



BUILDING RESILIENCE

TRAINING TOOLKIT

Disaster Risk Management
for Documentary Heritage and Digital Archives

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SHORT SUMMARY

Disaster risk management to safeguard archives and access to information

Today, more than half of memory institutions worldwide lack a comprehensive Disaster Risk Management (DRM) plan. This concerning situation is often due to a persisting gap in skills and resources. The lack of disaster preparedness and the accumulation of related challenges pose a threat to the preservation of unique records and their accessibility, particularly in the most vulnerable contexts.

In response to this concerning situation, UNESCO has produced a Training Toolkit covering a range of essential themes in relation to DRM for documentary heritage and digital collections, with the intention of supporting institutions which may be seeking to address this critically important subject.

The originality of the UNESCO DRM Training Toolkit lies in its practicality as a curriculum. First, it lays out a comprehensive set of six training modules covering, in turn, risk assessment, collection policies, storage management, community involvement, digital preservation, and climate change. Second, each module offers its own customized questionnaires and activity plans enabling memory institutions to practice with self-assessment. Finally, the Toolkit presents 23 informative case studies from Asia and the Pacific, offering stewards of memory institutions robust examples and scenarios from over a dozen countries.

Archivists, librarians, museum staff, educators and other related professionals are encouraged to use the Training Toolkit to develop their competences in DRM, and to potentially train their peers on mastering disaster prevention measures towards stronger resilience and long-term sustainability of their critically important heritage collections.

63

per cent of institutions surveyed reported not having a written management plan in case of emergency or disaster



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"Since wars begin in the minds of men and women it is in the minds of men and women that the defences of peace must be constructed"

BUILDING RESILIENCE

TRAINING TOOLKIT

Disaster Risk Management
for Documentary Heritage and Digital Archives

Foreword

Heritage institutions and documentary collections worldwide face increasing threats to their material integrity, from the chance effects of climate change to human-induced disasters in conflict situations. The expansion of digital archives and the challenges of digital preservation require archivists, museum professionals, heritage stewards, and librarians to adopt new tools and technologies to counter a broad range of risks, including stealthy cyberattacks.

UNESCO's Memory of the World's State of Preservation Report 2020 for South-East Asia highlights the urgent need to improve disaster preparedness to ensure the preservation and transmission of significant collections. The region's documentary heritage is diverse, encompassing ancient palm leaf manuscripts, stone inscriptions, photographs, and audiovisual collections, each with unique characteristics and preservation needs. Preventive actions are crucial in minimizing damage to valuable or irreplaceable items. Institutions in cooperation with their communities can implement these actions to ensure that South-East Asia's heritage remains accessible for future generations.

In line with the 2015 Recommendation Concerning the Preservation of, and Access to, Documentary Heritage in Digital Form, UNESCO aims to enhance local capacities in collection management, digital preservation, and disaster preparedness and recovery. In March 2023, 17 regional and international experts gathered in Bangkok for a UNESCO-organized consultation meeting on disaster risk management for heritage preservation. Topics included risk assessment, collections policies, storage management, community involvement in emergencies, digital preservation, traditional knowledge, and climate change.

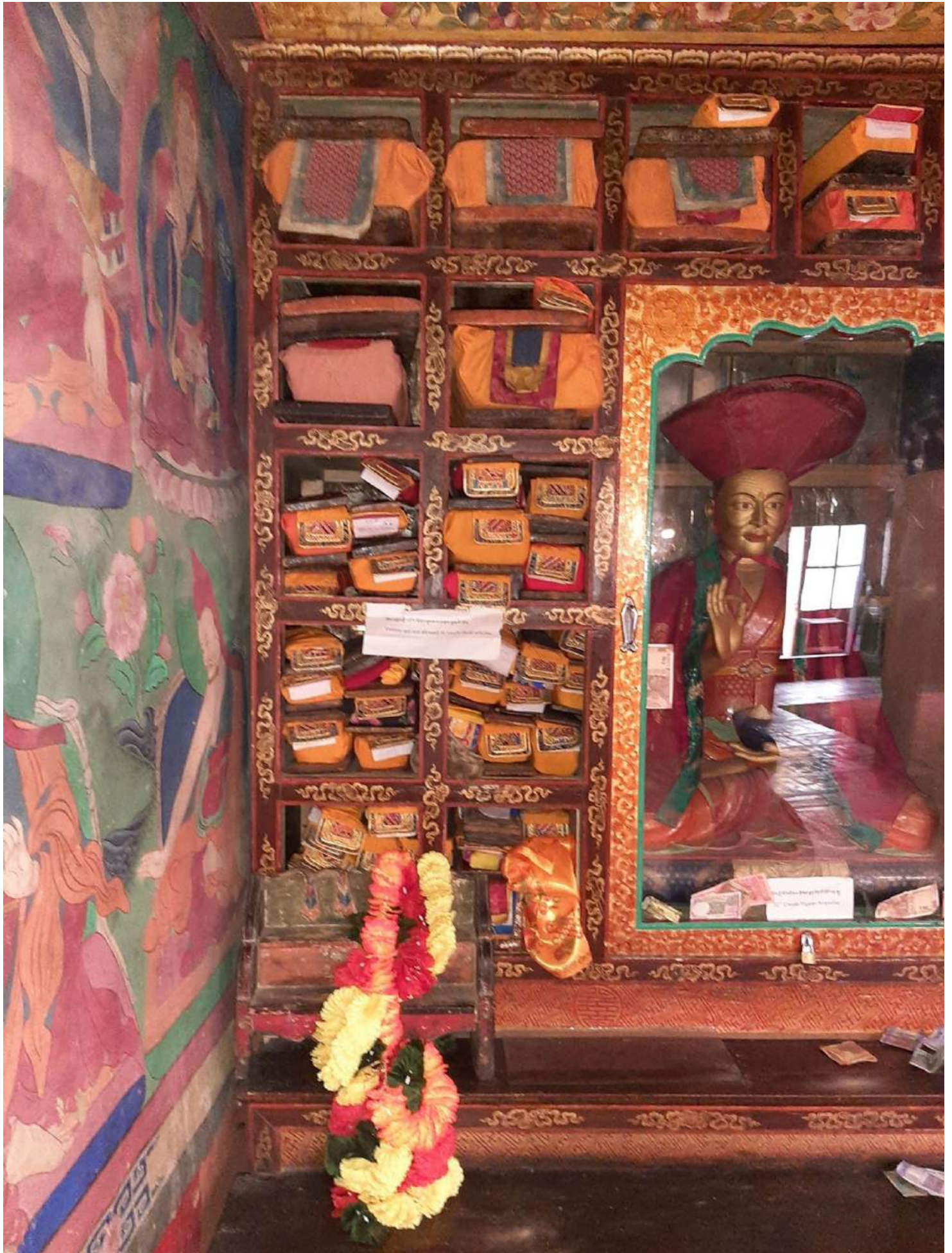
This Training Toolkit was developed in collaboration with the participating experts in that meeting. The Toolkit includes six learning modules, self-assessment tools, training exercises and case studies from Asia-Pacific. The authors are specialists within the documentary heritage and archive community from the Asia-Pacific region and Pacific Rim countries. Together, they offer firsthand perspectives and expertise on preparing for and minimizing the impacts of significant disasters.

The “Building Resilience” toolkit shares their experiences and knowledge to help colleagues strengthen their institutions’ resilience and sustain their capacities as custodians of the region’s knowledge, heritage, and culture. We emphasize real-life situations and case studies to improve the preparedness among memory institutions for potential disasters and mitigating pre-existing risks. The Toolkit also highlights the importance of local knowledge in disaster risk management (DRM), traditional solutions to environmental challenges and the need to integrate material and digital archives, as well as documentary and built heritage.

Special thanks go to the authors and editorial team, who have met our goal to produce a valuable resource that will serve many communities in Disaster Risk Management, documentary heritage and digital preservation. I also wish to acknowledge and thank Artlab Australia and the National Archives of Singapore for generously sharing their knowledge on disaster training.



Soohyun Kim
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Traditional storage space for manuscripts, Phyang Monastery, Ladakh, India © UNESCO / Achal Pandya

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Chen Yu and Yanxing Zhang contributed to her case studies.

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How to use this toolkit

As a practical modular tool, this toolkit offers training exercises that can be used in the order in which they are presented or in the order that best suits your organization's specific needs and priorities.

That said, it is advised that you begin with the self-assessment exercises in Module 1 titled '[Check Your Level](#)' and '[Your Situation](#)' to identify your organization's strengths and weaknesses. Based on this, you will be able to select the training modules and case studies that best respond to your organization's needs.

Each module begins with an introduction to a specific aspect of disaster risk management (DRM), for example 'risk assessments', and highlights common issues within that context and solutions to address them.

The various sections of the modules provide step-by-step technical guidance on particular topics, along with tips and questionnaires, and often provide links to useful resources.

The case studies illustrate disaster situations and recovery processes, and provide useful perspectives and options for overcoming challenges.

A [glossary of terms](#) can be found at the end of the publication.

Module 1

Setting the scene

As memory institutions become increasingly vulnerable to climate risks and impacts, it is important to undertake disaster risk management (DRM) planning and take action to mitigate risks. With the rise of digital technology in libraries, archives and museums, it is also important to have seamless management of physical and digital collections. In particular, it is beneficial to adopt a ‘connected approach’ in which related aspects of DRM planning are considered from the very beginning.

- 1. Why is disaster risk management so important?**
Lois M. Evans and Mary Grace Golfo-Barcelona
- 2. How to create a disaster plan**
Sanchai Chotirosseranee and Chalida Uabumrungjit
- 3. A connected approach to disaster risk management**
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Case studies

Emergency response to flooded archives in
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Mary Grace Golfo-Barcelona

The impact of the Brisbane river flood on the
State Library of Queensland
Heather Brown

Exercises

Your situation
Test your level in DRM
Evaluating the effectiveness of a DRM plan

Why is disaster risk management so important?

Lois M. Evans and Mary Grace Golfo-Barcelona

Keywords: preparation, adaptation, community, local context, networks

Introduction

Memory institutions play an integral role in helping societies understand themselves, their past and how their past impacts their future. In the face of challenges such as climate change and conflict, memory institutions (e.g. archives, heritage organizations, libraries and museums) also serve as key custodians, responsible for protecting their staff, facilities and collections, while also supporting their communities via training and awareness programmes.

The Intergovernmental Panel on Climate Change (IPCC) Working Group confirms that the Earth is warming due to human activities, and this is resulting in more frequent and intense weather events such as storms, floods, droughts and fires (IPCC, 2013). In recent decades, India, Japan, Malaysia, the Philippines and Thailand have endured disasters of a greater magnitude than in the past, such as super typhoons and catastrophic flooding, while Argentina, Australia, Canada and the United States have suffered extreme heat waves and more intense wildfires.

In the face of the increasing frequency and intensity of disasters worldwide, memory institutions must urgently engage in disaster risk management (DRM) so as to become better prepared for disasters, and be in a position to respond effectively and to recover quickly, and thereby prevent or minimize damage to their collections and continue to serve their communities.

In this regard, there is an urgent need to develop DRM expertise and programmes at all memory institutions, and particularly those in less-industrialized countries as they are often more vulnerable to the impacts of climate change due to their locations in high-risk regions. Developing institutional expertise in DRM will empower memory institutions to take informed and active steps to mitigate the impacts of climate change wherever possible and provide leadership for their communities.

Purpose of the toolkit

This toolkit is designed to assist memory institutions in Asia and the Pacific by:

- improving understanding and documentation of the impacts of disasters in the local context;
- enhancing preparedness for disasters, notably in improving planning processes and defining the roles and responsibilities of custodians in the event of a disaster;
- identifying resources that can support institutions to develop DRM strategies and disaster plans;
- connecting physical and digital archives in disaster plans; and
- enhancing networks, including connections and cooperation with local communities, emergency services, public authorities and other stakeholders through supporting better outreach and communication.

Tips

- Each DRM context is different and each memory institution will have its own needs and goals. Once we know and understand our own context, what we need to prepare for, what resources and networks are available and how to use them, we can begin to make plans and take action.
- When facing difficult situations, the most effective solutions involve connecting with others to determine what to do and then working together to make a difference. DRM programmes and disaster plans are significant undertakings and institutions will need the support of others to complete and implement them, so be as inclusive as possible. The best plans include other practitioners, local groups, communities and elders.
- Communities all over the world have developed time-tested strategies to improve their resilience to natural disasters. While indigenous people are among the most vulnerable to disasters (because their livelihoods are often tied directly to local biodiversity and ecosystem health), they are often also a highly valuable source of traditional knowledge and skills related to disaster mitigation. This traditional knowledge is increasingly gaining appreciation as communities learn from each other and work together to respond to climate change. In engaging with these communities, we must remember that this knowledge is owned by these communities, who have protocols around knowledge use that we must acknowledge and respect. [See related case studies in Module 2 and 3.](#)

Your situation | Questions

Answering the questions below will help you to identify your DRM priorities based on your current situation and the needs of your institution and community. This and other sections and exercises in this Toolkit are intended to engage you and your colleagues to start the DRM journey. They will add to your knowledge and skills so that you are better prepared for potential disasters and can protect your collections more effectively.

Do your best to answer the questions in one sitting. You can add more information later, but making a start will give you the momentum to continue. Answer the questions in cooperation with people from your institution who have accurate knowledge of its mandate, holdings, role in the community, and activities. As you work through these questions, be confident that you and your colleagues know the answers or can find them.

When you have answered these questions, arrange the sentences into paragraphs under the title, 'Disaster Risk Management Context' and include this in your disaster plan.

(A) Context

1. What is the name of your cultural institution?

2. Where is your cultural institution located (region/country)?

3. What is your institution's mission?

(B) Your knowledge and experience of DRM

4. How would you rate your general understanding of DRM and your experience in DRM?

low high



1 2 3 4 5 6 7 8 9 10

5. Have you or other staff members in your organization already received training in DRM?

☐ YES ☐ NO

6. How would you rate your organization's knowledge and experience in salvaging and recovering documents?

low high



1 2 3 4 5 6 7 8 9 10

7. Has your organization and/or community experienced any significant disasters? If yes, how was your institution impacted and how did it respond?

☐ YES ☐ NO

8. Does your organization engage with your local community on DRM and safeguarding heritage?

☐ YES ☐ NO

9. Has your organization already established a disaster plan? Do you consider it operational?

☐ YES ☐ NO

(C) Preparedness and risk assessment

10. Has your organization undertaken a risk assessment?

☐ YES

☐ NO

11. Has your organization undertaken a geographical analysis of your local area?

☐ YES

☐ NO

12. What are the threats to your collection/archive?

13. Are you aware of climate-related threats in your area?

☐ YES

☐ NO

14. What documentary and cultural heritage objects most require protection (due to their significance and value to the community and to your institution)? Are local traditional knowledge and/or indigenous cultures threatened? If yes, how?

15. How would you rate your level of preparedness for a disaster?



(D) Collection management

16. Is your collection (physical and/or digital) currently well-stored and well-organized? How would you rate the level of organization?



17. Do you have sufficient equipment and facilities to safeguard your collections?

☐ YES ☐ NO

18. Are you aware of the risks associated with digital archives?

☐ YES ☐ NO

19. Have you integrated digitization and safeguarding of digital archives into your disaster plan?

☐ YES ☐ NO

20. Does your institution apply environmentally-friendly measures to mitigate the impacts of climate change, such as reducing energy use and reducing waste? If yes, what measures has your institution taken? If no, what obstacles need to be overcome for your institution to take such measures?

☐ YES ☐ NO

(E) Resources/Networks

21. Do you have sufficient financial resources to meet your DRM needs?

☐ YES

☐ NO

22. Do you have any personnel who have been trained in DRM? Are enough personnel trained in DRM? Are they trained to a sufficient level?

☐ YES

☐ NO

23. Have you received any external support for DRM? If yes, what support have you received?

☐ YES

☐ NO

24. Are there any institutions or individuals that you can reach out to for support?

☐ YES

☐ NO

25. Do you receive support from government or disaster emergency services organizations?

☐ YES

☐ NO

(F) Community

26. Do you engage with your community and are they aware of your activities?

☐ YES

☐ NO

27. What groups of people within the community does your cultural institution serve?
Do you work with indigenous people and/or marginalized groups?

28. Does your institution collect local knowledge, such as indigenous knowledge about disaster risk management?

☐ YES

☐ NO

29. Have you carried out DRM training or other activities with your community? If yes, what kinds of training and activities?

☐ YES

☐ NO

30. Have you identified opportunities to better serve your community? If yes, what are those opportunities?

☐ YES

☐ NO

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Check your level | **Maturity level approach**

This self-assessment exercise enables you to check what level your organization is currently at with regard to the following three components:

- Risk Assessment
- Disaster Preparedness
- Response and Recovery

The five maturity levels are as follows.

- Ad hoc (low)
- Recognized (beginning)
- Defined (emerging)
- Managed (maturing)
- Optimized (high)

Use the tables below to identify your organization's strengths and weaknesses.

It is recommended that you do the self-assessment regularly to evaluate your organization's progress across the three components.

Risk Assessment

	Ad Hoc	Recognized	Defined	Managed	Optimized
	1	2	3	4	5
Geographic analysis and environmental risks	Your organization is not aware of local geographic and environmental risks.	You are aware of certain geographic and environmental risks and have documented them, but you have not identified actions to mitigate them and do not have a disaster plan.	You have identified actions to mitigate risks, and these have been shared across the organization, but you do not have a disaster plan.	You have implemented actions to mitigate risks, and have prepared a disaster plan, which includes details for rescue and salvage.	You are regularly evaluating your disaster plan and revising it accordingly.
Building, storage and infrastructure	Your organization is not aware of the risks associated with your building or storage.	You are aware of certain building and storage-related risks and have documented them, but have not identified actions to mitigate them.	You have identified actions to mitigate risks, and these have been shared across the organization, but your disaster plan does not include details for rescue and salvage.	You have implemented actions to mitigate risks, and have prepared a disaster plan, which includes details for rescue and salvage.	You are regularly evaluating your disaster plan and revising it accordingly.
Digital collections	Your organization is not aware of the risks to your digital collections.	You are aware of the risks to your digital collections and have documented them, but have not identified actions to mitigate them.	You have identified actions to mitigate risks, and these have been shared across the organization, but your disaster plan does not include the details concerning your digital collections.	You have prepared a disaster plan, which includes details for your digital collections.	You are regularly evaluating your disaster plan and revising it accordingly.
List of significant items and potential risks	Your organization has not prioritized significant items and has not identified the potential risks associated with them,	You have identified and listed the significant items and associated risks but have not identified actions to mitigate the risks.	You have identified actions to mitigate risks to the significant items, and these have been shared across the organization, but your disaster plan does not reflect this.	You have implemented actions to mitigate risks to the significant items, and have prepared a disaster plan, which includes details concerning the priority items.	You are regularly evaluating your disaster plan and revising it accordingly.
Emergency network	Your organization has only a partial understanding of the local emergency network.	You have identified the emergency network and team but have not documented it.	You have identified and documented the emergency network and team but have not integrated the information in your disaster plan.	You have identified, documented and integrated the network into your disaster plan.	You are regularly evaluating your disaster plan and revising it accordingly.

Disaster Preparedness

	Ad Hoc	Recognized	Defined	Managed	Optimized
	1	2	3	4	5
Staff training in disaster risk management	Your organization does not conduct staff training in disaster risk management.	You have put a training process in place but it is reactive – mostly based on previous experience.	You have put in place a proactive training process and are training staff regularly.	You have linked training with updates to your disaster plan.	You are regularly evaluating the training process through compiling feedback, and are improving the training accordingly.
Disaster team and designated roles	Your organization does not have a disaster team.	You have created a disaster team but the roles have not been clearly designated.	You have a disaster team with clearly designated roles.	You are conducting regular training and practice drills for the disaster team.	You are monitoring the performance of the disaster team, and are revising the training and drills accordingly.
Local communities and knowledge	Your organization has not established contact with local communities (or indigenous groups).	You have established contact, but have not drawn on the knowledge of the communities (or groups).	You have exchanged knowledge with communities (or groups) and have documented their DRM knowledge.	You have incorporated this documented knowledge into your disaster plan.	You are in regular contact with local communities to exchange knowledge and you update your disaster plan accordingly.
Storage organization	Your organization does not have a well-organized or secure storage system.	You have designed a system for organizing items in storage safely and efficiently, but have not yet implemented it.	You have an accession register, the storage items are secure, but some items have yet to be organized properly and be accessed more efficiently.	The storage items are secure, have been organized properly and can be accessed efficiently.	You are monitoring the storage system regularly and making improvements where necessary.
Vital records and significant items	Your organization does not have an accession register and has not identified significant items.	You have an accession register but it is not updated, and there is no priority salvage list.	You have a priority salvage list but no risk assessment associated with your collection items.	You have an up-to-date accessions list and priority salvage list associated with a risk assessment and disaster plan.	You have a system for keeping the accession register up to date and are updating the priority salvage list and associated risks regularly.
Disaster supplies and equipment	Your organization does not have any disaster supplies and equipment.	You have limited disaster supplies and equipment but these are not documented, or are difficult to access.	You have some disaster supplies and equipment, which are documented, but they are insufficient to meet the needs in a disaster.	You have sufficient disaster supplies and equipment and these are documented and can be accessed (or rented / borrowed) quickly in a disaster.	You are monitoring the disaster supplies and equipment to ensure they remain adequate and accessible.

Disaster Preparedness (continued from previous page)					
	Ad Hoc	Recognized	Defined	Managed	Optimized
	1	2	3	4	5
Emergency contact list	Your organization does not have an emergency contact list.	You have an emergency contact list but it is incomplete or not up to date.	You have a complete contact list but it is not up to date.	You have a complete and up-to-date contact list.	You have a process for regularly checking and updating the emergency contact list.
Digital collections, backup files and their locations	Your organization does not have any digital collections, digital copies or backup files.	You have digital collections, copies and backup files but they are not well organized or not sufficiently connected to your physical collections.	You have created a complete list of digital collections, copies and backup files and know where they are located, but this information has not been integrated into your disaster plan.	You have integrated the information about your digital collections, copies, and backup files into your disaster plan.	You have a schedule for regularly checking the information about your digital collections and backup files and updating your disaster plan accordingly.

Response and Recovery

	Ad Hoc	Recognized	Defined	Managed	Optimized
	1	2	3	4	5
Staff training in salvaging and rescue	Your organization does not conduct training of staff in salvaging and rescue.	You have put a training process in place but it is reactive – mostly based on previous experience.	You have identified the activities for training of staff in line with your DRM plan, but the training has not yet been implemented.	You have conducted training for staff in line with your DRM plan and local threats/needs.	You are regularly evaluating the training process through compiling feedback, and are improving the training accordingly.
Disaster team and emergency responders	Your organization's disaster team does not have any formal contacts with emergency services.	Your disaster team has met with local emergency services to discuss procedures to follow in an emergency, but these procedures have not been finalized.	Your disaster team and the local emergency services have agreed upon certain procedures to follow in an emergency, but these are not mentioned in a disaster plan.	You have documented the agreed procedures and incorporated them into your disaster plan.	You have a process for regularly checking the procedures and updating them and the plan if necessary.
Volunteers and local communities	Your organization has not established contact with local volunteers and communities.	You have made contact with local communities and know of some volunteers who can assist in an emergency, but the roles have not been defined.	You have defined the roles of local communities and volunteers for disaster response and recovery, but these roles have not been incorporated into your disaster plan.	You have incorporated the specific roles and responsibilities of local communities and volunteers into your disaster plan.	You have a process for regularly checking the roles and responsibilities and updating them and the plan if necessary.
Priority salvage for significant items	Your organization does not have a process for priority salvage of significant items.	You have a process in place but it is mostly based on previous experiences and is not sufficiently documented.	You have a systematic process and a priority salvage list, but this has not been integrated into your disaster plan alongside associated risks.	You have integrated the priority salvage list into your disaster plan together with a risk assessment and response/rescue plan.	You regularly check that the salvage list is up to date and revise it according to your context and needs when necessary.

Response and Recovery (continued from previous page)					
	Ad Hoc	Recognized	Defined	Managed	Optimized
	1	2	3	4	5
Links between physical and digital collections	Your organization does not have clear links between its physical and digital collections in the DRM plan for response and recovery.	The process is in place but reactive – mostly based on previous experiences.	The process is standardized and integrated into your disaster plan.	The process is understood, controlled and monitored.	The process is continuously improved through feedback and monitoring.
Record of disaster stories	Your organization does not have knowledge of previous disasters in the area or has never recorded past disasters.	You are aware of previous disasters but this knowledge is not documented or you have not created any records concerning disasters in your area.	You have documented knowledge or experience of previous disasters, but this knowledge has not been integrated into your risk assessment or disaster plan.	You have integrated the knowledge and experience of previous disasters into your risk assessment and disaster plan.	You regularly update your records of disasters and then review your risk assessment and disaster plan accordingly.

How to create a disaster plan

Sanchai Chotirosseranee and Chalida Uabumrungjit

Keywords: planning, coordination, resources, self-assessment

Introduction

With much at stake in a context of increasing climate risks, all memory institutions, of any size and means, should develop a Disaster Risk Management (DRM) plan. This should be done according to an institution's needs and within a realistic framework, in order for the DRM to be sustainable for the communities it serves.

Disaster plans play a fundamental role in ensuring preparedness, minimizing damage and limiting the destruction of irreplaceable items in emergency events. These plans can also prevent important financial losses and support the identification of significant records. While disaster plans may not be seen as beneficial in the short-term, a carefully thought-out plan brings long-term benefits and an enhanced organizational structure for archive institutions.

Preparing a plan requires awareness, knowledge, communication and coordination across a range of topics. It necessitates joint efforts from a variety of stakeholders, from the local level to the national level, and sometimes even the international level.

To create your plan, you will need to establish a clear starting point and a set of realistic targets. This module offers a guide for preparing and tailoring your plan.

Elements to consider before preparing a disaster plan

Essential elements to consider before preparing a DRM plan include the following:

Resources

These include financial and human resources, supplies, equipment and organizational infrastructure. It is necessary to list and prioritize actions and the resources required for each.

Expertise and skills of staff and communities

Effective DRM planning requires staff and local communities to have adequate knowledge and training concerning the potential risks and the solutions for mitigation of those risks, as well as knowledge of salvaging and recovery methods, preservation guidelines for physical and digital archives, and communication strategies.

Time

An institution will normally need between three and six months to develop a plan. The length of time varies depending on the allocated resources, the size and complexity of the collection and the scope of the plan. It is also necessary to allocate sufficient time for reviewing and updating the DRM plan, and to allocate time for regular training on disaster preparedness, response, and recovery procedures.

Coordination among stakeholders

DRM planning requires coordination between the various stakeholders, which range from government officials to local communities. Such coordination, cross-departmental cooperation and the active engagement of staff members with external bodies is required in order to make informed decisions and allocate adequate resources.

Guidelines for preparing a plan

Form a cross-disciplinary disaster team.

Include staff from different departments within your institution, such as the conservation, administration, information technology, maintenance and security departments. From the start, define clear roles and responsibilities for each individual.

Hold a DRM planning workshop.

Participants of this workshop should include your disaster team as well as senior management and decision-makers, along with representatives of relevant government agencies, external experts, disaster recovery specialists and local emergency response agencies who can provide practical information. Based on the combined expertise and perspectives, identify the key issues and priorities. This step will help to ensure that the purpose of disaster risk management is well understood by everyone and that priority actions are identified. It will also help in estimating and allocating available resources, and in prioritizing the plan's development and advocating for its implementation. While individuals with good DRM understanding are more likely to actively participate in this planning process, it is important to encourage everyone to provide inputs and gain confidence in the roles and responsibilities they will have if a disaster occurs.

Conduct a risk assessment and analysis.

The **risk assessment and analysis** should identify your organization's assets and collections, and the risks that they face. When assessing the risks, consider where and how items are stored, and the costs associated with protecting them and recovering them after a disaster.

Clearly outline your plan's objectives and targets.

Identify what your disaster plan aims to achieve, such as: minimizing damage, ensuring the safety of staff and visitors, preserving the integrity of the collection and facilitating a smooth recovery process.

Prepare and test the DRM plan.

To check whether the plan aligns with the unique needs and risks of your organization, respond to the questions below.

- Does the plan identify all of the potential hazards and vulnerabilities facing your archive or building?
- Are preventive measures clearly outlined in the plan? Are they practical and feasible?
- Are the roles and responsibilities in the event of a disaster clearly defined for your disaster team, other staff in your institution and among your external network and wider community?
- Have staff members received training on the disaster plan and do they know what their specific roles are if there is an emergency?
- Is there a mechanism for sharing information with and between staff and emergency responders?

Draft a budget, prioritizing the most urgent elements, but based on your available resources.

By understanding your resource constraints, you can prioritize the items to be protected, allocate resources effectively, explore alternative approaches and build partnerships with other organizations.

Update your DRM plan annually.

Regular revisions and improvements to the plan will enhance its effectiveness. When revising the plan, consider whether your institution's archival collection has grown since the previous plan was prepared, and whether there are any new potential risks.

Schedule annual training on disaster preparedness, response and recovery procedures.

This will support your personnel to better understand the disaster plan and what their roles and responsibilities will be if a disaster occurs.

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Evaluating the effectiveness of the DRM plan

Following an emergency, organizations can evaluate the effectiveness of their DRM plans by responding to the questions below, and use the conclusions to improve and update the disaster plans.

How well did the organization's response align with the procedures outlined in the DRM plan?



Were the roles and responsibilities clearly understood and executed by staff members during the disaster?



Did communication channels function effectively to share information with staff, emergency responders and other stakeholders?



Were the allocated resources (financial, personnel, equipment) sufficient and were they used effectively during the response and recovery phases?



Were the salvage and recovery efforts effective in minimizing damage to assets and collections?



What new insights or lessons were learned from the disaster experience that can inform updates to the disaster plan? List them here.

A connected approach to disaster risk management

Heather Brown

Keywords: connected, ecosystem, interconnectedness, integrated, convergence

Introduction

Disaster risk management (DRM) is about preparing for, responding to and recovering from disasters. DRM asks us to consider worst-case scenarios and plan for ways to prevent those from occurring. Managing disaster risks requires a good understanding of the dynamic, interconnected system of archival management, which increasingly involves **managing both physical and digital collections**. It is a process that encompasses organizational and managerial skills and technical knowledge, as well as communication skills, among others.

By taking a connected, people-centred and environmentally-sensitive approach to DRM, memory institutions can support and engage their communities, develop effective disaster plans and gain support for their wider programmes (ICCROM, 2022).

Adopting a connected approach facilitates the development of effective disaster plans because such plans link collections, buildings, facilities, business operations, emergency services and all other aspects of disaster risk management. Ultimately, effective disaster management depends on the ability to see these interconnections.

There are interconnections that occur within and across the collections themselves. Most heritage collections contain both digital and physical materials. Yet traditional disaster risk management tends to treat the two types of materials separately. There are benefits in connecting disaster management plans to cover all materials in the collection in an integrated way.

Connections and engagement with communities and public authorities are vital for successful disaster risk management. Such connections involve building trust and understanding, as well as working with community members to increase their awareness of disaster risk management and develop their capacity.

Making connections with emergency organizations is also important. This is because the greater their understanding of your organization's needs and procedures in the event of a disaster, the more your organization will be able to prevent damage and recover quickly.

How to apply the connected approach

RISK ASSESSMENT

- A connected approach to risk assessment involves seeking multiple perspectives regarding potential risks to your buildings and storage, collections and IT infrastructure. Such risks can include **local geographical factors** and **health hazards**. It also involves connecting with local communities and indigenous groups to learn about traditional knowledge and practices in disaster resilience. Through seeking out diverse viewpoints, you are likely to gain a richer understanding of the risks and ways of reducing them.

PLANNING

- All of the interconnected stages of disaster risk management are important, but the planning stage, which involves preparing for disasters, is the most important for preventing or minimizing damage. A trained team and a well prepared and up-to-date disaster plan are essential for connecting quickly with others when a disaster strikes.
- Preparing an effective disaster plan involves cooperating with others to gather information and addressing the vulnerabilities identified in the risk assessment. A disaster plan will typically include **emergency contacts**, **a salvage priority list** (significant items/vital collections) and their locations (ideally the locations of both physical and digital collections and archives), **disaster team roles and responsibilities**, **a list of emergency supplies and equipment**, and the access authorizations and protocols.

RESPONSE

- In the response phase, a connected approach involves communicating effectively with key contacts such as emergency services, and with building, facilities, security and IT staff, who can assess the impacts of the disaster and take appropriate action.

RECOVERY

- The **recovery stage** requires connecting with various groups, including suppliers of materials equipment, providers of IT backup services and local community members, to salvage damaged collections and return services to normal. Such connection is also essential for collecting lessons learned from the disaster and updating the disaster plan accordingly.

Case study

Emergency response to flooded archives in Zhengzhou, China

Meifang Zhang and Chen Yu

2021

Keywords: flood, archives, emergency response

On 20 July 2021, an extreme storm hit Zhengzhou. As a result of the storm, the First Affiliated Hospital of Zhengzhou University was flooded and its archives were drenched with water. More than 2.7 million volumes of archival collections, including medical and financial records and contracts, were damaged or destroyed. The shelves, some folders and other containers were also badly damaged and could no longer be used.

The flooding led to the archives being scattered, compressed and torn. Some were immersed in water for a long time, which led to mildew, conglutination, rot and image diffusion. This resulted in many documents becoming illegible, and resulting in a loss of information.

Key issues

The main issues facing the rescuers were as follows:

Many documents were saturated with water.

The flooding led to many documents becoming saturated and waterlogged. It was important to dry the soaked documents as quickly as possible.

The wet documents were stuck together.

Because the archives were soaked in water for a long time, the pages became stuck together. Special techniques were needed to separate the pages and salvage the documents.

The wet documents were damaged by mould and mildew.

Water damage coupled with high temperatures and high humidity led to the spread of mould on the documents. This mould was not only a serious threat to the archives, but was also potential harm to humans.

Actions taken to recover the archives

In the case of the Zhengzhou flood, the rescue workflow, under the guidance of a disaster plan, had seven main stages: preparation of the site; gathering of equipment and tools; appraisal of the damage; training of personnel in salvage techniques; preliminary treatment of damaged archives; archive disinfection and restoration; and storage.

The plan for rescuing the documents had both short-term and long-term work tasks. Short-term work included drying and disinfection, while long-term work involved restoration and organization.

The main tasks were as follows:

Disinfecting

More than a hundred species of microorganisms, including some pathogens, were found growing on the wet documents. Accordingly, the documents were wiped with formaldehyde or ethyl alcohol to kill the microorganisms.

Drying

The wet documents were dried using several methods: the wet documents were inserted between sheets of dry absorbent paper; the pages were aired on the shelves; a low temperature dryer was used to further dry the documents. While using these drying techniques, the staff also maintained good air circulation and reduced the humidity in the rooms.

Freezing

Damaged documents were placed in a freezer and then carefully examined to identify changes before the pages were separated, one by one. A needle awl and tweezers were used to gently find a gap between the layers and a bamboo spatula was inserted into the gap and was used to separate the pages.

Lessons learned

Key lessons learned from the Zhengzhou flood were as follows:

A disaster plan is necessary

Formulating an effective emergency response, preparing a plan and providing training in advance provided a sound basis for the rescue of archives in Zhengzhou, so that it took place quickly and efficiently. When making a plan, it is important to consider factors such as available funds and equipment, the availability of experts and the availability of trained personnel who can be relied upon to carry out the recovery actions.

Timely action is essential

Rapid action can avoid secondary damage to disaster-affected artefacts and archives. The extent of damage should be confirmed as soon as possible after a disaster – ensuring focused salvage actions – and the damaged items should

be moved quickly to a safe place before recovery work begins.

Protective measures for workers

In disasters such as floods, pathogenic microorganisms – which are potentially harmful to people – can develop on wet items. To prevent staff from contracting diseases and damaging their health in the process of rescuing, restoring, arranging and storing archives and artefacts, it is necessary to raise awareness among personnel regarding how to protect themselves and to disinfect the materials and spaces they have contact with.

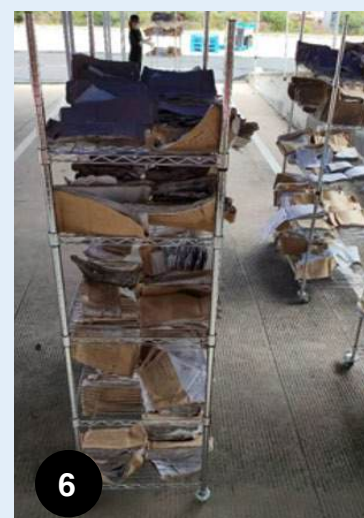
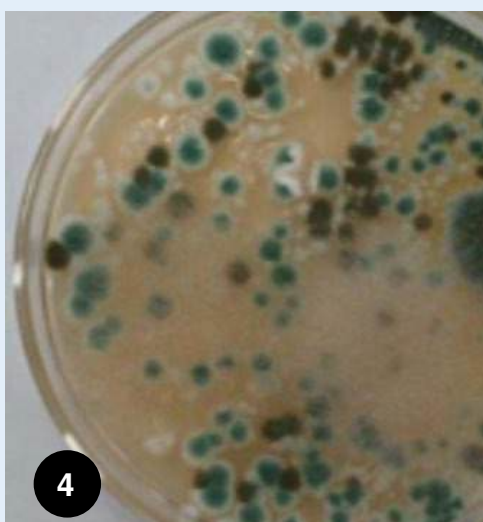
A long-term multi-agent emergency rescue linkage mechanism and an emergency management platform are necessary

An emergency rescue mechanism is effective when there is interdisciplinary, inter-regional and internal cooperation. To prepare for a disaster, the lead units need to establish an emergency material reserve system and ensure sufficient emergency supplies, and when a disaster strikes they need to cooperate with each other. Emergency management platforms for disaster-affected archives should collect and publish information about damaged items. And after institutions have conducted rescue work, they should document their experience in rescuing damaged archives in order to inform plans, processes and guidelines for future rescue work.



1. Shelves and folders were badly damaged
2. Mould and mildew grew on the wet documents
3. Soaked documents
4. Mildew growth
5. The wet documents were inserted between sheets of dry absorbent paper
6. The wet documents were aired on the shelves

© Meifang Zhang



Case study

Don't touch the records: experience of the Society of Filipino Archivists after Typhoon Haiyan

Mary Grace Golfo-Barcelona

Tacloban, Leyte, Philippines

2013

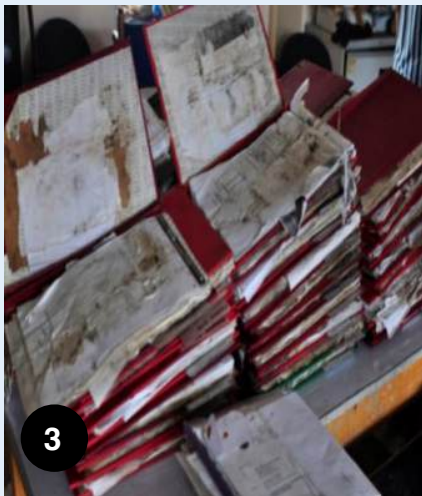
Keywords: typhoon, recovery, water damage, salvaging, restoration

Typhoon Haiyan, also known as Typhoon Yolanda, hit the Philippines on 8 November 2013. It made landfall in the provinces of Leyte and Samar, causing devastation to lives and property. The United Nations Office for the Coordination of Humanitarian Affairs (OCHA) reported that some 13 million people were affected by the storm, including over four million people displaced, with about 400,000 forced to move to evacuation centres (UNOCHA, 2013). This Category 5 storm was the strongest typhoon recorded in the country to that date.

For several days after the storm, the affected provinces did not have electricity, water or communication services. Assistance could not be extended immediately to those badly hit by the typhoon, and when help became available, the priority was on the provision of food, water, clothing, medicine and shelter for survivors. At that time, the salvaging of movable and built heritage was considered to be of secondary importance. Therefore, the valuable records and documentary heritage collections affected by the disaster were not rescued immediately. The area affected by Typhoon Haiyan was ultimately not accessible by archive staff until a month after the storm, by which time the records were already damaged by mould.

Preparation and coordination for the rescue of records

The Society of Filipino Archivists (SFA) is the first professional association of archivists to have been established in the Philippines. A non-profit organization, it provides technical assistance to institutions that wish to establish archives and offers training on archive management and conservation. SFA also conducts outreach programmes by helping government institutions to conserve archives and to restore damaged government records. The founders and officers of SFA were trained overseas and have significant experience in conservation and restoration of paper archives.



1. A building at the University of the Philippines in the aftermath of the disaster
2. A picture taken during the ocular visit, a month after the disaster occurred
3. Damaged documents seen during the ocular visit
4. Make-shift drying rack
5. Wires for drying

© Society of Filipino Archivists / Isamu Sakamoto



Access by the SFA team to Tacloban to rescue potentially damaged government records became possible when the Japanese International Cooperation Agency (JICA) sent Dr Isamu Sakamoto, a conservation specialist, to the Philippines. Dr Sakamoto had a plan to replicate the rescue and recovery work he had done elsewhere in Asia, and he needed assistance in salvaging cultural heritage and gathering data concerning damage to collections and records in the disaster-stricken areas in the Philippines. When he reached out to Ms. Lourdes T. David, a member of the Board for Librarians, she immediately connected him with the SFA.

Dr Sakamoto and the SFA team visited several government agencies to ensure coordination between activities and to seek support. Dr Sakamoto was told, however, that this work was not a priority and that all funding had already been allocated for the rebuilding of heritage sites in the province of Bohol, which had been damaged by a strong earthquake a few weeks before the typhoon. Dr Sakamoto and the SFA team nonetheless embarked on a trip to Tacloban. The SFA board covered travel expenses and other costs, and the team took SFA's restoration materials with them, including mylar sheets, buffer paper, brushes, paper hangers, alcohol and basins for washing the records. Even though Dr Sakamoto and SFA were able to visit the government offices in Tacloban and assess the damage to the records, the team was not allowed to touch them. Since the team was prohibited from touching the government records, they agreed to teach the government employees about first-aid interventions for water-damaged documents.

Key issues

Pre-existing issues

- **No local disaster response teams.** Human resources have been insufficient to conduct assessments and first-aid interventions in emergency situations.
- **Lack of government support.** The absence of a government-provided national disaster-response team for cultural heritage preservation hindered collaborative efforts towards restoration and preservation activities.
- **The standard procedures and protocols at the government level were inadequate.** In the context of disaster response, roles and responsibilities are not clearly defined.
- **Lack of awareness of the importance of preserving archives and cultural heritage.** Government institutions, both at the national and local levels, did not prioritize the management and preservation of records and cultural heritage collections.

Key issues encountered by the salvage team

- **Restricted access.** The team was unable to access the sites for roughly four weeks following the typhoon. By that time, most of the water-damaged records had already become mouldy and the damage to most records was irreversible.
- **Insufficient funding.** The salvage team did not receive funding for their transport or for delivering training. The team members slept in hospital wards for the three nights that they spent in the area.
- **Diverging interests.** The national agencies that have the mandate to preserve heritage collections were overtaken by private organizations in doing outreach services.

Lessons learned

Greater awareness. There is an urgent need to raise awareness of the importance of cultural heritage collections and to improve strategic planning capacity among memory institutions in the Philippines so that they are better able to engage in preservation and disaster response and recovery.

More opportunities to build partnerships across borders. The improvement of international cooperation mechanisms is necessary for better emergency response and recovery.

Greater understanding of local contexts and limitations. A good analysis of local situations is fundamental before embarking on salvage missions.

Better definitions of first response procedures and roles. They would include a clear delineation of assignments and tasks in the context of disaster risk management in heritage institutions.

More reliable funding support. Adequate resources are essential to secure first-aid supplies and implement first-response activities.

Proposed solutions

Establish disaster preparedness response teams in all local government units. With natural disasters occurring more frequently due to climate change, it should be mandatory for all local government units to have teams specifically responsible for ensuring the safety of cultural heritage collections.

Create a support network and teams of volunteers. Gather individuals who are willing to implement response activities following a disaster and organize training activities.

Identify practical solutions to minimize damage to heritage collections. For example, implement a digitization programme for documentary heritage collections and ensure the safe storage of original copies (while maintaining access to heritage items through digitized copies).

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6. Teaching volunteers on how to handle records
7. Process of cleaning records

© Society of Filipino Archivists / Isamu Sakamoto

Case study

The impact of the Brisbane river flood on the State Library of Queensland

Heather Brown

Australia
2011

Keywords: flood, library, risk management, prevention, preparation

The State Library of Queensland is located on the picturesque banks of the Brisbane River. This location, however, represents the highest risk to the State Library and its unique heritage collections.

