do because we've already done it."* Likewise with the statement from INF2...*"I think if covid-19 happens again, the procedure is ready, we won't be surprised anymore right"*.

Application of Open Science Principles in Malaysian Library Disaster Management

In library disaster management, an open science approach should be utilized so that valuable collections may be protected and library services can be maintained without interruption. This strategy has a strong emphasis on transparency, collaboration, and the sharing of data. It also places a strong emphasis on preparedness, response, recovery, and mitigation in an effort to lessen the effects of natural disasters and build resilience. The findings of the study also demonstrate how open science enables libraries to obtain access to real-time data and information regarding disasters, as well as share their experiences in dealing with the aftermath of disasters with other libraries. It was discovered that almost all the informants intended to directly or indirectly adopt open science principles in their libraries. However, there are challenges in applying this initiative. As mentioned by INF 4, *"we want to start with open science... We want to reveal aspects of the library but our staff cannot differentiate between technology and the role of the library itself... it is one of our efforts to strengthen our services towards the vision and mission university"*. According to INF5, *"we present an open science initiative to the management, so we want to go in that direction; it's just that in Malaysia the problem is that our mentality is not open yet, in (the international community)*

overseas it's okay." Although library managers have a limited understanding of open science, it has been found that aspects of open science principles have emerged indirectly as a result of the sharing that took place during the crisis. This is shown by the table presented below.

Table 2: Implementation / Application of Open Science Principles at Malaysian Public Academic Library

Open Science Principle / Lib	Library	Initiative
Open Access to Research Infrastructure	Lib5	Users from any university can access the subscription database and other research facilities provided in-house by the library.
Open Collaboration	Lib1	Collaboration with the Information Technology Centre for the organization of a discourse or webinar programme
	Lib4	The library has mobilized efforts to establish network relationships with strategic partners, such as the faculty and external organizations, by holding teaching collaborations, research writing collaborations, and organizing international seminars.
	Lib5	presently planning various modes of collaboration between public university libraries.
Open Data	Lib2	All research data are compiled by the university; if researchers from other organizations require university research data, they will consult the library. Additionally, the library collaborates with the ICT department, which has created a database similar to the current e-publication for retrieving research data.
	Lib5	Library would like for people to be able to track their research development, and at the end of their research, the data can be used immediately.

DISCUSSION

The findings of the study indicate that academic libraries in Malaysia do not have their own policies or guidelines that are particularly applicable to any disaster, since they define or classify the disaster in the risk management document. Most disaster-related policies or guidelines in libraries refer to their respective parent organizations. Certain clauses, selected according to the suitability and needs of the library, will be added as sub-items to the university's risk policy based on interviews with all informants. Regarding disasters caused by the COVID-19 pandemic, policies or guidelines related to disaster management, and safety measures to prevent the spread of the COVID-19 virus, each library will first adhere to the guidelines established by the National Security Council (MKN), the Ministry of Health Malaysia (Ministry of Health), the State Health and Safety Committee, and the University-level Committee. However, the library is seen as providing input and collaborates to think about

what is best to implement during the covid-19 crisis period. The creation of collaborative networks that bring together libraries, parent organizations and other stakeholders to share information and work together to develop effective disaster management strategies is one of the principles of open science. In addition, libraries serve as vital information centers in times of crisis, offering refugees access to real-time data. They can collaborate with disaster response agencies, government organizations, and community stakeholders to disseminate current information regarding evacuation routes, emergency shelters, medical services, and other essential resources (Young 2018). The infrastructure of libraries can be utilized to provide internet access, and communication facilities to ensure that affected individuals remain connected and informed. For example, according to one of the study's informants, during the post-covid period, library staff were involved as volunteers in giving vaccines to the community and also jointly made face shields and distributed them to the community as a form of collaboration with other stakeholders.

Changes in providing new standards for library services and administration are a significant obstacle for libraries in addressing this pandemic crisis. A suitable contingency plan is required for future crises of this nature. In the future, these modifications will make the service transformation process more applicable and functional in any circumstance. The results of interviews with library administrators and also librarians through a focus group discussion revealed how academic libraries extend/change their public service policies in response to the effects of natural disasters and the Covid-19 pandemic. Despite this, academic libraries must plan and establish a more detailed disaster management policy based on past disaster management experience as a guide for the future. It is crucial that library services and operations can continue and be provided as soon as possible, as libraries are central locations where the public can obtain trustworthy information. 78% of respondents believe that libraries assist them in finding credible and trustworthy information, as indicated by a survey conducted in 2017 by the Pew Research Centre (Horrigan 2017). It was found in this research that libraries always provide information relevant to infodemic either current research on covid-19, real-time data about pandemic in countries, etc., and this information was fed either through the library's website or through chat services.