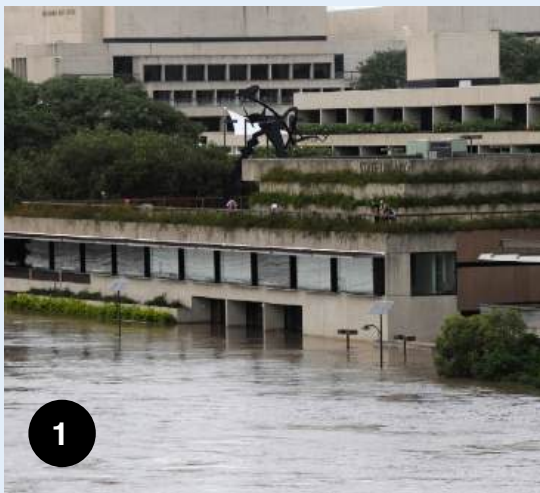
Despite a history of area flooding, in the mid-1970s the government acquired land on the river's south bank to develop a cultural precinct, with a new library building. The new State Library was built in 1988 and extended in 2006.

Several disaster risk mitigation and damage prevention measures were incorporated into the building's design that later proved to be important in preventing damage related to flooding. For example, the designers planned for most of the 'Queensland memory' heritage collections to be located on the upper floors, where they would be safer. Another risk mitigation decision was to invest in good insulation.

From the outset, the library's preservation staff and senior managers developed and implemented disaster risk management strategies for the collections, focusing particularly on the prevention and preparation stages. To this end, the State Library invested in developing, implementing and testing a disaster plan and a business continuity plan. Furthermore, the State Library established and trained a crisis management team and a disaster team and put in place emergency supplies and equipment.

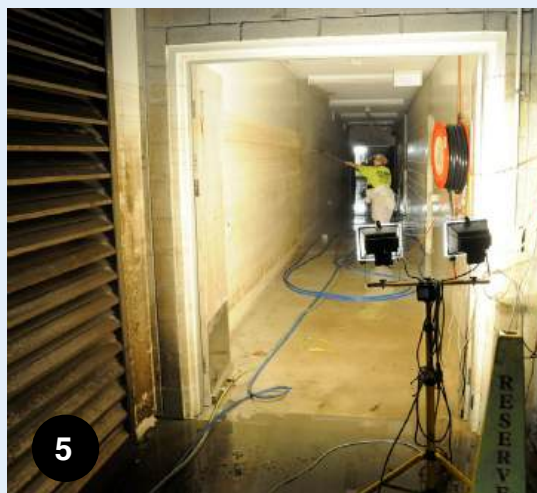
When a major area flood occurred in January 2011 in the wake of torrential rain in south-east Queensland, the basement of the State Library was flooded. The initial official advice had estimated that the waters would probably flood the basement to a level of between 300mm and 400mm, but the building experienced flooding to a level of to 1.9 metres. Moreover, as a result of the storm and flooding, electricity to the building was cut off, resulting in the air-conditioning system no longer functioning and the library's communication infrastructure being shut down entirely.

As the waters began to seep into the building, the library's disaster plan swung into action. Being prepared with a disaster plan and business continuity plan was invaluable in reducing risks and helping to guide the response and recovery.



1. Flood waters inundate lower levels of the State Library of Queensland. Photographer: Leif Ekstrom
2. Sandbagging in place in the basement of the State Library of Queensland 12 January 2011. John Oxley Library, State Library of Queensland. Photographer: Leif Ekstrom
3. State Library of Queensland staff moving collections to higher ground, 11 January 2011. John Oxley Library, State Library of Queensland. Photographer: Leif Ekstrom
4. Quarantine room in the State Library of Queensland damaged by flood water 2011. John Oxley Library, State Library of Queensland. Photographer: Leif Ekstrom
5. Silt being water blasted off the walls inside the State Library of Queensland after the flood 2011. John Oxley Library, State Library of Queensland. Photographer: Leif Ekstrom

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Actions

Evacuating at-risk collections

In accordance with the disaster plan, the initial response focused on moving heritage items from the lower to the upper levels of the building. Vulnerable heritage items included an extensive photograph collection (in the cold storage vaults) along with new acquisitions and donations that were in the quarantine facility. Over forty staff were mobilized to help with the evacuation of these two collections. One team moved the photographs, while a second moved the collections from the quarantine facility. Both teams successfully completed the relocations of these physical collection items, ensuring that no collections were damaged. Staff also worked to support the recovery process, which often meant climbing five stories, 20 to 30 times a day.

Mitigating risks

When moving the collections, it was important to mitigate the risks. For example, there was the risk of damaging fragile glass plate negatives during the move. Also, the items had to be moved quickly from a cold storage environment that normally operated at 4° C to the conservation studio upstairs, where the temperature was around 30° C, so there was a risk of condensation forming on the photographs. To mitigate these risks, the photographic collections, stored on easily movable trolleys, were covered with felt, which offered a small insulating buffer against the warm and humid conditions.

Digital infrastructure and digital collections were also at risk. Although the level of flooding was unknown, the ICT infrastructure (e.g. servers) was shut down as a precaution, recognizing that a power cut would lead to loss of air-conditioning, and if the servers remained turned on the heat load from them would cause the ICT server room to overheat. This precautionary action prevented any loss to the digital assets and collections. After the storm, power was restored, but the air conditioning was not working. Because repairs to the air conditioning would take some time, it was decided that only limited ICT infrastructure would be brought online (to minimize the heat load in the ICT server room and prevent overheating).

Establishing communications

Social media channels, especially Facebook and Twitter, were used to establish communication with the wider community during the period that the State Library's communications infrastructure was inoperable. Managing media messages was a top priority. Key staff were tasked with ensuring that timely and accurate messages were posted to mainstream and social media to prevent the spread of misinformation.

Key issues

Power cuts create challenges

The loss of electricity in the building created a cascading set of challenges. The loss of power severely impacted the communications infrastructure, which made it difficult to communicate with the library staff, who were scattered across the Brisbane metropolitan area. It was possible to contact some staff, so in the early hours of the morning before the building became flooded, seven members of the disaster team were called to the site to move items to higher levels. As the power had been cut, the elevators were not functioning, so the small team tackled this without elevators. The process involved carrying heavy equipment up many flights of stairs by torchlight. The task took six hours but was completed before the lower levels of the library became flooded.

The clean-up process takes time

After the flood waters receded, there was still much to tend to as there was a huge amount of mud, sludge and sewage on the lower level. It was necessary to pump this out of the building. Another challenge was to repair and rebuild damaged walls and doors, and to clean off the silt.

This recovery work took time, so there was a major disruption to the library infrastructure, particularly to the power substations, loading dock, audiovisual storage, cold storage vaults and the quarantine facility. The State Library was closed for a month and the car park area was closed for several months.

Lessons learned

Investing in prevention and preparation is essential

The floods demonstrated the benefits of investing in disaster prevention and preparation. A trained disaster team was able to implement the library's disaster plan and business continuity plan and follow the priorities for salvage that those plans identified. The decision by the building's designers to invest in good insulation also paid dividends. The insulation ensured that the temperature in the building remained largely stable, protecting the heritage collections during the period in which the power was cut off. Without these preventive measures, the heritage collections would have been severely damaged by mould and condensation.

Disasters affect both digital and physical collections

The power cut demonstrated that both physical and digital collections can be at risk in such disasters. At the State Library both collections were high priorities and both required a swift and planned response. This experience highlighted the benefits of including both physical and digital collections in disaster plans.

Relationships with emergency services personnel are necessary

When the recovery stage commenced, the value of establishing and building relationships with emergency services personnel became clear. Discussions with emergency services prior to the disaster would have helped those services to better understand why it was important for authorized library staff to be given access to the building and its collections at the earliest opportunity and to manage evolving risks in a timely manner.

It is necessary to adjust and adapt during a crisis

To respond effectively and mitigate the multiple risks to physical and digital collections, staff need to be alert to changing conditions. During the Brisbane Flood of 2011, the situation changed rapidly: flood waters rose more swiftly and higher than expected; staff access to the building was blocked; the power and air conditioning were cut

off; elevators were out of action; and standard communication technologies could not be used. As this cascading series of events unfolded, it was important to 'expect the unexpected' and adapt accordingly.

The inherent risk should not be forgotten

Since the disaster, the State Library has placed visual reference points around the building and on plans to provide a clear signpost for the future as to what a 'flood peak' means. These signs serve as a symbolic reminder that the library's riverbank location, while being a site of natural beauty, represents the library's highest risk.

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Module 2

Risk assessment

Collections, buildings and built environment

Risk assessment is a fundamental component of DRM planning. It involves listing the potential risks in and around your institution and identifying appropriate mitigation strategies. It requires compiling information regarding physical infrastructure (i.e. building, storage facilities and equipment) and identifying geographic and health hazards, based on staff and local knowledge.

- 1. Risk assessment: buildings, storage climate and other vulnerabilities**
Heather Brown
- 2. Conducting geographic analysis**
Lois M. Evans
- 3. Protecting collections by improving storage and organization**
Achal Pandya
- 4. Construction methods and disaster preparedness**
Brandon Oswald
- 5. Health hazards in handling documents and collections**
Sanira Beevi

Case studies

The A word: the discovery of arsenic in collections at the National Archives of Singapore
Sanira Beevi

Safeguarding the Thai Film Archive during the 2011 floods
Chalida Uabumrungjit

Disaster prevention via land management: indigenous cultural burning in Australia
Mick Newnham

The Vanuatu Library and Archives building and cyclone Pam
Brandon Oswald

Exercises

Risk assessment | Template
Geographic analysis
Storage risk assessment | Storage spaces
Building risks | Building assessment
Health hazards

Risk assessment: buildings, storage, climate and other vulnerabilities

Heather Brown

Keywords: risk assessment, physical, digital, mitigation, risk reduction

Introduction

Risk assessment can be summed up by the old proverb: ‘a stitch in time saves nine’. It involves evaluating the likelihood and impact of various types of disasters, identifying and analysing the risks of those disasters happening and then putting into place strategies to reduce the risks. Risk assessment shifts the focus of disaster management from reaction to prevention and informs what goes into a disaster plan.

We can never identify every risk; each disaster will play out differently, and there is always a chance of an unknown risk, but by investing in identifying and prioritizing risks, and by engaging in risk reduction, we can help to reduce the impact of disasters on our collections and archives.

This module explains how to conduct risk assessment and determine the nature and extent of disaster risks; it further discusses practical ways to reduce vulnerabilities before they become risks, thus reducing the impact of disasters.

Key elements

Categorize risks and vulnerabilities

A risk assessment begins with systematically identifying the types of vulnerabilities and risks that can potentially impact your collection. For example, draw up a broad list of types of risk, such as the vulnerability of your building to flooding, fire, and so forth; the **vulnerabilities relating to collections, digital infrastructure**, fire alarms and suppression systems, and security and staff training; and the risks associated with **local environmental conditions** (e.g. drought frequency; likelihood of flooding; and so forth). Grouping the risks will help you approach risk identification more systematically.

Tasks to identify vulnerabilities and risks include the following:

- Inspect the building(s) visually, paying close attention to vulnerable points such as the roof, cracks, gaps, pipes, gutters, window seals and gaps under doors
- Inspect the building for the possibility of pests entering and damaging collections
- Determine whether new collection items and donations of recent date were quarantined before they were added to the collection

- Find out how and where the digital collection is backed up (i.e. onsite or off-site)
- Check the **condition of physical collections**; such as whether they are protected, exposed to high-intensity light and UV levels, etc.
- Check the building for adequate ventilation and airflow
- Check the temperature and relative humidity and whether these fluctuate frequently and/or rapidly
- Check offsite storage locations for potential threats
- Identify what smoke and fire alert and suppression systems are in place
- Examine what kind of security systems are in place
- Compile information about past incidents and events in the local area (e.g. news accounts of previous disasters)

Identify diverse sources of information and consult them

An effective risk assessment is collaborative, involving various people who can provide diverse perspectives about disaster risks.

Groups to consult about potential risks include the following:

- Heritage conservation staff, especially long-standing employees, retired employees and volunteers, as they can share their awareness of vulnerable points and examples of disasters that occurred in the past.
- Staff who manage the information technology (IT) infrastructure, the databases, and digital collections, as they can explain what is backed up and where, and describe any potential vulnerabilities.
- Building maintenance staff, including plumbers, electricians and cleaners, as they are usually the first staff to respond to issues such as leaking roofs and flooded buildings, and they have in-depth knowledge of the site.
- Security staff, as they have experience and knowledge of vulnerabilities and past incidents.
- Emergency services contacts, such as the police and fire service, as they often have standard procedures for responding to disasters and often control access to sites following disasters.
- Other professional contacts, such as insurance providers, as they can offer useful information such as to what extent items can be insured, and by how much insurance premiums could increase following a disaster.
- Indigenous groups, because indigenous knowledge and traditions offer age-old wisdom and can provide important insights into mitigating risks at a local level, thereby strengthening the resilience of communities (MacDonald et al., 2022).
- Another useful mitigation approach is Ecosystem-based Disaster Risk Reduction (Eco-DRR). Eco-DRR is the sustainable management, conservation and restoration of ecosystems to reduce disaster risk. Further resources are available at [PEDRR Ecosystems for Disaster Risk Reduction](#) (2021).

Together, all these perspectives will provide valuable insights into the risks facing your organization and its collection and help to shape the priorities in your disaster plan.

Create a list of risks

After examining the site and discussing the potential risks with diverse experts, prepare a **list of the risks** that have been identified.

Examples include:

- The local context – your building's proximity to waterways and fault lines, vulnerability to brushfires, and weather events such as cyclones
- Overhanging tree branches
- Inappropriate storage of collections (e.g. directly on the floor)
- Items blocking access to exits and fire equipment
- Lack of backup for digital collections
- Lack of an alternative power supply in the event of power failures – leading to the risk of the server overheating and digital collections being destroyed
- Toxic hazards and dangers, for example the existence of asbestos in the building

Evaluate the probability and consequences of risks

The next step of a risk assessment is to evaluate the **probability of the risks** (see **Table 1**) happening or recurring. Examine each risk and decide whether it is almost certain or unlikely to occur.

Next, **evaluate the impacts of the risks** (see **Table 2 and 3**). For example, a small leak may have a minor impact, but a fire could have a major---if not catastrophic---impact.

Risk frameworks and matrices with scoring methods are useful tools for evaluating the likelihood of risks and their impacts. Choose the level of analysis that is appropriate to your organization's needs and capacity.

Consider the significance of each collection

In assessing risks, we also need to consider the significance of each of the items and collections and list the items and collections in order of priority. Not everything has the same significance. For collection items that are not considered significant, such as a collection of current popular magazines, a certain level of risk may be acceptable. However, for highly significant items, such as a collection of rare books, the same risk rating may not be acceptable. See the chapter on **Vital and Significant Collections** for further information about prioritizing.

Risk mitigation

Once you have identified and prioritized the risks, the next step is to consider how to reduce or mitigate those risks. The more significant the collection and the higher the risk, the more effort you will need to make to mitigate risk. The costs of mitigating the risks should always be considered in relation to the likelihood of the risk and the potential consequences.

Risk mitigation actions could include:

- moving significant collections off the floor to higher shelves;
- ensuring your organization has a current disaster plan and staff who are trained to respond;
- ensuring all staff are trained regarding the immediate steps they need to take if a disaster happens;
- installing security cameras and alarms;
- ensuring ICT backup arrangements in various locations;
- installing fire detection and suppression systems;
- arranging for uninterruptable power supplies (UPS) and backup generators;

- increasing preventive maintenance of the building, e.g. cleaning the gutters regularly, sealing doors and windows; etc.
- removing overhanging branches;
- formalizing procedures to quarantine donations and other vulnerable items before they come into the collection;
- installing sticky traps to identify whether or not insects are present in the building;
- having a store of emergency equipment and supplies ready; and
- clarifying coverage with your insurance broker.

Tips

- Check if your organization already has other risk management strategies in place, such as a business continuity plan and/or a risk register. If this is the case, there is an opportunity to include disaster risks in these frameworks.
- Many disasters occur during the hours when organizations are closed, so it is important to check that the security, fire detection, suppression systems, response procedures and IT systems are capable of operating 24 hours a day, and that your organization's disaster team (see Module 3.1) is available to take action if there is a disaster, including during holiday periods.
- Be aware that risk factors and circumstances can change over time, and that they vary with the different activities occurring in your organization. One of the highest risk times is during renovations and repairs. Your organization's risk assessments will need to be updated when changes occur, and when your disaster plan is revised.

Other tools

Risk assessment template of the National Archive of Singapore

The ALIA Disaster Management for Libraries Part One -Guide Table 3 (ALIA 2019). <https://read.alia.org.au/alia-disaster-management-libraries-part-one-guide> (Accessed 30 November 2023)

Basic Risk Assessment Matrix of the Pacific Regional Branch of the International Council on Archives (PARBICA) Recordkeeping for Good Governance Toolkit Risk assessment. Appendix C Basic Risk Assessment Matrix, Auckland, PARBICA 2007, pp 13.14. https://parbica.org/wp-content/uploads/2020/10/Guideline23-IdentifyingVitalRecordsforGovernmentDepartments_tcm50-103148.pdf (Accessed 30 November 2023)

National Museum of Australia (2012) 'Risk management criteria and matrix' in Collection care and Preservation Policy section 5.12 https://www.nma.gov.au/_data/assets/pdf_file/0004/558769/POL-C-042-Collection-care-and-preservation-v1.0.pdf (Accessed 19 March 2024)

Table 1. Probability of occurrence.

Collections Risk Assessment Components	
Probability	Rating for the probability of occurrence
Very low (1)	Almost Zero
Low (2)	Very rare (once a year)
Moderate (3)	Rare (several times a year)
High (4)	Frequently (once a month)
Very High (5)	Very frequently (weekly, daily)

Table 2. Severity of impact.

Magnitude	Rating severity of impact
Very low (1)	No damage/very limited damage; no conservation required.
Low (2)	Slight damage; surface damage, rehousing or conservation required.
Moderate (3)	Moderate damage, rehousing or conservation required.
High (4)	Serious damage (chemical, mechanical damage, disintegration, etc.) rehousing and conservation required.
Very High (5)	Severe damage (mechanical, pest, fire/water damage in the collection, etc.) rehousing or conservation required.

Source: National Archives Singapore, 2023.

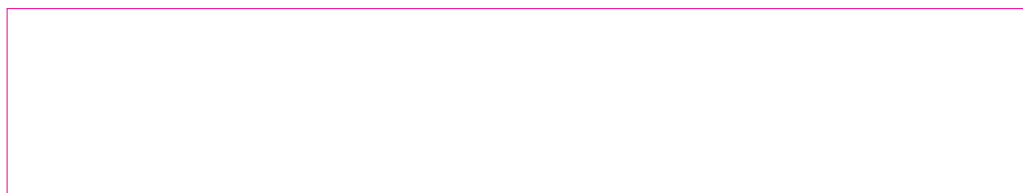
Table 3. Risk Assessment, to determine level of risk: probability x impact.

Probability	Risk Level				
	Very Serious 5	Serious 4	Moderate 3	Weak 2	Very Weak 1
Very High (5)	HIGH 25	HIGH 20	HIGH 15	MODERATE 10	LOW 5
High (4)	HIGH 20	HIGH 16	MODERATE 12	MODERATE 8	LOW 4
Moderate (3)	HIGH 15	MODERATE 12	MODERATE 9	LOW 6	LOW 3
Low (2)	MODERATE 10	MODERATE 8	LOW 6	LOW 4	LOW 2
Very Low (1)	LOW 5	LOW 4	LOW 3	LOW 2	LOW 1

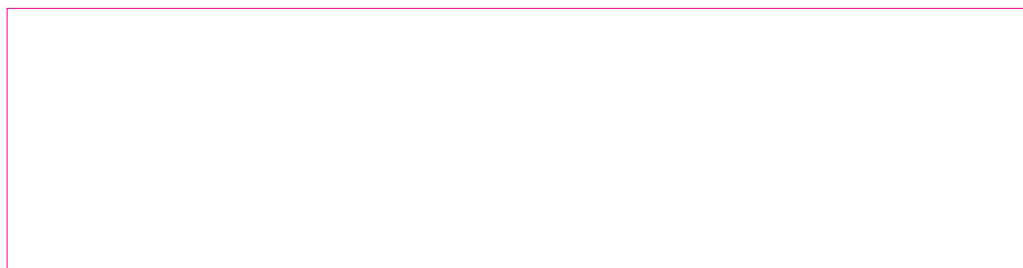
Source: National Archives Singapore, 2023.

Risk assessment | Questions

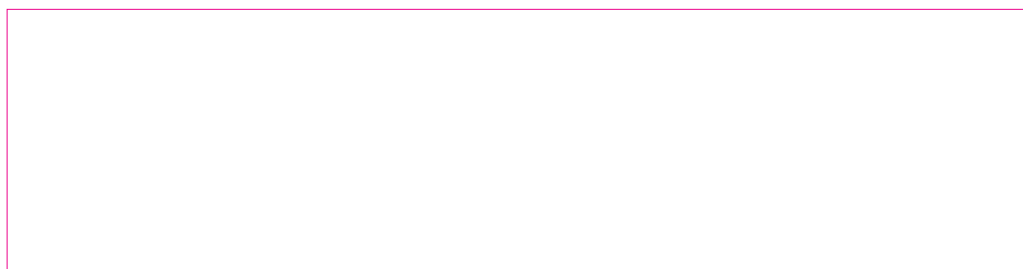
1. Are there people in your organization who can help you identify risks to your collections? If yes, what kinds of information could they potentially provide about risks?



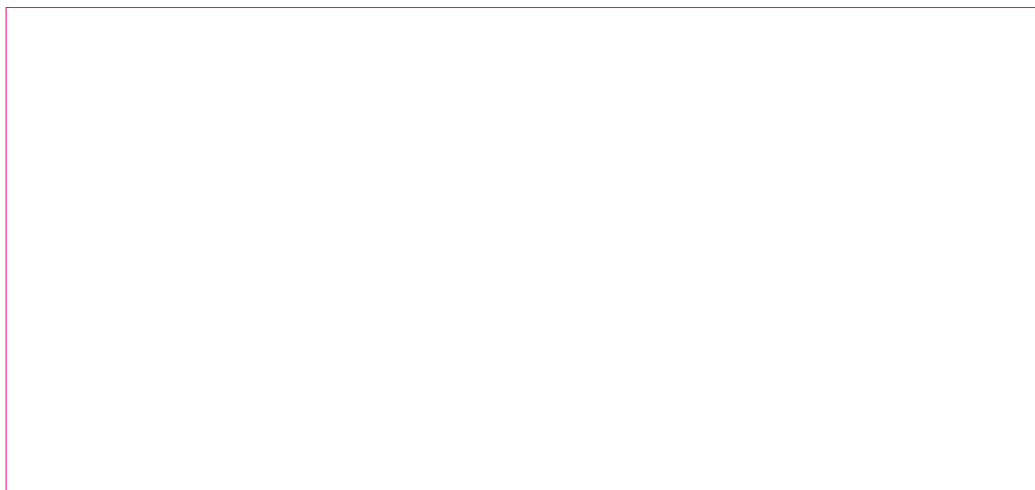
2. Do you know whom to contact at your local emergency services about risks to your organization's collections? If yes, make a list of their names.



3. [If relevant in your context] Have you taken steps to find out about indigenous local knowledge regarding managing disaster risks? Make a list of people to approach concerning such knowledge.



4. Does your organization use a risk management framework and matrix that you could adapt to help assess and prioritize disaster risks? If yes, how could you adapt it to include the disaster risks? If no, what other resources could you use to help you understand the likelihood and consequences of risks to your collections?



5. Have you identified broad categories of risks that might apply to the collections in your organization? If no, make a list of the types of vulnerabilities or risks you might find.

6. Have you identified the highest risks to collections in your organization? If yes, what are those risks? If no, create a list of the highest risks.

7. Does your organization have a risk register or accession register? If not, what are the ways that you can effectively make your disaster risks and mitigation strategies visible and supported by your organization?

8. Have actions already been taken to reduce disaster risks? If yes, what actions have been taken? If no, what practical steps can you take to mitigate the risks?

9. What resources or support do you need to mitigate the risks?

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Conducting geographic analysis

Lois M. Evans

Keywords: adaptation, climate, climate change, extreme weather

Introduction

This module looks at using geographic analysis to understand local weather patterns and the risks that our institutions may face due to climate change.

Geographic analysis is about using knowledge of geography and locations to assess the possible risks an institution, community and region may face because of extreme weather events. This knowledge includes records of rainfall, temperature, water levels, stream flows and other metrics, collected over many years.

When we understand the risks associated with our specific geographic locations, we are able to develop adaptation strategies.

Geographic diversity in the Asia-Pacific region

The Asia-Pacific region covers a large part of the globe, and local climates in the region range from dry to temperate to tropical, while our topographies range from mountainous to atolls. Average temperatures range from below 10°C to over 35°C, and annual precipitation ranges from .0003 metres to 3 metres.

Countries in our region often experience extreme weather events, such as earthquakes, tsunamis, hurricanes and cyclones. With climate change, such events are becoming more frequent and severe.

The various parts of the region are experiencing the impacts of climate change in different ways (IFRC, 2021):

- North-East Asia (e.g. China, Japan and the Republic of Korea): increasing frequency of floods and landslides due to heavy rain; rising temperatures, and severe storms.
- South Asia (e.g. Bangladesh and India): rising temperatures, heavy rainfall.
- Maritime South-East Asia (e.g. Indonesia and the Philippines): rising sea level; increasing frequency of flooding.
- Mekong countries (e.g. Cambodia, Lao PDR, Myanmar, Thailand and Viet Nam): rising heat and rainfall; increasing frequency of flooding.
- Australia: decreasing availability of water; increasing frequency of wildfires.
- Pacific Islands: sea level rise; increasing frequency of flooding.

If you have lived in a community or a region for a decade or more, you are likely to

know the local seasons and what to expect, and you have probably heard something about extreme weather events which have occurred in your area in the past. Other resources we can consult include the following:

- Elders and teachers in our community can provide information about local disasters which occurred in the past.
- Experts in geography and earth sciences can help us assess the climate risks in our local areas.
- Libraries and archives contain books and reports about seasonal weather patterns and unusual events.
- Currency, stamps and monuments commemorate past disasters. For example, Indonesia has currency and stamps that commemorate the eruption of Krakatoa in 1883, and Japan has monuments marking the sites of past earthquakes, such as the Unzen earthquake and tsunami of 1792.
- Websites such as Climate Central provide maps of coastal areas that show predicted sea-level rise. Visit <https://coastal.climatecentral.org/> to search for information about your region (available in English only).
- Other internet resources. Search with your country's name followed by 'AND extreme weather', 'AND climate change', 'AND climate maps', etc.

Adaptation

Adaptation refers to actions taken to reduce the impacts of climate change already experienced as well as those expected to happen in the future. This toolkit includes many examples of adaptive measures institutions can take in the short and long term. These measures include re-organizing collections to ensure that the most vulnerable materials are protected, and referencing vernacular building practices when constructing new facilities.

In many areas of Asia and the Pacific, the impacts of climate change are expected to be severe. For some institutions, retreat to less vulnerable locations may be advisable. In other places, digitization of documentary and built cultural heritage is becoming an important preservation strategy, resulting in the creation of virtual copies of the analogue originals. In the latter case, creating and managing digital files can be as demanding as it is for the analogue originals. In this regard, this toolkit recommends taking an integrated approach to the preservation of analogue and digital collections. The toolkit also includes a complete module on digitization, **Module 5**, which discusses digitization as a tool for preserving information contained in documents.

Key issues

Key issues associated with geographic analysis and adaptation include the following:

- Some areas of the world have limited scientific information concerning their geographic elements and climate risks, which restricts capacity to undertake geographic analysis.
- While the techniques used to assess disaster risk are straightforward, talking

about past events and thinking about future disasters can be emotionally difficult for some parties. Suggested ways to respond to these key issues include the following:

- Ask how your community how it healed and recovered from past traumas and what it thinks might be appropriate for moving forwards.
- Take a break from discussions of disasters if they become emotional stressful or overwhelming for some participants.
- Reach out to colleagues, family and friends to recall positive experiences in tandem with expressing concerns over future unknowns.
- Take time to experience and enjoy nature with gratitude.
- Take action to reduce risks and gain control over what you can.

Tips for compiling information about your area

- Talk to elders and others who have lived in your community for several decades, including members of your own family, about any environmental changes they have noticed. Consider inviting these people to a community meeting to respond to the preservation issues as a group.
- Identify well-known extreme weather events that have occurred in your country or area, and identify stories and articles about how climate change is impacting your region.
- Ask local archivists, historians, librarians and teachers if they know about climate and weather changes in your region.



1. The Kesennuma Koyo High School gymnasium after the Great Eastern Japan Earthquake of 11 March 2011. The school is now preserved as a disaster heritage site. Photograph by Yasu (1 June 2019. Public Domain. Wikimedia Commons)
2. Monuments in Uki mark the extent of sea-level rise during the Unzen earthquake and tsunami, which struck Japan on 21 May 1792. Photograph by Mizushimasea (10 March 2022. Public Domain. Wikimedia Commons)

Geographic Analysis | Questions

Begin your geographic analysis by answering the questions below, based on your own knowledge. Next, consult external resources (see suggested sources listed above) to fill in the blanks.

(A) Describe your institution's geographic location.

- Is your region's climate dry, temperate or tropical?
- What are the weather patterns of the various seasons like? Which months are usually the wettest and driest? Which months are usually the hottest; and which the coolest?
- Is your institution located close to the ocean or is it inland?
- Is the terrain flat, hilly or mountainous?
- Is your institution located close to a water source such as a river, lake or ocean?
- Is your institution located in an urban, suburban or rural area?
- What is the vegetation like around the institution?

(B) Describe any extreme weather events experienced in your region over the past two decades.

- What extreme weather events have occurred? What happened? When did this happen?
- How did these events impact your community?
- How did your community respond?
- Was your institution itself affected?
- How did your institution respond to the event?
- Have you observed clear signs of progress, or other responsive changes in recent years?

(C) Describe the weather patterns in your area, and any changes and impacts.

- Are local patterns of weather (especially rainfall) changing?
- How are changes impacting your community?
- How are changes impacting your institution?

(D) Has your institution taken any steps to respond to extreme weather events or changing climate?

- If yes, describe your institution's adaptation efforts.
- If your institution has not taken any such steps, what barriers might be standing in the way?
- How could such barriers be overcome?
- Do you have any suggestions regarding steps your institution could take towards greater adaptation to change?
- What institutions and/or individuals might be able to help your institution develop adaptation strategies?

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Protecting collections by improving storage and organization

Achal Pandya

Keywords: collections, storage, space, preventive conservation

Introduction

Key problems that many heritage institutions (libraries, museums and collection houses) face is a lack of space and disorganized storage areas. Collections are growing and it is important to store them in an organized and secure manner. When collections are disorganized and not easily accessible, and when they have incomplete documentation, this hinders effective disaster risk management and poses a risk to the collections.

This chapter discusses the benefits of reorganizing collections and how to go about such a process.

The benefits of reorganizing collections

Reorganization can enhance the overall management and preservation of the museum's collections. In particular, reorganizing collections can:

- reduce risks to collections,
- improve accessibility,
- facilitate efficient retrieval and handling of objects,
- enhance exhibition displays,
- enable the accommodation of new acquisitions and
- optimize the use of space.

Reorganization involves restructuring and reordering an institution's collections, and typically focuses on the physical arrangement of objects. It may also involve assessing the condition of objects, updating and cataloguing information and implementing appropriate storage and conservation measures, such as making changes in storage locations, shelving systems and storage methods.



1. Before regrouping a stone collection at a museum in India
2. After regrouping the stone collection
3. Before reorganizing a storage space
4. The reorganized storage space following the Re-Org method

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The Re-Org method

The [Re-Org method](#), developed by ICCROM and UNESCO with inputs from heritage institutions, offers a systematic approach to reorganization efforts, enabling institutions to optimize storage space, organize collections and assess and minimize the risks to collections associated with storage. The entire Re-Org method, including a toolkit, workbooks and other useful resources, can be accessed on the [ICCROM website](#).

The Re-Org method is useful in preparing disaster plans because often between 80 per cent and 95 per cent of a museum's collection is in storage. In order to prepare an effective disaster plan for any heritage institution it is necessary to study the existing storage system and spaces and assess potential risks associated with them.

The process of reorganizing a collection

The idea of reorganizing an entire collection may seem like an impossible task to begin with, but using the right methods and with an effective team, it is indeed possible.

Prior to reorganizing a collection, it is necessary to carefully plan the process, document the collection and ensure smooth collaboration between museum staff, including curators, conservators, registrars and collection managers.

A key part of the Re-Org process is 'regrouping', which involves rearranging objects within existing collection categories or creating new groupings based on thematic, chronological or value-based considerations so that objects are organized into coherent subsets or assemblages that align with specific needs, such as conservation, exhibition themes, research projects and educational programmes. It may involve shifting objects from one exhibition or display area to another, creating temporary exhibits or developing new permanent gallery layouts.

Regrouping allows curators and exhibition designers to create meaningful narratives, highlight connections between objects and present a cohesive story or concept to the museum's visitors. Regrouping can breathe new life into collections and provide fresh perspectives for interpretation.

While reorganization focuses on the physical storage and management aspects of collections, regrouping emphasizes the conceptual arrangement and presentation of collection objects for exhibition and educational purposes. Both contribute to effective curation and presentation of collections, ensuring their accessibility, engagement with the public and preservation.

How to regroup your collection

In favour of Objects regrouped by	Message	Conservation	Gain of space	Security
Origin				
Materials				
Dimension/weight				
Financial value				

Aggressors: elements that pose threats to collections

In the context of collection objects, an ‘aggressor’ refers to any factor or element that poses a threat or potential harm to the objects. Aggressors can be forces or agents that have the potential to damage or degrade the physical condition, integrity or overall preservation of the objects, and they can be either human-induced or natural factors. Understanding and identifying potential aggressors is crucial when assessing risks, so as to be able to mitigate those risks and ensure the long-term preservation of heritage objects.

List of Aggressors	
NATURAL	
A • Earthquake • Volcanic eruption • Storm • Hurricane • Lightning / hail • Flood • Tidal wave • Fire	B • Erosion • Inappropriate temperature • Dissolved salts • Inappropriate relative humidity • Corrosion agents • Pollution • Light • Microorganisms • Vegetation • Insects • Rodents • Dust
HUMAN	
C (public) • War • Terrorist attack • Fire • Public works • Deep ploughing • Illegal excavation • Urban development • Fanatism • Vandalism • Theft	D (public) • Abrasion • Vibration • Ignorance • Graffiti • Treasure hunting
E (professional) • Lack of: cultural project, legislative framework, administrative framework, awareness, motivation, training, security, programmes, communication. • Improper execution: excavation, transport, building, distribution, documentation, handling, storage, conservation, maintenance. exhibition, etc.	

Resources

About the Re-Org Method

<https://www.iccrom.org/programmes/re-org>

Re-Org Resources and guides

<https://www.iccrom.org/programmes/re-org/resources>

Additional resources on Re-Org

https://www.iccrom.org/sites/default/files/2017-11/en_iii_add_reso_nov2017_a4.pdf

Re-Org Workbook and self-evaluation forms

https://www.iccrom.org/sites/default/files/2018-01/en_i_workbook_jan2018_-_a4.pdf

Sample planner for museum storages

<https://www.iccrom.org/sites/default/files/05.%20Tables%20and%20memo.pdf>

List of Aggressors

<https://www.iccrom.org/sites/default/files/inline-images/Preventive-conservation.png>

Guide to risk management of cultural heritage ICCROM

https://www.iccrom.org/sites/default/files/2017-12/risk_management_guide_english_web.pdf

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Storage spaces and associated risks | Questions

(A) Storage spaces

- Is there adequate space in the storage areas to accommodate current and future collections?
- Are objects stored in designated areas to prevent overcrowding and ensure proper organization?
- Is there a systematic approach for optimizing the use of storage spaces, such as using vertical space and compact shelving systems?

(B) Shelving and storage systems

- Are shelving units sturdy and able to support the weight of the objects?
- Are the shelving units adjustable or customizable to accommodate objects of different sizes and shapes?
- Are appropriate padding and cushioning materials used to protect objects from damage during storage?
- Are objects stored in appropriate containers, such as acid-free boxes and archival sleeves, to prevent physical deterioration?

(C) Climate control and environmental conditions

- Is a climate control system in place to regulate the temperature and humidity levels within the recommended range for the stored objects?
- Are there regular monitoring and maintenance procedures to ensure the climate control system functions effectively?
- Are measures taken to minimize fluctuations in temperature and humidity, such as insulation and moisture barriers?
- Are light levels and UV exposure controlled (e.g. through appropriate lighting fixtures, window treatments and UV filters)?

(D) Pest management

- Are regular inspections conducted to identify signs of infestations by insects, rodents and mould? See chapter on [health hazards](#).
- Are effective pest control measures implemented, such as traps, baits and preventive treatments?
- Is there a pest management plan in place? Does it outline procedures for prevention, detection and treatment of pests?
- Are staff members trained in recognizing and responding to potential pest-related issues?

(E) Inventory management

- Are objects documented and labelled with unique identification numbers for easy identification and tracking? See chapter on [accession register](#).
- Are inventory records maintained in a centralized database or inventory management system?
- Is there a regular process for updating inventory records and reconciling them with the physical objects?
- Are there procedures in place for conducting periodic physical audits to ensure the accuracy of inventory records?

(F) Security measures

- Are the storage areas equipped with appropriate security systems, such as alarms, motion sensors and access control systems?
- Are there designated entry points with restricted access to authorized personnel only?
- Are there protocols for monitoring and recording access to the storage areas?
- Is there a comprehensive security plan that includes measures for preventing theft, vandalism and unauthorized removal of objects?

(G) Accessibility

- Are objects arranged in a logical and systematic manner to facilitate easy retrieval when needed?
- Are storage areas properly labelled, with clear signage indicating the contents or categories of stored objects?
- Is there a comprehensive inventory index or catalogue system that aids in locating specific objects within the storage areas?
- Are there appropriate handling and lifting equipment available to safely retrieve objects without causing damage?

(H) Funding and resources

- Are there allocated budgets or funding resources specifically designated for storage improvements and maintenance?
- Are sufficient staff employed? Do they have the necessary expertise in collection management and storage practices?
- Are there ongoing professional development opportunities for staff members to enhance their knowledge and skills in storage management?

(I) Emergency preparedness

- Is there an emergency response plan in place that outlines procedures for mitigating risks and handling potential disasters, such as fire and flooding?
- Are emergency contact information and relevant resources readily accessible to staff members?
- Is there a system for regularly testing and maintaining emergency equipment, such as fire extinguishers and emergency lighting?
- Are there protocols for evacuating objects safely in the event of an emergency?

(J) Regular training and review

- Are regular training sessions or workshops conducted for staff members about storage best practices, handling techniques and risk management?
- Are staff members provided with resources, guidelines or manuals to support their understanding of storage procedures?
- Is there a system for periodic review and assessment of storage practices to identify areas for improvement and implement necessary changes?

(K) Collaboration and networking

- Have collaborations or partnerships been established with other museums, institutions and professionals to share knowledge and best practices in storage management?
- Do staff members participate in industry conferences, workshops and forums to keep up with current trends and advancements in storage techniques?

Worksheet 1 | Storage / Risk assessment

Worksheet 1 can help to identify and assess risks associated with display and storage spaces.

It can be modified or expanded to suit your organization's purposes.

	Storage organization and potential risks	Description	Potential impacts	Mitigation measures	Action plan / Notes	Risk rating (low/medium/high)
1	Storage space	Evaluate the available storage space and its sufficiency.	Overcrowding			
			Improper stacking			
			Difficulties in object handling			
2	Shelving and storage systems	Assess the condition and suitability of shelving systems.	Insufficient shelving capacity			
			Inadequate support for fragile objects			
			Lack of appropriate storage containers			
3	Climate control and environmental conditions	Evaluate the effectiveness of climate control and monitoring.	Fluctuations in temperature and humidity			
			Light damage and UV exposure			
			Mould growth and deterioration			
4	Pest management	Assess the effectiveness of pest control measures.	Infestation by insects, rodents, or moulds			
			Damage to objects			
5	Inventory management	Evaluate the efficiency of inventory management practices.	Loss or misplacement of objects			
			Inaccurate or incomplete records			

	Storage organization and potential risks	Description	Potential impacts	Mitigation measures	Action plan / Notes	Risk rating (low/medium/high)
6	Security measures	Assess the level of security measures in place.	Theft or unauthorized access to objects			
			Vandalism or damage to objects			
7	Accessibility	Evaluate the accessibility of stored objects for various uses.	Difficulties in locating and retrieving objects			
			Impediments to research and loan requests			
8	Funding and resources	Assess the availability of resources for storage improvements.	Insufficient funding for storage infrastructure			
			Lack of staffing and expertise for storage			
9	Emergency preparedness	Evaluate preparedness for emergencies and disaster situations.	Fire, water damage, or other disasters			
			Loss or damage to stored objects			
10	Staff training and development	Assess the training and development of staff in storage management.	Inadequate knowledge of storage best practices			
			Lack of expertise in preventive conservation			
11	Monitoring and maintenance	Establish procedures for ongoing monitoring and maintenance of storage facilities.	Neglect of storage conditions			
			Deterioration of storage infrastructure			
12	Documentation and record keeping	Develop a system for proper documentation and record keeping of stored objects.	Loss or misidentification of objects			
			Lack of historical provenance information			

	Storage organization and potential risks	Description	Potential impacts	Mitigation measures	Action plan / Notes	Risk rating (low/medium/high)
13	Disaster recovery and contingency planning	Create a plan for disaster recovery and contingency in case of emergencies.	Inability to salvage objects			
			Disruption of museum operations			
14	Regular training and review	Establish a schedule for regular training and review of storage practices and risks.	Lack of awareness of evolving risks and best practices			
			Inadequate response to changing circumstances,			
15	Collaboration and networking	Foster collaboration and networking with other institutions and professionals for knowledge and support.	Limited access to resources and expertise			
			Missed opportunities for improvement			
16	Overall risk assessment	Rate the overall level of risk in your museum's storage.				

Source: Re-Org - ICCROM, UNESCO

Construction methods and disaster preparedness

Brandon Oswald

Keywords: vernacular architecture, environmental risks, traditional construction, traditional materials, building assessment

Introduction

In order to keep collections safe and secure, archives and other buildings that house records and collections must be water resistant, earthquake proof, durable and accessible and must have working environments that are healthy and comfortable. To achieve this, buildings should be designed to suit local conditions.

When designing or renovating a building, it is important to analyse the **geographic location** in order to identify potential climate-related risks (e.g. floods, hurricanes, fires, etc.) and other risks in the local area (e.g. nearby rivers that may overflow following extreme rainfall). This way, we can ensure buildings are suitable and resilient, and also develop appropriate adaptation strategies.

This module highlights the benefits and relevance of vernacular buildings for archives and heritage institutions, and provides a template for assessing the risks associated with all types of buildings in the context of disaster risk management.

Vernacular architecture

Vernacular architecture is often referred to as 'building without architects'. A traditional practice that has evolved over generations in response to the local climate, topography, culture and context, it tackled issues related to air circulation, moisture, pest infestation and heat long before the advent of modern technologies that address those issues. Vernacular architecture also uses locally available natural materials (e.g. pandanus leaves; coconut branches; reeds; etc.), which are usually readily accessible and are more suitable for the local climate than modern materials (e.g. thatched roofs made of leaves or straw will keep a house cooler than tin roofs). And because these local materials do not need to be transported very far, they have a low carbon footprint.

Vernacular architecture is one of two types of ‘non-engineered’ construction that is adapted to local context and made with local materials. Its construction techniques are passed on from one generation to the next and this architecture is often more resilient to local natural hazards. Moreover, it is culturally connected to its environment and communities (...) traditional settlements are developed in harmony with their cultural and social environment and therefore foster social resilience to natural disasters. However, this type of construction sometimes needs to be improved to be more resilient to disasters without losing their features/strengths (Narafu, 2016).

Table 1 compares non-engineered and engineered houses in terms of materials, workers, need for technical intervention and users/dwellers.

Studies have shown that traditional buildings are often resilient in disasters. This is because they are made of materials that have a level of flexibility that modern buildings do not have and are made of materials that are light in weight and cause less damage to other structures in heavy storm situations and earthquakes. For example, **nakamal buildings in Vanuatu** are known to withstand cyclonic conditions and have been used as community shelters in such conditions.

Table 1. Comparison of non-engineered and engineered houses.

Items	Non-engineered	Engineered
Materials	Available in the area No quality control	Usually controlled in size, quality, etc.
Construction workers	Non-skilled or semi-skilled workers	Skilled workers
Technical intervention	Little or no intervention	Intervention in design, construction procedures
Users/dwellers	Low or middle income	Middle or high income

Source: *Guidelines for Earthquake Resistant Non-Engineered Construction*, UNESCO.

Assessing the risks associated with a building

Conducting a risk assessment identifies risks associated with a building and gaps that need to be addressed. See below for a template that can be used and adapted.

Overall situation					
Categories to consider	Risks/Hazards	Probability H/L	Impact H/L	Level of Risk	Preventive Actions
Climate risks / Geographic location (i.e. proximity to water, frequent storms, earthquakes)					
Infrastructure / Utilities (e.g. water pipes, electrical wires)					
Available staff for maintenance and repairs					
Available staff who have been trained to respond to a disaster					
Available shelter / storage in case of a disaster					
Available building materials in the aftermath of a disaster					
Proximity and accessibility to emergency services					

Internal situation (building and storage)					
Categories to consider	Risks/Hazards	Probability H/L	Impact H/L	Level of Risk	Preventive Actions
Unsafe elements in the building (i.e. deterioration, pests, neglected areas)					
Toxic materials					
Air circulation / ventilation					
Light / heat / radiation					
Storage conditions / furniture and shelving / locked items					
Digital equipment rooms					
Building materials that are prone to hazards					

Source: PARBICA, 2007

Tips

Appropriate, resilient and sustainable building design requires having an understanding of structural resilience, local geographic risks, utilities and infrastructure, among other factors. If you are in the process of designing a new building or renovating an old one, the tips below will assist you to ensure your building suits your local context and is resilient in the face of disasters.

- Examine how the resilient and sustainable buildings in your area or region were designed and constructed, including local traditional buildings.
- Collect knowledge from local communities about traditional buildings and how their design is related to disaster risk management strategies.
- Search for training courses, documentation or networks on vernacular architecture in your area.
- Look for international programmes, resources or manuals on non-engineered architecture and disaster resilience. See, for example, IAEE, 1986.
- While traditional materials can sometimes be more expensive than modern materials, they are usually more sustainable.
- Whenever possible, share the lessons you learned about vernacular architecture at regional workshops and conferences, as well as via online platforms and relevant publications to facilitate the dissemination of knowledge that can benefit other institutions and communities.

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Building assessment | Questions

1. Have you carried out a risk assessment for your organization's building?

2. Was your building constructed using traditional construction methods and materials? If so, describe the building's components and materials and how they can help to mitigate the impact of natural disasters.

3. Do you plan to make changes to your building or build a new building in the near future? If so, which areas would you like to improve for better resilience? What steps have you already taken in the planning of your new archives building?

4. Have you or one of your staff received previous training on spatial design or architecture in connection to disaster risk management (DRM)?

5. What kinds of spaces and rooms are needed in your archives building to keep your collection safe?

6. What kinds of natural materials in your area could be used in the construction of your new archives building?

7. Are there individuals or construction companies with indigenous or traditional knowledge that could help plan and construct your new archives building?

8. Do you have access to information on vernacular architecture and disaster-resilient architecture?

Health hazards in handling documents and collections

Sanira Beevi

Keywords: hazardous substances, occupational health and safety, disaster, personal protection

Introduction

Heritage institutions have a mandate to manage and preserve their collections and their country's records of historical importance for the long-term. People who are responsible for managing libraries and archives, including librarians, curators, archivists and conservators, have a professional duty to ensure that items within their collections are maintained in appropriate conditions. In carrying out their duties, conservation professionals must also protect themselves against potential health and safety impacts.

This module will cover:

- Signs of deterioration of items and collections
- Personal health and safety measures
- Measures for protecting items and collections
- The dos and don'ts of handling items and collections

Key issues

- Occupational health and safety are not always priority considerations when managing collections
- Threats to the health and safety for collection staff might not be immediately recognizable
- Some agencies, institutions or donors may not be aware of safe procedures for managing and transferring items and collections, or may not have such procedures in place

Signs of deterioration

Common signs of deterioration of collections and archives (especially paper) include the following.

- Foxing: Flecks which range from light yellow to light brown or black. General ageing of paper due to acidity.
- Corrosion stains: Visibly discoloured. Brown to black stains. Discolouration in and on the material, caused by metal objects such as pins, staples, fasteners, paper clips, file clasps, etc.
- Insect frass: Dust-like debris left behind by pests.

- Pest damage: Areas on the material where the surface has been eaten away.
- Tide lines (water damage): Water stains (yellow to light brown patches will be discernible in the material) and tide lines will be visible on the edges of the stain. These are often accompanied by running ink.



Foxing



Corrosion Stain



Insect Frass



Pest Damage



Tide Lines - Water Damage

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Less-common signs of deterioration and abnormalities in collections that collection staff should be aware of include the following:

- Dormant mould (characterized by dark spots that smear upon touch)
- Active mould
- Live pests
- Chemical agents
- Soot

Health effects of exposure to mould

An active mould outbreak is due to high levels of moisture and almost always follows a water-related incident or disaster.

Exposure to mould can cause a blocked nose, eye irritation, wheezing and skin irritation. In severe cases, it may cause difficulty in breathing, fever and shortness of breath.

The following people should NOT work near mould:

- Patients taking medicines that suppress the immune system.
- Cancer patients undergoing chemotherapy.
- People who have received an organ transplant.

Live pests

Finding live pests in collections signals a lapse in integrated pest management and demands quick attention. Staff should avoid direct contact with any pests and must wear gloves when removing pest frass and faeces.

Chemical agents

In recent years, collecting institutions have found that hazardous chemical agents have contaminated their collections; often these chemicals are in the form of pesticides. It is important for collection staff who are the frontliners when assessing and listing items and collections to be aware of potential dangers such as chemical agents and take measures to protect themselves.

Soot

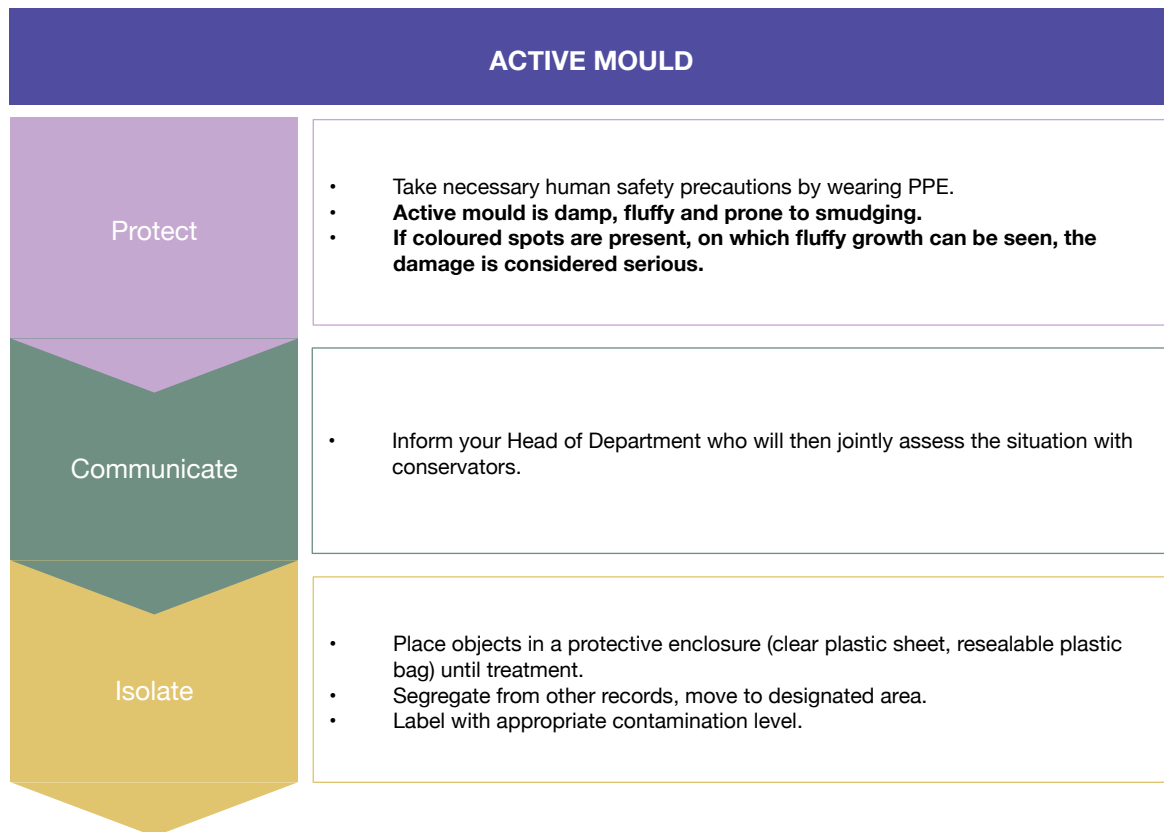
Soot is carcinogenic and is hazardous to health. Following fires and other disasters that produce soot, staff should ensure that they do not touch soot with bare hands and should wear masks to prevent inhaling it.

Recommended contamination warnings

- Label with appropriate contamination warning.
- Label items immediately with the collection name, box number, date etc.
- Label with appropriate and clear warning sign, e.g. Active Mould (Do Not Touch)
- Large-scale collections should have a hazard awareness sign posted on entrance.



Source: National Archives of Singapore



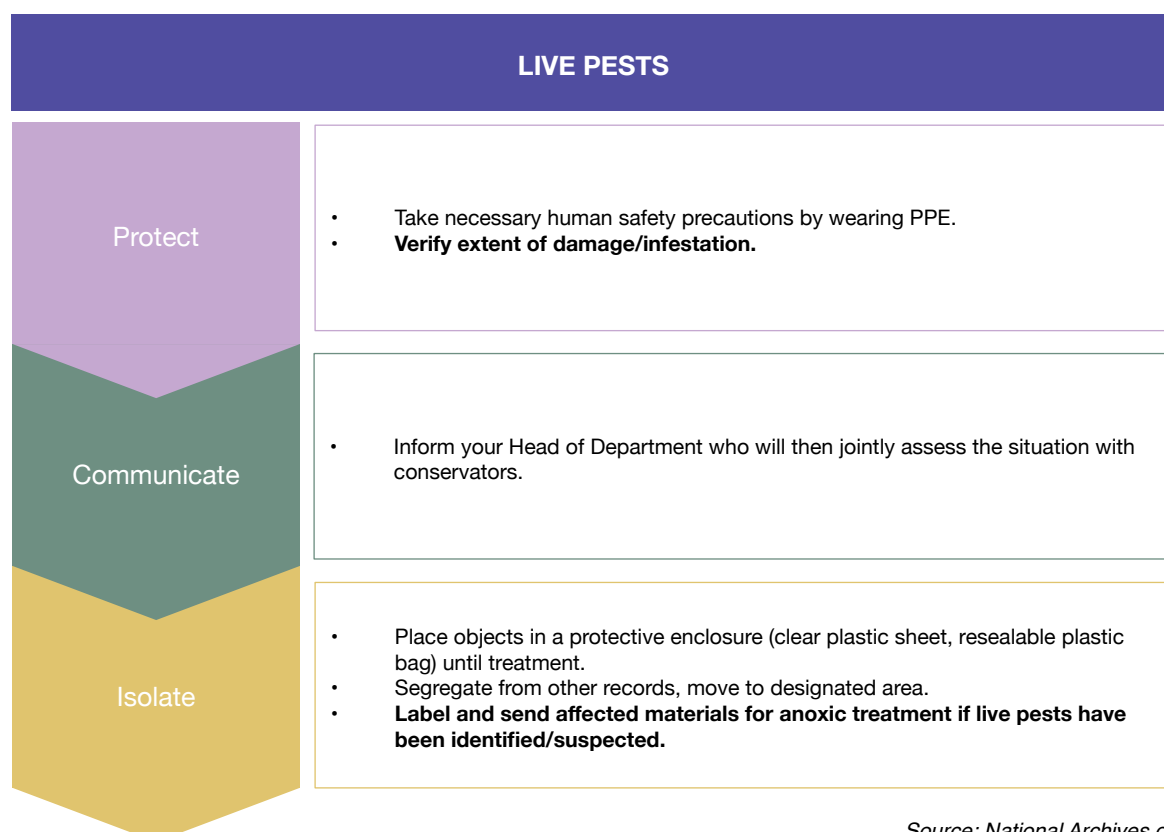
dormant mould / stain



active mould



silverfish



CHEMICAL AGENTS	
Visual assessments are never conclusive; analytical testing is required to identify actual compound	
Protect	Take necessary human safety precautions by wearing PPE.
Communicate	Inform your Head of Department who will then jointly assess the situation with conservators.
Isolate	- Place objects in a protective enclosure (clear plastic sheet, resealable plastic bag) until treatment. - Segregate from other records, move to designated area. - Label with appropriate contamination level.

Common chemical agents include: naphtalene, paradichlorobenzene, arsenic, mercuric salts and pigments containing lead.



arsenic oxide



soot

SOOT	
Protect	Take necessary human safety precautions by wearing PPE.
Communicate	Inform your Head of Department who will then jointly assess the situation with conservators.
Isolate	- Place objects in a protective enclosure (clear plastic sheet, resealable plastic bag) until treatment. - Segregate from other records, move to designated area. - Label with appropriate contamination level.

Health and safety recommendations

Basic ways to protect your health

To protect yourself:

- Wear personal protective equipment (PPE), such as gloves, eye protection, masks and protective clothing, during collection-handling activities to avoid exposure to harmful substances.
- Ensure good ventilation in your work area. For example, ensure that the air-conditioning is running with sufficient air flow, and that it has adequate filters.
- Wash hands, arms and exposed skin with soap and water after removing work gloves before leaving the work area and before beginning a different task.



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Inform your reporting officer of any illnesses or other symptoms, e.g. eye irritation or respiratory problems, in case they are associated with your work.

Advice on glove usage

Gloves not only prevent the transfer of oils and dirt from fingers to collection items and materials (which can damage or destroy the materials over time), they also protect people from potential hazards.

To stay safe, remember the following.

- Gloves cannot be shared.
- Avoid touching your eyes, nose, mouth or adjusting eyewear after touching potentially contaminated surfaces.
- While wearing contaminated gloves, do not eat, drink, smoke or apply cosmetics.
- Gloves are single-use items and must be removed and disposed of immediately if they are contaminated and likely to spread contamination.
- Gloves should not be washed, decontaminated or reused.
- Remove and replace gloves once damaged.
- Carefully remove gloves to minimize skin contamination.
- Dispose of gloves appropriately (i.e. in special bins that prevent the spread of contamination).

Measures to protect yourself and others during and after a disaster

Health and safety measures:

- If there is flooding following torrential rains or a plumbing leak, or if there is water damage because of a fire, do not enter the flooded area until the electricity supply has been disconnected.
- Only enter when authorized experts have declared the area to be safe.
- When entering the affected space, take personal safety precautions by wearing PPE.
- If items and collections are contaminated, label them with a clear warning sign that explains the type of contamination e.g. Active Mould (Do Not Touch).



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Measures for protecting items and collections

To prevent contamination and damage to archives and collections:

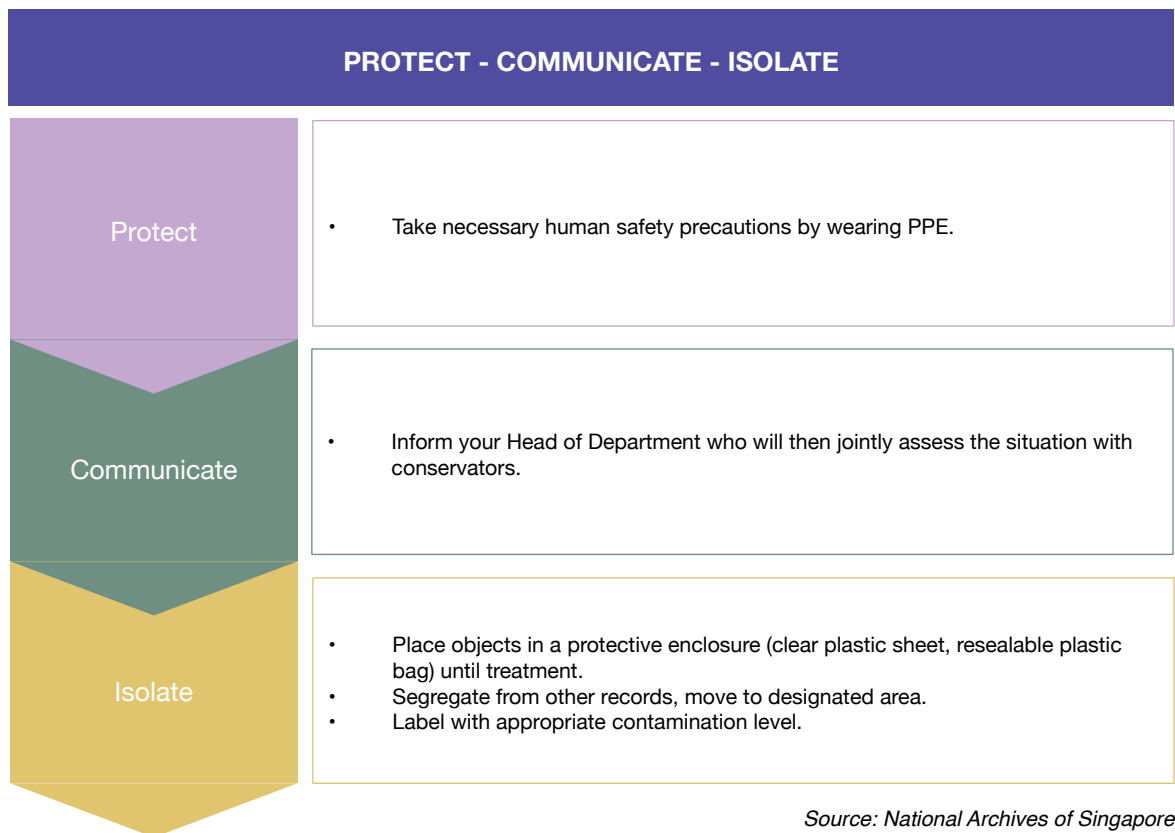
- Keep your workspace tidy, clean and dry.
- Do not drink, eat or smoke in collection areas.
- Ensure there is adequate working space.
- Dust the workspace with a dry cloth.
- Use a damp cloth if necessary to clean the workspace, but ensure that the surface is thoroughly dry before placing objects on it.
- Remember to clean your stationery and laptop before and after use.

Actions to take to rescue collections during and following a disaster:

- If water is dripping from the ceiling, cover collections with plastic sheeting and place buckets under the leaks.
- In the event of large-scale water inflow, collection staff must alert their

department heads who will make the call to arrange for affected records to be rescued and quarantined.

- Label items with the collection name, box number, date, etc.
- Move collections to designated safe areas.



Recommended equipment

When handling wet items and collections, it is useful to measure moisture levels in order to assess the severity of moisture contamination and the efficacy of drying methods.

A pin-free paper moisture detector is recommended, such as a microprocessor-controlled, handheld moisture meter. When the sensor is pressed against paper, the moisture content is displayed in a few seconds. The acceptable level of moisture is below 13 per cent.

An ultraviolet (UV) examination kit is recommended for any emergency kit. It should include a UV inspection lamp and UV-absorbing goggles (as UV light can be damaging to your eyes). An ideal inspection lamp allows long wave UV emitting light at 365nm. As UV rays may cause deterioration to light sensitive media and material, inspections should be as short as possible.

Dos and don'ts for handling items and collections

Materials such as paper are vulnerable to damage when handled. Repeated handling of physical records can reduce their lifespan.

Do	Don't
MARKING AND WRITING	
- Only use pencil (2B) to make any necessary marks or inscriptions. - Only make inscriptions when the paper is on a clean, hard surface, to avoid embossing the paper.	Don't use pens, highlighter markers, adhesives labels.
MOVING	
- Use elevators to move objects from one floor to another. If an elevator is not available, have 2 handlers move small quantities each time. - Always use protective enclosures (boxes, folders, portfolios, etc.) when transporting objects from one location to another.	- Don't expose the collection to the environment during transporting. - Don't fold or roll the records. - Don't use a goods trolley for transporting.
HANDLING	
- Use a page turner or support to turn the page. - Wear gloves if you need to use both hands.	- Don't touch the text or image on the page. - Don't lean, rest, write or place anything on top of objects. - Don't apply hand creams, lotions when handling collections. - Don't wear jewelry when handling collections.
CLEANING	
Use a soft brush for cleaning of records.	Don't use cleaning products or detergents such as bleach.
STORAGE	
- Always place the collections at least 6 feet (180 cm) above ground level. - Limit light exposure. - Use only cotton tape to bundle or tie the enclosure.	- Don't use rubber bands, rope or raffia to bundle the collection. - Don't fold over the corners of pages, use paper clips or other fasteners.

Source:
National Archives of Singapore

Health hazards | Questions

To identify issues and gaps related to the safe management and handling of collections in your institution, answer the following questions.

1. How are documents/items moved within your institution, from ingestion to listing to storage?
2. Do you have an action plan when it comes to removing hazardous substances such as mould or pesticides from collections?
3. How would your institution deal with an outbreak of active mould?
4. Does your institution have an integrated pest management plan? How do you keep pests away?
5. Who are the staff that handle the items in your collections?
6. Do you have an in-house team of conservators or staff accountable for preservation matters?
7. Are your collection staff trained to handle documents in the correct ways, such as the correct way of turning pages, or how to remove metal objects while accessioning or listing?
8. Do your staff have access to personal protection equipment (PPE), such as gloves, disposable aprons, etc?
9. Does your country have designated agencies for workplace health and safety and for the safe disposal of chemicals?
10. What are the environmental conditions (temperature, humidity, lighting, etc.) in your repositories or collection storage areas?
11. Do you have a designated space to isolate and assess potentially hazardous materials?
12. Does your institution have adequate tools and equipment for decontamination? How often are these checked and replaced?
13. Does your institution have access to fume hoods, chest freezers or HEPA filtration systems?

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Acknowledgements

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Case study

The A Word: The discovery of Arsenic in collections at the National Archives of Singapore

Sanira Beevi

2020

Keywords: hazardous substances, occupational health and safety, disaster, mitigation

In 2020, conservators at the National Archives of Singapore (NAS) discovered a powdery white substance in the government records collection that they had never encountered before. After establishing through material testing that it was arsenic oxide, NAS consulted with their local workplace safety and health guidelines and the National Environment Agency to identify the safest way forward. Cross-referencing other international case studies, NAS then developed and put in motion a comprehensive response plan to manage the arsenic-contaminated materials in their archive and library collections.

Problem identification

In early 2020, documents that were to be digitized were identified as needing conservation. They had an advanced stage of deterioration from termite infestation, with termite carcasses inside the volumes. The pages were stuck together, making mechanical handling very difficult. The conservators who

examined the documents realized that there was a strange white powdery substance that had almost hardened and adhered to the valleys of the volumes.

The team suspected hazardous pesticides were used by the transferring agency, so a decision was made to send some samples for testing. The white substance was eventually identified through testing and analysis as inorganic arsenic oxide, a highly hazardous substance. It was discovered that a transferring agency had used arsenic-based pesticides to fumigate the termite-ridden records before transfer to the NAS.

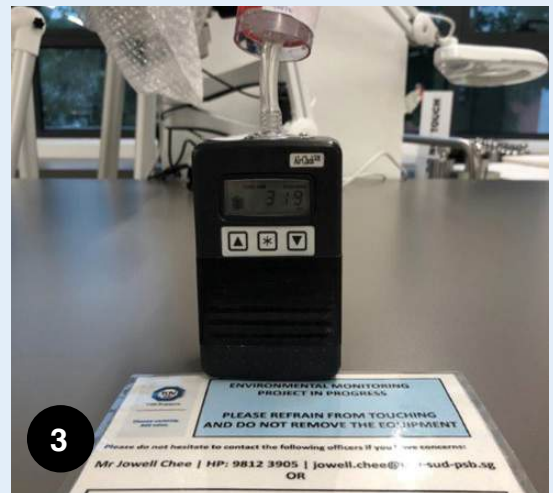
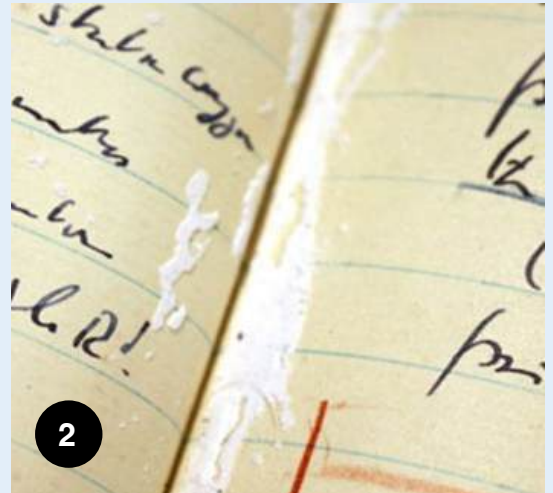
Solutions

NAS approached this issue by:

- Studying material safety data sheets on arsenic oxide to understand the substance better.
- Restricting access to the repository housing this collection.
- Seeking advice from Singapore's agency for the environment, the National Environment Agency (NEA), on safe disposal of this contaminant.
- Referring to the Labour Ministry's workplace safety and health guidelines for information about managing the arsenic contamination of the workplace.

NAS subsequently determined that the highest priority was to address any health and safety concerns and ensure that the workspace was safe. Even though arsenic is not typically airborne and although some time had elapsed since discovery, air quality testing experts were hired to test for arsenic in the places the records had been in. The test results showed that the building was not contaminated, so steady state operations resumed.

NAS also arranged medical testing with an occupational health and safety specialist for all staff who had come in contact with the collection. There was no evidence of arsenic poisoning among any of the staff.



1. Pest damage
2. White powdery substance
3. Air test for arsenic in workspaces
4. Collection staff going through training on safe handling using PPE

© National Archives of Singapore

Once NAS had ensured workspaces were safe and that the staff were not adversely affected by this exposure, the next task was to arrange the safe cleaning of the collection, which was large, consisting of A5-sized notebooks and files of loose sheets housed in 28 boxes.

NAS decided to outsource this part of the operation to external experts to ensure safety and to prevent cross contamination with other collections.

The following considerations guided NAS in selecting an expert to remove the contaminants.

- The expert had to be trained and certified, and specialized in entomology (insects).
- The expert had to guarantee the security of the documents; ensuring they would be stored under lock and key in a place with 24/7 CCTV surveillance.
- The expert had to ensure compliance with our technical requirements for removal and handling of the records – specifying cleaning using a HEPA vacuum with a custom-made laboratory glove box.

NAS drew up a clearly demarcated route from the point of the retrieval of boxes in the NAS facility to the point of loading them into the vehicle to transport them to the vendor's premises.

Health and safety precautions included the following:

- Full PPE was worn by the cleaning specialists and movers.
- The boxes were double bagged.
- Air scrubbers were deployed.
- The affected shelves and the movement route were cleaned thoroughly using an IPA solution.

The subsequent cleaning of over 160,000 pages took thirty-two working days, using custom-built equipment.

After the documents had been cleaned, the NAS team of conservators tested the documents for arsenic again using surface swab tests, as a control measure. These tests were negative; no arsenic remained on the documents.

While NAS had a business continuity plan for responding to disasters such as pandemics, fire,

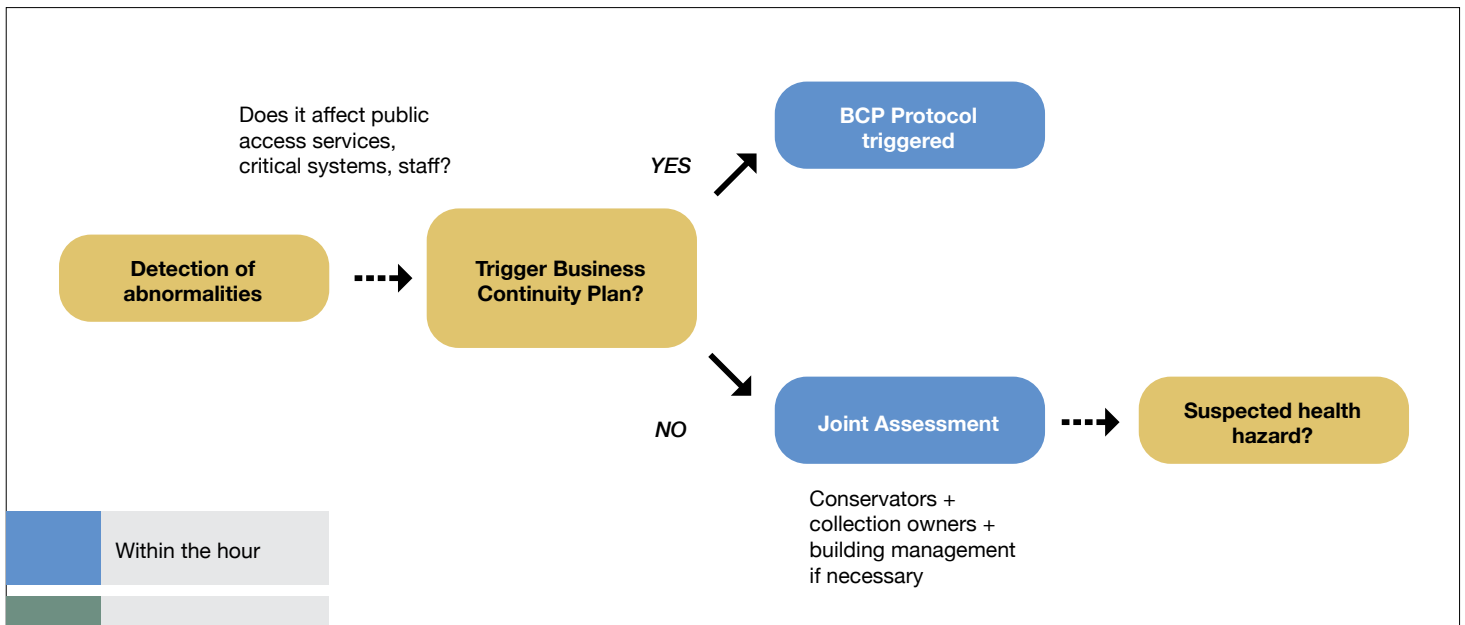
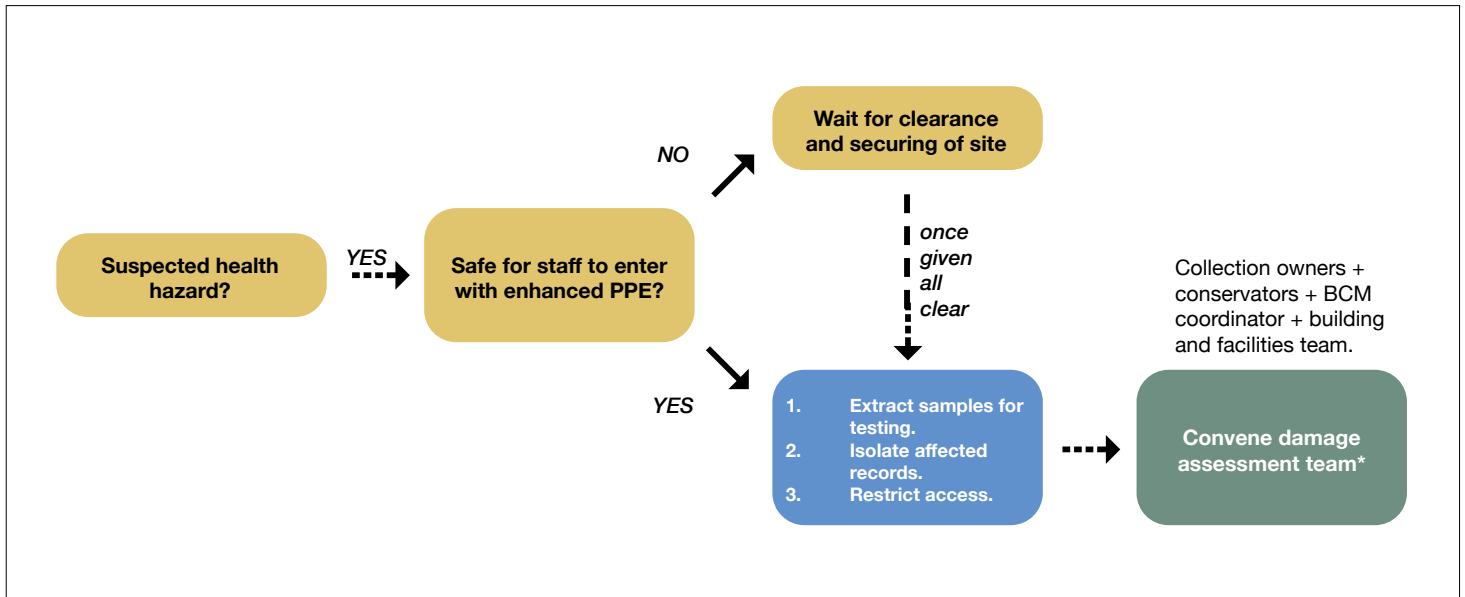
haze and terrorism, it did not have standard operating procedures (SOP) for managing hazardous materials. NAS consequently reviewed its plan and introduced an SOP and workflow for hazardous materials, with timelines for actions.

In the new plan, if a discovery of abnormalities does not trigger the implementation of the plan (meaning basic access services to the public are not affected), then a joint assessment must take place within the hour. This joint assessment would be done by conservators, collection owners, building and facilities management if necessary.

If it is a suspected health hazard, the damage assessment team will determine if it is safe to enter the space for the extraction of samples. Once site clearance is obtained, samples will be extracted, while access will be restricted until the results of the testing are available. A damage assessment team comprising collection owners, conservators and building and facilities management would then be convened within 24 hours. Depending on the scale of the issue, the team would then update and inform relevant departments, coordinate testing and update the management with a status report.

If it is determined to be not a health hazard, then a de-escalation timeline is followed, where a determination is made as to whether it is a risk to other records, such as in the case of a pest infestation. If internal conservation treatment is necessary, the collection team and the repository unit would be informed promptly.

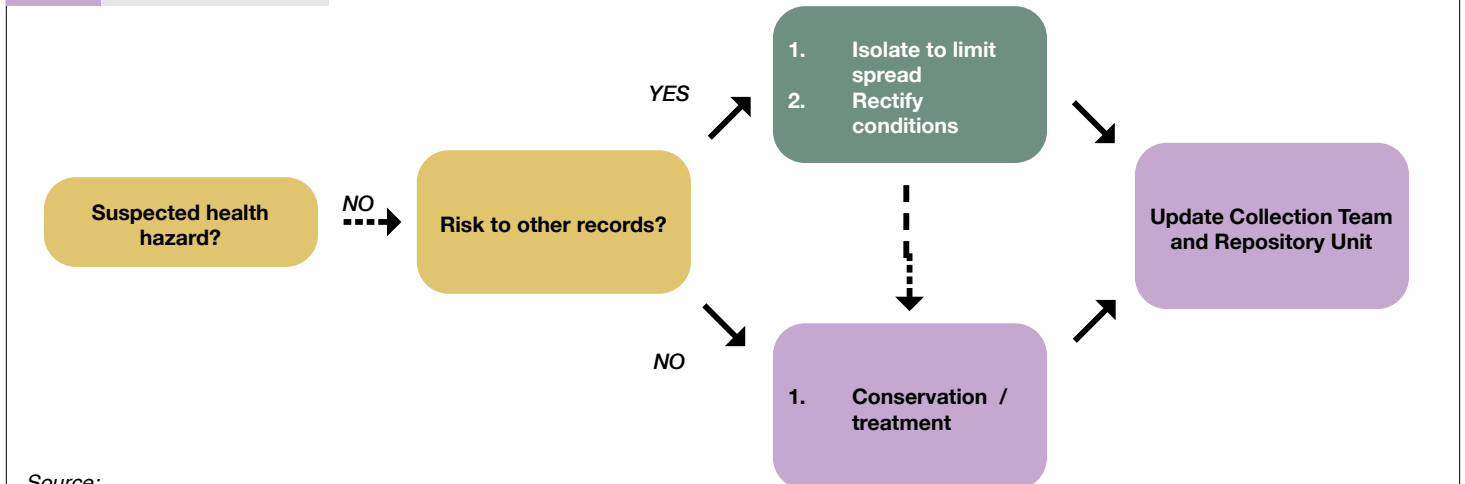
New Workflow for Hazardous Materials



Within the hour

Within 24 hours

Within 2 weeks



Source:
National Archives of Singapore

Lessons learned

The main lessons learned from this incident were as follows:

- Staff should wear appropriate PPE. The NAS has since made it mandatory for collection staff to wear gloves and aprons when appraising and listing records.
- It is necessary to have a clear SOP for hazardous materials and transparent communication to ensure the safety of staff and the protection of the collections. The NAS hazardous materials SOP now sits within the larger disaster plan for the Library and Archives, which was reviewed to include the Prevention – Preparation – Response – Recovery (PPRR) Framework, from the four stages of disaster management (ALIA, 2010).
- It is important to have a designated space that can be used as an isolation room to handle any hazardous materials. Following the arsenic incident, NAS converted a space for this purpose. This isolation room is equipped with fume extractors as well as ultraviolet-C light (UVC) and X-Ray fluorescence capabilities.
- Knowledge of how to identify potentially hazardous substances should not be limited to conservators; instead, everyone interacting with collections should have this knowledge. NAS has since empowered collections staff with the necessary skills and knowledge to protect themselves, to promptly communicate a discovery and escalate it through the relevant channels, and to independently isolate potentially hazardous substances, so as to minimize any risks. Regular training, conducted by the NAS conservators, focuses on signal detection and PPE controls. Collection staff are taught to identify abnormalities such as mould, soot and chemical agents, and a simple easy mnemonic was taught that enables staff to remember to protect, communicate and isolate. NAS plans to provide this training for all library and archives staff in future and make it a compulsory part of their development and training plan.
- It is useful to have a two-year collection

survey plan for all key collections in the archives, so that issues can be detected and addressed in a timely manner.

- An up-to-date list of service providers is necessary so that providers can be contacted quickly when needed during an emergency. The list should include the contact details of experts, specialists and local agencies as well as law enforcement officers.

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Acknowledgements

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Case study

Safeguarding the Thai Film Archive during the 2011 floods

Chalida Uabumrungjit

Keywords: flood, preparedness, monitoring, Thailand

In 2011, the film archive of Thailand found itself in an unprecedented situation. The buildings housing the precious film collection were at high risk of being flooded.

The neighbourhood of Salaya Nakhon Pathom, home to the film archive, is situated within a water retention zone of the Chao Phraya River and the buildings are on swampy ground, which can easily become flooded.

In previous rainy seasons, the neighbourhood had been spared the floods that other areas had experienced. The year 2011 proved to be an exception. That year, the area received the highest ever recorded rainfall (35 per cent higher between January and October 2011 than the previous fifty-year average) and there were five consecutive tropical storms. These weather conditions combined with inappropriate land use in the plains and flood mismanagement (Poaponsakorn N. and Meethom, P., 2013) led to the Chao Phraya River overflowing. This caused flooding in irrigation canals and paddy fields, which normally served as water retention zones to mitigate flooding in the Bangkok metropolitan area.

Predictions were dire, suggesting that water levels might reach between 1.5 metres and 3 metres, posing a significant threat to the archive. The most pressing challenge was to protect the extensive reel film collection – an invaluable repository of Thailand’s cinematic heritage. These films encapsulate the nation’s history of motion pictures, and the collection is kept in a controlled environment. In addition, it was necessary to protect irreplaceable museum objects, some of which could not be moved.

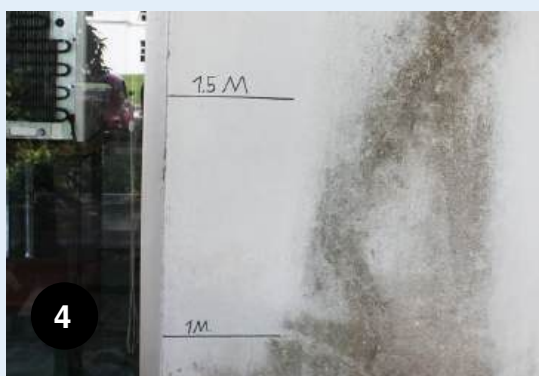
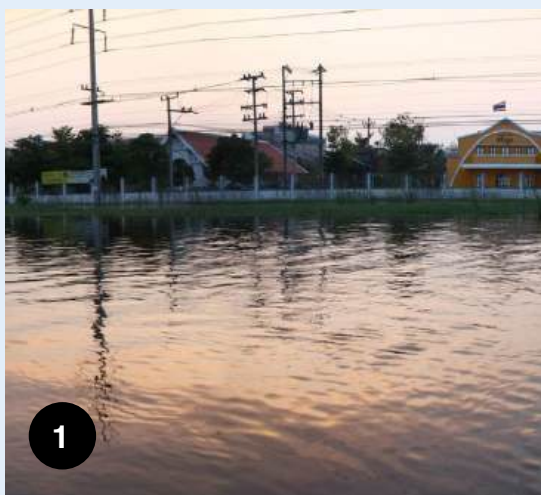
Fortunately, the water level did not rise above the building’s threshold, and the building was not flooded. However, the collection remained at risk from power cuts, which would interrupt the supply of air conditioning and lead to excess heat and humidity, thereby putting the films at risk.

Thanks to proactive measures, the air conditioning in the vault remained operational throughout the period, ensuring no films were damaged, and the situation returned to normal after around a month.

Key issues

The key issues faced by the archive team were as follows:

- **Impossibility of relocation:** The films could not be moved swiftly to an alternative location because of the surrounding floodwaters.
- **A continuous electricity supply was essential:** An uninterrupted power supply was necessary to ensure the storage conditions remained optimal.
- **Lack of experience:** The absence of prior experience in dealing with floods made the disaster a daunting challenge.



1. Monitoring water level at the nearby street
2. Elevating films on stakes for protection
3. Securing the window with a seal
4. Gauging the water level estimation
5. Film storage during the flood, sand bags preventing water ingress
6. Relocating books to higher floors

© Thai Film Archive

Actions

The archive team took the following actions.

- Moving items to higher shelves: Given the impossibility of relocating the films, the archive staff worked tirelessly to move valuable items off the floor and onto higher shelves.
- Monitoring water levels: The staff divided tasks to check each building to monitor the water levels every morning and evening, keeping a constant eye on the evolving situation. The director and several staff members remained on-site throughout the entire period, monitoring the situation daily and addressing emerging issues promptly. The staff also practiced evacuation procedures in case the worst-case scenario occurred.
- Swift leak mitigation: The archive staff diligently checked all rooms for leaks. Some leaks were found that originated from the floor. The staff then ensured that the affected areas were dried promptly.
- Preventing water ingress: The team prepared plans to prevent water from entering the buildings.
- Proactive maintenance: The staff proactively identified and addressed issues, such as an air conditioning unit that was at risk of water damage. They addressed the issue promptly, ensuring the continued operation of the air conditioning.
- Checking neighbouring areas: The staff also kept a close watch on the situation in neighbouring areas, gathering information to inform their actions.
- Post-flood actions: After the floodwaters receded, the staff carefully examined the film collection. Changes, if any, were documented and scrutinized. Sections of the building and equipment damaged by the flood were repaired. Importantly, the team prepared a plan for responding to future disasters.

Lessons learned

- Ensuring conservation from the ground up: The importance of building with foresight cannot be overstated. Architectural

decisions about where to build and how to build can prove pivotal in preventing damage in crises.

- Thorough preparation is necessary: The crisis demonstrated that preparedness is the linchpin of successful disaster management. It is necessary to have a disaster plan and a cadre of well-trained personnel who are ready for any situation.
- Remain alert and responsive: In an extreme weather event or other crisis, maintaining alertness and adaptability to changing conditions is paramount. Regular disaster risk monitoring and responsiveness are indispensable. Even events that are considered unlikely should not be dismissed. The evolving situation should be monitored and, when necessary, action must be taken in a timely manner to prevent damage to collections.

Conclusion

The mission of film archivists extends beyond the preservation of physical artefacts; it involves safeguarding cultural treasures that represent a nation's history and identity. The 2011 Thailand floods demonstrated the importance of preparation, vigilance and adaptability in ensuring that the archive's cinematic treasures were protected and remain in place for future generations to cherish. While challenges may come in various forms, having a disaster plan in place and well-trained staff is necessary to fulfil the archivist's ultimate mission: providing the best possible protection for the collections under their care.

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Case study

Disaster prevention via land management: indigenous cultural burning

Mick Newnham

Australia
2020

Keywords: traditional knowledge, cold fire, land management, hazard reduction

For millennia, the traditional owners of Australia have practiced land management through the use of fire. With knowledge developed and passed down through generations, the technique of controlled burning reduced the risk of major fires, which would have otherwise destroyed valuable food-producing areas.

This technique involves selecting a time when conditions are suitable and lighting small fires that burn slowly in green or damp vegetation. This type of fire has been described as one 'that progresses no faster than walking pace', and as a 'cool' burn and 'cultural burning'.