In addition, role changes in the provision of services and facilities are more needed during disasters. Library management and librarians are seen to be very quick and agile in applying digital technology as an alternative service when physical services cannot be provided. Librarians are also seen to be very active in connecting and providing services to their users. They are also seen to be very active in organizing webinars in various fields of knowledge that are open not only to their internal users but also open to the public. The organization of these numerous webinars is also carried out in partnership with a variety of parties, which provides the library with an opportunity to apply the concept of open education to their community (Chisita and Chizoma 2021). It enables libraries and librarians to provide more effective value-added services, particularly as facilitators, moderators, and knowledge aides, as a result of these efforts. Even when the library was physically unavailable to its patrons, the library's ability to be flexible and adaptable was the most important factor in providing seamless service to those patrons. Libraries are required to keep their websites and social media accounts up to date on a consistent basis in order to develop a platform for their user services,

which may include the most recent news services, information services that can be relied upon, virtual reference services, digital resource services, education and training services, and so on.

As a result of the interviews, it was found that the need to create disaster management policies or guidelines should be given high emphasis. Libraries should also look at opportunities to implement open science principles in the development of library disaster management policies or guidelines. Open science principles can be utilized to enhance library disaster management in several ways (UNESCO 2022; Gallagher et al. 2019; Ignat and Ayriss 2021) such as :

- (i) Data sharing and collaboration - libraries can adopt open data practices by sharing relevant information about their disaster preparedness plans, response strategies, and lessons learned from past incidents. By openly sharing this information, libraries can facilitate collaboration and knowledge exchange among institutions, enabling them to learn from each other's experiences and improve their own disaster management efforts,
- (ii) Transparent documentation - maintaining detailed documentation of their disaster management protocols, including guidelines, policies, and procedures. Transparent documentation ensures that the library's strategies are well-documented and accessible to staff members, enabling them to effectively respond to emergencies. It also facilitates knowledge transfer during staff turnover or when new employees join the library,
- (iii) Community engagement - involving library users, staff, and stakeholders in the development and review of their disaster management plans. By soliciting input, feedback, and insights from these stakeholders, libraries can ensure that their plans are inclusive, responsive, and address the specific needs and concerns of their community during disasters,
- (iv) (Open access to information - Libraries can contribute to this principle by ensuring that critical information related to disaster management is easily accessible to their users and the broader community,
- (v) Crowdsourcing and citizen science - Open source technologies allow libraries to adapt and modify tools according to their specific needs, ensuring flexibility, interoperability, and long-term sustainability,
- (vi) Open education and training - developing and sharing open educational materials, online courses, or training modules related to disaster management. These resources can be made freely available to library staff, users, and the broader community, enabling them to enhance their knowledge and skills in preparing for and responding to emergencies. By integrating these additional aspects of open science into library disaster management, libraries can enhance their preparedness, response, and recovery efforts, while fostering collaboration, knowledge sharing, and community resilience. Through this study and the experience shared by library managers it can be used as a benchmark for other libraries to use as appropriate in their libraries.

CONCLUSION

Library disaster management is a crucial component that must be taken into consideration to protect and maintain the integrity of precious information resources. It involves preparing for, reacting to, and recovering from a broad array of possible disasters that might have an effect on the library. This disaster may be natural, like flooding or earthquakes, or man-made, like fires or cyber-attack or pandemic crisis. The use or application of open science principles in disaster management guidelines is widely seen as a crucial step towards enhancing the efficacy of library disaster management practices. For instance, libraries may lead to improved preparedness via more cooperation and the sharing of information. The dissemination of research findings via open access channels enables the global library community to exchange and adopt best practices in disaster planning and recovery. As a conclusion, the exponential growth of open science, which is founded on the primary values of accessibility and transparency, presents an opportunity for libraries to build disaster management guidelines that are more comprehensive, efficient, and sustainable. The spread of open science compels libraries to rethink their traditional responsibilities and develop creative techniques to aid researchers, students, and the public in getting access to and exploiting research results even in the case of a disaster that causes physical services to be closed. It is a unique and exciting idea that the library has the potential to evolve into a thriving center of knowledge, which would allow for unrestricted access to publicly available materials for study and foster cooperation across academic lines. The integration and use of Open Science principles in the development of disaster management guidelines enhances the capacity of libraries to effectively align their services and resources with the ever-changing needs of their users. The ongoing significance of a library will be predominantly influenced by several aspects, including the extent of its collection, its dedication to open access and transparency, and its capacity to use diverse data sources for the betterment of the community during times of disaster.

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