Following European colonization of Australia in the late eighteenth century, indigenous cultural burning was suppressed by the colonizers, who did not understand the country's environment and imposed inappropriate fire management techniques. Hazard reduction burning since European colonization has not always been effective and has occasionally resulted in major fires.

Major bushfires cause devastating loss of life, destroy irreplaceable built heritage and culturally significant objects and sites, destroy natural areas and kill wildlife, and have a negative impact on communities. Major fires also diminish well-being, through impacts on physical health (fires are a cause of respiratory and cardiac illnesses) and on mental health, and therefore have a negative impact on the economy. In the twenty-first century, particularly following the catastrophic bushfires of 2019/20, in which over 24.3 million hectares (243,000 square kilometres) of Australia were burned, there has been a renewed interest in the practice of cultural burning as a land management tool and fire reduction method.

According to the report of the inquiry into the bushfires that took place in New South Wales (NSW) in 2019/2020, cultural burning 'is one component of a broader practice of traditional Aboriginal land management and is an important cultural practice, not simply another technique of hazard reduction burning' (NSW Government, 2020, [Recommendation 25](#)). The report from the Royal Commission into Natural Disaster Arrangements made a similar assessment of cultural burning (RCNDA, 2020, [Chapter 18](#), p. 389).

Benefits of traditional burning practices

Cultural burning:

- Reduces the threat of major bushfires by removing fuel on the forest floor, such as fallen leaves and twigs and dry grasses.
- Encourages the regeneration of native flora, because 'cool' burning fires are less likely to burn intensely. In a 'hot' fire, fallen seeds are destroyed and the organic matter in the soil and microfauna and flora are killed, 'sterilizing' the soil.
- Assists in protecting native animal habitats, by preventing damage (which would have been caused by major fires) to the tree canopy, thus ensuring that shade remains for native species, and species continue to have refuge from predators.
- Reduces the severity of future fires and therefore results in bushfires causing less damage and having a lower social and economic impact. Anecdotal evidence suggests that during the 2020 bushfires, properties in south-east New South Wales that had practiced cultural burning generally suffered less damage than other nearby properties.

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Case study

The Vanuatu National Library and Archives building and cyclone Pam

Brandon Oswald

Port Vila, Vanuatu
2015

Keywords: cyclone, climate change, vernacular architecture, archive, construction techniques

In 2009, the records of the Vanuatu National Archives were relocated from a dilapidated building to the Cultural Centre for better safeguarding. There, the records were stored in every available space, as well as in two twenty-foot containers in the Centre's grounds. In the absence of a Records Management programme, the storage situation became dire and the government did not know where or how to store the records, or how to retrieve them easily. Consequently, a new Vanuatu National Archives building became a high priority.

In 2012, work began on designing a new Vanuatu National Library and Archives (VNLA) building. The aim was to create a safe building that could withstand cyclones and earthquakes and which would be in compliance with the building standards of Australia and New Zealand. The architects also sought to integrate vernacular architectural knowledge and sustainable design principles, including installing equipment that was low-energy consuming, creating a rainwater harvesting system, and designing a cross-ventilation system that maximized natural air flow. The new VNLA building opened in 2013.

In March 2015, Cyclone Pam, a very powerful Category 5 cyclone, devastated Vanuatu. The strong winds and torrential rain led to many buildings being stripped of their roofs or flattened. Fortunately, the VNLA building, with its carefully designed structure, sustained minimal damage. The building showed excellent resilience in the face of a disaster.

While the VNLA still lacks a Records Management programme and although funding and storage remain constant issues, the institution's building serves as a model in the region for its design, which protects staff and the collections, while consuming little energy and reflecting local cultural traditions.



1. Devastation following cyclone Pam © Humans of Vanuatu (Public Domain, Wikimedia Commons)
2. Destruction caused by strong winds
3. Rainwater catcher at the VNLA building. © UNESCO / Brandon Oswald
4. A traditional Nakamal structure that served as inspiration for the VNLA building design. © Andrew Gray (Public Domain, Wikimedia Commons)
5. The new architectural design based on vernacular architecture © Antoine Hochet (Public Domain, Wikimedia Commons)

Key elements of the design and construction process

Familiarity with the local context, construction methods and materials

- The architects familiarized themselves with the local culture, materials, site and conditions, including geographical constraints, existing traffic and pedestrian movements, locations of major utility services, etc.

Local community involvement

- The architects learned from the community's knowledge of local [vernacular architecture](#).
- Archive staff members and other stakeholders participated in the design and construction of the new building from start to finish.

Organization and coordination

- A risk assessment was conducted by archive staff and stakeholders to identify risks that could compromise the new building.
- Training was provided on applicable 'green' design solutions that mitigate the impacts of climate change and minimize the building's environmental impacts and costs, including life cycle costs, and promote ease of maintenance.
- The relationship with the government (ministry in charge) and with those responsible for the archives building was improved through meetings and events.
- Good communication was established between the building contractor and the archival staff.

Architectural features

- The building was constructed using local, natural materials, including stone and thatch, which are readily available in Vanuatu, and are economical and suitable for the local climate and culture.
- Sound tropical architectural principles suited to Vanuatu's climate were applied, including louver-style windows throughout the building, which provide excellent ventilation. Natural cross ventilation is also enhanced through a linear building design,

optimizing airflow. When closed and locked, however, the windows give protection against gale force winds and rain.

- The building has strong roofing and concrete floors.
- Equipment in the building includes earthquake-proof shelving, which is bolted to the ground.
- The materials used for the façade, cladding and roofing optimize the building's insulation.

Lessons learned

- The cyclone demonstrated that careful design to suit the context, with the inclusion of vernacular architectural features, enabled the building to withstand a Category 5 cyclone and protect the collections. It is noteworthy that the national archives of Palau and Samoa, which did not have appropriately designed buildings, needed to construct new buildings following the cyclone.
- Cyclone Pam made the local disaster risk management (DRM) team better understand the importance of having a disaster plan in place.
- It can take time for operations to return to normal. Although the archival building was intact after the cyclone, it still took several days before a return to normal operations was possible because employees had to contend with damage and flooding in their villages, as well as damage to communications infrastructure and roads, and many of the establishments in the city of Port Vila were closed for cleanup.

Module 3

Local context and communication

DRM planning is most effective when it is carried out in close coordination with local communities, emergency response teams and disaster teams. Clear communication between all stakeholders is essential to avoid misunderstandings during disasters. Disaster plans are most effective when they include the knowledge of local indigenous communities and groups about disaster prevention and recovery, and about traditional conservation methods.

- 1. Disaster teams and emergency contact lists**
Heather Brown
- 2. The DIG training tool for disaster preparedness**
Dowon Kim
- 3. Respecting local and traditional knowledge for disaster risk management**
Lois M. Evans and Mary Grace Golfo-Barcelona
- 4. Preserving collections through traditional know-how**
Achal Pandya

Case studies

Community-based disaster risk management in George Town
Ming Chee Ang

From a reactive to a proactive approach:
lessons from Typhoon Haiyan
Mary Grace Golfo-Barcelona

Traditional practices for managing collections in India
Achal Pandya

Measures and methods for emergency response in China
Meifang Zhang and Yanxin Zhang

Rescue and restoration of cultural heritage by volunteers
Dowon Kim

Exercises

Emergency contacts
Disaster Imagination Game
Local knowledge and DRM
Traditional methods for conservation

Disaster teams and emergency contacts lists

Heather Brown

Keywords: disaster team, disaster plan, emergency contacts, disaster team leader

Introduction

A disaster team and an emergency contacts list are essential for an effective disaster plan. This module will explain the roles and responsibilities of the key members of a disaster team and the importance of having an emergency contacts list.

Disaster team roles and responsibilities

The disaster team is a core group of staff members who respond to a disaster and assist in the recovery process. It is important that they are willing to assist and are physically and mentally able to undertake the roles required. For this, disaster team members need to be trained, so that they have a good understanding of their roles and what to do in a crisis situation. A disaster team that is not trained will not serve any purpose.

Key roles in the disaster team

The disaster team will include the following roles.

- A disaster team leader: to manage the disaster response and recovery processes.
- A record keeper: to keep track of the sequence of events, to document key steps in the response and recovery, and to record major decisions such as moving the collection items. This team member also takes photographs of the damage, flood water levels (if any), etc.
- Collection specialist(s): to guide the team leader in planning the response and recovery actions based on their knowledge of the collections. It may be necessary to have several collection specialists, each with knowledge of particular collections, including specialists who have knowledge of the digital collections and infrastructure.
- A finance officer: to authorize purchases.
- A logistics person: to order equipment and supplies, and arrange transport, accommodation, food and other logistics.
- A health, safety and well-being officer: to support the team leader by helping to ensure that disaster responders remain physically safe and mentally positive. This team member will be alert to any existing or emerging hazards in the building, such as mould or asbestos, and advise the disaster team leader of any such hazards.

- An environmental monitor: to check on factors such as temperature and relative humidity, and inform the team leader if additional equipment, such as dehumidifiers, is needed.
- A media liaison officer: to respond to questions from the media and provide statements about the situation of the organization during and after a disaster.
- A salvage staff member: to undertake recovery activities, for example air drying of water-damaged items (ALIA, 2019b, p. 19).

The number and roles of the team members depend on the size of the organization. In smaller organizations, such as community museums, a team member will have multiple roles.

Roles and actions of the disaster team leader

The team leader is responsible for coordinating all stages of disaster management. This person leads the response to a disaster and leads the recovery process. The disaster team leader has the authority to make decisions and guides the actions of the other members of the team. In large organizations, such as a national archive or library, the disaster team leader(s) may report to an overall coordinator such as a crisis management team leader.

If your organization's disaster plan encompasses both digital and physical collections, you may need to consider having two disaster team leaders — one who specializes in digital collections and one who is an expert in physical collections. Alternatively, the disaster team leader can call in another member of the team with specialist knowledge to help.

The team leader is usually the first member of the team to respond to a disaster, and the leader will contact the rest of the team. In a disaster, the team members that the disaster team leader will call in first are likely to be the record keeper and collection specialist(s). After the team leader has assessed the situation and planned the response and the initial recovery steps with the collection specialist(s) and record keeper, the team leader will then call in other team members as and when the team leader needs their support. It is best to avoid calling in too many members of the disaster team at the initial stages. Too many people standing around at the beginning will potentially undermine the planning stage, and can create further stress.

Common actions that a team leader will take include:

- Contact the record keeper and collection specialist(s).
- Determine priorities and develop an initial response plan. This plan will be based on the disaster plan and the collection priorities (significance) as well as the scale and type of disaster, the impact on the collection and the format of the collection materials.
- Contact other members of the team, as needed.
- Assess which methods to use to stabilize and recover the collections.
- Set up a recovery and salvage centre.
- Coordinate the purchase and/or hire of equipment (e.g. dehumidifiers), if necessary.
- Liaise with outside experts e.g. freezing services.
- Ensure health and safety measures are implemented and followed.

Table 1. Example of disaster team roles and responsibilities.

Disaster Team (roles and responsibilities)			
Role Title	Description	Staff members P: Physical D: Digital	
Disaster Team Leader - physical and digital	Leads and guides the whole operation of response and recovery. There may be separate roles for a Physical and Digital Team Leader. May report to another leader e.g. Crisis Management Team Leader.	P	D
Salvage staff - physical and digital	Undertake salvage (e.g. recovery of water-damaged physical collection items) or access and reinstall backup copies of digital collections.	P	D
Record keeper(s) - physical and digital	Record keepers document damage to physical and digital collections including by taking photographs. They record major decisions as well as movement of collections.	P	D
Finance officer	Authorizes purchase of supplies and equipment.	Covering P & D	
Broadcast / mass media coordinator	May require two separate roles depending on scale of disaster and staff skill sets. Liaises with the broadcast / mass media.	Covering P & D	
Social media coordinator	Keeps the social media up-to-date.	Covering P & D	
Logistics staff	Equipment and supplies. Transport and accommodation. Food and beverages. Additional human resources - staff and volunteers	Covering P & D	
Health and well-being staff	Ensure that disaster responders remain physically safe and mentally positive, through encouragement and acknowledgement. Monitor risks of hazards such as manual handling, dirt and mould. Ensure test breaks are taken. Arrange for health and safety issues to be addressed during debriefing.	Covering P & D	

Source: ALIA, 2019.

- Debrief the team after the disaster to get their feedback, and follow up on lessons learned.
- Update the disaster plan following the disaster (with inputs from the rest of the team and other stakeholders).
- Coordinate the replacement of the supplies and equipment that were used during salvage work. (ALIA, 2019b, p. 18).

Emergency contact list

The emergency contact list is a guide for whom to contact for support in an emergency, both within your organization and externally.

The contact list contains the names, roles and contact details (phone and email) of staff and services (people and organizations) with specialist knowledge and skills, including emergency services, and therefore enables rapid access to people who can assist in a disaster.

The list will include the members of the disaster team, security staff and the facilities manager, as well as the fire department, police, ambulance and other relevant contacts. To be effective, it must be tailored to the needs of your organization and kept up to date.

This contact list should be included in the disaster plan and also displayed in a place that is visible and easy to access.

Internal contacts could include:

- Disaster team members
- Director/Head person
- Department managers
- Security staff
- Cleaning staff

If your organization is part of a larger body such as a university, a government department, regional council or network, you may need to include parent organization contacts.

Contacts in the parent organization could include:

- Director/Executive manager
- Media and communications manager and IT manager
- Facilities staff

Contacts of services used by your organization could include:

- Plumbers, electricians, etc. (i.e. a list of people authorized to turn off the gas, electricity and water)
- External ICT staff (e.g. a list of people authorized to shut down a server, if necessary)
- External security staff
- External cleaning staff

External emergency contacts could include:

- Fire service

- Police
- Ambulance service

Tips

- When forming a disaster team, try to align the roles with the natural attributes and skills of the staff. For example, if there is a staff member who is well organized, methodical and meticulous, that person would potentially make a good record keeper.
- Disaster team members need to be trained regarding their roles and the roles of others in the team, and what each person must do in the event of a disaster.

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Emergency contacts | Questions

1. Does your institution have a disaster team?

☐

YES

☐

NO

2. If you have a disaster team, what rating would it currently have if it needed to respond to a disaster today? Why?

very poor

excellent



1

2

3

4

5

6

7

8

9

10

3. If you do not have a disaster team, how would you go about forming one? What support would you need, from whom and from where?

4. Based on the key responsibilities of a disaster team leader, who in your organization could potentially take on this role?

5. What qualities and skills would be required by the record keeper?

6. Who in your organization could potentially take on the collection specialist role for physical collections?

7. Who in your organization could potentially take on the collection specialist role for digital collections and ICT infrastructure?

8. Who could potentially take on the role of media liaison? What qualities and skills would they need? What could happen if you did not have someone in this role in your disaster team?

9. How often does your organization assess the emergency supplies and equipment that your organization might need in the event of a disaster?



10. What would the supplies and equipment be used for?

11. Have you created an emergency contact list?

☐ YES ☐ NO

12. If you have a disaster plan, does it include the emergency contact list?

☐ YES ☐ NO

13. How do you keep the emergency contact list up to date?

14. Where could you display the emergency contact list, so that this critical information can be found quickly and easily in a crisis event?

The DIG training tool for disaster preparedness

Dowon Kim

Keywords: preparedness, mitigation, risk assessment, risk mapping, training, disaster imagination game

Introduction

When preparing for potential disasters, it is essential that local emergency responders, planners, heritage managers, experts and communities are trained in how to communicate and collaborate, and that they understand the challenges they may encounter when protecting heritage collections, and can overcome them. The Disaster Imagination Game (DIG) is a useful tool for this kind of training.

The Disaster Imagination Game

The DIG is a tailored training workshop that uses an area map to identify the challenges that can arise in crisis, and how to respond, while also improving communication and cooperation between stakeholders.

The outcomes of the workshop are a 'risk map' (which is shared with all the participants and with any other local stakeholders and emergency responders) and a disaster plan.

The process of developing the map and plan involves discussing the risks and possible measures to take, identifying the roles of all of the stakeholders, and creating communication channels.

Participants can use the emergency contact list and risk assessment training tools in conjunction with the DIG process to define their disaster teams' roles and responsibilities, and the outcomes can be integrated into existing disaster plans.

Materials needed for the DIG

- A map of your site (e.g. archives building; museum; etc), with key areas marked, such as the storage area, display area and surrounding grounds. It is recommended that the map is bigger than an A1 sheet of paper.
- Transparent sheets (acetate) the same size as the map. These will be overlaid on the map (provide at least three sheets per table, in line with the number of situations you intend to simulate).
- Coloured pens, stickers and post-it notes.
- Hazard information about the site.

DIG exercise workflow

1

INTRODUCTION

2

Identification of Emergency Response Infrastructure

Mark the key locations on a map and indicate the category (e.g. fire).



3

Make a list of priorities for protection, salvage and rescue.



Imagine a scenario of a possible disaster that could affect your institution.
e.g. building collapse, road blockage, power cuts, disrupted water supply.

(A) Possible scenario for a fire

- Is water available and where?
- Where can firefighters intervene?
- What is needed to ensure the safety of personnel?
- Which are the significant items to rescue and how?

(B) Possible scenario for an evacuation

- Are the roads safe?
- What do we need to facilitate the evacuation?
- Is there space for sheltering?
- Are there areas that should be avoided?



4

Discussion and Brainstorming

List the main challenges and key actions identified during the exercise to ensure good communication and preparedness.

Source: Dowon Kim

Steps

Step 1. The lead workshop coordinator introduces the overall DIG training approach, including the purpose, workflow and training materials.

Step 2. The lead coordinator divides the participants into groups of about five to eight people. Each group will have a separate table and their own facilitator ('disaster team leader') who will need to be pre-trained to carry out the DIG exercise.

Step 3. Each group takes part in an ice-breaking session, led by their facilitators.

Step 4. The groups identify and profile the heritage assets that need to be protected, the emergency response facilities and the possible evacuation routes and spaces.

Using a sheet of acetate over the map, the group identifies the locations of important elements, such as heritage collections, disaster management resources (e.g. firefighting facilities), safe areas for evacuation and vulnerable/dangerous areas for residents and tourists, etc.

Questions to ask in this step:

- What must be managed, protected and/or salvaged?
- How many people are on your disaster team? What are **their roles**? Do you have a record keeper and collection specialist for each location?
- Who would be the emergency responders (or first responders) in a post-disaster situation in your context? Where are their facilities? How many emergency responders would there be?
- Where are the safe areas for evacuation?
- Where are the unsafe areas for people to be?

Step 5. The facilitator shares relevant hazard information with the participants. Based on this information, the group imagines what the local conditions would be like if there was a disaster (e.g. an earthquake, flood, landslide, etc.). The group discusses the challenges and the possible measures to take that can prevent or reduce damage to the heritage collection(s).

Using another sheet of acetate (overlying it on the first sheet) and using pens and sticky notes, the group members draw or indicate where risk factors are, such as areas that could experience flooding, building collapses, road blockages, water and power outages, and where possible damage could occur.

The group members then imagine what some secondary hazards might be. For example, an earthquake (primary hazard) could lead to a fire (secondary hazard); a typhoon could lead to flooding; an earthquake could lead to a tsunami; etc. The groups then draw on the acetate sheet the conditions that could occur as a result of a secondary hazard.

Examples of risk factors include:

- Local environmental features – proximity to rivers and fault lines; seasonal weather patterns such as cyclones and bushfires; etc.
- Overhanging tree branches.
- Storage of collections on the floor.

- Items blocking access to exits and firefighting equipment.
- Lack of backup for digital collections.
- Lack of power backups for computer servers in the event of power failures – leading to a risk of air-conditioning not functioning, the server overheating and digital collections being damaged or destroyed.
- Toxic hazards, for example the presence of asbestos in the building.

Step 6. Put another sheet of acetate over the map. Discuss, imagine and draw the evacuation options from buildings to safe spaces, using coloured pens and sticky notes. The evacuation should consider people and movable heritage (collections). Discuss the possible routes to dispatch emergency teams, to get access to risk management resources, and who will manage them and how. The discussion will identify the challenges involved in an evacuation and emergency actions, and ways to overcome those challenges.

Step 7. The groups then discuss potential risk management measures.

Risk management and mitigation actions could include:

- Ensuring your organization has an up-to-date disaster plan.
- Ensuring all staff are aware of the immediate actions to take if a disaster happens, and the disaster team is trained to respond.
- Installing security cameras, so that the building can be observed from a distance, and alarms to alert staff of hazards (e.g. fire).
- Increasing the amount of preventative maintenance of the building e.g. cleaning the gutters; sealing doors and windows.
- Installing a fire suppression system (e.g. ceiling sprinklers, if appropriate).
- Installing an Uninterruptable Power Supply (UPS) and backup generators.
- Ensuring ICT backup arrangements.
- Formalizing procedures to quarantine donations and other vulnerable items before they come into the collection.
- Installing sticky traps to monitor any insect activity in the building.
- Having a store of emergency supplies and equipment ready.
- Moving significant collections off the floor to higher shelves and storeys of the building.
- Clarifying coverage with the organization's insurance broker.

Questions to ask in this step:

- What are the key vulnerabilities in your area? Have you carried out **a risk assessment for your building and your collections**?
- What are the vulnerabilities related to your storage/infrastructure/site?
- Are your collections at risk? In what ways?
- Are there any secondary hazards tied to the primary hazards that your organization faces? E.g. landslides may occur after an earthquake.
- What steps have you already taken to minimize risks and prevent damage?

Step 8. Each group shares its findings with the other groups, and all of the participants discuss the challenges and solutions.

Step 9. Together, the participants develop a disaster plan based on the outcome of the DIG exercises. By gaining a better understanding of the various vulnerabilities and challenges through the DIG exercises, they can develop a targeted plan, identify

resources and outline possible risk mitigation measures. The PDCA (Plan, Do, Check and Action) cycle can help the participants to create the disaster plan.

Step 10. Finally, organize a disaster drill to test the ‘risk map’ and disaster plan. A disaster drill will test the operational dimension of the plan and highlight the challenges in a real context on site. This will require collaboration with emergency responders.

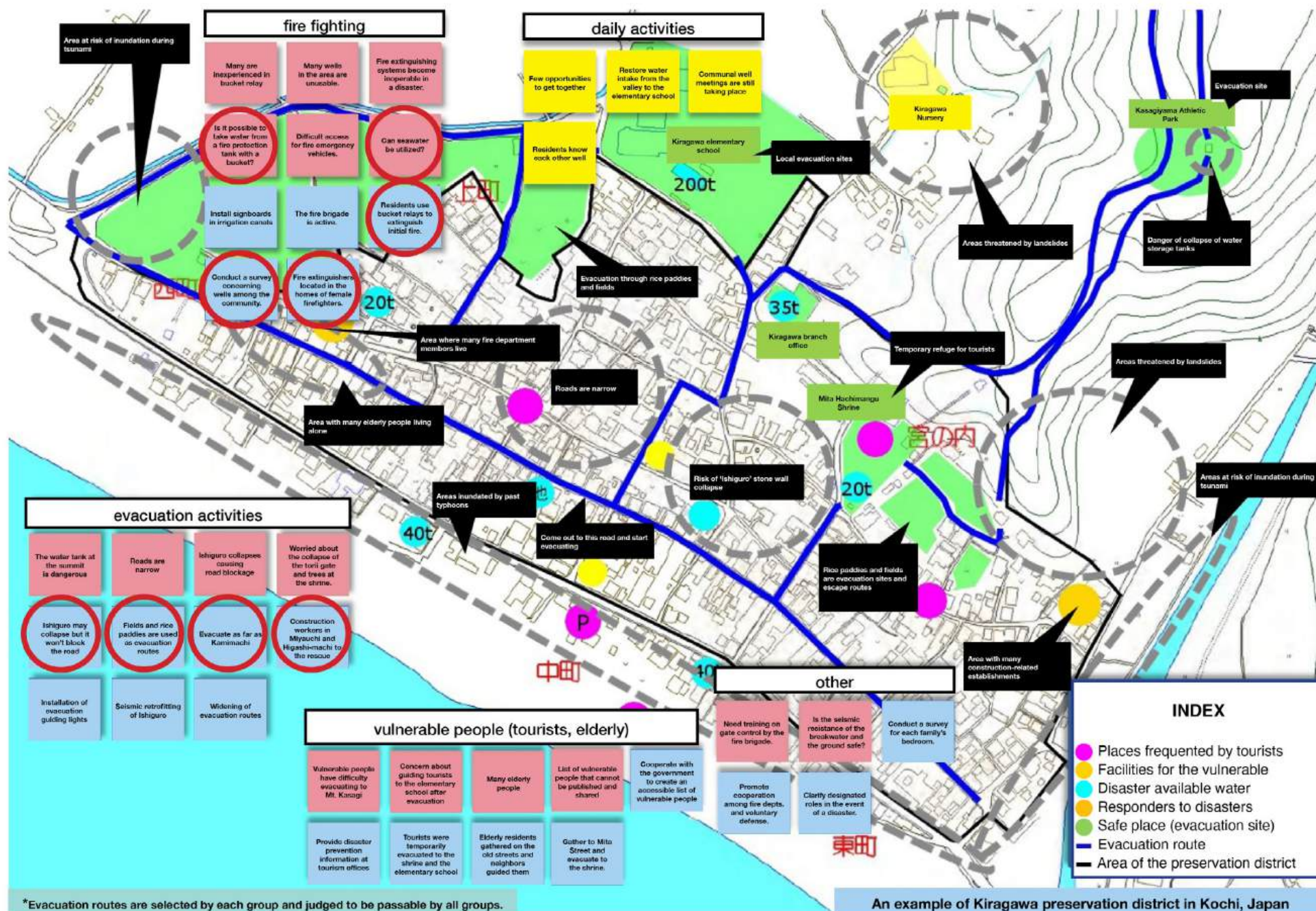
Tips for compiling information about your area

- Talk to elders and others who have lived in your community for several decades, including members of your own family, about any changes they have noticed. Consider inviting these people to a community meeting to respond to the questions as a group.
- Identify famous extreme weather events that occurred in your country or area, and stories and articles about how climate change is impacting your region.
- Ask local archivists, historians, librarians and teachers if they know about how the climate and weather are changing in your region.



1. Local community members serving in the fire emergency response team
2. Testing a fire hydrant with emergency responders
3. Evacuation drill at a cultural heritage location

© Dowon Kim



Disaster Imagination Game | Questions

1. Who would the emergency responders (or first responders) be in a post-disaster situation in your area? Please imagine several post-disaster situations that are affected by multiple hazards.

2. How many emergency responders would there be? When can they access the affected sites?

3. How would you communicate with the local emergency responders and prepare them for a potential disaster?

4. Have you shared an area map with the responders and discussed local risks?

☐

YES

☐

NO

5. Have you ever conducted drills with the emergency responders?

☐

YES

☐

NO

6. How many archives do you need to manage, protect and salvage? Do you have a list of the archives to salvage?

7. Does everyone understand the disaster risks and their roles in a disaster situation?

☐

YES

☐

NO

8. Do you have hazard information about your site/building?

☐

YES

☐

NO

9. What are the resources available in your institution? Make a list.

10. What would be the likely post-disaster situation in your area, based on a specific scenario (e.g. flood; fire; etc.)?

11. What are the vulnerabilities of your building and collection(s)?

12. What are the vulnerabilities related to your storage/infrastructure/site?

13. Which steps have you taken to minimize risk and prevent damage?

Respecting local and traditional knowledge for disaster risk management

Lois M. Evans and Mary Grace Golfo-Barcelona

Keywords: local knowledge, mitigation, resilience, traditional knowledge

Introduction

Local knowledge is the understanding, awareness and skills that people in a community acquire based on their experiences in a location, regardless of how long they have lived there. The use of local knowledge aligns with passive management, which is a strategy used to manage heritage sites and buildings through natural, low-cost interventions.

Traditional indigenous knowledge is different from local knowledge in that it includes the traditions, customs, beliefs and skills held by indigenous people. It is passed down from generation to generation. Traditional knowledge is considered the collective property of society and is often transmitted to others via storytelling, art and dance.

In times of disaster, local and traditional knowledge can allow people to save their properties and even their lives. For example, traditional knowledge regarding the link between the water level in the ocean and an impending tsunami has saved lives. Likewise, local knowledge that extreme heat is often followed by torrential rain has saved properties by alerting people to prepare in advance for flooding.

In the face of climate change and potential future disasters, local and traditional knowledge about how a community has responded to past situations can help cultural institutions to develop appropriate disaster risk management strategies, and to prepare for and respond to disasters using low-impact strategies and solutions.

While it is important to maintain organizational identities, structures and functions, cultural institutions also need to embrace change by learning, developing capacity and transforming to meet new situations. By engaging with local and indigenous groups, cultural institutions can better fulfil their mandates, and build the necessary capacity and resilience to prevent or cope with disasters.

Learning from groups of people who have local and traditional knowledge requires community engagement. This involves collaborating with various groups of people. The main premise of community engagement is that people have a right to be informed, consulted, involved and empowered on issues that impact them. When we engage with community groups, we must recognize these rights while at the same time respecting any protocols groups have in place.

Key Issues

Some of the challenges associated with accessing local and traditional knowledge include:

- Lack of familiarity with the groups in the community.
- Lack of contacts and relationships with the groups or group leaders.
- Lack of familiarity with local and traditional community protocols.
- Lack of means for communication and collaboration.
- Lack of community engagement skills and experience.

Fortunately, many of these challenges can be overcome through research, planning and communication.

Tips

When engaging with communities to gather information for disaster planning:

- Remain focused on information that is relevant to disaster risk management. Other information of interest to your institution can be noted and researched in further detail at a later date.
- Clearly communicate that you understand and respect all boundaries set by communities and groups in relation to local and traditional knowledge.

Local knowledge and DRM | Questions

Answering these questions will help you to better understand and engage with your local community.

1. Who does your institution serve? List and describe the groups in your community.
2. Do these groups include men and women, elders and youth, indigenous peoples?
3. Do any of these groups regularly participate in your institution's initiatives?
4. Do any of these groups have local or traditional knowledge relevant to disaster risk management in your local area? If yes, is there any documentation of this knowledge and related practices? If no, has your institution considered collaborating with these groups to document their knowledge and practices?

Responding to these questions will assist you to assess your institution's community engagement efforts.

1. Does your institution actively engage with any of the groups in your community?
2. Are there any conflicts within the community that might impact such engagement? If yes, are there ways that these conflicts might be safely addressed?
3. How can community engagement be used to develop your disaster plan?

Answering these questions will assist you to identify ways to engage effectively with your local community.

1. What role could cultural practices play in improving your institution's community engagement?
2. Are there ways that storytelling, plays, music or film might be used to access local and traditional information that would be useful for your institution's disaster plan?

Preserving collections through traditional know-how

Achal Pandya

Keywords: collections, local knowledge, preservation, climate

Introduction

Preserving collections, particularly those made of organic materials, is a perpetual battle against a myriad of aggressors, including pest infestation, light and fluctuations in humidity and temperature. Such aggressors have destructive impacts and it is important to understand and manage them.

The aggressors and risks that collections face have largely remained the same throughout history. Our practices and strategies for avoiding those aggressors and mitigating risks have changed over time, however. Traditional methods for preserving collections have been mostly replaced by new methods, including those that use electricity, such as air-conditioned climate-controlled environments inside storage repositories.

Traditional methods remain valuable as they were refined over time based on experience and knowledge passed down through generations. By studying these practices and incorporating them into disaster risk management and conservation plans, cultural institutions can prevent damage and enhance the overall care and conservation of collections.

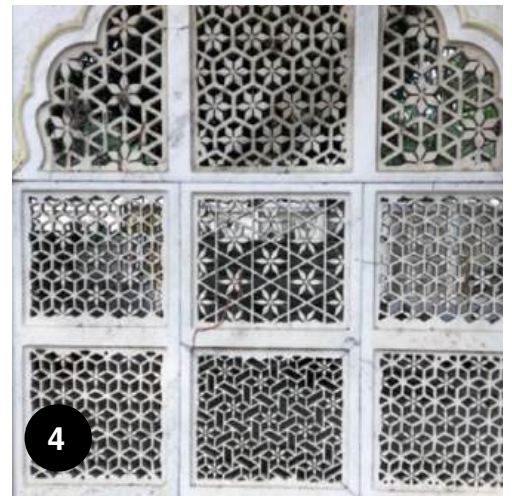
This chapter discusses indigenous and traditional architectural and pest-management practices for preserving collections, focusing on practices used in India.

Traditional building design for regulating temperature and airflow

Long before air-conditioning was invented, people in India developed ways to keep buildings cool through architectural design and structures to promote natural ventilation and cooling. These techniques varied according to the specific climatic conditions of different regions, resulting in a diverse range of architectural solutions.

1. Jharokhas: Catching the breeze

Jharokhas are balconies that project from the exterior of buildings. These architectural features, commonly found in Rajasthani architecture, are strategically positioned to take advantage of the wind direction. Jharokhas catch the prevailing breeze and channel it into the interior, providing ventilation and cooling. The cool breeze



1. Manuscript with traces of pest infestation
2. Faded wall painting on part of a temple wall
3. Jharokha
4. Different Jaali patterns
5. Application of protective coating on manuscripts made of natural ingredients
6. Veranda in a traditional South Indian house

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passing through the jharokhas circulates within the building, offering respite from the scorching heat outside.

2. Jaalis: Filtering sunlight and promoting airflow

Jaalis are intricately carved stone screens that cover windows and doorways in buildings. They allow air to enter the building, while also diffusing sunlight, creating a pleasant and cool environment in the interior. Jaalis also add aesthetic charm because the carvings are striking and the patterns cast beautiful shadows inside.

3. Water bodies and fountains: Evaporative cooling

The use of water bodies such as pools and fountains is a common practice in traditional Indian architecture. Water bodies act as natural coolants because the process of evaporation reduces the ambient temperature and creates a refreshing environment. The cool air generated by this process then circulates within the surrounding buildings, making the interiors more comfortable for the occupants.

4. Verandas and awnings: Shade and airflow

Verandas, covered walkways and awnings are common features in traditional Indian architecture. By providing shade and preventing direct sunlight from entering the interior, these architectural elements play a crucial role in preventing heat from entering buildings.

Verandas also allow residents to enjoy outdoor spaces while remaining protected from the sun, and they often incorporate elements like jaalis or open windows to facilitate airflow. Awnings, extended from exterior walls, likewise offer shade and shelter while allowing air to circulate freely.

Traditional methods for storing manuscripts

Traditional methods of preservation in India were designed to prevent the factors that promote growth of microorganisms and to protect items from aggressors.

These factors and aggressors include:

- High moisture in the air
- Stagnant air
- High temperatures
- Insects and other animals
- Dust

In the past, libraries, archives and monasteries in India had dedicated storage rooms or halls, often called bhandaras or bhandargrihas, which were specifically designed to house and safeguard manuscripts. The manuscripts were organized by subject. Librarians, archivists and monks were responsible for their maintenance and protection.

The methods used to protect manuscripts varied depending on the type of material being preserved (e.g. palm leaves; paper; metal; etc.), the region and the time period.

Palm leaves were one of the earliest materials used for writing in India. The leaves

were carefully dried, treated and cut into rectangular strips, and then text was inscribed on these strips using a stylus or a sharp instrument. The leaves were often tied together with string and these manuscripts were protected with wooden covers. The palm-leaf manuscripts were then placed in special boxes and containers, protecting them from insects, moisture and other aggressors.

In later eras, manuscripts were made of paper and other materials. To protect them, they were bundled together and then wrapped in cloth or leather.

In certain regions of India, metal plates, made of copper or brass, were used for writing, using sharp tools and engraving techniques. These metal plates were highly durable and were stored in chests or boxes made of metal or wood. The chests were often decorated and had locking mechanisms to ensure the security of the metal manuscripts.

Criteria to ensure adequate storage and preserve a collection

These criteria include the following:

- A qualified member of staff is in charge.
- Storage rooms contain only collection objects.
- Separate spaces are dedicated to supporting other functions: office, workroom, storage of equipment and other materials.
- Storage and retrieval policies and procedures exist and are applied.
- No object is placed directly on the floor.
- Every object has a designated location in storage and can be located within three minutes.
- Every object can be accessed without moving more than two others.
- Objects are arranged by category, based on the object's material or type, or according to dimensions.
- Building and storage rooms offer adequate protection for the collection.
- Every object is free from active deterioration and is ready to be used for the collection organization's activities.

7. Tight wrapping of religious manuscripts to prevent gaps or holes
8. Use of wooden planks as a structural support for the folios

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Traditional methods for conservation | Questions

This questionnaire will enable you to gain insights into traditional methods and practices used in your region to preserve collections and heritage objects, and help you to assess whether these traditional methods are still applicable today. When answering the following questions, it is recommended that you talk with local elders and other community members who are knowledgeable about traditional practices, to gather their insights.

1. Do you know how artefacts, documents and objects were stored traditionally in your local area to ensure their preservation?
2. Are you aware of any examples of cultural heritage or collections that were preserved without the use of any source of energy? Make a list.
3. Were any specific materials or containers used for storing and protecting collections in the absence of modern technology? Make a list.
4. In the past, before electric air-conditioning was used, how did people control temperature and humidity to prevent damage to items and collections?
5. How did people protect items and collections from pests and insects?
6. How did people prevent exposure of items and collections to light and sunlight?
7. Did the methods of preserving items and collections vary depending on the types of artefacts or materials involved? Provide some examples.
8. Were any traditional methods used to protect items and collections from natural disasters, such as floods, earthquakes and fires? List the methods and mention if they are still used or can be used today.
9. Did community members have specific roles or responsibilities in maintaining and safeguarding the items and collections? Describe the different roles and responsibilities and indicate if they still exist today.
10. Were there local experts who provided guidance or assistance in the preservation of items and collections?
11. Were there any rituals or practices associated with the preservation of collections and heritage objects? Make a list.
12. Were any techniques or remedies used to treat and restore damaged or deteriorating objects? Describe the methods.
13. Do you have any stories or anecdotes related to the preservation of items and collections using traditional methods?
14. Are there any practices or techniques from the past that you believe could be valuable for preserving items and collections today?
15. Do you have any additional information, suggestions or insights you would like to share regarding the preservation of collections?

List the traditional methods used in your area or country in Table 1 (below), and identify those that would be relevant for your disaster risk management (DRM) plan and that can potentially be shared with other institutions in your area and beyond.

Table 1. Inventory of traditional conservation techniques - template

Traditional Method / Technique	Category of threat of damage (e.g. humidity, pests, heat, mould)	Related communities / Number of practitioners	Status / Condition (safe or endangered knowledge, documented or not)	Geographic location(s)

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Case study

Community-based disaster risk management in George Town

Ming Chee Ang

Penang, Malaysia
2017 - present

Keywords: community-based, cultural heritage, World Heritage site

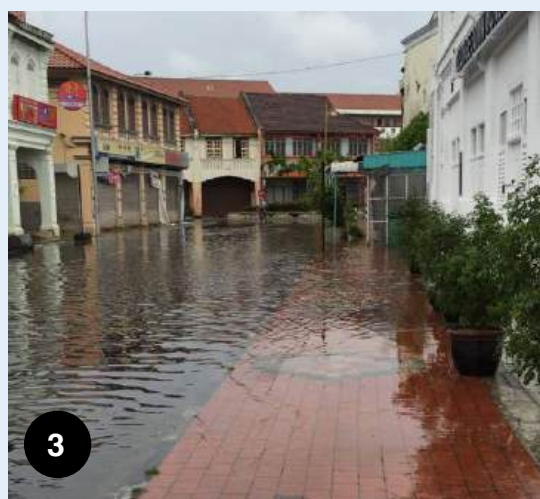
The site management agency for George Town Heritage City, George Town World Heritage Incorporated (GTWHI), conducts many community-based capacity building projects to protect and enhance the universal values of the city's world heritage assets. One such project is the Community-Based Disaster Risk Management project, which was launched in 2017 and is being implemented through people-public-private and professional collaboration.

The project began when UNESCO selected George Town as one of the pilot cases under the broader 'Capacity Building for Disaster Risk Reduction of Heritage Cities in South-East Asia and Small Island Developing States in the Pacific' project. Its aim is to achieve the goals linked to the Sendai Framework for Disaster Reduction 2015-2030. The Sendai Framework highlights the need for collaboration and integration, and the inclusion of heritage in national and local disaster risk management plans, and it seeks to address disaster risks in the overall heritage management plans of sites and institutions.

To mitigate the risks associated with climate change for local institutions and communities in Malaysia and prevent damage, disaster risk management is needed. This is urgent, given that the impacts of climate change are already being felt in Malaysia. For example, there has been a six-fold increase in rainfall in Penang since the 1990s, and there has been an increase in flash floods. Indeed, 70 per cent of natural disasters in Malaysia between 1998 and 2018 were floods. In addition, seasons have become more unpredictable (Othman et. al, 2021).

As the impacts of climate change increase, such as the growing risk of fires, heritage in George Town is increasingly at risk. For example, old shophouses are made of timber, and most of these heritage buildings are located very close to each other, making them all vulnerable if one catches fire.

George Town is very diverse culturally, linguistically, socially and in terms of approaches to heritage conservation. Diversity makes the heritage management process challenging and patience is key to reach consensus between different parties. Despite such challenges, the shared understanding that we need to live in a safe environment has prompted the various stakeholders to overcome their differences and work collectively towards an effective Disaster Risk Reduction Management Plan. Perseverance, communication, trust and the empowerment of local community members have been essential in making this plan sustainable and functional.



1. 2017 floods in the city centre
2. The GTWHI office building has disaster-resilient structural components
3. 2017 floods at Lebuhraya, a street in the heritage zone
4. Penang Hill Disaster Risk Assessment project

© UNESCO / Ming Chee Ang

Key issues

The main factors that limit effective action include the following:

- Legislation and guidelines related to disaster management are currently inadequate.
- The George Town Disaster Risk Reduction and Management Action Plan needs to be further developed and implemented to mitigate the impacts of climate change (e.g. floods, fires, etc.).
- Heritage conservation staff and local communities lack sufficient awareness and knowledge in areas such as risk reduction methods, risk management and how to assess damage and restore damaged items.

Solutions

Institutional guidelines and monitoring

- Through National Security Council Directive No. 20, the national disaster management agency is working to enhance legislation linked to heritage-related departments and agencies. The directive provides guidelines on disaster management, such as defining the responsibilities and functions of the agencies within an integrated emergency management system.
- A new chapter on disaster risk management will be introduced in the revised George Town UNESCO World Heritage Site Special Area Plan. This Special Area Plan also functions as the guidelines to implement the Conservation Management Plan of the George Town UNESCO World Heritage Site.
- A list of cultural heritage properties and artefacts in George Town will be established, and a copy of the document will be safeguarded by the GTWHI.
- A Geographic Information System on fire hydrants will be developed and updated and shared with the Fire and Rescue Department.
- Post-disaster assessments of disaster-affected heritage properties have been carried out.

Capacity-building and training

- A series of community-based disaster risk reduction capacity-building sessions was conducted to empower local communities. Five workshops were organized in 2018 and an emergency response team was created by community-based first responders. In addition, GTWHI staff and more than 100 local communities received emergency response training from the fire and rescue department in 2017 and 2019. Each participant received a set of fire extinguishers and smoke detectors.
- A standard operational procedure for damage assessment was established through a training session, which GTWHI staff participated in.
- Public awareness campaigns were rolled out. For example, a Disaster Risk Management for Cultural Heritage poster was released to raise awareness on risk management and preparedness among George Town community members (e.g. residents, owners of heritage properties, etc.) and to introduce the concept of to-go bags and provide knowledge on first aid for documents and artefacts. These posters were printed in four languages (English, Malay, Chinese and Tamil) and were displayed in strategic locations in Penang.

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Case study

From a reactive to a proactive approach: Lessons from Typhoon Haiyan

Mary Grace Golfo-Barcelona

Philippines

Keywords: recovery, cultural heritage, preparedness and response, legislation

According to the World Risk Report of 2021, the Philippines was the eighth most vulnerable country to disasters in the world that year (Aleksandrova et al., 2021). The following year, the World Risk Report ranked the Philippines as having the highest disaster risk worldwide (Atwii et al., 2022). This risk is partly due to the country's location and weather patterns. The Philippines lies along the Pacific 'Ring of Fire' where 80 per cent of the world's strongest earthquakes occur, and it has about 220 known volcanoes, 22 of which are considered active. Additionally, between 20 and 25 typhoons ravage the country each year. These typhoons lead to the loss of lives and cause costly damage to livelihoods and infrastructure.

In November 2013, the Philippines was devastated by one of the strongest typhoons ever recorded in history. Typhoon Haiyan, referred to as Typhoon Yolanda in the Philippines, killed many people, resulted in the separation and displacement of many Filipino families, and caused severe damage in several provinces in the country.

From a reactive to a proactive approach

Recognizing the large number of deaths and high costs of such disasters, in 2010 the Government of the Philippines approved the Philippine Disaster Risk Reduction and Management Act (Republic Act 10121 or DRRM Act), which emphasizes a proactive response and strategies for disaster risk management (Government of the Philippines, 2010).

Previous legislation focused on disaster responses after disasters happened (a reactive approach). The PDRRM Act sought, however, to reduce the risks before disasters occurred (a proactive approach).

The mechanism developed for this purpose was the National Disaster Risk Reduction and Management Framework (NDRRMF), which aimed to develop 'safer, adaptive, and disaster-resilient Filipino communities' (Government of the Philippines, 2011a). The framework focuses on raising awareness and understanding among all Filipinos of disaster risks and prevention approaches, thereby helping to minimize the damage and losses caused by disasters. This requires multisectoral involvement in disaster risk reduction and management (DRRM) planning and implementation.

In 2011, the government prepared a National Disaster Risk Reduction and Management Plan (NDRRMP) for 2011 to 2028 (Government of the Philippines, 2011b), which describes the strategies, guidelines and action plans to be implemented over the 17-year period to achieve coherent, integrated, efficient and responsive disaster risk management at all levels. Specific goals were set for 2011–2013, 2014–2016 and 2017–2028. The government had only just begun implementing the NDRRMP when Typhoon Haiyan occurred in 2013.

Key issues

Need to better define roles and responsibilities for protecting and rescuing cultural heritage.

The PDRRM Act did not cater for the proactive preservation of cultural heritage, in that heritage institutions were not included in the councils involved in the implementation of the NDRRM Plan. Although other legislation addresses the preservation of cultural heritage of the country, such as Republic Act 10066, which was passed a year before the PDRRM Act, the law does not have a provision for determining the entities responsible for ensuring a safety and recovery plan when disasters occur. Thus, when Typhoon Haiyan hit, no agency could take the lead on managing cultural heritage affected by the typhoon, and government agencies in the disaster-stricken areas did not have DRRM manuals to guide them in salvaging their records and cultural heritage collections.

Slow disaster management response.

The National Archives of the Philippines (NAP), which monitors the condition of government records and is supposed to provide immediate response in the event of a disaster, only intervened five months after Typhoon Haiyan, with a Memorandum Circular: 'Guidelines on Records Recovery and Disposal Measures' (NAP, 2014).

DRRM training needs more focus on the heritage context.

Although institutional efforts towards training on DRRM have been undertaken by different sectors, their approach has not been sufficiently detailed regarding the risks facing documentary and other cultural heritage assets.

Solutions

Guidelines on record management published.

In 2023, the NAP released a Memorandum Circular titled '[Guidelines on Records Management for Disaster Recovery and Prevention](#)' (REMDRAP) which provides guidance on how to manage records in the context of disasters (NAP, 2023).

Short courses on records conservation are being provided.

Due to increasing awareness of the impacts of climate change, and as a pattern of worsening disasters has

become apparent in recent years, more and more short-term courses and workshops are being offered by professional associations in records conservation, digital preservation and DRRM.

Such courses are being provided by institutions such as the [University of the Philippines School of Library and Information Studies](#), the [National Archives of the Philippines](#), the [National Commission on Culture and the Arts](#), and other professional associations, such as the Society of Filipino Archivists, the Society of Film and Audio Visual Archives and the [Philippine Records Management Association](#).

Specialized training for archivists is being provided in the Philippines.

In recent years, numerous efforts have been undertaken to ensure the preservation of documentary heritage, including by providing specialized training for archivists. The pioneer archivists in the country were primarily trained abroad, but today those archivists are often providing local training and workshops in the conservation of archives and special collections in libraries and on archive restoration, through various professional associations.

In 2021, the first graduate programme in archive and records management in the Philippines and the South-East Asia region was approved (SEAPAVAA, 2021). The first cohort of students started in 2022.

Lessons learned

- National and local agencies should adopt proactive measures to ensure the safety of people, properties and heritage. The DRRM plans for every community should clarify communication mechanisms and the roles and responsibilities of all relevant agencies.
- Given that cultural heritage institutions were not included in the PDRRM Act, individual agencies and their local communities must take responsibility for managing and ensuring the safety of their cultural heritage collections.
- The involvement of volunteers from the local community can contribute positively to the development and implementation of a disaster plan. Enhanced understanding of DRRM among members of the community is crucial for conservation work and for effective emergency responses. Everyone has a role to play.

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Case study

Traditional practices for managing collections in India

Achal Pandya

Keywords: traditional knowledge, conservation, technique, documentation, India

Tangible heritage in India encompasses a wide variety of objects and structures, from family heirlooms to religious statues and built heritage. These objects and structures hold immense historical, cultural and sentimental value, and their preservation is of paramount importance to communities across the country.

Before modern methods of conservation emerged, indigenous methods and traditional knowledge were employed to care for, preserve and manage tangible heritage, ensuring their survival over the centuries. For example, the preservation of old manuscripts, textiles, statues and artefacts relied on traditional methods that had been passed down through generations.

Traditional practices vary across regions, communities and types of objects. The methods employed are age-old techniques that have stood the test of time, and they use natural substances. Traditional preservation techniques highlight the deep connection between material culture and the communities that create and cherish these objects. These practices have been documented and are

often handed down through rituals. Traditional methods are cost-effective and accessible alternatives to modern treatments and also respect the integrity and historical significance of heritage objects and structures, preserving their authenticity. These practices often combine a profound understanding of the material properties of the objects with a deep reverence for their cultural significance.

While modern conservation approaches have brought new tools and methods, it is important to recognize and appreciate traditional preservation practices because they not only safeguard the physical integrity of tangible heritage, but also preserve the intangible heritage associated with them.

Manuscripts and documentary heritage

In ancient times, manuscripts were written on palm leaves, and later they were written on handmade paper. To preserve these fragile documents, several traditional methods of preservation are employed. Traditional preservation methods include the following:

- Turmeric paste, and neem, lemon grass and other essential oils are applied as a protective coating on the leaves of the manuscripts to keep insects away.
- Manuscripts are usually wrapped in red fabric that has been dyed with a mixture of alum, lime, turmeric and essential oils, which acts as insect repellent.
- An insect-repelling powder is used. The ingredients to create the powder are: sweet flag 1-part, black cumin 1 part, bark of cinnamon 1 part, pepper ¼ part, cloves ¼ part, camphor 5 to 10 grams. This powder has been used in the

Thanjavur Sarasvati Mahal Library since 1882.

- Wooden binding boards are used to cover the manuscripts. They keep the leaves flat and protect them from insects and moisture.
- Manuscripts are kept in wooden chests, which serve as a buffer against fluctuations in temperature and relative humidity.

Textile preservation using natural products

Traditional methods of textile conservation, which preserve fabric and protect it from insect damage, often involve the use of herbal treatments, such as neem leaves, which have natural insect-repelling properties.

Textiles are carefully cleaned and then treated with a solution made from neem leaves, creating a protective barrier against pests. This method not only prevents insect infestation but also helps retain the fabric's original colours and textures.

An instance of traditional textile conservation practice can be found in the preservation of an extraordinary collection of carpets and rugs at Albert Hall Museum in Jaipur.

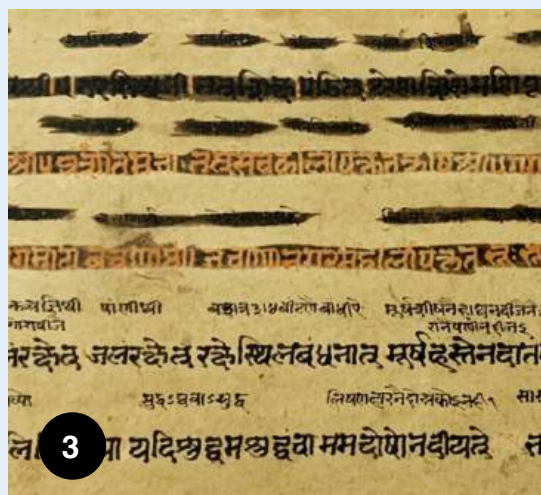
Display cases are also treated with neem leaf solutions, and drawers are filled with neem leaves, to safeguard them from insect damage and ensure their longevity.

Age-old practices in households of southern India

Kolam, a traditional form of floor decoration prevalent in South India, is not only a beautiful decorative art, but also serves as a natural insect repellent. Kolam has are drawn outside houses, and act as a barrier that prevents insects from entering the premises, thereby preserving manuscripts and other items that are vulnerable to insects.

The primary ingredient used in kolam designs is rice flour. By providing food for the insects outside, these designs divert insects and prevent them from entering houses.

This is an eco-friendly and sustainable approach to pest control, and one that does not require potentially harmful chemicals or pesticides.



1. Traditional way of storing manuscripts
© UNESCO / Achal Pandya
2. A woman draws a *kolam*, a floor decoration that also serves as an insect repellent
© UNESCO / Achal Pandya
3. A manuscript that contains a colophon intended to protect itself: '*protect me from oil, protect from water, protect me from loose binding, and never hand me over to a fool*' © Sarwarul Haque (courtesy of the National Mission for Manuscript (NMM), IGNC, New Delhi)

Rituals and daily practices for temple sculptures

In India and elsewhere, tangible heritage is often safeguarded through rituals and traditions attached to objects and buildings.

For example, the ritual cleaning of idols and temples serves to preserve this tangible heritage. Other periodic practices (practiced daily, weekly or annually) are also curatorial practices that protect and preserve heritage items. These practices include samprokshnam, abhishekam, aalepanam, ashtbanbhanam, jaladhivasham, ghritdhivasham, panchamritasnanam, sarkarasnanam, dadhisnanam and sudhodakasnanam. References to restoration and conservation are present in ancient texts, including Silparatna, Manasara, Vishnudharmotar Puran, Sukraniti and Agnipurana.

Conclusion

Traditional methods and practices play a crucial role in safeguarding cultural collections from damage caused by various aggressors. By employing age-old traditional methods, such as neem leaves for repelling insects and kolam as a preventive barrier, together with careful monitoring, we can prevent the deterioration and loss of invaluable cultural artefacts. Moreover, the use of proactive strategies that integrate traditional and indigenous knowledge can help to minimize the risk factors in a sustainable and affordable manner.

Traditional preservation practices in India continue to be honoured and respected for their historical and cultural importance. They are a testament to the wisdom and ingenuity of past generations, who developed effective techniques to ensure the longevity of valuable items without the aid of modern technology. By understanding and documenting these practices, we can continue to learn from the wisdom of our ancestors and integrate their invaluable insights into contemporary disaster risk management strategies.

4. Daily temple rituals associated with deities use natural ingredients that help the preservation of artworks.
5. Neem leaves are used as insect repellent to protect textile materials.
6. A palm leaf manuscript stored using a traditional method.

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Case study

Measures and methods for emergency response in China

Meifang Zhang and Yanxin Zhang

2023

Keywords: sudden disasters, emergency response, rescue and restoration

With continuous deterioration of the natural environment, China is experiencing a high incidence of emergencies that threaten archives and in some cases have already caused irreversible losses. It is urgent for archive departments and memory institutions to improve capacities and resilience to ensure the long-term security of archive collections.

Key issues

Disasters threaten archives and have already caused significant damage.

Natural disasters of various types, including earthquakes, floods and fires, occur frequently in China. The increasing complexity of social and cultural landscapes and the rise of information technology have also led to other types of emergencies, including terrorist attacks and cyber attacks, from time to time. Such events can cause serious damage and even destroy archives and other heritage items.

Large and sudden disasters have led to a shortage of emergency resources for archive institutions.

Sudden disasters can cause devastating impacts on people's lives and property, and on transportation infrastructure and other public services. Frequent disasters have led to a shortage of emergency rescue resources, such as personnel, funds and equipment, leaving archive institutions with unmet needs.

Lack of preparation by archive institutions for sudden events has hindered an efficient emergency response.

There is insufficient awareness of the serious nature and potential impacts of disasters, resulting in a lack of preparation and enormous challenges concerning the rescue and recovery of damaged archives following disasters. A systematic disaster response mechanism is needed.

Solutions

Ensure the disaster team is prepared to respond to emergencies.

When natural disasters (e.g. fires, floods, etc.) and other disastrous events (e.g. burst water pipes, roof leakages, etc.) occur in archive buildings, it is important that the disaster team has been trained and is ready to immediately launch the disaster plan. At the same time, the team should begin compiling a record of the emergency rescue work. Subsequently, a comprehensive list of the damage and losses should be prepared.

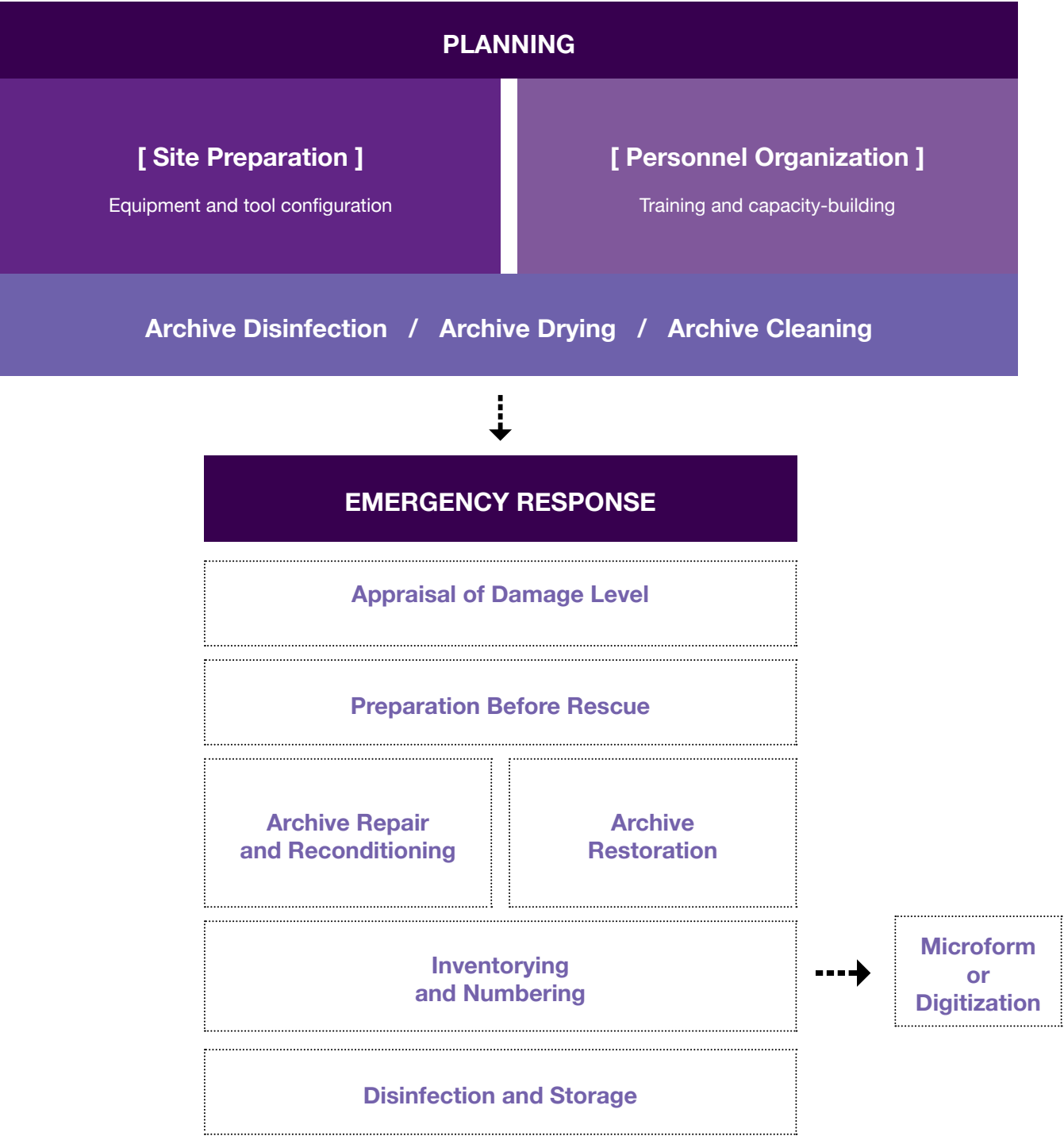
Report any threats or damage immediately.

The disaster team should report any threats or damage to the police, emergency rescue department and other relevant personnel so that emergency response measures can be implemented to reduce the risks and potentially prevent damage. The local administrative department for archives should be informed as soon as possible.

Evaluate the situation and take appropriate measures in a timely manner.

The head of the disaster team is responsible for leading the disaster response and for ensuring the safety of personnel. This person evaluates the severity of the situation and takes measures to limit any damage, in cooperation with archive experts and other team members, in accordance with the disaster plan. The disaster team leader is also responsible for compiling information about the causes of the disaster and about the actions taken and results of those actions. This information is compiled to inform

Figure 1: The emergency rescue mechanism in China



Source: Meifang Zhang

evaluations in the post-disaster period and to update the disaster plan.

The response chosen by the disaster team leader will depend on the type of emergency. In the event of a fire, for example, measures should be taken to extinguish the fire (if possible), while ensuring personnel safety. In addition, it is necessary to contact the local fire department quickly for support; take measures to prevent the fire from reigniting; and undertake action to restore damaged archives, based on predetermined salvage priorities. In the case of a flood, it is necessary to first identify the root cause of the flood, drain the water (if possible) and dry any wet archives and objects as soon as possible. Other responses include organizing evacuation of personnel and archives/objects, transporting items to a safe place and contacting the local government to ask for assistance.

Undertake restoration and reconstruction actions immediately.

Archives and other heritage items damaged by disasters should be rescued and restored immediately. In the case of flooded archives, freezing and drying measures should be taken in a timely manner to stabilize the archives and avoid further deterioration. Rescuers will need safe rooms and facilities for rescued items and means of transportation to transfer damaged items safely. This should be done carefully to avoid damage to items or injury to personnel during the transfer process.

Lessons learned

A collaborative emergency rescue mechanism is necessary for an effective response.

In China, the national archives staff cooperated with government departments and the military to establish an emergency rescue mechanism, and collaborated with experts in disaster management and with enterprises offering relevant services. Having a professional team to respond to a disaster will ensure that the necessary knowledge, capacity, technology and skills are available to rescue archives and heritage items in an emergency. Sufficient emergency supplies should be prepared in advance.

A better warning mechanism would help to prevent damage in a disaster.

A reliable early warning system is a prerequisite for damage prevention. This can be achieved through cooperation between departments such as geology, meteorology, water conservation and fire protection.

Infrastructure should be safe and strong.

Efforts should be made to improve the safety of infrastructure. For example, when designing new buildings, the geographical location, architectural design (such as earthquake-proof buildings), layout, etc. should ensure a secure environment for archives and heritage items, and buildings must adhere to construction standards (DA/T. 2019).

Digital backup of paper materials can ensure the safety of archives.

Creating digital backups and storing them in several locations is an effective measure for preserving information contained in archives. The standards and processes for archive backup should be improved to increase the security of backup files.

A shortage of professional and technical personnel hinders the emergency response.

Resources for archive protection and rescue should be increased as there is a shortage of professional and technical personnel dedicated to archive emergency response, rescue and restoration in China, which limits the ability of archive institutions to respond to disasters effectively. It is necessary to improve education and training on disaster response, so as to increase the number of personnel with professional skills and abilities.

Emergency drills improves the disaster response capacity of archives.

Regular drills can help improve the emergency response capacity of archive personnel and other stakeholders. Various methods, including practical drills, should be used to prepare staff and identify gaps in staff capacities and in the disaster plan, which should then be revised to enhance its effectiveness.

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Case study

Rescue and restoration of cultural heritage by volunteers

Dowon Kim

Hirafuku, Sayo, Japan
2009

Keywords: flood, community engagement, network, prevention

The Network for Historical Materials, known in Japan as Siryo-Net, is a volunteer organization that was established in the wake of the Great Hanshin-Awaji Earthquake of 1995. It is based in the Community Outreach Centre of the Graduate School of Humanities of Kobe University.

Having experienced the massive disaster of the [Great Hanshin-Awaji Earthquake](#), a group of people formed Siryo-Net to preserve items such as old documents and folk elements. Members of the group include history researchers (faculty and graduate and undergraduate students), local government officials in charge of cultural properties and local history research groups.

The members visit areas damaged by disasters such as earthquakes, storms and floods throughout Japan to share the expertise of the organization and support the rescue and restoration of damaged historical materials.

The organization also works with cultural property staff, local historical research groups and local residents to protect historical materials from potential disasters. Specifically, the organization provides support for protecting personal archives (such as letters and diaries), newspapers, paintings, screens, photographs, negatives, films and other old documents and undesignated cultural property in private homes.

As of 2021, more than thirty groups had been established in Japan, including prefectural groups that were organized in response to the windstorms, floods and earthquakes that occur every year, and 'prevention-nets', which were organized to engage in disaster prevention and mitigation measures.

The Hirafuku Disaster

On 9 August 2009, a heavy rainstorm caused by Typhoon 9 hit the Nishi-Harima region of Hyogo Prefecture. In one hour, the region received 81.5 mm of rain, and in 24 hours it received 326.5 mm. The Sayo River overflowed, leading to severe flooding in the town of Sayo, inundating 804 buildings, which resulted in the deaths of eighteen people, and two people went missing. In addition, seventy-five buildings were destroyed. Much of the documentary heritage in Sayo was affected. The historic district of Sayo, Hirafuku, was particularly affected. In this district, residents had many private collections, such as old documents, photographs, etc., and the flooding caused extensive damage to these items.

Because of the extensive damage caused by the massive disaster, the amount of documentary heritage affected was too large to be preserved by cultural property specialists alone. It was not possible to get

public assistance and funding for undesignated cultural property stored in ordinary homes, therefore volunteer-based rescue and preservation activities were needed.

In response to a call from the Sayo municipal government, volunteers registered to give their assistance. The volunteers and cultural specialists reached out to the affected people immediately after the rainstorm to inform them that it was possible to rescue and restore their damaged cultural heritage. Timely action was essential. If the owners of the damaged cultural heritage had not known that they would get assistance, they would have abandoned the process of salvaging the items and that heritage would have been lost.

The specialists and volunteers rescued, treated and restored the archival heritage of each damaged house in the Hirafuku area, then returned the heritage items to their respective owners.

Lessons learned

Since it is difficult to take action during and immediately after a disaster, it is necessary to prepare in advance, notably by taking the following measures.

- Creating a network of relevant organizations and specialists, including cultural heritage staff, museums, universities and researchers, among others.
- Establishing support systems in the field and improving coordination and information exchange between various areas of expertise.
- Developing skills on how to rescue and restore cultural assets and historical documents.

The following elements are necessary in the immediate post-disaster stage.

- Places to store documents and other heritage items.
- Information about the area.
- Funding.
- Effective dissemination of information to facilitate cooperation.
- A large volunteer workforce (if there is a large number of damaged documentary items owned by local residents in the area).

To ensure that communities are prepared and can protect their collections, it is necessary to do the following:

- Make local communities aware of the issues and share guidelines on how to protect private heritage collections.
- Implement regular educational programmes for volunteers and experts to ensure they are capable of taking first aid measures for damaged items.



1. Floor damaged by floods
2. Treatment of historical documents
3. A folding screen damaged by mould and water

Module 4

Collection management

Creating a DRM plan requires coordination, expertise, skills and resource management, as well as effective collection management. This involves establishing and regularly updating the accession register, identifying vital collections and significant items, creating a priority salvage list, ensuring adequate storage space and organization, and establishing access protocols and clear digitization procedures.

- 1. Creating an accession register**
Mary Grace Golfo-Barcelona
- 2. Prioritizing your vital and significant collections**
Brandon Oswald and Heather Brown
- 3. Preparing a disaster kit and emergency equipment**
Heather Brown
- 4. Linking audiovisual collections, digitization and DRM plans**
Sanchai Chotirosseeanee and Chalida Uabumrungjit
- 5. Connecting physical and digital collections in DRM plans**
Heather Brown

Case studies

Storage management at museums, archives
and repositories in India
Achal Pandya

Collections management at the National Archives
of Singapore - risk assessments
Sanira Beevi

Exercises

Accession register
Vital and significant collections
Disaster kit
Audiovisual collections
Physical and digital collections

Appendix A
Appendix B

Collections Survey
Collections Risk Assessment

Creating an accession register

Mary Grace Golfo-Barcelona

Keywords: accessioning, organization, inventory, database, digitization

Introduction

One of the basic requirements when preparing a disaster risk management (DRM) plan for your institution is to have what is referred to as an accession register. This is a comprehensive record of all your collection and resources. It may be in the form of a log book or accession forms. Cultural heritage institutions such as libraries, archives and museums often have their accession forms or logs encoded into their collection databases. These databases are made accessible to the users and researchers of their collections.

The accession register allows an institution to keep track of what specific collections it has, as well as the types of collections, when the collections were acquired, where the collections originated and the details of their purchase or donation, including the dates and details of the transfer of ownership.

As you develop your disaster plan, this register can serve as a basis for a number of important considerations. These include the following:

- The **level of priority** attributed to a collection. The accession register will help you to decide which items in your collection should be secured first if a disaster strikes, so it will help you create a salvage priority list.
- The **value of the collection**. The accession register notes the value of the collection in terms of relevance, use and demand for research.
- Methods of conservation. The accession register includes details of the specific conservation interventions that your collection requires.
- Digitization requirements. The accession register contains information about any **digitization projects**, and existing access to your collection.

Ideally, an accession register should be created when you first establish your institution's repository (archive, library, museum, etc.) or when a new collection is acquired. In reality, institutions often make many acquisitions before starting to create an inventory or an accession register. This is due to a various factors, including a lack of personnel to create an accession register; a large amount of items that have not yet been added to an inventory or register; and in some cases the need to justify the purpose of the register.

Basic requirements of an accession register

Accession form

The accession form is the main basis of your accession register. It is a record that proves the transfer to, or acquisition of, your specific collection. It also serves as the legal evidence that would prove the transfer of ownership to your institution or repository. Thus, it is important to have this form filled in and signed by the donor or seller. You can customize your accession form according to your institution's requirements.

Accession details / information

There is no standard format for an accession form. Different formats (paper records or archives, digital collections, archival objects, or published materials) of collection entail different set of information that should be captured in the accession register. But in all formats, your accession form should include the following details:

- Name, address, and contact details of your institution and other details such as your website and email addresses.
- A unique reference number for each entry, e.g. collection series code, year and consecutive numbering, if necessary.
- Details as to whether a collection is donated or on loan and the duration of the loan.
- The name and contact details of the donor or seller.
- Date of acquisition or receipt.
- Date range. This usually refers to the date of creation. If the date of creation spans a certain period, the date would also be a certain period. e.g. 1970-1975.
- The title of the collection (e.g. Nguyen Dynasty Collection)
- The volume and storage formats (e.g. boxes, folders, items)
- A brief description of the contents (e.g. local history research, physical and digital photographs, digital film files, sketches, diaries, notebooks, etc.)

Unique accession number

A unique accession number is assigned to each item or group of collections as you include it in your register. It provides number control, so that you can see at a glance the reference number of each accession and track it.

Tips

- If you are starting from scratch, and have a large amount of unprocessed collections, it is best to identify priorities (i.e. identify which collections are most important) before beginning to create an accession register.
- Strive to make your accession form as comprehensive as possible, so these forms can also be used as your initial catalogue.
- As mentioned, there is no specific standard format for an accession form. However, if your institution is starting to set up its collection, you may find the following resources to be useful as guides.

Resources

For Archival Collection

Canadian Archival Accession Information Standard Final 1.0 May 2019 https://archivescanada.ca/wp-content/uploads/2023/07/CAAIS_2019May15_EN.pdf
(Accessed 12 March 2024.)

For Archival Objects (if any)

Standards on Accessioning of the International Council of Museums
https://icom.museum/wp-content/uploads/2022/03/Accessioning-Standards_EN.pdf
(Accessed 12 March 2024.)

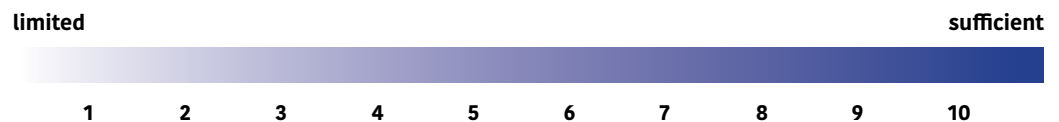
Module 2: RE-ORG method for collection management

1. Do you keep detailed records about your collection? Is there an existing log book, inventory or list of all your holdings?

2. How would you evaluate the current record/inventory of your collection?



3. Is the information compiled in your log sufficient? Is there anything that you could add to improve it?



4. Do you know the percentage of items in your collection that have not yet been processed?

5. Have you considered conducting a risk assessment or appraisal of your collection, especially concerning vital or significant collections?

6. Is your institution required to periodically report its acquisitions?

7. Who is responsible for updating your records when an item is acquired?

8. How do you make your collection accessible to your researchers and users? Do you have a collection database?

9. How soon after an item is acquired can you make it accessible to researchers and users?

10. If your accession register is not up to date, are there any available resources to clear the backlog and ensure the accession register is kept up to date?

11. Are there any personnel who can clear the backlog?

Prioritizing your vital and significant collections

Heather Brown and Brandon Oswald

Keywords: vital records, collection assessment, method, priority collections, salvaging

Introduction

The aim of this module is to develop awareness and provide methods to assess the significance of records, objects and assets, so as to identify the most important (vital) ones. This module will also explain how to create a salvage priority list. The items on this list would be the first to be protected and/or salvaged if a disaster strikes.

Criteria for assessing importance

The importance of records and collections can be assessed against criteria such as the items' historical, aesthetic, artistic, scientific, social, spiritual and/or monetary value. The value of collection items also depends on their rarity, provenance, condition and interpretive capacity.

Examples of important items include unique materials such as local historical photographs, manuscripts, diaries and records of oral history interviews and rare books. Very recent material can also be important, for example scientific research data held in digital repositories.

In most cases, the collections to prioritize are those that are unique and impossible to replace. For example, in a library a local history collection that contains unique, irreplaceable manuscripts would be a top priority to protect and salvage. Other items of top priority include important museum pieces, tools that provide information about these collections, such as the [accession register](#), catalogue, collection management system and in-house indexes and search aids, and assets that affect human resources and information management, such as computer equipment, servers and personnel files.

Criteria for assessing significance do not replace criteria, policies or frameworks for other assessments. With its emphasis on a variety of elements such as context, history, and social values, significance assessments can complement and enrich our understanding of other assessments that are used by libraries, archives, museums and galleries.

For libraries for example, significance criteria will enhance and closely align with collection development policies. Collections such as rare books, special collections, local history collections and research collections are commonly identified as high priority collections to preserve for the long term. Some libraries, such as national

libraries, may have a legal mandate to safeguard their priority collections. In all cases, disaster management is central to the long-term preservation of significant collections.

Generally, a collection policy defines the scope of existing collections and also describes processes such as deselection, retention, preservation and storage. It provides guidance for staff, organizations and individuals.

Creating a salvage priority list

After assessing the significance of records, assets and collections, the next task is to create a list of the most significant items or collections (**a salvage priority list**), ranked in order of priority. This list is like a master key to effective response and recovery. It is a shortcut to identifying what items and collections are the top priorities to be rescued and salvaged during disaster. If such a list does not exist, staff will waste valuable time in trying to work out what to save. This can cause stress and confusion as people use up time and energy debating about everyone's personal favourites. In the meantime, they would unfortunately miss a valuable opportunity to protect and salvage significant items and collections.

The salvage priority list is one of the most important features of the disaster plan, and it should cover both physical and digital collections. It is important to identify the locations of the significant items and collections on the floor plans so they can be located quickly and easily in the event of a disaster. For priority digital collections, backup arrangements should be identified. For example, they may be backed up in the cloud and/or offsite. Any salvage priority items or collections that are sacred or culturally sensitive need to be **handled in a special way**.

Note that salvage priority lists, along with the mapped locations of important items, are a potential security risk. For this reason, such lists must be treated as strictly confidential, and access to them and to disaster plans should be restricted to authorized staff.

Key steps

Create a Vital Collections Committee.

The committee should include experienced staff who are responsible for managing collections; digital collection staff; information technology staff and other staff and experts who are familiar with your organization's collection. The number of committee members will vary depending on the size of your organization and your collection.

Assess the significance of collection items.

Although all collections in the organization may be considered irreplaceable, usually some collections are more significant than others. It is essential to review this list every year because new items acquired over the year may be of high importance and will need to be added to the list.

One way to start assessing items is to divide them into two categories: high value items such as historic material and items with high monetary value, and irreplaceable material such as old manuscripts and fragile sacramental records. Next assess each item and/or each collection.

Collection Assessment - Primary Criteria	
Criteria	Questions
Historical significance	- Is your record or collection associated with an important historical figure, event or place? If so, why is it important? - Does it tell us something about a historical period or movement? - Does it help us to understand the history of a particular time, place, person or event?
Artistic or aesthetic significance	- Is the record or collection a good example of a particular artistic style or movement? - Is it representative of the work of a particular artist? - Is it original or innovative? - Does it represent a significant person, place or event?
Scientific or research significance	- Does the record or collection have research potential? If so, how? - Do you know of any researchers who may be interested in studying the record or collection? - Do you think there may be future research interest in the record or collection?
Social or spiritual significance	- Does the record or collection hold particular significance to a community or group of people? If so, how is it important? - Does the record or collection have meaning through the beliefs, customs, traditions or practices it holds for a particular group or groups of people or community? If so, how have you consulted with the community or group of people and recorded this meaning?

Table 1. Primary criteria in collection assessment. Source: PARBICA, 2007.

Collection Assessment - Comparative Criteria	
Criteria	Questions
Provenance	- Is the provenance of the record or collection well-documented and sound? - Do you know who created or used the item or collection? - Is there strong evidence of the chain of ownership?
Rarity or representativeness	- Is the record or collection unique, rare or endangered? - Does it have unusual qualities or uses that make it different from similar records? - Is the record or collection particularly well documented?
Condition or completeness	- Is the record or collection in good physical condition? - Is it complete? - Is it in its original condition?
Interpretive capacity	- How is the record or collection relevant to your organization's purpose, collecting policies and programmes? - Does it fit thematically with other record or collections, or have a special place in your holdings? - Does the record or collection assist in interpreting place, history or context?

Table 1 lists primary criteria along with questions that will assist in determining the significance of items and collections. Table 2 lists comparative criteria and associated questions.

List the significant items in your collection using a **Vital and Significant Collections Form** (see next page), while referring to Tables 1, 2, 3.

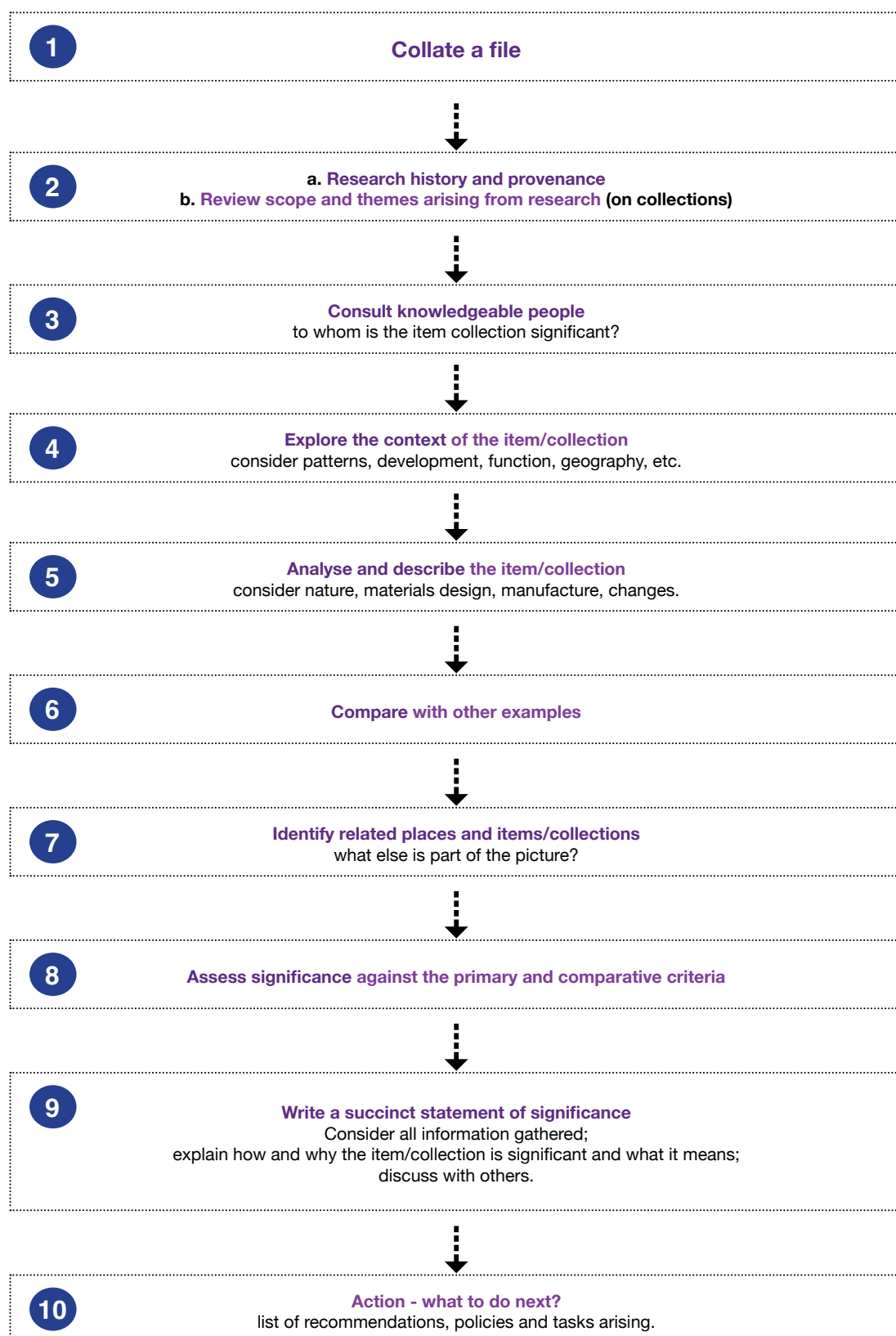


Table 3. The significance assessment process. Source: PARBICA, 2007.

Vital and significant collections form (template)

ID	Type	Department	Location	Digital records	Format	Why vital?	Risks	Protection measures	Recover if backups are suitable

Table 4 below shows how a Salvage Priority List can be developed from significant collections and refers to the collection locations.

Salvage priority list				
Priority	Physical format	Digital format	Location - physical	Location - digital
Local history collection	Books, paper	Photographs - digital	Ground floor local history room	Stored on server in basement
	Maps	Maps - digital		
	Photographs - analogue	Archived web pages		
	Microforms	Film/video - digital		
	AV (films, videos, analogue sound recordings)	Sound - digital		
	Memorabilia			
Rare books collection	Books, journals, paper-based items		Ground floor local history room	
In-house indexes, local databases and finding aids		Digital		Stored on server in basement
Library catalogue		Digital		Stored on server in basement

Table 4. Salvage priority list, sample. Source: ALIA, 2019.

Conduct a risk assessment.

Work through your Vital Collection Form, carrying out a risk assessment for each type of item. Begin by identifying the threats and vulnerabilities that your vital records, objects and assets are exposed to.

See the [risk assessment and analysis methods](#) listed in Module 2.

Tips

- Knowing the locations of your vital records, objects and assets will help you to have the correct equipment nearby to protect them in an emergency. For example, if there are leaks in the ceiling and water is coming in, have tarpaulins stored in a cupboard nearby so that it is possible to quickly cover shelf units that contain vital records.
- Put colour-coded stickers on collection boxes and/or shelves to mark the level of importance of collections. For example, red stickers to indicate high priority for protection and salvage, orange stickers for medium priority and blue for low priority.
- Think of extra steps that can be taken to protect vital records so they are safe in case of an emergency. For example, identify an off-site storage facility, with fireproof storage areas, where you can move your vital collections to if there is an impending disaster, or if there is an earthquake and your building is damaged.
- Establish procedures for regular backup of vital digital records once a year.
- Ensure that new employees, volunteers and anyone else in charge of salvaging material after a disaster know which items are of high priority and where they are located.
- The Vital Collections Committee should also be involved in the preparation of the disaster plan.

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Vital and significant collections | Questions

1. Does your institution have a Vital or Significant Collections Committee? If not, identify the staff members in your organization who would be in this committee and list them here.

2. Does your institution have a collection policy?

☐ YES

☐ NO

3. Have you already done a significance assessment? Have you identified your priority items? Does your institution already have a vital collections list and/or a salvage priority list?

☐ YES

☐ NO

4. Do you know where the most significant physical collections or items in your institution are located?

☐ YES

☐ NO

5. Do you know where your digital collections and catalogues or collection management systems are stored or backed up?

6. Have you already carried out a risk assessment for the items in your institution?

☐

YES

☐

NO

7. What collections/items are unique or would be extremely expensive to replace?

8. Is your record or collection associated with an important historical figure, event or place? If so, why is it important?

☐

YES

☐

NO

9. Do individual items or the collection have potential research value? If so, how?

☐

YES

☐

NO

10. Do individual items or the collection hold particular significance to a community or group of people? If so, how important?

☐

YES

☐

NO

11. Do any of the collections or items have particular protocols for viewing, handling, or otherwise accessing them?

☐

YES

☐

NO

12. Are any of the physical collections fragile?

☐

YES

☐

NO

13. Can significant physical items or groups be moved easily, or will they require a team or people and equipment?

☐

YES

☐

NO

14. How often, where and how are the digital collections backed up? If they are stored off-site or on a cloud drive, what are the contact or login details, and where do you keep this information?

Preparing a disaster kit and emergency equipment

Heather Brown

Keywords: emergency equipment, disaster supplies, disaster plan, disaster kit

Introduction

This module discusses the importance of having a disaster kit and emergency equipment ready in case of a disaster. Having one or more disaster kits and equipment helps the disaster team to respond quickly and can help to minimize the impact of a disaster on collections. Knowing that a basic stock of supplies and equipment are available will also reduce stress for the disaster team. These kits are particularly useful for small disasters, such as leaks.

Key elements

Each organization should prepare a disaster kit, and tailor it to its needs. Discussions with colleagues and conducting a risk assessment will help the disaster team decide what should go into the kit, how many kits are needed and where they should be located ([ALIA, 2019b, p. 22](#)).

Many disasters involve water. For example, leaking pipes and roofs; floods; and when fires are put out with sprinklers or a fire hose. If collection items are damp or wet, there will be a high risk of mould developing. The salvage team should focus on removing water from the area, drying the wet items, making sure the air is moving and reducing humidity. This means disaster kits should include supplies such as mops, sponges, blotters and sheets of plastic.

Basic disaster equipment include water pumps, portable tables, crates, trolleys and fans. Other equipment that can assist with disaster rescue and recovery efforts include tools that monitor the levels of relative humidity (e.g. a hygrometer); a dehumidifier to help to reduce humidity; a wet/dry vacuum cleaner or water pump to remove water; fans to keep the air moving and to help to dry spaces quickly and speed up the drying of wet items; and a freezer in which some types of wet items can be stored temporarily to prevent mould from growing.

Instead of buying equipment, consider borrowing it or renting it. Make a list of suppliers who rent suitable equipment, along with the details of the costs of rental, and the time it would take to deliver the equipment in an emergency. Larger organizations may decide to purchase and manage their own stock of disaster equipment and will therefore have a separate disaster store stocked with supplies (see image 2). If you are intending to purchase tools and equipment, always arrange for a demonstration first and seek confidential advice from others who have purchased such equipment in the past. Also keep in mind that any supplies, tools and equipment you buy will need to be stored somewhere where it will not be damaged by any disasters.

Some organizations keep their disaster kit in a waterproof movable 'disaster bin' with wheels (see image 1). The bin keeps the supplies safe and dry and can be wheeled to the site of a disaster quickly, which will keep critical response times to a minimum. And if there is a leaking roof, the bin can be used to collect water (after emptying out the supplies).

External suppliers can provide transport services and commercial data recovery services, among others. In some countries, there are also commercial disaster recovery services that can assist with cleaning up. However, these organizations may not be experienced in working with archives and collections, so it is important to thoroughly investigate their experience and to be aware of the limitations to the services that they can provide, as well as any potential risks to collection items.

Typical supplies for a disaster kit

The following list is a guide for what to include in your disaster kit, which you can modify according to your organization's needs. For a comprehensive list, refer to ALIA, 2019b.

Protection and drying supplies

- plastic sheeting
- packing tape
- cloths
- cotton bath towels
- blotting paper
- butcher's paper
- pegs
- clothesline
- string
- nylon net (for padding out textiles)
- spun polyester for carrying fragile objects

Cleaning supplies

- brooms
- dustpans
- buckets
- mops
- rubbish bins
- rubbish bags

Stationery and record-keeping supplies

- self-adhesive labels
- waterproof pens and pencils
- scissors and tape
- writing pads
- freezer bags
- tags
- clipboards
- spare batteries

Health and safety supplies

- masks
- gloves
- goggles
- rubber boots
- laboratory coats or dust coats.

Disaster equipment

The following is a list of typical equipment that an organization can consider borrowing, renting or buying to support disaster response and recovery efforts.

Salvage workspace tools

- extension leads
- torches
- portable fans
- mobile phone chargers
- plastic crates
- tools for monitoring temperature and relative humidity

Equipment

- folding tables
- freezers (check with a conservator before freezing anything)
- generators / uninterrupted power supply (UPS)
- dehumidifiers
- industrial fans
- wet/dry vacuum cleaners (larger size)
- water pumps
- trolleys

Services

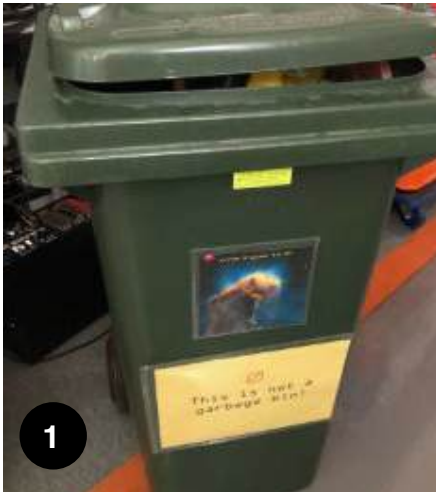
Below is a list of some of the services that may be available to assist the disaster team in rescue and recovery efforts.

Rescue and recovery services

- external conservators
- cleaning companies
- commercial data recovery services
- transport companies
- disaster restoration services (e.g. freeze-drying services).

Tips

- If you wait until a disaster happens, you may find that supplies of useful materials have run out, or cannot easily be obtained (ALIA, 2019a, p.18).
- The locations of the equipment and disaster kit, and a list of the kit's contents, must be included in the disaster plan. In addition, the locations of these items must be recorded on the floor plan so they can be found easily and be put to use quickly.
- The disaster team should ask other heritage and archive institutes and organizations in their area or country about what disaster supplies they use and which suppliers they buy or rent equipment from. Those institutions and organizations may be able to give advice on which materials work best, which are most cost-effective and if there are any quality or supply issues to be aware of, and may be able to share their experience of dealing with equipment suppliers.
- To ensure the necessary supplies and equipment are provided in a timely manner, it is useful to build a relationship with the suppliers. In addition, find out how your organization can get quick priority access to equipment. For example, ask if you can set up an account with the supplier so that purchases or rentals can be arranged quickly in the future.
- Disaster kits, supplies and equipment must be checked and restocked following a disaster and also annually, in conjunction with the update of your disaster plan.



1. Disaster bin containing emergency supplies
2. Disaster equipment store for South Australia's major organizations
3. Wet/dry vacuum cleaner

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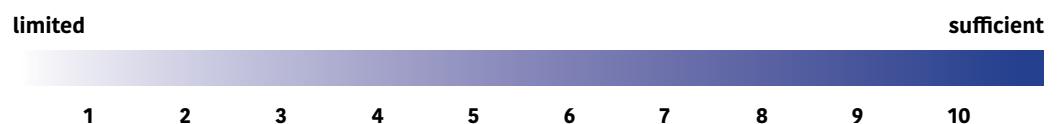
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Disaster kit and supplies | Questions

1. Does your organization have a disaster kit?
2. If yes, what supplies are in the kit?
3. If no, what supplies might your organization need?
4. If you have disaster kits, where are they located? Why are they in that location?
5. How would you ensure that the contents of your disaster kit are kept secure and are also replenished after a disaster?
6. How would you rate your staff's knowledge on disaster supplies? Are there any major gaps in their knowledge?



7. Which member of the disaster team would use tools for measuring changes in temperature and relative humidity?
8. Why is it important to keep the air moving and to reduce humidity if collection items get wet?
9. Why is a dehumidifier useful? Why is a wet/dry vacuum cleaner useful?
10. Does your organization have equipment to support disaster response and recovery? Are there any major gaps?



11. How could you procure or rent the necessary equipment?
12. Do you know where your organization could hire, borrow or buy a humidifier and a wet/dry vacuum cleaner? If one is not available, what simple alternative could you use?
13. Do you know where your organization could hire a large chest freezer or freezer container?
14. In your disaster plan, where would you include the list of the contents of your disaster kit and the list of your disaster equipment so the lists are easy to find?

Linking audiovisual collections, digitization and DRM plans

Sanchai Chotirosseranee and Chalida Uabumrungjit

Keywords: audiovisual, analogue, digital, formats, copies

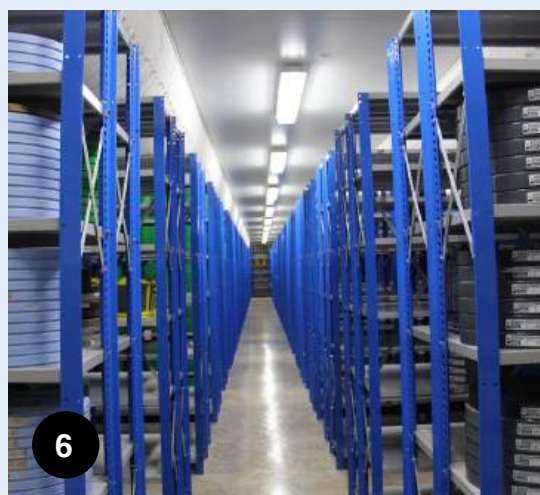
Introduction

Audiovisual collections include film reels, magnetic tapes, audio recordings and multimedia materials. Such archives now include three main categories of materials: original analogue materials, digital copies of the analogue materials and born-digital files. Thus, audiovisual materials have many formats. Each format requires specialized playback equipment and each has its own technical specificities and vulnerabilities, as well as its own needs in terms of preservation and safeguarding. For example, analogue audiovisual materials should be kept at a stable temperature and be handled with care because they can be degraded and damaged by exposure to unsuitable temperatures, humidity and light, and by improper handling. Given these specificities, the staff members of archive institutions need to consider the unique characteristics and vulnerabilities of each type of audiovisual material before developing their DRM plan.

Digital files face specific risks in disaster situations. Digital materials and equipment are vulnerable to corruption and permanent data loss. Moreover, due to their large size, digitalized audiovisual files, especially high-resolution videos and uncompressed audiovisual files, require maintenance and resources in order to be managed, accessed, stored and preserved securely in the long term.

Disaster preparedness

- When deciding which audiovisual files to give greater protection, prioritize original audiovisual materials over digital copies because the original materials are authentic and unique. Original items need to be safeguarded for long-term preservation against risks such as format obsolescence, data loss and technological failures, which could also affect the accessibility and integrity of digital or reproduced copies.
- Consider the vulnerabilities associated with each format in your collection and how each would be impacted in a disaster situation. For example, nitrate and acetate films are sensitive to high temperatures, humidity and water. Moisture can lead to mould growth and deterioration (and vinegar syndrome in case of acetate films). In a fire, nitrate film can burn rapidly. For magnetic tapes, water and humidity can lead to distortion, mould growth and loss of information. Storing tapes in high temperatures and strong magnetic fields can further damage magnetic signals. High temperatures



1. Colour grading station
2. Film scanner
3. Film inspection
4. U-matic tape player
5. Deteriorated film
6. Climate controlled film storage

© Thai Film Archive

and water damage can cause warping and melting of optical discs (DVDs and CDs) and audio records (vinyl records, wax cylinders).

- Many archives digitize their collection to enhance public access and to preserve files. Digital copies are backup files if the original items are lost or damaged in a disaster. Digitization can therefore support disaster preparedness and recovery.
- The process of digitization calls for thorough planning, organization and coordination among archive staff. Digitization plans should follow a standard layout, like those presented by the International Federation of Film Archives in their comprehensive guidelines for digitization process workflow.
- It is important for your digitization plan to be linked with your disaster plan. The plan needs to consider factors related to the preservation of both analogue and digital audiovisual collections and needs to include recovery plans for each format.
- Maintain off-site backups of digitized audiovisual files. Store backups in different geographic locations to keep backup files safe.
- Create a comprehensive inventory of your audiovisual files, including their formats, descriptions, locations and condition.

During a disaster

- In a disaster, before deciding to evacuate your audiovisual collections from their permanent storage, it is necessary to assess the severity of the disaster. This assessment should consider factors such as the type of disaster, its potential impact on materials and the urgency of the situation (i.e. the safety of the personnel who will evacuate the collections).
- If you need to evacuate collections and your resources are limited, prioritize the most valuable and irreplaceable materials.
- Ensure an inventory is made of the audiovisual files that are evacuated, in order to ensure they can be tracked and identified during and after the evacuation process.

Recovery

- [The Disaster Recovery – First Actions For Film, Tape, and Discs](#) produced by the Association of Moving Image Archivists (AMIA) gives step-by-step procedures for actions to take when rescuing and recovering audiovisual files.
- The National Film and Sound Archive of Australia (NFSA) first aid salvage manual provides comprehensive advice for the recovery of audiovisual materials that have been exposed to [fire](#) and [water](#).

- The National Film and Sound Archive of Australia offers guidelines for [disaster recovery of audiovisual collections](#), which focus on risk mitigation strategies.
- The Federal Emergency Management Agency (FEMA) in the United States of America offers a [manual for dealing with mildew and mold in physical spaces](#). As it explains, after a water-related disaster, areas with excess moisture may be susceptible to mildew and mould. Without action, the mould can harm audiovisual materials. It is therefore important to clean and disinfect items to prevent mildew and mould growth. The [Canadian Council of Archives](#) recommends that mould should be brushed or vacuumed off (in an area away from the collection). A high-efficiency particulate air (HEPA) filter vacuum is recommended. If the mould cannot be removed through drying or vacuuming, in some cases freezing the materials can prevent further mould growth. It is important to note, however, that freezing does not kill mould, and that not all items can be frozen.
- To protect their health, staff should wear masks and gloves when handling mouldy materials.

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Audiovisual collections | Questions

1. What are the specific vulnerabilities and risks associated with your audiovisual collections (physical and digital)? Have you identified the needs of the different audiovisual formats within your collection?

2. Has your organization prioritized collection items and identified the most valuable ones?

☐ YES ☐ NO

3. Have you linked your digitization strategy to your disaster plan?

☐ YES ☐ NO

4. Have you established an inventory that includes both your physical and digital collections?

☐ YES ☐ NO

5. Are your digital copies sufficiently organized to support recovery in the event of a disaster?

☐ YES

☐ NO

6. Does your organization's storage vault and server have a reliable power supply and an emergency power supply? How long does the emergency power supply last?

☐ YES

☐ NO

7. Does your digital collection have backups? And are they preserved in different locations? Is the backup process regular and comprehensive?

☐ YES

☐ NO

8. Do you have a recovery procedure?

☐ YES

☐ NO

9. How would you handle water-damaged, fire-affected, or mould-infected audiovisual materials?

10. Do you have the necessary supplies and equipment readily available for a disaster response, such as specialized containers for wet materials, drying racks, cleaning supplies and temporary storage?

☐

YES

☐

NO

11. What are the evacuation protocols you would follow for your audiovisual collection materials in the case of a disaster?

12. Are you aware of best practices for cataloguing and documenting audiovisual collections in the context of disaster management, particularly practices that encompass physical and digital collections?

☐

YES

☐

NO

Connecting physical and digital collections in DRM plans

Heather Brown

Keywords: integrated, digital collections, hybrid collections, connecting, physical collections

Introduction

A major divide exists between the disaster management of physical collections and that of digital collections (Brown, 2021). While many organizations have disaster plans, these plans largely focus on physical collections. The responsibility for disaster management of digital collections is usually separate, and the role is frequently assigned to information technology (IT) staff.

This module aims to help connect the disaster management plans of physical and digital collections and therefore bridge the divide between these two areas. In particular, this module provides guidance for the development of an integrated plan that connects physical and digital assets, using a clear method.

Method

Connecting physical and digital collections during the prevention stage

The prevention stage of disaster risk management primarily involves conducting a risk assessment and identifying preventive actions that can mitigate risks. Ideally, a risk assessment is collaborative, involving a team of people from across the organization who have differing areas of expertise and experience and can provide diverse perspectives. In this context, a risk assessment of physical and digital collections should be conducted by a diverse disaster team composed of members with expertise in physical and digital collections. [This table provides guidance on forming a diverse disaster team.](#)

Connecting physical and digital collections during the preparation stage

This stage focuses on the steps taken in advance to prepare for a disaster. It involves identifying the locations of collections; developing a disaster plan; identifying external contacts; determining authorization and collection access protocols, equipment and supplies; and conducting training.

An approach that connects physical and digital collections ensures a holistic understanding of collection locations, including what is stored off-site, which may include digital backups and cloud storage. In a connected disaster plan, the list of

external contacts and suppliers could include the digital cloud storage provider (to recover digital collections) as well as commercial freeze-drying services (for water-damaged physical collections). Likewise, disaster training would involve all disaster team members, including staff with expertise in physical collections and staff with expertise in digital connections. **Table 1** can assist in identifying the locations of physical and digital collections.

Connecting physical and digital collections during disaster response

The response stage takes place during a disaster and involves taking steps to limit the impacts of that disaster. Actions can include turning off or redirecting the flow of water; starting up a generator; or contacting the data centre or digital cloud storage provider. The response depends on the scale of the disaster, type of disaster and collections involved. Having a connected response means that there is a shared understanding of the immediate risks and the potential impact of the disaster on both physical and digital collections.

Connecting physical and digital collections during recovery

The recovery stage is the aftermath of a disaster. A connected and coordinated recovery across both digital and physical collections will minimize disruption to services and return services to normal or near normal quickly. An example of an action in this stage could be restoring the website, so as to enable access to digital collections and also to provide information about physical collections.

Tips

- **An integrated disaster plan that covers both physical and digital collections encourages a holistic and coordinated approach.** A connected disaster plan enables shared understanding and more informed prioritizing of collections before, during and after a disaster.
- **Effective change management** is critical to achieving a connected approach as it ensures that buy-in and understanding occur at all levels in the organization. It must be embedded into all stages of developing a disaster plan, including in staff training.
- **Good communication is essential.** To find out what disaster management actions may be occurring separately in the physical and digital collections in your organization, communicate with the staff who work with physical collections, as well as with those who work with digital collections (e.g. IT staff), and with building staff and security staff. It may be possible to connect their activities and practices and thereby strengthen disaster management across your organization.

References

Brown, H. 2021. Interconnected Disaster Management: Bridging the Physical and Digital Divide. *Journal of the Australian Library and Information Association*, Vol. 70, No. 3, pp.263-286.

Table 1. Identifying the locations of physical and digital collections.

Backups, surrogates and master copies					
Priority	Location of original	Surrogate type A - master or highest quality copy	Surrogate type B - lower quality copy	Location of surrogates	Location of backups
Local history photographs	Ground floor, local history room	Digitized uncompressed	Digitized compressed (access copy)	All digital surrogate types A & B are stored on server in basement	All digital surrogate types A & B are backed up in cloud storage commercial provider X
Local history newspapers	Ground floor, local history room	Master microfilm	Duplicate master stored onsite	Basement on site	Masters stored at off-site cold store
Oral history interviews	Server basement	Digitized uncompressed	Digitized compressed (access copy)	All digital surrogate types A & B are stored on server in basement	All digital surrogate types A & B are backed up in cloud storage commercial provider X
In-house indexes, local databases and finding aids	Server basement	Not applicable NA	NA	NA	Cloud storage commercial provider X
Library catalogue	Server basement	NA	NA	All digital surrogate types A & B are stored on server in basement	Cloud storage commercial provider Y

Source: ALIA, 2019.

Physical and digital collections | Questions

1. Does your organization have both physical and digital collections? Give two examples of each. Give examples of what is unique and significant in your digital and physical collections.

☐

YES

☐

NO

2. Does your organization currently have a disaster plan? If yes, does it cover both physical and digital collections? Are your physical and digital collections integrated in your disaster plan? If yes, how are they integrated? If your organization does not have a disaster plan, look for an example of a disaster plan from a similar organization. Does their plan cover both physical and digital collections?

☐

YES

☐

NO

3. Give examples of how you could connect the digital and physical collections in cooperation with relevant staff at the preparation stage.

4. Give two examples of information in a disaster plan that are relevant to your digital collections, and two that are relevant to your physical collections.

5. What are the benefits for your organization in having an integrated disaster plan that covers both physical and digital collections? Are there any barriers? If yes, how could these barriers be overcome?

Case study

Storage management (RE-ORG) at museums, archives and cultural repositories in India

Achal Pandya

India
2011 - present

Keywords: collection management, storage, preventive conservation

According to the National Digital Repository for Museums, India has more than 1,000 active museums and about 55,000 public libraries (ORG-MARG). These institutions expand their collections over time through acquisitions, donations and discoveries (excavations), resulting in a growing number of cultural artefacts, ranging from scriptures and paintings to archaeological and ethnographic objects, each possessing a particular historical, artistic or scientific significance. Many of these items are kept in storage areas.

Under the purview of risk reduction and disaster management, having well-managed storage areas is of utmost importance. Disasters are sudden and can occur at any given time; but by preparing in advance and ensuring that storage repositories are well managed, we can minimize damage.

Key issues

With the increasing size of their collections, museums and archives in India are facing serious challenges, including the following:

- Insufficient storage infrastructure and/ or space.
- Lack of trained staff to manage administrative processes.
- Absence of a standardized documentation/ or inventory systems.
- Inadequate financial and management support.

Due to such challenges, disasters such as floods, fires, heavy rain have caused significant losses to museums, libraries and cultural repositories in the past and threaten their future. The loss of collections in any form (physical or digital) can prove fatal for such institutions, so it is important to address these issues.

These challenges are faced worldwide (UNESCO-ICCROM, 2011) and one way to address them is the RE-ORG (reorganization of storage) method put forward by ICCROM in collaboration with other cultural institutions. This method was designed with museum storage in mind, but it is applicable to other institutions, including archives and libraries. It is an affordable and practical method and is therefore an accessible solution for any community and region.



1. Existing storage condition at Mamlatdar office, Silvassa
2. Removing non-collection items from the storage
3. Installation of new furniture
4. Condition of shelves before the workshop
5. New storage and shelves following the workshop
6. RE-ORG team at the Assam State Museum

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The method involves examining four aspects, namely: the building and storage space; management of the stored items; the archives or collection; and the storage furniture. This process reveals any issues with the existing storage system and identifies areas that need to be improved.

[ICCROM's RE-ORG toolbox](#) assists institutions to evaluate their collections and storage spaces, and improve the management and accessibility of stored collections on a limited budget.

RE-ORG India

In February 2011, ICCROM collaborated with the Indira Gandhi National Centre for the Arts (IGNCA) to apply the RE-ORG method. This was the first time the method was used in India, and it was a huge success. The exercise was led by a team of twelve over a period of eight days and cost around Rs. 20,000 (equivalent to 240 USD).

This marked the beginning of the mission of improving museum storage spaces in India, and between 2011 and 2023, at least twelve museums and cultural institutions used the RE-ORG method (see Table 1).

RE-ORG at the Mamlatdar office in Silvassa

The Mamlatdar Office, a public records office in Silvassa, is a good example of the successful use of the RE-ORG method. Located in the capital city of the Union Territory of Dadra and Nagar Haveli and Daman and Diu, this government authority assists in administrative matters related to such things as land records, revenue, public distribution and civil registration. The office stores civil records, including land archives and data sheets.

The team studied the four aspects of the storage system at the Mamlatdar Office and found that the main issues were as follows.

- Lack of appropriate storage containers and furniture. Most of the archives in the office were paper documents and were packed in jute sacks. The existing shelves in the storage room were not sufficient to house the archives. Around 70 per cent of the sacks were on the floor.

- Lack of inventory management. The office had no accession register (see Module 4.4). This, along with a lack of an indexing system and proper labelling, as well as poor organization, made it impossible to know what was inside the sacks.
- Limited access. Sacks were stacked on top of one another, leading to difficulty in accessing documents when they were needed.
- Non-archival materials were stored with archival material. Most of the space was taken up by non-archival materials, i.e. materials that were not actually part of the archives or that did not have an accession or reference number.
- Lack of maintenance. The storage space was not cleaned or maintained, leading to a high risk of pest infestation.
- Lack of storage guidelines. The office did not have any policy or guidelines to aid staff in ensuring the archives were organized and accessible.
- Lack of knowledge of how to reorganize the archives. The management staff were keen to reorient their archives but did not have a clear idea of where to begin.
- Lack of staff training and expertise in managing the archives. The office staff were not trained in how to manage archives.

Looking at the initial condition of the storage space, the office staff were not optimistic about the success of the exercise. This is usually the case when a RE-ORG exercise is conducted for the first time.

The RE-ORG exercise at Mamlatdar Office took twelve working days and was achieved by a diverse team of thirteen, including conservators, curators, museum staff and government officials. The storage space underwent a transformation in a short period of time and on a very small budget, and all of the issues were addressed.

Steps included making sure no documents or objects were kept on the floor, regrouping archives for better organization, removing items that should not be there, cleaning the storage room and archival material, storing documents in archival boxes with labels, and creating a system for locating items in storage. In addition, the walls and electrical fixtures of the storage

Table 1. List of museums that carried out the RE-ORG exercises in India.

No.	Institution	Year	Size of the collection (number of objects)	Time required	Number of people in the RE-ORG team
1	Janpada Sampada IGNCA, New Delhi	2011	500	One week	9
2	National Crafts Museum, New Delhi	2012	4800	Two weeks	9
3	Janpada Sampada IGNCA, New Delhi	2013	500	One week	15
4	Alwar Museum, Rajasthan	2015	2174	Two weeks	18
5	Udaipur Palace Museum, Rajasthan	2016	3000	Two weeks	10
6	Assam State Museum	2016	2500	Two weeks	14
7	Baroda Museum, Gujarat	2019	3800	Two weeks	21
8	Assembly Museum, Manipur	2019	2000	Two weeks	10
9	District Museum, Jorhat	2019	1600	Two weeks	16
10	Mamlatdar Office, Silvassa	2021	6500	Two weeks	13
11	Crafts Museum, New Delhi	2021	30,000	One week	18
12	Parliament Museum and Archives, New Delhi	2022	2300	Two weeks	12

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room were cleaned and repaired.

Following the process, the team observed that the stored archives could be found and accessed easily, which helped in creating an inventory of all of the archives for the very first time.

Lessons learned

The RE-ORG method is an effective initial step in disaster risk mitigation. This method not only serves to improve the organization and accessibility of archives and collections, it is useful in mitigating potential hazards. For example, by installing appropriate storage furniture, the Mamlatdar Office was able to reduce the risk of the archives becoming wet from flooding and reduce the risk of pest infestations and damage to the archives.

By embracing this method, we can pave the way to a safer and more resilient future, ensuring the well-being and security of archives and collections in the long term.

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Case study

Collections management at the National Archives of Singapore – risk assessments

Sanira Beevi

2021

Keywords: risk assessment, prevention, disaster, mitigation, collection surveys

The National Archives of Singapore (NAS) is the custodian of the nation's heritage. Its collections include the following:

- Government files
- Records acquired from overseas relating to Singapore
- Records from private individuals or organizations and associations
- Maps and building plans
- Photographs and posters
- Speeches and press releases
- Oral history interview transcripts
- Audiovisual material and sound recordings

Risk assessment in the context of preservation is a major part of collection management and is one of the first steps in formulating a good disaster plan. This process anticipates what might go wrong and the potential for collection items to be damaged or lost, and also considers what measures should be taken to preserve collections. Knowing what the risks are also helps institutions to allocate resources effectively so that collections are cared for and protected (Waller, 1995).

Risk assessments examine potential threats, aggressors and agents of deterioration to identify their probability of occurring and likely impact (see Table 1). Risk level is determined by probability x impact (see Table 2).

Everyone in a cultural institution has a part to play in risk assessments, from the building management and collection staff to archivists and conservators.

In collection care, 10 agents of deterioration identified by The Canadian Conservation Institute (CCI) are used by NAS to categorize the major causes of change, loss or damage to collection items.

- Physical forces
- Theft and vandalism
- Fire
- Water
- Pests
- Pollutants
- Light
- Incorrect temperatures
- Incorrect relative humidity
- Dissociation (custodial neglect)

Key issues

The NAS had no systematic approach to risk assessment, and this was reflected in the condition of key collections and collection spaces. This presented a dissociation risk to collections.

Solutions

To address this issue, NAS began by conducting a collection survey. This survey is an effective tool for generating data for preventive conservation and collection management planning. It is similar to a condition report (that conservators use when assessing records to determine the right course of treatments), but with a focus on producing recommendations relating to risk.

A collection survey (see [Appendix A](#)) allows collection owners to identify and proactively address threats before they escalate into bigger problems. Using this tool, organizations can identify priority areas requiring immediate attention, for example pests, overloading of electrical points and condensation issues. Collections identified as showing signs of degradation can be fast-tracked for treatment.

Based on the findings of the collection survey, the NAS completed the risk assessment template (see [Appendix B](#)). This form is populated with customized elements about archives and collection. Based on this, the risk is calculated using scales of probability and impact.

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Appendix A
Collection Survey
Summary Sheet 1

Accession No	
Name/Title of Work	
Type of Work/Medium	
Existing Storage Display System/ Location	
Dimensions	
Condition	☐ CR1 ☐ CR2 ☐ CR3 ☐ CR4 ☐ CR5 CR1: Very Good (No treatment required. Framing/rehousing/encapsulation may be required) CR2: Good (Stable, no immediate treatment required. May have light deterioration and damage) CR3: Fair (Fairly stable, would benefit from conservation treatment) CR4: Poor (Unstable, action desirable) CR5: Unacceptable (Unstable, severely deteriorated, immediate action required)
Proposed Treatment Summary	☐ Accretion removal ☐ Adhesive / tape removal ☐ Analytical testing ☐ Anoxic treatment ☐ Backing removal ☐ Board reattachment ☐ Consolidation (leather) ☐ Consolidation (structural) ☐ Consolidation (media) ☐ Deacidification ☐ Flattening ☐ Lining ☐ Mould treatment ☐ Sizing ☐ Stain reduction ☐ Surface cleaning ☐ Humidification ☐ Photo-documentation ☐ Rebacking ☐ Rebinding ☐ Reinforcement ☐ Tear repairs / in-fills

Estimated time	/ hours
Previous treatment	Yes / No ☐ / ☐
Recommendations	
Name/Designation	
Date	

Appendix B Collections Risk Assessment Template

Department		RA Leader		Approved by
Location		RA member		Name:
Assessment Date:		RA member		Designation:
Last Review Date:		RA member		Date:
Next Review Date:		RA member		

Risks/ Types of Hazards	Type of Collection/Location	Probability	Impact	Level of Risk	Action Plan: Risk Reduction/ Elimination
Natural physical events <i>Torrential rain, floods, earthquake, high winds, landslide</i>	<i>Sample: All of Basement Repository</i>	<i>(earthquake) 1</i>	3	3 (low)	<i>Ensure records are housed appropriately and placed securely on shelves.</i> <i>Malfunctioned shelves to be addressed.</i>
	<i>Sample</i>	<i>(torrential rain, floods) 3</i>	4	12 (moderate)	<i>Records are not to be placed directly on the floor and must be elevated.</i>
Water <i>Fresh water supply and wastewater e.g. roof leaks, rising damp, plumbing faults</i>					
Fires <i>Fire in adjacent property,</i>					

<i>electrical fault, lightning</i>					
Criminal activity <i>Robbery, theft, vandalism, embezzlement</i>					
Bio deterioration <i>Pest and mould infestation</i>					
Environment 1 <i>High radiation and light exposure</i>					
Environment 2 <i>High temperature and humidity</i>					
Dissociation / Custodial neglect <i>Loss of data, poor handling,</i>					

<i>storage of records on the floor, shelf collapse</i>					
Pollutants <i>Gaseous and particulate, off-gasing from display or storage materials, acidic packing materials</i>					

Collections Risk Assessment for (Location)

Summary of Recommendations

No.	Departments	Actions	Remarks
1			
2		-	
3		-	

All contents belong to the National Archives of Singapore.

Module 5

Digitization and climate action

Digitization brings new opportunities for memory institutions as it increases access to collections and their use by the general public while also providing copies of items that may be impacted by a disaster. The process of digitizing collections comes with an array of challenges, however, including technological obsolescence, e-waste and cyber threats. The process of digitizing physical collections and the management of ‘born digital’ files require strict protocols to ensure the files’ sustainability and accessibility over the long term.

1. Advantages of digitizing archives

Widiatmoko Adi Putranto, Lois M. Evans
and Mary Grace Golfo-Barcelona

2. Digitizing collections: a step-by-step guide

Mick Newnham, Lois M. Evans, Heather Brown

3. Digital storage and e-waste management

Linda Tadic and Lois M. Evans

Case studies

The digital preservation of information and archives
in Myanmar

Digitizing projects in Indonesia

Widiatmoko Adi Putranto

The digitization of the imperial archives
of the Nguyen Dynasty

Minh Huong Vu Thi

Responses by memory institutions to the
COVID-19 pandemic

Sanchai Chotirosseeanee

Exercises

Digitizing Collections

E-waste

Digital Projects

Advantages of digitizing archives

**Widiatmoko Adi Putranto, Mary Grace Golfo-Barcelona
and Lois M. Evans**

Keywords: cultural resources, digital collections, access, preservation, representation, ICT

Introduction

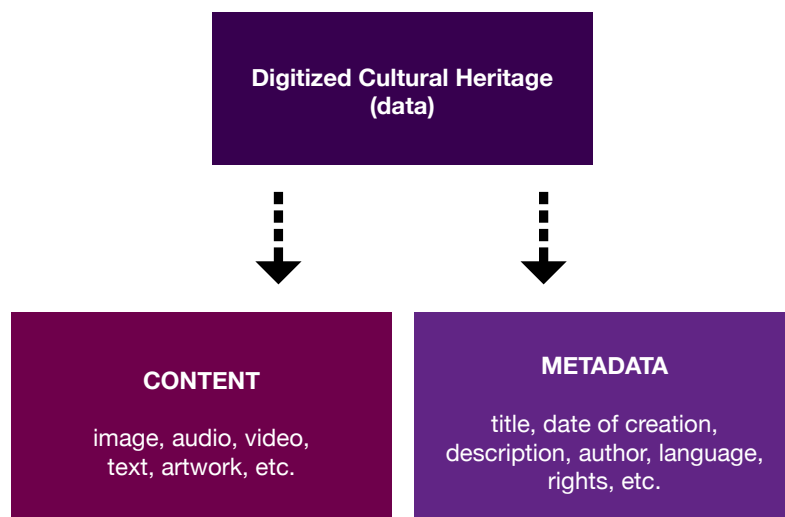
The rapid development of information and communication technology (ICT) in recent years has made it possible to digitize both tangible and intangible cultural heritage archives. Digitization can be as simple as recording an intangible heritage practice on a smartphone or using a copier to copy documents.

This module highlights how projects to digitize heritage objects and practices can benefit heritage preservation, memory institutions and communities.

Advantages of digitization

Advantages of digitizing archives and heritage include the following:

- Once a heritage item is digitized, it is organized as data, which consists of both content (file) and metadata (the information that describes the file/content). **With the internet and the digitally networked environment, both the content and metadata can be made available online and shared.** Digital copies can be published on a website and exchanged via emails or messages, allowing users to explore them anywhere and anytime. People can therefore have access to heritage archives without physically travelling to a memory institution. This increases the accessibility of such archives.



- Digitization of holdings can **support virtual reunification and even repatriation of cultural or archival materials**. This is beneficial when collections are dispersed across a wide geographical area or across different countries. For example, Indonesia has its collections dispersed across various countries, including the Netherlands and England. While physical repatriation often deals with complex preservation issues, the online accessibility of heritage can lead to the virtual reunification of shared heritage collections, previously scattered and owned by multiple institutions (Punzalan, 2014). Thus, in the digital environment, dispersed holdings can be brought together. Online visibility of digitized collections also provides opportunities for countries to open discussions and reclaim their displaced heritage.
- In the context of climate change and disasters, **digitization offers institutions a way to document heritage for a disaster risk management (DRM) plan**.
- Digital copies can be used in disaster recovery efforts to confirm inventories, prioritize actions, and even recreate damaged sites or lost materials. In a worst-case scenario, digital copies may be all that remains of a site.
- Digitization and **three-dimensional technology can be used to create physical copies of heritage objects**. In a few cases, institutions have done this, and have returned the originals to the rightful owners. More commonly, digital copies of historical photographs and drawings have been used to create replicas of objects that no longer exist.
- Digitization encourages **inter-institutional collaboration on managing resources and networking in the heritage domain**, which in turn fosters resilience in heritage preservation. Collaboration on shared digital collections can provide practical benefits to galleries, libraries, archives and museums (GLAMs) because individual institutions may have insufficient resources to properly manage their collections on their own. For example, Wikimedia Indonesia provides technical assistance for small and medium-sized GLAMs that have limited funding and infrastructure to digitize their collections and make them more accessible online (Wahidi, R., Chairman of Wikimedia Indonesia, personal communication, 16 March 2021). Through content exposure, GLAMs will receive credit, gain recognition and show more relevance in their community and beyond.
- Digitization can **facilitate the production of new types of works, such as virtual tours and exhibitions and even commercial products**. Virtual tours and exhibitions showing digitized cultural heritage are today common in museums and platforms around the world, including at the National Museum of Indonesia and on the Google Arts & Culture platform.
- The distribution and reproduction of the digitized cultural materials helps facilitate a new dynamic model for long-term preservation of intangible heritage (Pessach, 2018).

- Digital formats make it possible to combine cultural data, so that **whenever the copyright status or license allows, cultural data can be mixed to create new works**. For example, an environmentalist can repurpose archival material, mixing a digital image of birds with the digital sound of the birds, and use that for advocacy campaigns.

Key issues

- Even if memory institutions go through the process of digitizing their collections, the digital items do not become accessible online automatically. This is because it can be difficult to install the infrastructure necessary to make content accessible online, to ensure the quality of information and to make sense of digital copies. It can also be problematic to manage how digital files are stored and viewed and to ensure they meet the requirements of online publishing and dissemination. In 2015, the Online Computer Library Centre (OCLC) reported that half of archival collections in North American libraries do not have online presence.
- Digitization requires planning for the long term, in line with available resources and budget, to cover payments for and maintenance of capture devices, servers, cloud storage, internet connectivity and energy. It also requires having trained professionals available and having the resources to pay them.
- Digitization is only one step towards preserving collections, and should not be confused with digital preservation.
- Digitizing all of an institution's holdings is unlikely because most institutions do not have enough time or resources to digitize everything.
- Most heritage collections are subject to copyright protection. This means that these collections may not be shared free of charge online. This is where awareness on copyright and legal frameworks becomes essential. Copyright is limited in time, however, and once expired, an intellectual work enters the public domain (Hamilton and Saunderson, 2017). One of the OpenGLAM Principles (2023) is that memory institutions 'keep digital representations of works for which copyright has expired (public domain) in the public domain by not adding new rights to them'. However, intellectual property laws in some countries may not allow this. OpenGLAM Principles (2023) encourage the active engagement of users in promoting collections, including those with low exposure. In the context of heritage as resources, GLAM institutions have more credibility than the main search engines because of their status as custodians of heritage, and because they can offer curated collections that are distinctive and difficult to find elsewhere. It is important to note that institutions need to have a clear policy and terms of use.

Guidelines for digitization

- Begin by defining the purpose of digitizing a particular collection and identifying the target audience. This will determine how the collection will be presented and shared, and the level of accessibility of the digital collection to the audience. For example, some university libraries in Japan provide 'pick-up collections', a series of highlighted collections, while State libraries in Australia offer thematic grouping for their digital collections. These methods provide opportunities for readers to be inspired and explore the collections in new ways.
- Start by digitizing the parts of your collection that have the highest priority given their condition, cultural value, age and/or significance to your institution, community and target audience.
- When sharing and providing access to digitized heritage, institutions need to carefully examine intellectual property laws in their country of operation and adhere to those laws.
- Institutions should work closely with external stakeholders to overcome possible challenges and barriers. Decision-makers need to be aware of and involve experts, partner institutions, higher education institutions, relevant government institutions and other stakeholders to ensure the successful digitization of heritage materials and their accessibility.

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1. Does your institution conduct digitization and provide access to digital collections? If yes, for what purpose?
2. Who is your target audience?
3. Do you know your users' preferences in consulting and using the collections?
4. Do you plan to promote your digitized collections and reach a wider audience?
5. How can digital collections remain accessible for users over the long term? Do you have a long-term plan?
6. Do you collaborate with other institutions in the management of your digital collections? If yes, please elaborate. If no, what kind of support do you need to start collaborating?
7. Is your digital collection already part of a disaster plan?
8. What issues do you currently face in conducting digitization projects?
9. Does your institution have sufficient knowledge to initiate a digitization project?
10. Does anyone at your institution hold the skills and knowledge to set up and maintain a digitization programme? Is there someone interested and willing to learn? Do you have the resources to hire an external expert/technician?
11. Do you have sufficient resources to initiate a long-term digitization project? Do you have funding (internal or external) to support such a project?
12. Do you have a detailed inventory of the holdings you want to digitize and share publicly?
13. Do you have additional resources available to promote the digital collections?
14. What are your plans to overcome the challenges involved in managing digital collections?
15. Are you aware of risks or concerns concerning public access to digitized collections?
16. Have you examined the copyright or legal status of your collections?

Digitizing collections: A step-by-step guide

Mick Newnham, Lois M. Evans and Heather Brown

Keywords: standards, formats, metadata, cycle, preservation

Introduction

Digitization is the process of creating digital copies of analogue materials for computer access. Analogue materials are objects that exist in the physical world including documents, books, works of art, museum pieces, audio tapes, film, and video.

From the perspective of disaster risk management, digitization supports several objectives.

- Preservation of originals: digital copies reduce the need to handle fragile originals.
- Increased access: educators and researchers do not have to travel to the source location as they can view materials at any time via the internet.
- Replication of lost materials: digital copies of materials stored online may continue to exist if the originals are lost in a disaster.
- Documentation: digital images show what an object or place looked like before a disaster and can be used to assess damage and support recovery efforts.

A guide to digitization projects

This section provides a brief summary of key steps in developing successful digitization projects, see [Figure 1](#) for quick reference.

1. Plan and document the project

As with all projects, digitization projects need careful planning. A project to digitize documents requires clear goals and a realistic budget.

An important consideration is the scope of the proposed project. If a scanning operator working a five-hour shift can complete 25 scans, this means that the operator will need about 200 hours to create 1,000 scans – and this does not include all the other work needed to prepare the materials for digitization, manage digital files, arrange online access, or preserve the files so that they do not become obsolete over time.

For many digitization projects, it can be useful to complete a pilot project before proceeding with the main project. This allows the team to work through requirements

such as materials, equipment and workspaces, workflows and labour resources, digitization standards, file naming and metadata, digital storage, digital access, and the long-term persistence of digital files. For large, ongoing projects, it can be useful to break the project into segments based on the number of objects digitized, a set amount of time, or both. For example, a team can commit to digitizing 250 objects every three months, which leads to a sense of accomplishment when the goal is achieved as well as a sense of momentum for the project.

At the outset, the project manager should create a project charter to bring together and document all of the project considerations. The charter should be comprehensive, but can be brief at about 2-3 pages. Section headings in a digitization project charter may include: purpose; goal; objectives; significance of materials; current use of materials; risk assessment; digitization activities; metadata fields and content; funding and labour resources; stakeholders and change management; equipment and software; milestones and schedule; author; and date.

2. Select and manage source materials

To make the most of finite resources, institutions should develop a prioritized list of materials identified for digitization. The criteria for what to digitize must align with the institution's collection and appraisal policies and typically includes significant and fragile objects (e.g., rare documents), formats subject to obsolescence or degradation (e.g., video types), and objects that are frequently accessed and of high interest to researchers.

Handling, preparing, and protecting source materials is an important aspect of digitization projects. Before digitization, any dust or debris should be carefully removed from the source materials for optimum results and to avoid damaging the digitization equipment. Fragile documents may need to be placed in polyester enclosures to prevent further damage.

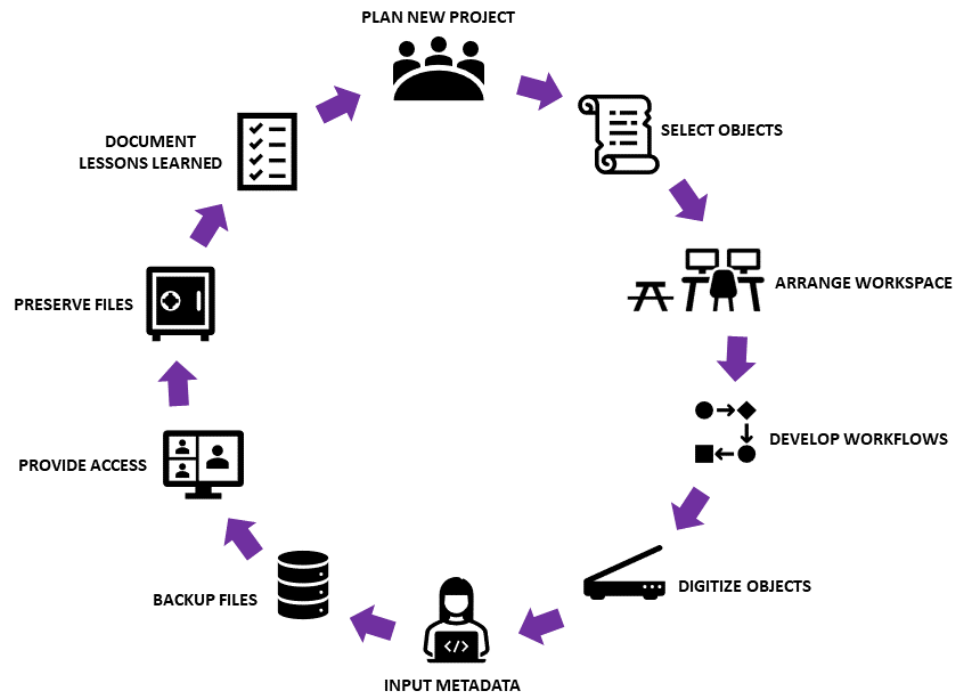
Digitization may also affect the decision making around salvage priorities in a disaster with digitized objects having lower priority than similar objects that are not digitized. The disaster plan should include a list of digitized materials for this reason. As well, objects may be withdrawn, taken out of secure storage areas or taken out of display areas for digitization. When the objects are moved, the salvage priority list must be updated to indicate the new locations.

The History Trust of South Australia has produced useful guides to developing a selection framework for digitization and for preparing and handling materials ([see Resources](#)).

3. Position the digitization equipment and optimize the workspace

Digitization equipment ranges in size from hand-held cameras to large devices attached to computer workstations. Ideally, digitization equipment is kept in secure, stable conditions, plugged directly into surge-protected electrical sockets, and turned off when not in use. Tables located adjacent or near to the digitization station provide extra surface space to lay out materials for digitization and for reshelfing after digitization is complete.

Figure 1: Key steps in digitization projects. © UNESCO / Lois M. Evans



4. Design workflows and assign labour resources

Digitization workflows extend beyond digitization to include gathering source materials, inputting standardized file names and metadata, calibrating and configuring digitization equipment, preparing digital storage, digitizing objects, and relocating source materials when the process is complete. Ideally, many of these activities are supported by other parties so that the scanning operator can focus on digitization.

5. Develop and document digitization procedures and set standards

The scanner operator must have sufficient technical knowledge to run the digitization equipment and trouble-shoot issues. Before turning on the digitization equipment for the first time, the scanner operator must read the instruction manual from cover to cover and investigate any training videos available through the manufacturer's website or elsewhere on the internet. This is a necessary step even if the scanner operator has worked with other digitization equipment as there is always something new to learn. The scanner operator must be able to configure the equipment for optimum use and to calibrate the equipment on a regular basis. Calibration includes both the scanner and the monitor to ensure that files viewed on the monitor are a realistic rendering of the source object.

The project manager and scanner operator need to work together to determine what digitization standards apply to the project. They must confirm configuration settings (e.g., file resolution, colour space, file format, compression, etc.) and document these for future reference. While some standards will apply to all materials, others will vary by project. For example, colour photographs are digitized to different standards than reels of black-and-white microfilm.

6. Determine file names and metadata standards

File names are critical to tracking and managing digital files. Each file is given a unique file name for identification purposes. File names may also include information about the creator, the collection, and/or object. In some cases, the scanner software can be preset to automatically track this information and to advance the file number for each file, and in others metadata is tracked using a spreadsheet. Either way, the file name is a key piece in generating a larger set of metadata that connects the file to the source object and provides users with ways to search and retrieve digitized image files.

7. Organize digital storage and backups

Good digital storage management is an important aspect of digitization projects. Digitization produces many high-resolution digitized image files that require significant amounts of digital storage. This storage needs to be well organized, with appropriately named folders and sub-folders that make sense to all parties involved in the project.

In many cases, files are stored on network drives, which must be backed up. While some backup systems involve digital tapes or auxiliary drives stored in a second secure location, many institutions now rely on online storage provided by a cloud service provider. This can be a good option, but care must be taken to ensure that the provider is dependable and will remain in business over the long term. In addition, the institution may need to consider whether costs can be covered as the extent of storage increases, including the cost of retrieving items from cloud storage.

For smaller organizations, it may be possible to work out a shared service model with larger institutions such as national, state, or university cultural institutions with the smaller organization providing digitized images and metadata and the larger institution providing digital storage, backups, and/or access. Other free options include non-profits that provide services like the Internet Archives' Archive-It or businesses providers like Google Arts & Culture Collections. For any of these options, care must be taken to ensure that the terms and conditions suit the organization especially where objects include culturally protected materials.

8. Provide access to digitized images

Providing internal access to digitized images can be as simple as giving users access to the drive where the files are stored. Care must be taken to restrict permissions to "read only" so that the master files cannot be accidentally deleted or edited.

If the institution has a website, a decision may be made to make the digital files available online, which often involves developing a search and results interface to allow researchers to find digitized images of interest. In many cases, the master files will be repurposed to reduce file size through conversion to a different file format or smaller resolution. The institution will need to consider whether they have the legal right to post the material as well as any rights they wish to retain over the digitized images. The institution should also include a sample citation so that other researchers will be able to find their way back to images they see published elsewhere.

9. Ensure digitized images persist over time through digital preservation

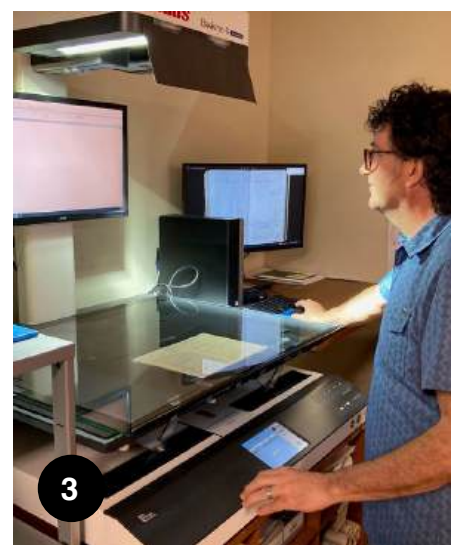
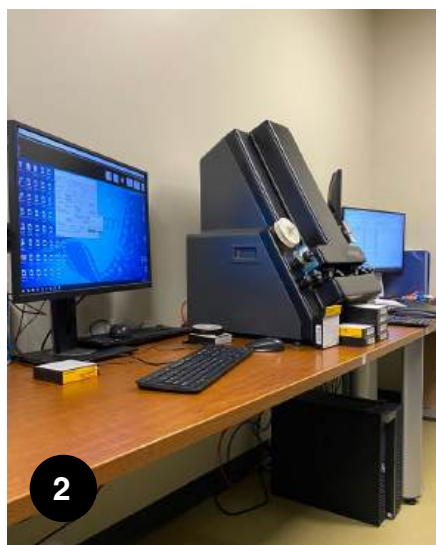
Digital preservation involves activities designed to ensure that files persist over the long term (see Figures 2, 3). Digital technology is subject to obsolescence, which means that over time hardware, software, applications, and file formats become outdated and do not work as well with newer systems.

While larger institutions may have the resources and expertise to install digital preservation systems, smaller institutions can take steps to ensure that digitized image files last as long as possible by digitizing to file formats endorsed by larger institutions (e.g., TIF, PDF/A), regularly updating software, and documenting projects. More complex digital preservations involve storing master files in a preservation system and adding checksums to each file. A checksum is a string of digits generated from scanning the digital file that is then used to detect any changes in the data (e.g., errors, corruption). For smaller organizations, digital preservation may be another reason for partnering with a larger institution.

10. Document lessons learned

Through digitization projects, teams develop a range of new skills and knowledge, and it is often useful to take stock of these at the end of a project. In addition to ensuring that all procedural documentation is updated, the project manager should reflect on the project as a whole and write down some of these broader learning in a project report. This document ensures that if the project manager leaves the organization or funding for digitization is suspended, the next digitization project will benefit from earlier experiences rather than starting from the beginning.

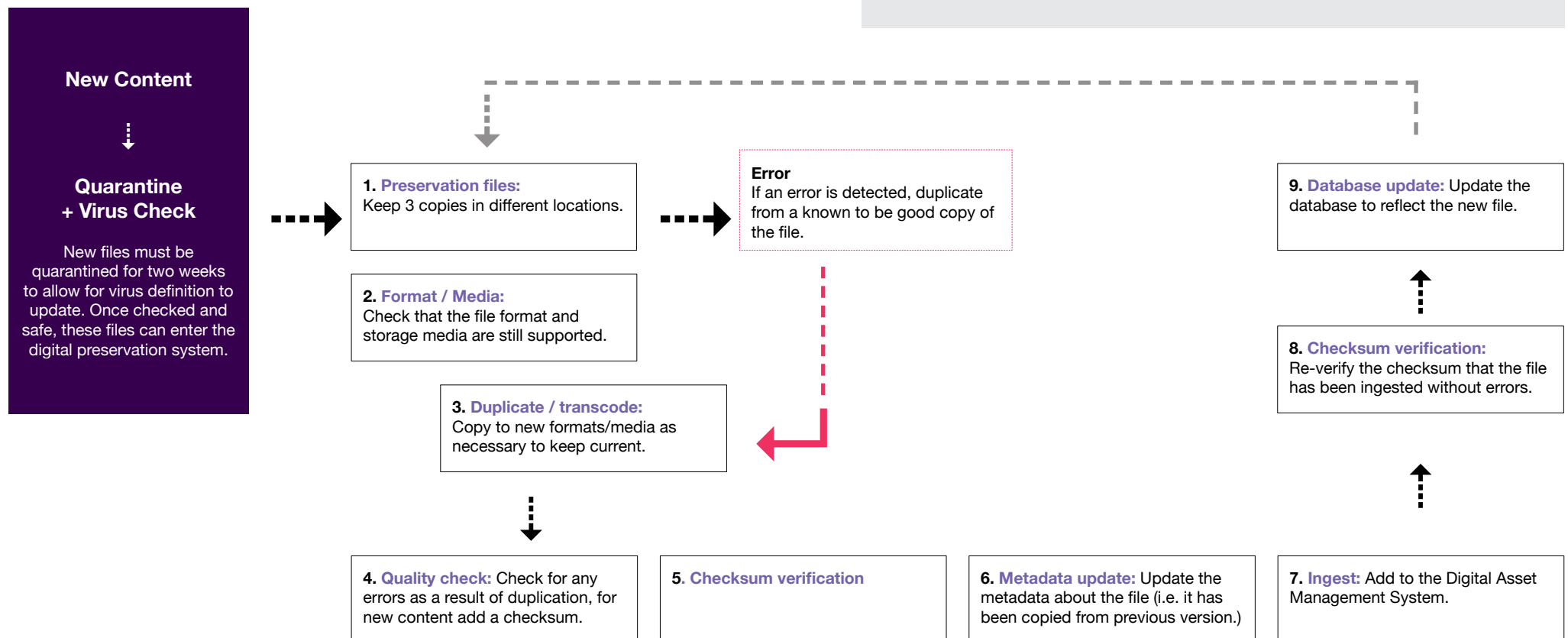
Section headings in a digitization project report may include: summary of outcomes; summary of challenges and accommodations; and advice for future projects.



1. Drum scanner
2. Microfilm scanner
3. Book scanner

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Figure 2: Expanded digital preservation cycle



Checksum

A digit representing the sum of the correct digits in a piece of stored or transmitted digital data, against which later comparisons can be made to detect errors.

Metadata

A set of data that describes and gives information about other data such as a document or article.

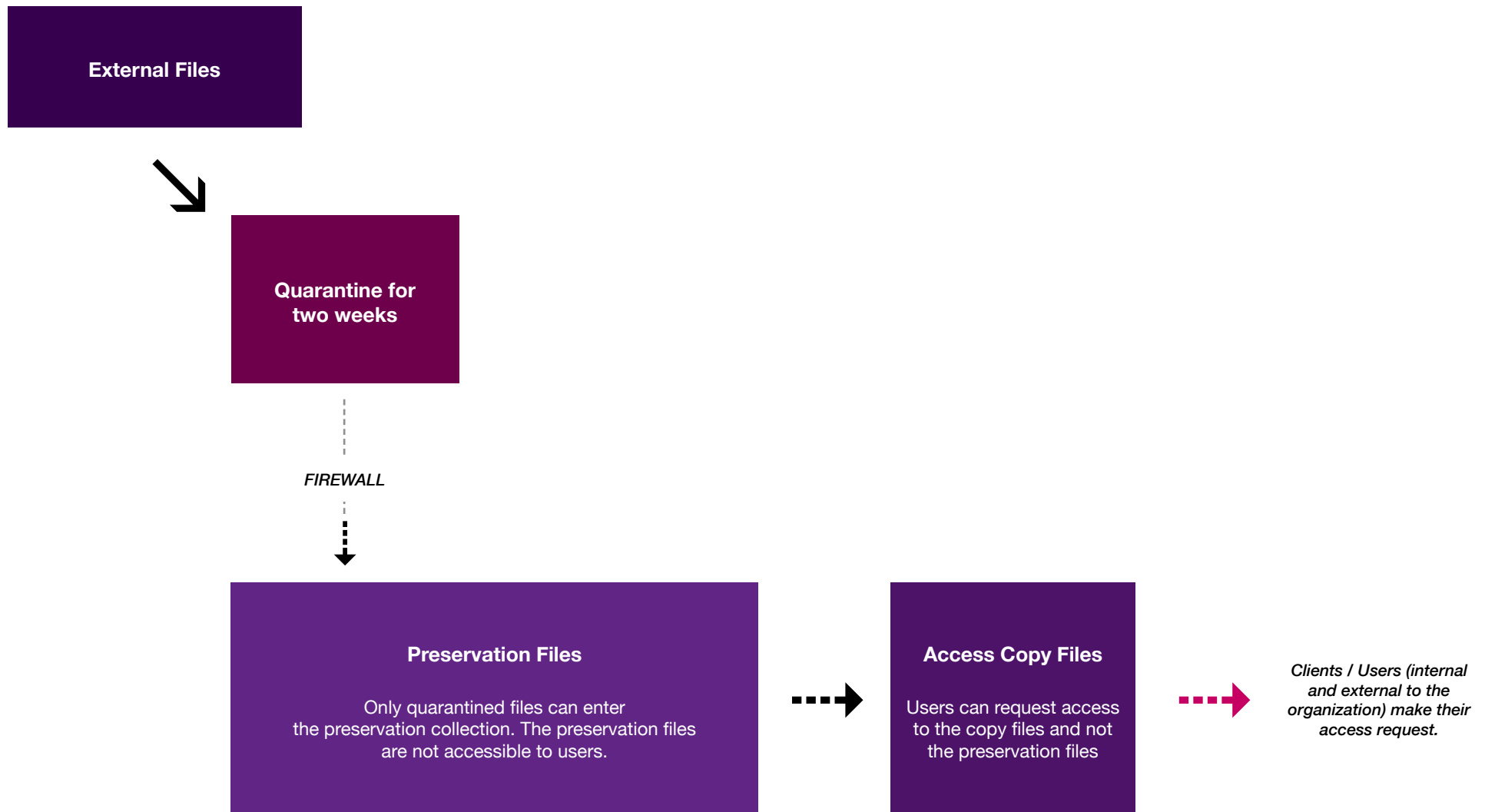
Transcoding

A digital to digital conversion of one type of encoded data to another (video or audio).

Data ingestion

The process of importing large assorted data files from multiple sources into a database, cloud-based storage, data warehouse, where it can be accessed.

Figure 3: Protecting digital collections from external attack



Source: Mick Newnham

Table 1: Digitization equipment uses, advantages and disadvantages

Equipment	Uses	Advantages	Disadvantages
Camera phone	To document sites and inventory holdings (basic)	Mobility; easy-to-use; affordable	Easy-to-lose device; difficult to avoid image distortion for documents, items and large scenes
Specialized camera	To document sites and inventory holdings (advanced)	Mobility; high-quality images with little distortion	Expensive; requires a more advanced skill set; risk of theft
Printer-copier	To make low-quality copies of office-sized documents	Easy-to-use; may be readily available due to other office needs	Limited size; difficult to calibrate; often poor quality images
Flat-bed scanner	To make high-quality copies of office sized documents	Relatively easy-to-use; somewhat affordable	Limited size; requires more advanced technical skills
Drum scanner	To make high quality copies of maps, plans, and other large documents	Suited for large-format materials; exceptional quality of images (resolution, color balance)	Expensive; requires very advanced technical skills
Specialty scanner	To make high-quality copies of books, microfilm, or other specialty formats	Suited for specialized materials; exceptional quality of images (resolution, color balance)	Very expensive; requires very advanced technical skills

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Tips

General

- Look for similar collections that have been digitized by other institutions. Contact the institution to ask for project documentation and advice.
- Ask for support from the cultural heritage community. Look for training and workshop opportunities and equipment that they may be willing to share or give away if it is being updated.
- Make sure that everyone involved in the project is taught how to handle objects, including external service providers.
- Ensure that a service level agreement is in place with any external service providers so that it is clear what services are provided and there is a clear basis for resolving any disputes.

Hardware, software and equipment

- Understand that general office equipment may not have sufficient capacity for a digitization project. Seek advice from the cultural heritage community around hardware, software, and digitization equipment requirements.
- Design the IT system from the back end to the front. Start with digital storage, move to connectivity, look at the capacity of the available computer workstation, and consider digitization equipment last. If there is insufficient storage to run a digitization project, it may not make sense to buy a scanner until this challenge is overcome.
- Purchase hardware and digitization equipment with the future in mind. Where possible, buy more storage and better equipment so that it will last for a long time.
- Use sustainable file formats that are supported by a recognized standard (e.g., TIF, PDF) as these formats have a large user base, which means that changes will occur slowly.
- Although file compression may seem like an option to reduce storage requirements, it may result in loss or alteration to content. Any compression applied to master files must be lossless. Copies made from the master file can be compressed as needed to facilitate dissemination.

Resources

Cultural organizations worldwide have freely available and reliable information on their websites regarding digitizing collections. Useful sources include the [International Council on Archives](#), [The Open Preservation Foundation](#), the [Internet Archive's Archive IT programme](#), and the [International Association of Sound and Audiovisual Archives](#). Follow this advice and ask for help in understanding the issues.

Resources on standards for digitizing include [Hunter \(2018\)](#) and [FADGI \(2023\)](#).

The History Trust of South Australia has compiled a set of [best-practice resources](#) and a [series of videos](#) about how to prepare and handle original collection items when they are being digitized.

More resource links are listed below.

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1. Does your institution already have a strategy or plan concerning creating digital copies?
2. Do you know what physical types of documents (e.g. handwritten manuscripts, printed papers, photographic items, etc.) your collection contains?
3. Do you know how many of each type you have?
4. Have you carried out a significance assessment of the collection and prioritized the items of the collection to be digitized?
5. How many high priority documents do you have that you want to digitize?
6. Do your staff have sufficient understanding of the digitization process and skills?
7. Does your institution need external help for some steps, or all, of the project?
8. Do you know if local IT support is available?
9. Are there volunteers in your community who have the required knowledge and skills to support your digitization project?
10. What other skills do you need (e.g. handling skills, conservation skills to prepare the documents for digitization and to care for them afterwards, organizational skills, technological knowledge)?
11. What equipment do you have and what will you need to buy?
12. Do you have sufficient digital/IT infrastructure in your organization? Do you have sufficient storage space and space for equipment?
13. What ongoing support will be given to manage the digital items over time?
14. Are there professional associations your institution can contact to obtain funding, equipment and/or technical support for your digitization project?
15. Do you have backups of your digital files?
16. Do you have a disaster plan for your digital collection? Is it linked to or combined with the disaster plan for your physical collection?

Digital storage and e-waste management

Linda Tadic and Lois M. Evans

Keywords: data storage, environment, e-waste, digital preservation, green practices

Introduction

Digital archives can have both a positive and negative impact on the environment. On the one hand, they can help to reduce paper consumption, thus limiting the depletion of natural resources (wood), and they decrease the volume of carbon emissions generated by transportation because people have remote access to digitized documents. On the other hand, computer technology requires vast amounts of resources for it to be operational, and hardware must be replaced periodically, requiring the use of more natural resources. Furthermore, when computer technology becomes redundant or cannot be repaired and can no longer be used, it becomes e-waste.

This section discusses the e-waste that is generated by using data storage media. It suggests actions that memory institutions can take so that they minimize their e-waste and therefore minimize their impact on the environment. This section also provides recommendations on how to be part of the global circular economy, and offers resources about how to responsibly dispose of data storage media.

Key issues

Depleting natural resources and increasing pollution

Making anything, including electronic products such as phones, computers, televisions, servers, hard drives, solid state drives, magnets and batteries, requires using natural resources.

The natural resources used in the manufacture of electronic products include the following.

- **Rare-earth metals.** These are found in concentrations in only a few places on Earth.
- **Heavy metals.** These include arsenic, aluminium, antimony, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, silver, thallium and zinc. Metals require energy-intensive activities such as mining, refining and smelting to turn them into useful products.
- **Crude oil and other fossil fuels** (e.g. coal and gas). These are used to generate energy to power the manufacturing industry and are also used in

transport, storage, construction, etc. In addition, oil is a key ingredient in making plastic.

- **Silica sand.** This is used to make electronics through energy-intensive manufacturing processes.
- **Helium.** This is used to make hard drives spin more efficiently.
- **Water.** This is used to make many electronic products such as solid state drives and microchips, and to cool data centres. A mid-sized data centre uses 300,000 gallons of water per day; an enormous amount, especially considering the increasing frequency of droughts in many countries.

As production and consumption of electronic products increases, the natural resources that are required to make them are being depleted.

At the same time, making electronic and other products also causes pollution and carbon emissions. Most of the carbon emissions from electronic products, such as data storage media, are from manufacturing, not from use.

Electronic products such as computer storage devices are not designed to last for more than a few years and need to be replaced on a regular basis.

These products generally have two service lives:

- Initial service life (original owner use): This is between two and eight years. Manufacturers also build-in 'end of life' as new models are released; they no longer support older models.
- Second service life (subsequent owner(s) to end of life): This is between five and twenty years.

Types of data storage media

Digital content is data that is stored on media.

There are four kinds of data storage media:

- Spinning disk (hard drives)
- NAND flash memory (include solid state drives or SSD)
- Data tape (sometimes referred to as linear tape open or LTO)
- Optical media (CD-ROMs, DVD-ROMs)

The 'cloud' uses a mix of the first three types of media. Your memory institution also might use a mix of media. For example, if you employ on-premise servers and a desktop LTO drive for offline storage.

Each type of media is manufactured using various materials, and they are all powered using electricity, which, unless your institution has a source of renewable energy (solar, wind, geothermal, etc.), is generated through burning fossil fuels (which produces greenhouse gas emissions). The manufacture and use of data storage media therefore contributes to climate change.

Data must be migrated (refreshed) to new storage media over time due to storage media obsolescence and failure. Memory institutions with digital content must therefore migrate data periodically as part of their data and storage management activities. And for security and to preserve data, memory institutions must make multiple copies of data and disperse them geographically. When media become obsolete, they are usually sent to landfill.

Details about the amount of electricity use, life expectancy and recyclability of the four types of media are provided below.

1. Spinning disk (hard drives)

Hard drives (HDDs) are detachable storage devices that can be connected to a computer or included in servers or network-attached storage devices (NAS). They are used for immediate access to data ('online' storage).



Images, left: A hard drive. Right: A server which can hold both hard drives and solid state drives
Source: Pixabay (public domain)

Electricity use: High. Hard drives spin very fast inside their enclosures, generating heat. The operating environment must be maintained at constant temperature, so internal fans keep the drives cool. Some hard drives are filled with helium to help with cooling. This type of hard drive reduces energy use by 23 per cent, but helium is a finite natural resource.



Image: The interior of a hard drive, showing the actuator arm and the disk that spins
Source: Pixabay (public domain)

Life expectancy: Drives and server parts are usually replaced every three to five years (initial service life), but with improvements in manufacturing over time, HDDs and servers are increasingly being used for longer periods.

Potentially recyclable parts: The parts of hard drives and servers that can potentially be recycled include plastics, rare earth metals, magnetic material and heavy metals (copper, aluminium and steel). Also, server cases and motherboards have re-use potential (second life). Until now, most efforts in recycling this type of media have focused on reclaiming magnetic material and aluminium. Most materials, including rare-earth metals, are not recycled. This is mainly due to the high cost of retrieving and recycling them (Wayman, 2023). Millions of drives are shredded every year without any effort to reclaim the materials they contain.

2. NAND flash memory

Solid state drives (SSDs) use flash storage. SSDs can be used as detachable drives for data storage – for example, USB-attached drives or thumb drives – but they are more often found in servers and computers.



*Images, left: A USD-attached solid state drive. Right: The components inside a flash thumb drive
Source: Pixabay (public domain)*

Electricity use: Low to medium. SSDs do not have moving parts; they can work in extreme environments (up to 85°C / 185° F); and they are powered up only when used. While SSDs consume lower amounts of electricity while in use, they emit two times the carbon dioxide (CO₂) over the media's lifetime compared to HDDs with comparable storage (Tannu and Nair, 2022).

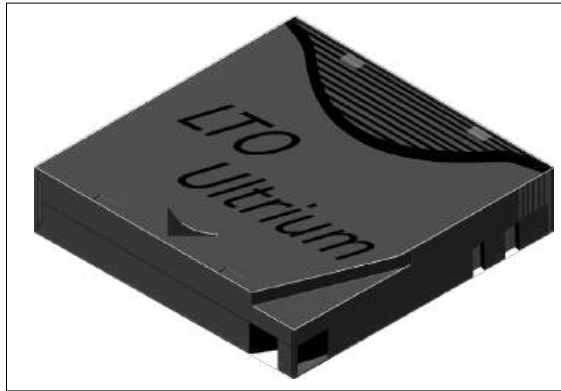
Life expectancy: SSDs have a finite number of writes and an infinite number of reads. Life expectancy can depend on the number of writes. Because data 'fades' (loses bits) over time, flash storage is not a good long-term data storage medium. Data can fade even when the drive is stored inert on a shelf.

Potentially recyclable parts: SSDs contain silicon and copper, which can be reclaimed and recycled if it is cost-effective to do so. SSDs have limited second life re-use potential compared to HDDs because they have a shorter life expectancy.

3. Data tape

Data tape is used as long-term, offline storage. It is frequently used by IT departments for data backup and is commonly used by memory institutions for compact, inexpensive data storage.

To 'write' data onto the tape and 'read' the data that is stored on the tape, it is necessary to either outsource media migration (to companies that provide this service) or purchase a tape drive (hardware), which is an additional cost.



*Image: The form factor of a data tape cartridge (Note: This is not a real LTO tape)
Source: Pixabay (public domain)*

Electricity use: Low to medium. Data tape only uses electricity when the tape is put in a drive and read. The tape can be stored on a shelf in an office environment; it does not need cold storage.

Life expectancy: Data tape does not have the preservation concerns of magnetic carriers (video tape and audio tape). Manufacturers state that data tape lasts for 30 years, but in reality the media is refreshed every two to three generations (approximately every five to ten years). Refreshing data requires purchasing drives to read and write the newer generation of data tape. As of 2023, the two current generations are LTO-9 (which stores up to 18 TB uncompressed) and LTO-8 (which stores up to 12 TB uncompressed).

Potentially recyclable parts: Data tape contains plastics and screws (metal). The parts are usually not recycled. There is no process yet to separate the tape's mylar ribbon, which is potentially recyclable, from the barium ferrite (BaFe), metal particle and other components. Data tape does not have a useful second life due to its generational obsolescence and finite number of 'reads'.

4. Optical media

Optical media (CD-ROMs and DVD-ROMs) are used to store smaller files such as images and documents. Like data tape, the media requires a CD drive or DVD drive to write and read the data.

Optical media and their drives are quickly becoming obsolete. In addition, optical media can grow mould in a humid environment. Because of this, memory institutions that have archival data on optical media should copy it off to newer storage media as soon as possible.

For detailed information on problems associated with optical media, refer to the section on optical media in Webinar 3, FAIC, 2013. Download the colour PDF, because identifying optical media and videotape formats are sometimes dependent on colour.

Tips

Memory institutions must carefully consider what electronic products and storage devices they need for sustaining their digital collections and establish good standards of practice in order to mitigate the negative impacts of such products and devices. Consider whether your institution can fulfil any of the following actions:

Ensure the security of digital collections:

- Store data on different media, depending on the digital content's purpose. Examples: Large files that are not accessed frequently can be stored on LTO data tape. Files that require immediate access can be stored on hard drives, network-attached storage (NAS), servers or in the cloud.
- Create lower-resolution digital files so they use less storage. However, be sure that the files are in a widely adopted format.
- Copy any archival data currently on SSDs and optical discs to more stable storage media (hard drives and data tape).
- If data is stored on data tape (LTO), migrate it to new media every two to three generations LTO (every five to ten years). More files will be stored on the new generation tape, resulting in fewer media items.
- Consolidate and virtualize several applications on one server. This also results in fewer servers to replace/recycle.

Reduce e-waste and become part of the global circular economy:

- Purchase refurbished devices such as servers and computers (i.e. re-use old devices). This will not only reduce e-waste but will also help lower your organization's expenditure.
- Sell your old data storage devices for re-use (second life) when possible. The revenue from such sales can help to cover the cost of buying new equipment.
- Upgrade servers by upgrading drives, motherboards, or other accessory items (not the entire box).
- Where possible, recycle data tape and hard drives with vendors that strip out parts and re-use and/or recycle components.

Reduce consumption of resources and energy:

- Maintain existing equipment as long as possible by protecting the devices and following care instructions.
- When buying new equipment, choose brands and models that are known to last, have a long warranty, and are easy to maintain and repair over the years.
- Power down all devices at the end of the day, unless the servers are required for backups or other processing.
- Form a data-storage cooperative with partner organizations. This can be as simple as storing duplicate hard drives or LTO tapes with partners, or as complex as creating an online data-storage network.

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Resources for responsibly recycling e-waste

Participate in the circular economy by choosing refurbished and recycled media, and responsibly disposing of retired media. The resources listed here are international. There could be others local to your archive or region.

Recycle storage media and electronics

[List of R2-certified recycling facilities](#)

[E-Stewards certified recycling facilities](#)

[SIMS Lifecycle Services](#)

Manufacturers' recycling programmes

[Dell Technologies](#)

[Hewlett Packard](#)

[Seagate](#)

International contacts: <https://www.seagate.com/contacts/>

A. Equipment

1. How is your institution currently storing its digital content? List the data storage media types and methods.

- ◇ hard drives
- ◇ solid state drives (SSD)
- ◇ data tape (LTO)
- ◇ optical media such as CD-ROMs
- ◇ on-premise servers
- ◇ on-premise network-attached storage (NAS)
- ◇ cloud

2. What electronic and computer equipment is in use at your institution? How old is it and how regularly is it used?

3. Is the equipment kept in a secure environment, away from heat, moisture and dust? Have you taken any steps to protect and maintain your equipment?

4. Do you only buy new equipment or do you also buy refurbished equipment? Can you identify reliable vendors where you can buy refurbished hardware and data storage devices?

B. Management

5. How do you organize your digital storage? Do you have file inventories for what is stored on each piece of storage media, and when the data was written?

6. How old is your oldest data storage media?

7. Are copies made? If so, where are the copies stored? Are they in a region with a different disaster threat?

8. Do you have plans to procure new equipment? What is your procurement plan (i.e. purpose, budget, etc.) and who is in charge of it?

☐

YES

☐

NO

9. Do you conduct research about the quality of equipment before purchasing it?

☐ YES

☐ NO

10. Do you have training activities for your staff about computer equipment, usage, maintenance, recycling and green practices? Do you encourage your staff to participate in training (of this kind) that is held by other organizations?

☐ YES

☐ NO

C. Recycling

11. Have you identified companies or services in your area or country that buy and sell older computer equipment and/or recycle obsolete and failed data storage media? Is there an e-waste recycling centre in your area?
12. Are you aware whether your country has any e-waste regulations?
13. Are you aware of any agencies or organizations that support e-waste initiatives in your city or country?

Case study

The digital preservation of information and archives in Myanmar

2023

Keywords: civic technology, parliamentary records, digitization, post-military takeover

Myanmar is a country in South-East Asia that has undergone major political and social changes in recent years. Over the course of only one decade, the country transitioned to becoming a parliamentary democracy and, at the same time, it experienced an unprecedented digital transformation with internet and mobile phone use rising from a small percentage of the population to almost universal access. This coincided with an opening up of press freedom, which allowed multiple new media outlets to emerge. These changes created a marked increase in the availability of digital media related to journalism and to records of democratic processes such as parliamentary records and election results.

In 2021, however, a military takeover annulled the results of the 2020 elections and led to the institution of a de facto authority known as the State Administration Council (SAC). Consequently, many of the digital media that had been flourishing over the past decade had to either cease operations in the country or adapt their editorial standards.

This case study documents the challenges presented for the preservation of media for archival purposes in a time of rapid political change, and how independent community-driven efforts are a key driver in the work of preserving digital media and records.

Key issues

Closure of publications and websites

In the immediate aftermath of the military takeover of 1 February 2021, many digital publications, including prominent news outlets such as 7Day, shut down their websites. In addition, some digital documents and datasets, such as those published on Union and State or regional parliament websites that contained information about members of parliament and provided data and information about the democratic process, were taken down by the authorities. It is believed that much of the content of these websites had not been systematically backed up and archived by any systematic initiative.

Lack of workflows for periodic backups

Many of Myanmar's civil society groups were caught off guard by the military takeover and their workflows were disrupted. During the first few months following the takeover, civic technologists did what they could to back up the websites and digital publications that were at risk of being taken down. However, it was poorly coordinated because there had not been any prior planning for what to do if such an event occurred.

Lack of digital skills

Many staff employed in government departments who are working on collecting and publishing datasets and documents want to modernize their departments' workflows and some of them have learned digital skills so that they can do so within their own local offices. However, much of this has been haphazard and not scalable. Many offices have been tasked with publishing digital versions of documents, but without specific technical guidelines. This resulted, for example, in the Union Election Commission publishing election results in large PDF files, which

used multiple types of font encodings, which made it difficult to extract the raw data from these files for analysis and visualization. When appropriate direction and guidance were provided, however, there was a marked improvement in the quality of the data published. For instance, civil society groups working together with the Union and State/regional parliaments were able to get detailed data and transcripts of the questions raised by members of parliament and the answers that were submitted.

Lack of funding and infrastructure for digital archives

Funding for Myanmar's universities, research institutes and libraries has been inadequate for many decades. Moreover, many of the staff members employed at these institutions who carry out archival work have not had training in digital technologies and techniques. As a result, few institutional mechanisms for archiving websites and digital documents existed at the onset of the rapid changes in digital connectivity that the country experienced in the 2010s. The number of locally based websites and digital publications expanded rapidly during that decade. Many government institutions were not able to adjust to the rapidly changing needs, so the task of creating and maintaining digital archives was largely picked up by civil society. However, civil society groups in Myanmar are often underfunded and understaffed and there is a tendency for a high turnover of staff. In addition, digital archival work done by civil society groups often operates as informal collaborations within a loose collective of civic technology practitioners. As such, there is a risk that valuable know-how about digital resources and digitization technologies will be lost.

Safety and security of journalists and media workers

Recent developments in surveillance by state and non-state actors, as well as big data and artificial intelligence (AI), are impacting the work of journalists, media workers and media outlets. The use of digital equipment leaves footprints that can be used to track records and activities online, sometimes resulting in the arrest of media professionals. In this context, cyber threats and attacks continue to disrupt the flow of information and deny the public access to information.

Actions

The ongoing work of civic technology coalitions offers continuity.

In the latter half of the 2010s, a community of civic technologists formed in Myanmar, which included civil society organizations such as Phandeeyar, Myanmar Fifth Estate, Ananda Data and the Myanmar Information and Communication Technology Development Organization (MIDO). These organizations worked with international non-governmental organizations (NGOs), local activists, community groups and various government departments to digitize and publish datasets that were especially valuable for documenting democratic processes, such as parliamentary proceedings and election results. However, even before the advent of these civic technology groups, work had begun in the country to preserve digital documents. One particular organization, the Online Myanmar Library, founded in the 1990s, has been archiving documents, articles and newspapers relating to Myanmar since the early 2000s, and is considered the most authoritative source of digital archival materials about the country. Its founder and main contributor, David Arnott, passed away in 2020 but due to links that he established with the new generation of civic technologists, the archival work of the organization still continues. The work of these organizations offers continuity in maintaining digital archives even though official government websites are no longer active.

Technicians leverage digitization technologies.

A challenging aspect of digitizing and extracting information from documents written in the Myanmar language is that some technologies, such as Optical Character Recognition (OCR), which is commonly used to extract text from scanned documents, have limited support. However, newly available cloud-based technologies such as Google's Vision Application Programming Interface (API) make it possible to use OCR for documents in the Myanmar language, albeit with the caveat that using the API requires technicians with a high level of computer programming skills, which are rare in Myanmar.

Local groups leverage the international civic technology community for technical and institutional support.

Across the Asia-Pacific region, there are multiple civic technology groups that are working with the

same vision and ethos as groups in Myanmar. In times of need, many of these groups can lend much needed support, both in terms of taking over tasks that could be done remotely via the internet, or providing institutional support in the form of joint fundraising. An example of this kind of collaboration is one between a Malaysian civic technology group, Sinar Project, and Myanmar Fifth Estate, when they jointly developed the technology behind Open Hluttaw, a directory and archive of data about members of parliament in Myanmar.

Lessons learned

Prepare workflows for periodic backups.

Having a systematic workflow that creates periodic backups of all websites of archival value in place can avoid loss of data and information in times of disaster and political upheaval.

Engage in systematic knowledge sharing and exchange.

Information about digital resources and digitization technologies needs to be well documented and the people doing archival work should engage in knowledge sharing and exchange more often and in a planned and systematic way so as to ensure institutional knowledge about archiving is not lost. This exchange should include continued knowledge sharing between domestic and international civic technology groups regarding the uptake of technologies and institutional support from international groups.

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Case study

Digitization projects in Indonesia

Widiatmoko Adi Putranto

Indonesia
2023

Keywords: digitization, management, cultural heritage, access, capacity-building

Advances in technology have prompted many libraries, archives and museums (LAMs) in Indonesia to implement projects to digitize their collections. Such efforts face challenges, however, and these challenges are the same regardless of the type of institution and its context. Obstacles include insufficient financial resources; a lack of skills and human resources, infrastructure and facilities; and a lack of international standards or guidelines for digitizing heritage materials.

Key issues

This section presents examples of obstacles that have been faced by Indonesian LAMs in their attempts to digitize collections.

Lack of communication

The archival team of De Tjolomadoe Museum in Solo, Central Java, found hundreds of photographs, negatives, ephemera and sensitive documents in the old residence of a former plantation supervisor opposite the museum. The museum wanted to digitize this collection, but it was stored in a locked room along with furniture, musical instruments, artefacts, etc. The security guards were initially hesitant to let the team inside because the guards did not think that there were valuable archives as the 'important documents'

had already been moved to the museum. There were no written agreements regarding the right of the museum to have the physical photographs and the digital surrogates. This example demonstrates a lack of communication between heritage workers and other stakeholders (e.g. guards). Additionally, the digitization project was understaffed, with only a project leader and a staff member, so the digitization process was slow.

Inadequate funding and resources

Regional institutions in Indonesia often struggle to keep up with the pace of digital advancement because of issues such as a shortage of adequate facilities and infrastructure, and a lack of well-defined standard operating procedures (SOP) for digitization. These issues stem from limited funding. Government-funded LAMs, in particular, tend to have very limited funding and infrastructure due to a lack of awareness of the importance of archives among government leaders (Putranto, Sari and Mayzana, 2022). For example, the city library in Madiun, East Java, only has one scanner to use in digitization projects, and the State library in Yogyakarta only has one internal hard drive to store digitized files. This lack of resources is also experienced by some private regional museums. For example, the Tino Sidin Museum, a family-owned, private museum, which only has a simple digital camera for digitization projects and is only able to implement such projects with the help of volunteers and interns. Regional institutions also often do not have standard procedures for digitization, which makes such projects challenging, especially when employees do not have any training or skills in digitization.

Lack of human resource capacity

Indonesian memory institutions generally have very few staff with the training and skills required to implement digitization projects. While some LAMs have the necessary physical infrastructure, they lack technical assistance and training. Even LAMs in the capital city of Jakarta lack skilled human resources. For example, the H.B. Jassin Literary Documentation Centre has only one employee with training in library studies. The institution held a training session on archive management once, but not all staff members participated. Those who received training were asked



1. Tino Sidin Museum © D. Ristiyani
2. Digitized film archives at the National Archives of Indonesia © R.D. Shalsa Mayzana
3. H.B. Jassin Literary Documentation Center © R.D. Shalsa Mayzana
4. National Library of Indonesia © R. Dzikrina
5. Evacuating photographs from a sugar factory © UNESCO / W. A. Putranto

to teach the others. As a result, most staff have little knowledge of digitization procedures. When the institution launched a digitization project, it did not have backup files, which resulted in the complete loss of the data that had been created, which was a waste of work hours and hindered progress. Another common training-related issue in LAMs is that digitization training often does not cover the topics of intellectual property and copyright, even though they are vital for managing open access digital collections. As a result, even when LAMs are able to implement digitization projects, they are not able to go further and provide open access to their digitized collections.

Solutions

Research and awareness

Academic communities across the world have been seeking to raise awareness among decision-makers of the advantages of digitization and the obstacles faced by LAMs. In Indonesia, lecturers, scholars and experts regularly participate in discussions regarding digitization in LAMs, especially in connection to increasing IT capacity. This has led to increased awareness among decision-makers of the topic. Although progress is undeniably slow, this gives hope for the future development of digitization in memory institutions. Without the contributions of scholars and experts in promoting awareness of the advantages and issues involved in digitization, LAM institutions would face even greater struggles to implement digitization projects.

Volunteers and interns

Institutions with unskilled staff can be supported by mobilizing university students from library and archives departments to work as interns and provide technical skills. This has benefited many regional institutions, and in return the institutions provide students with experience. Interns also benefit from information about the institutions they work for, which enables them to write their undergraduate theses on the partner institutions. Such theses also assist LAMS as the theses offer evaluations and recommendations for the future development of the LAMs. Many institutions now have long-term cooperation and internship agreements with universities, through which students are regularly sent to LAM institutions as interns.

Training of human resources with consistent support and assistance

Online workshops and training during the pandemic showed that institutions can increase the capacity of their staff regardless of their limitations in size, budget or distance. Consistent support in terms of funding and other types of assistance are still required however from the government and peer institutions, and hands-on experience remains a crucial element in preservation and conservation training.

Lessons learned

- The digitization of physical materials does not necessarily guarantee the safety of those collections. Appropriate management of physical collections remains essential. Furthermore, digital formats can be fragile and challenging to manage. To ensure good management of both physical and digital collections and to overcome any issues, institutions at all levels should collaborate with each other. Increased collaboration and breaking the silos to connect libraries, archives, and museums is also relevant to the globalization of heritage.¹
- The improvement of digitization infrastructure and increases in funding for LAMs can only occur with greater awareness and understanding of the issues by all parties, from the policy-makers to the staff of the LAMs. It is important for stakeholders to communicate with each other, so as to reach understanding and achieve mutual goals.
- The provision of digitization infrastructure does not necessarily enable an organization to conduct a successful digitization project. In some cases, small and medium-sized organizations need ongoing technical support as well as assistance to improve the capacity of their staff. This is likely to be a long-term issue in a country like Indonesia with a large geographical area. Adequate funding and strong commitment can help in overcoming this issue.
- Standards and guidelines set by national-level institutions, which are mostly based in Jakarta, which arguably has the best infrastructure, do not necessarily match the needs of other areas. Currently, regional organizations mostly follow the same standards as the national institutions even if they face different circumstances. Therefore, local studies and evaluations are needed to identify the specific circumstances of LAMs

in regional areas and ensure that standards and guidelines are appropriate for overcoming challenges faced by institutions in those areas.

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Endnote

1. The globalization of heritage through digitization and open access allows it to be accessed by different communities across different countries at any time for various purposes. Much heritage is 'displaced' in that heritage items are located in countries other than their origins. A set of heritage may be owned by multiple organizations in different countries with different visions and missions.

Case study

The digitization of the imperial archives of the Nguyen Dynasty

Minh Huong Vu Thi

Hanoi, Viet Nam
2016-2023

Keywords: digitization, restoration, paper, cultural promotion, public records

In 2014, the Imperial Archives of the Nguyen Dynasty (1802-1945) were inscribed to the Memory of the World Committee for Asia and the Pacific (MOWCAP) Register and in 2017 to the Memory of the World (MoW) Register. The collection is currently preserved at the National Archives Center No 1 in Hanoi (under the State Records and Archives Department).

The collection consists of 773 volumes with 85,000 records from eleven Nguyen dynasties (1802-1945). This archival project was initiated by the Vietnamese emperors, to record Viet Nam's entire history, including its economic and social background.

In 2015, the State Records and Archives Department submitted the 'Preserving and Promoting the Value of the Imperial Archives of the Nguyen Dynasty – Documentary Heritage of MOWCAP' project for approval by the national government. This project aimed to safeguard the archives, ensure long-term access and promote the value of documentary heritage among the general public. It was approved on 30 May 2016.

Results of the first phase of the project

Phase 1 of the project (2016-2020) achieved the following results:

Restoration of damaged volumes of the imperial archives via cooperation between the Viet Nam archives department and the Tokyo Restoration and Conservation Center.



1. Damaged paper archives
2. Japanese Document Restoration experts at the National Archives Center No 1 Hanoi
3. The Vietnamese Archives Delegation at the Tokyo Restoration and Conservation Center

© National Archives Center No 1 Hanoi

Digitizing documents and building databases

- Digitizing documents in high resolution.
- Editing of the catalogues.
- Creation of a database of archives in English.
- Summarizing, translating from Sino-Nôm into English.
- Burning to CD-ROMs as backup.
- Translating summary content of each document from Sino-Nôm into Vietnamese (85,000 documents).
- Building level 1 and level 2 information systems on the intranet of the National Archives Center.
- Creating an interface to enable access to the documents.

Promoting the value of documentary heritage

Many activities were implemented to promote documentary heritage, including television documentaries, publications and exhibitions, such as the Seals on the Imperial Archives of the Nguyen Dynasty exhibition. Publications about the archives include:

- Contents of the Imperial Archives of the Nguyen Dynasty (two volumes).
- Seals on the Imperial Archives of the Nguyen Dynasty.
- A Catalogue of Imperial Archives of Nguyen Dynasty (in English).
- National History through the Imperial Archives of the Nguyen Dynasty.
- The Nguyen Dynasty Document - World Documentary Heritage.
- The Royal Court in the Imperial Archives of the Nguyen Dynasty.
- State Administrative Documents in the Imperial Archives of the Nguyen Dynasty.

Key issues

- The Imperial Archives of the Nguyen Dynasty consist of fragile documents that had been moved in the past to many places including Da Lat and Hồ Chí Minh city, and had been kept in unsuitable storage conditions. Due

to the humid tropical climate, some volumes had become moist and were badly damaged.

- Through handling, dissecting and backing up the badly damaged volumes, twenty-two out of the twenty-eight volumes were restored; the remaining volumes need a suitable solution for restoration.
- The process of document dissection involves many issues. One issue is that following their extraction, it is difficult to keep documents in good condition. Another issue faced in the project was the challenging nature of content translation. The documents were written in an ancient language with many terms that have no equivalent in other languages, including some agency names and titles, causing hurdles in translating from Sino-Nôm language to Vietnamese and from Vietnamese into English.

Solutions

Before Memory of the World (MoW) registration

- Actions taken included cataloguing the collection, building a database and creating backups of the Imperial archives on CD-ROM.
- The information system of the Imperial Archives of the Nguyen Dynasty on an internal network. The system management program is built on PHP, HTML combined with a MySQL SERVER and CLIENT database manager. The program can be accessed using a web browser, to search for documents.

Following the MoW registration

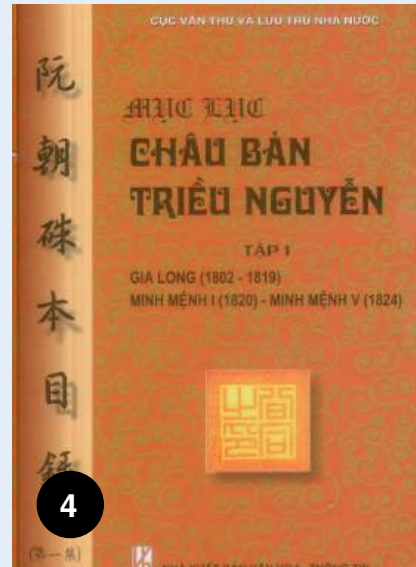
- The National Archives Center No 1 is managing the documentary heritage and will continue the process of digitizing the archives and building the database until 2025.
- Active participation in the annual activities of MoW and MOWCAP strengthens linkages, exchanges, learning and shared experiences on conservation, preservation and promotion of the value of documentary heritage among active members.
- Actions include implementing the UNESCO's

2015 Recommendation Concerning the Preservation of, and Access to, Documentary Heritage, including in Digital Form.

- A dialogue is maintained with UNESCO, the Viet Nam National Commission for UNESCO and with other Asia-Pacific countries that have similar documentary heritage assets, notably Japan, Korea and China, to enhance cooperation in the field of documentary heritage preservation.

Lessons learned

- **Sharing of experiences** by experts in the field of conservation in the Asia-Pacific region contributes to greater awareness of the importance of documentary heritage in Member States.
- In working groups, **experts from museums, archives and libraries can discuss disaster risks and related challenges in the region**, share good practices and propose potential solutions to tackle disaster-related challenges and/or enhance access to information, including digital access.
- The digitization of documentary heritage in a variety of media is an essential means for **ensuring the long-term accessibility and preservation** of documentary heritage.



4. Publication of the Imperial Archives of the Nguyen Dynasty
5. Exhibition of the Imperial Archives of the Nguyen Dynasty
6. Multimedia exhibition of the Imperial archives

© National Archives Center No 1 Hanoi

Case study

Responses by memory institutions to the COVID-19 pandemic

Sanchai Chotirosseranee

Thailand and the Pacific
2020–2022

Keywords: COVID-19, adaptation, accessibility, digital archive

The COVID-19 pandemic had a large impact on memory institutions because of the restrictions on movement (for health and safety) that were imposed during this period (2020–2022).

Many archives suspended their operations, and this led to numerous challenges, which required innovative solutions, including the use of digital technology, to enable staff to continue working and to ensure ongoing public access to items.

This chapter describes the impact of the COVID-19 pandemic on memory institutions, and lessons learned during this time. These lessons learned are applicable to other crises and disasters that can lead to the temporary closure of such institutions.

Key issues

Suspension of on-site activities and travel restrictions

The impact of the COVID-19 crisis on memory institutions varied from country to country. For example, in New Caledonia, New Zealand and Thailand, memory institutions had to suspend their on-site activities for long periods. Therefore, most staff members from [Bibliothèque Bernheim](#) in New Caledonia, [Ngā Taonga Sound and Vision](#) in New Zealand and the [National Archives of Thailand](#) and [Thai Film Archive](#) had to work from home and could not travel.

On the other hand, the Tuvalu National Library and Archives only closed for two weeks, because Tuvalu did not have a COVID case until November 2022. During those two weeks, staff worked from home.

In contrast, the Kiribati National Library and Archives never closed during the crisis. Their staff were asked to follow the government's 'new normal' procedures and precautions, such as limiting the number of staff and visitors permitted inside the building at any given time and respecting social distancing measures while in the office. Those who had flu-like symptoms were not allowed to go to the office. Even though staff members were normally permitted to go to the office, the majority of staff did not want to because they did not want to take the risk of getting infected and passing on the disease to vulnerable members of their families and communities.

Regardless of whether the memory institutions had to close their doors to the public or not, the crisis had an impact because it meant the suspension of professional networking activities and meetings between specialists, such as international seminars and conferences. This suspension disrupted the sharing of professional knowledge, collaboration and advocacy within the community.

Lack of online content

Memory institutions without the capacity to provide online access to their collections and archives during the pandemic sometimes had to stay open, in spite of the risks to their staff. For example, when the COVID-19 crisis hit, the Kiribati National Library and Archives did not have equipment and facilities to provide online access to their documents and therefore remained open.

Some institutions invested in the necessary equipment and infrastructure to provide online access to their collection during the pandemic, but this came at a high cost. Such equipment and infrastructure included scanning equipment, digital storage systems and adequate bandwidth and connectivity for efficient data transfer.

Financial challenges

Many memory institutions faced financial challenges as a result of the COVID-19 crisis, both during the pandemic and afterwards. The Bibliothèque Bernheim in New Caledonia, for example, had lower revenue but increasing expenditure because of the need to create an online platform and procure health protection equipment such as masks, hand sanitizers and plexiglass shields.

In Thailand, the economic recession and high inflation following the pandemic led to budget cuts for the cultural and heritage sector, which is not prioritized by the government. The Thai Film Archive is one of the many institutions in Thailand impacted by diminishing public funding.

Public expectation of access to virtual content

New challenges came as the general public largely expected to have access to virtual events after the end of the crisis. Now, online accessibility is largely viewed by the public as something that should be available by default. These public expectations add to the pressure on archive staff members and to their workloads, as they strive to meet the surging demand for virtual content while managing other archival responsibilities.

Solutions

Continuing to work during the crisis

When archivists and staff members were working from home, they were able to perform many tasks, including cataloguing, data cleaning, documentation, research, maintaining contact with donors and updating directories. However, they could not perform tasks related to the physical collection remotely. These tasks included film inspection, facility maintenance, equipment checks and ensuring the proper functioning of specialized machinery, such as film lab machines, film projectors and climate-control equipment. When staff members worked in the office, they followed the [World Health Organization's hygiene protocols](#), such as wearing masks, washing hands and practicing social distancing.

Using cost-efficient online meeting platforms

During the pandemic, archive staff members used online platforms for meetings, training sessions and other virtual activities. These platforms facilitated communication, even long-distance, and both domestically and internationally, between peers without generating a financial burden. Since the return to normal, many archive institution staff have continued to meet online for collaboration and communication, which has resulted in a significant reduction in transportation costs.

Ensuring continued public access

Throughout the pandemic shutdown, virtual screening and live broadcasting enabled archive institutions to reach and engage remote audiences consistently, often surpassing the number of visits during normal times. In addition, many institutions provided public access and outreach activities through their digitized collections. For example, the Tuvalu National Library and Archives provided information to users through digital copies of records; Bibliothèque Bernheim shared useful links and advice online; and Ngā Taonga Sound & Vision, National Archives of Thailand, and Thai Film Archive provided access to their digital collections through virtual exhibitions and online platforms.

Providing virtual activities

If the goal is to extend outreach to diverse audiences, online platforms often outperform physical counterparts. However, online activities often necessitate technical support, a larger budget and careful consideration of the appropriate duration of

activities (in order to avoid potential online fatigue). To meet the expectation users have of having virtual access to activities, it is important to consider these and other factors, including the activity's nature, purposes and target audiences, when planning such activities. While in-person activities are more conducive to effective networking and should therefore not be replaced entirely by virtual sessions, sharing digital recordings reaches wider audiences. This does not require the same level of technical resources and budgets as live sessions online and are therefore manageable for staff.

Lessons learned

Adaptability is essential

The emergence of COVID-19 was an unforeseen and sudden event that affected people worldwide, with travel restrictions implemented on a global scale. This type of health crisis was also unexpected, and in the preceding century had not been considered to be a particular threat to archives. Consequently, institutions did not have any manuals or guidelines to address the challenges posed by this type of crisis. Over the course of the three years between early 2020 and the end of 2022, memory institutions had to actively learn and identify solutions to enable them to continue their work and provide their services amid the crisis. The adaptability of archives and flexibility of staff members became crucial, as they navigated unprecedented circumstances and modified their operations accordingly.

Digitization reduces disruption

While the term 'digitization' has been prevalent among archives for many years, the COVID-19 pandemic underscored its significance. Institutions that had already undergone a digitization process or were in the midst of such a process and had reliable digital infrastructure, were better prepared to provide uninterrupted public access to their collections and to enable their staff members to work remotely from any location. Recognizing the importance of digitization, it is important for institutions to allocate enough resources to maintain their digital infrastructure over the long term.

Analogue materials need to be preserved

While the pandemic highlighted the importance of digital technology to enable continued public access

and engagement, it is also essential to ensure the preservation of analogue materials. The integrity and quality of analogue materials directly impact the accuracy and authenticity of the digital surrogates. Ensuring the preservation of both analogue and digital materials ensures long-term accessibility, especially in times of crisis.

Acknowledgements

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Module 6

Response and recovery

Response and recovery are the most challenging stages in DRM as they call for technical expertise and adequate material and financial resources. Prioritizing actions and focusing on significant items will help to minimize damage and loss. The recording of the disaster story is also an important part of the response and recovery process, ensuring valuable lessons learned are compiled and then used to inform revisions of the disaster plan.

1. Responding to disasters and salvaging collections

Heather Brown

2. Keeping disaster plans up to date

Heather Brown

Case studies

Salvage and treatment of archives following the Beichuan Earthquake, China

Meifang Zhang

The impact of the 2020 flood on Albert Hall Museum, Jaipur, India

Achal Pandya

Recovery after bushfires: photographs in a fireproof safe, Canberra, Australia

Mick Newnham

Family-owned heritage in post-disaster recovery Kotagede, Yogyakarta, Indonesia

Widiatmoko Adi Putranto

Lifecycle of disaster plans for Artlab Australia

Heather Brown

Exercises

Response and salvage

Keeping DRM plan up to date

Responding to disasters and salvaging collections

Heather Brown

Keywords: response, salvage, salvage priorities, recovery, prioritizing

Introduction

This section identifies response actions that can minimize the impacts of a disaster and limit damage to collections. It also describes processes and techniques for salvaging damaged collections.

Key steps to take in responding to a disaster

The first step when responding to any disaster is to ensure human safety. If the building or space is unsafe, you will need to evacuate staff, visitors, community members and anyone else affected by the disaster.

After ensuring safety, the next step is to notify key contacts, including emergency services contacts such as the fire department and security, and the disaster team leader.

The disaster team leader will assess the situation and activate the disaster plan by notifying other key people, including other members of the disaster team, particularly the collection specialist(s) and record keeper. It is important not to call in too many members of the disaster team straight away, as this will lead to a group of stressed people standing around before the response and recovery steps can be properly planned. The team leader may also contact security staff and facilities and building maintenance staff.

The next step is that team members and other staff will respond by taking appropriate actions to prevent or limit damage. Such actions may include shutting off the water supply, placing containers under leaks, protecting objects with waterproof covers, moving objects off the ground and mopping up excess water. Subsequent salvage techniques can include air drying, freezing or freeze drying, interleaving wet books and rinsing dirty items.

It is useful to have copies of your own or another 'emergency immediate actions chart' (see Figure 1) displayed at prominent points to quickly guide staff through the first steps of responding to a disaster. Your own 'emergency immediate actions chart' should be included in your organization's disaster plan. In addition, having a prepared disaster bin that contains supplies and having rapid access to essential rescue and salvage equipment will help people to respond quickly and effectively.

Figure 1: Emergency Immediate Actions Chart.



Source: ALIA 2019

Factors that guide the emergency response process

The salvage priority list (which is part of the disaster plan) highlights the most significant collections and is the primary guide to what items and collections are of highest priority to be protected, rescued and salvaged following a disaster. Refer to the section on [tips on prioritizing items](#) for disaster management, for further information about this list.

While the significance of items and collections is the overarching factor to consider when deciding on what actions to take in a disaster, other key factors also guide the disaster response and recovery process. One of these factors is the scale of the disaster. That is, is the disaster small, or is it catastrophic? For example, with a small-scale disaster incident such as a mould outbreak in fewer than fifty items, the response may involve isolating the affected area for a day and then the recovery will involve treating the mould. On the other hand, a major disaster such as a cyclone that affects the entire building and collection is likely to need all members of the disaster team and the involvement of emergency services and external specialists to respond effectively. And the recovery stage may take several years. A useful reference showing how the scale of disaster can impact physical and digital collections is [Table 2](#).

Another factor affecting the response and recovery process is the type of disaster. For example, while many disasters are water related (they involve water as the result of floods, leaks, burst pipes and storms), other disasters involve fire. Other types of disasters include those that involve earthquakes (resulting in landslides, rockslides, structural damage, building collapse, etc.); pest infestation; hazardous substances; vandalism; and armed conflict. These different types of disasters result in different types of damage. For example, documents and objects become wet in water-related disasters, and are damaged or covered in soot in fire-related disasters. A useful summary linking the type of damage with salvage methods can be found in *All is Not*

Lost (Museum of Applied Sciences, 2012, p. 10).

Another major factor that guides response and recovery action is the format of the collection items. As a general guide, wet organic material such as paper, books, textiles and plant fibres are a priority to salvage first, as they are susceptible to the growth of mould. Next, wet metal objects should get attention as they can corrode quickly. Other inorganic objects such as ceramics, stone and glass can be ranked low priority to salvage in a water-related disaster.

Table 1 can serve as a guide to help you prioritize which items to rescue and salvage in a water-related disaster when collection items have become wet or damp.

Table 1: A guide to prioritizing rescue and salvage actions in water-related disasters.

Format	Priority level
High priority format to salvage	
Coated paper (e.g. shiny plates in books)	very high - within 6 hours
CDs and CD-ROMs	high - within 48 hours
Daguerrotypes, glass plate negatives	high - within 48 hours
Leather	high - within 48 hours
Metals	high - within 48 hours
Organic materials (e.g. fur, basketry, feathers)	high - within 48 hours
Paintings	high - within 48 hours
Paper	high - within 48 hours
Parchment, vellum	high - within 48 hours
Records	high - within 48 hours
Medium priority format to salvage	
Audio and video tapes	medium - within 72 hours
Computer hard drives (backups or specialist)	medium - within 72 hours
Microfilm	medium - within 72 hours
Photographic negatives, transparencies	medium - within 72 hours
Photographic prints	medium - within 72 hours
Low priority format to salvage	
Wood	medium to low - within 72-96 hours
Stone, ceramic, glass	low - within 96 hours

Table 2: Scale of Disaster Impacting on Responses in Physical and Digital Collections

	SCALE	Event type	Collections affected	Interruption to library operations	Staff / Services / Involvement / Resolution	External involvement	Example
LEVEL 1	INCIDENT	Event is a minor unforeseen situation calling for immediate action.	Physical: Incidental damage only to a few items.	Nil	Disaster Recovery Team Leader (Physical collection) Minimal number of staff required less than 4 hrs to rectify.	No	Water spill
			Digital: Interruption to non-critical service or critical services for short time. (<2 hrs)	Minimal, usually affecting a small area or use of a service.	Disaster Team Leader (Digital collection) Staff specialists with skillset to fix the issue.	Possible Suppliers	Small power issue, e.g. cable pulled. Service failure that may require a restart, e.g. email virus scanner stops.
LEVEL 2	SMALL DISASTER	Event limited to a situation affecting an isolated area of the collections or digital services for a short period.	Physical: Up to 100 items.	Minimal, isolation of affected area. Collection may be in isolation for less than 1 day.	Disaster Team Leader (Physical collection) Requires response/ recovery by 1-3 physical disaster team members. Up to 1 week to remediate collection items affected.	Yes Department, e.g. government dept., university.	Small mould outbreak.
			Digital: Interruption to non-critical services or critical services for short time requiring an interim solution. Failure of non-critical hardware that only affects a small number of users.	Minimal services affected. Or Limited number of people affected.	All digital surrogate types A & B are stored on server in basement.	Possible Suppliers	Server failure. Server environmental conditions outside specified parameters necessitating shutting down services to protect servers. Switch fails - may require return to manufacturers. Data services affected.

	SCALE	Event type	Collections affected	Interruption to library operations	Staff / Services / Involvement / Resolution	External involvement	Example
LEVEL 3	MEDIUM DISASTER	Event limited to situation affecting whole floor or portion of floor of collections or digital services for a short period.	Physical: Up to 500 items.	Interrupted services or operations are resumed within 5 working days with zone closure likely.	Disaster Recovery Team Leader (Physical collection) Requires response/ recovery by up to 10 Physical Disaster Team members.	Yes Department, e.g. government dept., university.	Accidental water sprinkler activation requires moving materials out of the immediate area and closure of stack areas for mop-up.
			Digital: Potential for loss of digital data.	Sudden power loss affecting ICT services with expected return of service greater than 1hr. Critical environmental parameters exceeded with expected restoration of environmental parameters greater than 10 minutes. Failure of core/essential hardware.	Disaster Team Leader (Digital collection) & Digital Disaster Team members. Critical serves affected may take more than 2hrs to restore, or longer as required. Digital Disaster Team with specialist skillsets to fix the issue.	Yes Department, e.g. government dept., university. Suppliers	Loss of power supplying critical service, e.g. Storage Area Network or servers. Unsuccessful generator test resulting in UPS shutdown. Core hardware failure. Air conditioning failure.

Source: ALIA 2019

	SCALE	Event type	Collections affected	Interruption to library operations	Staff / Services / Involvement / Resolution	External involvement	Example
LEVEL 4	MAJOR / LARGE SCALE or WIDE-AREA DISASTER	Wide-area disaster involving the entire institution and/or across multiple locations. There is a sudden loss of power to server room with unknown restoration time.	Physical: Major portion of collections in repositories damaged / impacted.	Situation lasts over 48 hours. Collections requiring extensive salvage and may not be accessible for more than 40 working days.	Disaster Team Leader (Physical collection) Facilities Manager Requires response / recovery by more than 10 Disaster Team members (physical).	Yes Crisis Management Team Director/CEO & Minister. Department, e.g. government dept., university.	Extensive building damage and infrastructure damage, e.g. from cyclone.
			Digital: Major loss of digital data	Major data loss. Loss of critical ICT infrastructure.	Disaster Team Leader (Digital collection) Facilities Manager Digital Disaster Team with specialist skillsets to fix the issue.	Yes Crisis Management Team Director/CEO & Minister Department, e.g. government dept., university. Suppliers	Extensive building damage and infrastructure damage, e.g. from cyclone. Extensive damage to infrastructure or loss of server room, e.g. catastrophic failure of hardware.

Salvage processes and techniques

Setting up the salvage area

It is best to locate the salvage treatment area in a safe place away from threats. Ideally, the area should be dust free, cool, well ventilated and as dry as possible. You will need to cover tables and flat surfaces with absorbent paper, such as blotting paper, paper towels and butcher's paper, and you will need to change absorbent materials frequently to avoid mould growth. Ideally, you will have a stock of supplies in your disaster bin or storage area (see Learning about relevant disaster supplies, emergency equipment and suppliers). Do not use printed paper to cover tables or dry wet materials as the dyes can run when wet.

Salvage equipment will be needed in some circumstances. For example, fans help to increase air circulation and speed up air drying, and portable dehumidifiers help to lower humidity levels (State Library of Queensland, 2022).

Salvage techniques

The type of salvage technique that is used depends on the type of damage (e.g. water damage; fire damage; insect damage; etc.) and depends on the format of the items (e.g. paper; metal; glass; etc.). Preservation Australia has produced a series of videos on various salvage techniques and the State Library of Queensland has made a useful introductory video on how to salvage water-damaged collections. See the References section below for links to these and other useful resources.

Techniques used to salvage water-damaged collections

- **Air drying**

This is the most common method for salvaging water-damaged items. When drying items, avoid using heaters or hair dryers as they encourage mould and can cause distortion.

- **Freezing**

This is a technique that can buy time when dealing with a large group of damaged collections. A rough rule of thumb is that once there are over 500 damaged items, it is too much for a small team to salvage, so you will need to consider freezing. It is used when collections are wet and when they have been damaged by insects. Not all materials can be frozen safely, however. Check with a conservator for specific advice before freezing any objects. Table 3 provides general advice regarding what is safe to freeze and what is not.

- **Freeze drying**

This is used for the most significant items as it is an expensive process. It is usually undertaken by commercial services. Items are first frozen and then transported to a commercial organization for freeze drying in a vacuum chamber, which allows the frozen water to evaporate straight into gas (sublimation). The outcome is usually much more aesthetically pleasing than with other methods as there is no additional wetting (which causes further distortion beyond the damage that occurred before the items were frozen). When preparing your disaster plan, find out if commercial freeze-drying services are available in your country. If so, contact several companies to find out if they can freeze-dry collection items. If they can do so safely, you can then list them among the emergency contacts in your disaster plan.

Table 3: What is safe to freeze and what is not.

Generally safe to freeze	Do NOT freeze
Books	CDs, CD-ROMs, computer hard drives
Coated papers	Ceramic items
Feathers	Ethnographic items with mud, ochre, etc. (e.g. masks)
Organic fibres (e.g. baskets)	Camera film or motion picture film
Paper-based objects or games	Glass
Paper files and records	Ivory
Maps - paper and fabric based	Metals
Textiles - including those with blending inks but not those with metal components	Musical instruments
Traditional cloth made of bark	Scientific equipment
Soft toys	Objects under tension (e.g. stretched canvases, drums)
	Paintings
	Parchment and vellum
	Photographic objects; daguerrotypes, glass plate negatives and lantern slides
	Records (vinyl, shellac and acetate)
	Wood

Source: *Heritage Collections Council, 2000, Appendix 4*

Packing items for freezing

When packing items for freezing, it is best to pack them in sturdy, uniform containers. Label the contents of each container.

When freezing books, first wrap them loosely with wax or freezer paper and pack one layer deep, spine down. You can also pack books in individual freezer bags. Remove excess air from freezer bags before sealing. Be careful not to crush the book or create holes in the bag.

When packing documents (records/archives), leave them in their boxes and folders, if possible. If their boxes are damaged, pack the folders into containers laid on their sides, for ease of filling. Interleave with wax or freezer paper every couple of folders (NEDCC, 1999; State Library of Queensland, 2022).

Safety tips

Safety is always the first priority. When undertaking response, rescue and salvage actions, follow safety precautions, such as:

- Although the disaster team and other staff will be allowed back on the premises by emergency services staff when they ascertain that it is safe to enter, the situation can change, so the disaster team members and other staff must be prepared to evacuate at any time during the response and recovery stages.
- Personal **protective equipment** such as masks, closed footwear, protective eyewear and heavy-duty gloves must be worn during the rescue and recovery stages to avoid injury.
- Where **mould** is present, give special attention to wearing masks with filters and replace filters and masks regularly.
- Check the **health and safety guidelines**.

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- Salvage of water damaged objects <https://www.youtube.com/watch?v=HwDo4MsRgIE>
- Introduction to salvaging water damaged material, mould and freezing

option <https://www.youtube.com/watch?v=jhtWAF8JkU8&t=37s>

- Salvage of water damaged documents and leaflets <https://www.youtube.com/watch?v=y0iauJVHyss> (Accessed 30 November 2023.)

State Library of Queensland. 2022. Salvaging damaged collections. [Series]

- Part two: how to salvage your water-damaged collection [video]
- Emergency recovery of water-damaged collections
- Freezing water-damaged and insect-infested collections
- Salvaging water-damaged collections.

<https://www.slq.qld.gov.au/get-involved/caring-your-collections/salvaging-damaged-collections> (Accessed 30 November 2023.)

Response and Salvage | Questions

1. Does your organization have the equivalent of an 'emergency immediate actions chart' for collections? If yes, what information is included? If no, what simple instructions could you list in a chart for your organization?

☐ YES

☐ NO

2. Does your organization have a list of emergency services contacts?

☐ YES

☐ NO

3. What are the most common types of disasters that are likely to impact your organization's collections? How does the type of disaster affect the recovery and salvage steps?

4. What are some typical response actions that can be taken to prevent further damage to collections?

5. If you were a disaster team leader, which members of your disaster team would you call in first? Why?

6. How does the scale of a disaster affect the approach to response and recovery? Give some examples of what this would mean for your organization in the cases of a small disaster and a catastrophic disaster.

7. Within your organization's salvage priority list, what formats of materials would be your first priority to salvage if they are water damaged? Why?

8. In your organization's building or complex, where would be a suitable area to set up as a salvage area? Why?

9. What equipment and materials would you need for salvaging water-damaged items? How would you set it up?

10. Give examples of three materials that you can freeze (in general) and three that are not suitable for freezing.

11. Describe how you would pack wet books for freezing.

12. What does air drying of wet items involve? Describe how it would occur in your organization, and which members of your disaster team would be involved.

13. What are the advantages of freeze drying? Are there any freeze drying services in your country?

☐

YES

☐

NO

Keeping disaster plans up to date

Heather Brown

Keywords: response, recovery, debriefing, reviewing, updating

Introduction

A disaster plan is never a 'set and forget' tool. A disaster plan that remains static, without being improved by lessons learned, rapidly loses its relevance. Furthermore, a disaster plan that contains out-of-date emergency services and disaster team contacts, and incorrect collection locations, is useless. This module explains why disaster plans should be kept up to date and how to do so.

When and how to update your disaster plan

Regular reviews

One way of making sure a disaster plan is kept up to date is to conduct a regular, systematic review in a particular week or month each year. Ideally, this should be scheduled as a regular part of your organization's operations. For example, it can appear on your organization's calendar of scheduled activities.

Some organizations find it useful to carry out their review of disaster plans and training before periods of peak risk, e.g. before the cyclone, bushfire and rainy seasons. The Australian Institute for the Conservation of Cultural Material disaster calendar (AICCM, 2023) provides a useful framework that you can adapt to help you schedule your organization's disaster activities.

Make a checklist of the parts of the disaster plan that are likely to change, such as emergency service numbers, members of the disaster team and their roles and contact details, changes to collection locations and access, and the contact details of suppliers, and ensure that all of these parts are reviewed and updated.

It is important that whenever a disaster plan is revised, the new version is marked with the date on which it was updated.

Reviewing after a disaster

Another time to update a disaster plan is after a disaster. In this case, the disaster team leader or another appropriate staff member should organize a debriefing meeting with the disaster team and other key staff, such as IT, facilities and security staff, and consider what worked well and what could be improved, and whether the disaster incident uncovered new risks that need to be mitigated. Ideally, the debriefing should be carried out as soon as possible after a disaster, when the experience is fresh in everyone's minds.

Keeping a record of all disasters, large and small, will provide a valuable insight into the areas of risk within your organization, ensure that disaster risk management strategies are relevant and address areas of weakness within your organization. Furthermore, preparing a disaster incident report during the disaster response and recovery period will provide useful information for the debriefing later and remind everyone about the actions and the decisions that were made. This report is the responsibility of the record keeper, who should also take photographs during the various stages of the disaster. These photographs will also be useful for the debriefing. ALIA provides an [example of a disaster incident report](#) that can be tailored to your organization's needs (2019b, p. 30).

How the debriefing is carried out is just as important as what is covered. Debriefing should be carried out in a positive and respectful manner with a focus on how to strengthen the plan for future. The debriefing is an opportunity to thank everyone for their support during and post disaster and to consider what could be done differently next time, rather than to blame people for mistakes. Use the first-hand experience of the staff to update and strengthen the disaster plan and your organization's overall disaster risk management strategies.

Useful questions to ask in the debriefing include the following:

- What worked well?
- What was useful in the plan?
- Was everyone in the team clear about their roles and did they know what to do?
- What suggestions do you have for making it easy to find important items (e.g. how can we improve the arrangement, layout and signposting)?
- Were there any barriers to access (e.g. lack of keys)?
- Were there enough supplies and equipment in the disaster bin and/or storage area?
- Did these supplies and equipment get damaged in the disaster? If so, is there a better place to store them?
- What supplies and equipment need to be replenished?
- Are there any other supplies and equipment that would have been useful and that we should stock up on so that we can be better prepared for any future disasters?
- Were there any communication challenges? If so, how could communication be improved in future?
- Is further disaster training needed? In what areas?

Information from the debriefing should then be incorporated into the disaster plan, strengthening the plan for the future.

Reviewing when there are major changes

Another time to update the disaster plan is prior to any major changes, such as a building being renovated. Construction work and renovations present high risks, so a new risk assessment is needed at such times. It is worth noting that the fire at Notre Dame Cathedral occurred during renovations to the building (Pena, 2019).

Disaster plans are based on risk assessments, so the risk assessment will highlight what sections of the disaster plan need to be changed. It is essential to do the risk assessment, mitigate the risks and update the disaster plan before any major renovation work begins.

Another type of change that would trigger a new risk assessment and a review of the disaster plan is when the organization has acquired a new significant collection item that has been added to the salvage priority list. Likewise, if there are changes to the IT infrastructure and data storage systems (such as moving data to the cloud), a new risk assessment is needed and the disaster plan must be updated.

Reviewing when there are exhibitions

Another time in which a new risk assessment and disaster plan may be needed is when an organization has a new exhibition, especially if the exhibition includes loaned items. The decision regarding whether a new risk assessment is needed will depend on the value, significance and the fragility of exhibition items, and on the size of the exhibition. If it is a large exhibition, for example, large crowd sizes will pose new risks, which require risk mitigation strategies such as crowd control and extra security. If the exhibition contains items of high significance, including significant loaned items, it will be necessary to update the salvage priority list. Indeed, the lending organization may require, in the loan agreement, that loaned items are added to the host organization's salvage priority list for the period of the exhibition and that the borrowing organization has a disaster plan. If the salvage priority list is modified to include loaned items, it will be necessary to update the list again when items are returned. For an example of a loan agreement, see the AMaGA [Loan Agreement](#), in particular section 15, pp. 7–8.

Tips

Link training to updates of the disaster plan

Unless the changes to the disaster plan are minor, updates to the disaster plan should be followed by training to ensure that the disaster team will know how to put the plan into action in a disaster. Training should cover topics such as who to contact in an emergency, the contents of the salvage priority list, the various roles and responsibilities of the disaster team, and the response and recovery techniques for each type of disaster. Training sessions for the disaster team are also a useful opportunity to get suggestions from the team regarding any areas of the disaster plan that need clarifying or updating. Use this feedback to strengthen the plan.

Include the disaster plan in the organization's management framework

It is important to include the disaster plan in your organization's management framework. This helps to ensure that disaster risk management is part of standard operations, rather than something that occurs intermittently. For example, the disaster plan can be linked to the organization's strategic management plans, such as the business continuity plan, risk management plan, staff emergency procedures and the IT plan.

the IT plan.

Ensure senior managers review and endorse disaster plans

Whenever the disaster plan is updated, it should be reviewed and endorsed by a senior manager. This ensures that the plan is recognized as an integral and continuous part of your organization's management framework.

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Keeping DRM plan up to date | Questions

1. In the context of your local seasons, such as the rainy season or cyclone period, when would be the best time of year to schedule an annual review of your organization's disaster plan? Why?
2. Give examples of changes in your organization that could potentially affect your physical collections and require changes to your disaster plan.
3. Give examples of changes in your organization that could potentially affect your digital collections and require changes to your disaster plan.
4. In your annual review and update of your organization's disaster plan, what areas would you focus on? How would you go about finding out new information to include? Who could assist?
5. If you were leading a debriefing of disaster team members and other key staff after a disaster, what questions would you ask them?
6. What management plans in your organization could be linked to your disaster plan?
7. What are the benefits in getting a senior manager to sign off your organization's disaster plan? Who would you get to sign off the plan in your organization?

Case study

Salvage and treatment of archives following the Beichuan earthquake

Meifang Zhang

China
2008

Keywords: earthquake, disaster-stricken archives, restoration, disinfection

On 12 May 2008, a catastrophic earthquake struck the Qiang Autonomous County of Beichuan in Sichuan Province, China. The earthquake triggered landslides, rockfalls and mudslides, which caused great destruction. The local archives and repository were severely impacted and over 80,000 archives were buried in mud and debris.

After the earthquake, violent rainstorms hit the area, which caused the already damaged archives buried under the building's debris to become wet and accelerated their deterioration. Over 12,000 archives were severely damaged because of the impact of rainwater, heat and the prolonged time in which they remained buried in dust and debris. Some archives were torn and others lost their shape completely. The wet documents became covered with mould and bacteria.

After the archives were excavated from the mud and debris, the staff conducted a preliminary appraisal. Emergency salvage and conservation work were crucial. The local archives bureau set up a Beichuan archives salvage team and formulated a general plan for salvage work. The overall project had six stages: on-site excavation; emergency disposal; salvage and restoration; systematic arrangements; digital processing and storage.

The salvage and restoration stage of the project had the following steps: classification, transfer, drying, disinfection, examination of damage and restoration (including washing, stain removal, separation of file archives, mounting, filling of lacuna, re-binding of archives). The Beichuan archives were then stored at temperatures of 18–22 °C and humidity levels of between 45 per cent and 50 per cent. These measures and the treatment methods were beneficial to the restoration and long-term preservation of the documents.



1. Condition of the archives during the rescue operations
2. The archives were completely wet and the ink partially washed away
3. A distorted document that lost its original shape

© Meifang Zhang

Key issues

Contamination by multiple substances

Because the archives were buried in a large amount of mud, sand, stones and other debris, they became contaminated and were stained.

Serious material damage

The archives that had been soaked in water and buried in mud and debris were torn and damaged, and some had lost their shape completely. In addition, because the archives had become wet, the inks and dyes had bled out, causing further damage.

Secondary damage after the earthquake

Due to the heavy rain after the earthquake, which made the archives wet, the documents became infested with bacteria and other microorganisms, which posed a threat to the longevity of the archives and to the health of the staff and other people in contact with the wet documents.

Actions

Cleaning and drying

First, the contaminated documents were cleaned, which involved the removal of dust, stone particles and ash from the surface of the documents. The pages of the wet documents were separated and absorbent paper was put between them. The absorbent paper was changed two or three times to ensure that all the water was absorbed. The paper was very fragile when wet, so they had to be handled with great care.

Flattening and repairing

After being cleaned, the distorted documents were moistened with damp towels, then flattened with metallic flattening equipment or weights. Areas of loss were then filled in using the leaf-casting method, and the documents were relined. The more severely damaged archives comprising very fragile and brittle papers had to be lined with Xuan paper (traditional handmade paper). Later, these documents were dried and flattened on a paper-wall for two or three days.

Disinfection

To remove microorganisms, the documents were disinfected with ethylene oxide. This process proved to be effective and no living organisms could be detected on the documents after treatment.

Lessons learned

Planning and preparation are vital.

Preparing disaster plans, emergency response plans, rescue measures and treatment methods in advance, before a disaster strikes, can minimize the damage to documents and losses to archives.

Maintaining a stable temperature and humidity can inhibit further deterioration.

The preservation of damaged archives requires strict control of environmental conditions, especially temperature and humidity, to prevent deterioration of the documents and the growth of microorganisms.

Tailored approaches are necessary for each type of damage.

The steps and procedures chosen for salvaging and restoring documents depend on the extent and type of damage. Therefore, it is important to begin by assessing the damage and identifying appropriate solutions with regard to the specific condition of the documents. The steps for salvaging and restoration should be linked and closely coordinated, and the methods and sequence used should be tailored to each special case.

Case study

The impact of the 2020 flood on Albert Hall Museum, Jaipur

Achal Pandya

India
2020

Keywords: floods, museum collections, mitigation measures, rescue

On 14 August 2020, Jaipur, the capital city of Rajasthan, experienced an unprecedented weather event, with the meteorological centre recording over 100 mm of rainfall in six hours. This torrential downpour led to widespread flooding in low-lying areas across Jaipur, including in the vicinity of the Albert Hall Museum. The Albert Hall Museum, housed within a magnificent Indo-Saracenic style building, showcases the city's rich heritage, including historical artefacts, paintings, sculptures and other invaluable items. However, the museum's storage area, crucial for safeguarding its valuable artefacts, was in the basement, which was particularly susceptible to flood damage. The unprecedented flooding event had a profound impact on the museum, particularly its basement storage area.



1. Albert Hall Museum before and after the floods
2. Water that seeped inside the museum storage
3. Rescue of a 2,400 year-old mummy from the basement

© Albert Hall Museum, Jaipur, Rajasthan

Key issues

Lack of planning for unprecedented events

The region in which Jaipur is located is dry and arid, and normally has very little rainfall. The museum authorities therefore did not see torrential rains and floods as an immediate risk. As a result, they were not adequately prepared for this rare event.

Storage areas were highly vulnerable to flooding

The historic architecture of the building does not allow for a dedicated storage space and as a result most of the collection was kept in the basement area where the temperature was cooler, making it an ideal storage space. However, the basement is inherently vulnerable to flooding.

Changes in the museum's surroundings increased its vulnerability to flooding

Civil works and urban development around the museum premises in the preceding years had led to roads and surrounding areas rising by up to 10 inches. The museum building was therefore lower in elevation, with the result that flood waters flowed down into the museum premises, and the basement became flooded.

No outlet for flood waters

The basement had no outlets through which to drain out the flood water. It was therefore necessary to pump out the water, which required special equipment.

Mould and mildew damaged the museum's collections

The high moisture and humidity levels resulting from the floods created an ideal environment for the growth of mould and mildew. These microorganisms posed a substantial threat to the longevity of the invaluable artefacts housed within the museum and were a health hazard.

Response and mitigation measures

The flooding of Albert Hall Museum compelled the management to take swift action to minimize damage to the collections and prevent similar occurrences in the future.

The immediate measures were to:

- retrieve and salvage the artefacts from the flooded areas;
- remove the water from the basement;
- assess the damage.

The following mitigation measures were implemented to fortify the museum's resilience to flooding:

Enhanced flood barrier systems were installed.

Walls were constructed around the museum premises to divert excess rainwater from the building. This proactive measure will reduce the risk of flooding in the event of future heavy rainfall.

Waterproofing measures were taken. The windows on the side of the building where water had entered were sealed and waterproofed. This will prevent any future water infiltration and subsequent water damage to the basement storage area.

Artefacts were moved to safer locations. The basement storage area was reorganized and artefacts were moved to higher floors of the museum. This will ensure their protection against future flooding incidents.

Disaster management and mitigation training was organized. This training will equip museum staff with the necessary skills and knowledge to implement proactive measures and respond effectively to any future natural disasters.

Lessons learned

The management of Albert Hall Museum gained several insights as a result of the disaster. Taking these lessons learned into account will help the museum and other cultural institutions to enhance their preparedness for disasters, mitigate risks and protect their invaluable artefacts and historical sites from the devastating impacts of future disasters.

Planning is essential.

The flooding served as a reminder of the necessity of comprehensive disaster preparedness planning. Cultural institutions must develop plans and procedures to prevent and reduce damage during natural disasters. Actions should include training staff, implementing preventive measures (e.g. constructing flood barriers) and establishing emergency response and recovery plans to expedite these processes and minimize damage.

Thorough risk assessments are necessary.

The flooding incident at Albert Hall Museum highlighted the importance of conducting a thorough vulnerability/risk assessment. Although rainfall is rare in Jaipur, the museum's location at a lower elevation than the surrounding roads and buildings made it extremely vulnerable to flood damage. A better understanding of the specific vulnerabilities and risks associated with the museum's location prior to the disaster would have enabled effective mitigation measures to be put in place.

Collaboration is valuable in ensuring a timely response.

The flood demonstrated the benefits of establishing strong partnerships and collaboration with meteorological departments and emergency response teams. Regular communication and sharing of information prior to and during disasters can aid in proactive decision-making and timely responses.

Public awareness and education can foster support.

The event served as a reminder of the importance of public awareness and education regarding the value of preserving cultural heritage. Engaging with the community, conducting outreach programmes, and raising awareness of the value and vulnerability of heritage sites can foster a sense of responsibility among the public and increase support for heritage protection.

Documentation is necessary.

The flooding incident showed the usefulness of maintaining comprehensive documentation of museum collections, including detailed inventories, photographs and condition reports.

Resource allocation for disaster management programmes is essential.

The incident emphasized the necessity of allocating adequate funds and resources for the protection and conservation of cultural heritage sites. Prioritizing investments in preventive measures, infrastructure upgrades and staff training is crucial for ensuring the long-term sustainability of museums and historical buildings.

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4. The window where the floodwater entered was reduced and sealed following the disaster
5. Storage space after the floodwater was pumped out

Case study

Recovery after bushfires: photographs in a fireproof safe

Mick Newnham

Canberra, Australia
2003

Keywords: fire, fireproof safe, thermal resistance, salvage, conservation

In January 2003, Canberra, the capital of Australia, was hit by an unexpected and unprecedented bushfire that caused great destruction. The fire had begun approximately 40 kilometres from Canberra in an inaccessible part of the mountains bordering the city and burned for several days. Attempts were made to put out the fire, but fire crews were not able to fight it safely. On 18 January, a day when the temperature exceeded 40°C, a strong wind fanned the fire and it travelled at unexpected speed and tore through the outer suburbs of the city. It was estimated that the fire temperatures exceeded 1400°C, sufficient for piles of sand to become glass. In just a few hours, the fire had destroyed over 500 homes and damaged many others.

Bushfires are not uncommon in the area, and many people prepare for bushfires by storing valuable documents in fireproof safes. These safes are resistant to heat for several hours, which is normally sufficient

time for fire suppression systems to have extinguished a typical fire. However, due to the intensity of the 2003 fire and its duration, the safes became heated to an extreme temperature, and they maintained this temperature for a long time due to the residual heat of the fire in surrounding materials. In effect, the safe became an oven and ‘cooked’ the fragile objects inside.

In the case study discussed here, the contents of the safe were irreplaceable family photographs. During the fire, the photographs fused together into a ‘brick’ (Figure 1). The owners of the photographs wished to restore them, but restorers lacked knowledge of how to recover photographs affected to this extent by heat. A significant amount of research was required to develop a workable salvage technique.

Techniques used to recover the photographs

As direct physical separation was impossible, it was necessary to find an aqueous treatment to separate the photographs, but one that did not harm the images.

A treatment of approximately 2 per cent sodium polymetaphosphate was used. To permit this solution to diffuse between the photographs, the hardened edges of the photo ‘brick’ were first sawn off with a fine-tooth saw (Figure 2).

The ‘brick’ was then soaked in the solution for several days. A weight was necessary to keep the photographs completely submerged (Figure 3). After the solution had sufficiently penetrated the ‘brick’, it swelled the emulsion layer and broke down the interlayer adhesion.

Next, the photographs were separated by carefully releasing the adhesion with a soft brush (Figure 4). This process took many hours of slow careful work.

After each of the photographs had been separated from each other, they were air dried and stored in acid-free tissue. However, even after this careful recovery work, the photographs showed severe damage (Figure 5).

Lessons learned

There is a lack of understanding of the limitations of fireproof safes in protecting valuables from extreme fire events.

It should be clarified that such safes only buffer the impact of fire and do not fully protect fragile contents in the event of major fire with high temperatures and a sustained duration. Paper objects, such as loose papers and books, can be damaged by temperatures as low as 50°C. In such conditions, fragile objects such as photographs will sustain considerable irreparable damage. Photograph storage systems, such as photo albums and photo pockets, offer no protection from extreme temperatures and may contribute to damaging the photos. In a disaster the negatives are usually lost. It is therefore important to store negatives in a place without a large fire risk.

Digitization and a physical separation of valuable documents and photographs will reduce the impact of a disaster.

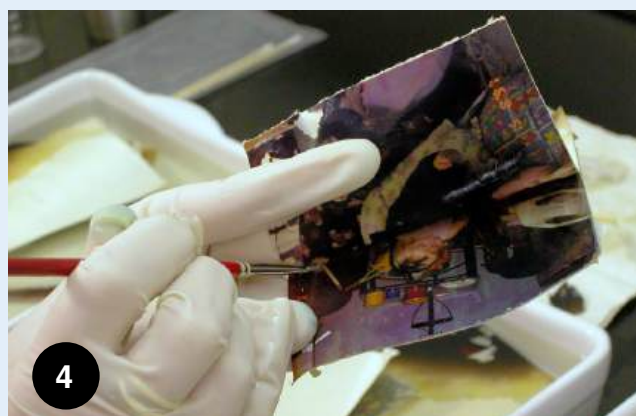
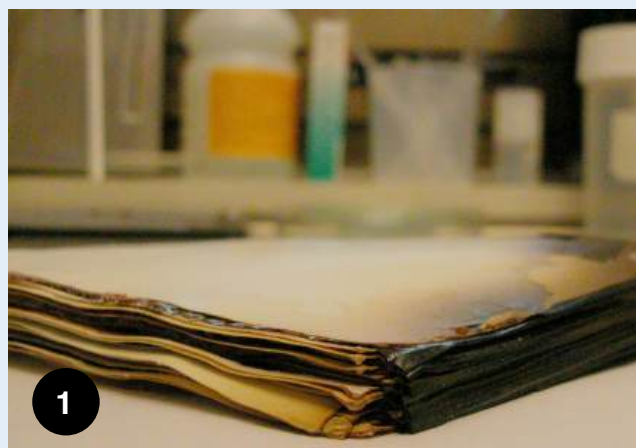
Digitization of prints and negatives is an important preservation action, but it is necessary to also carefully safeguard the digital copies of the prints.

There will be a long delay between the disaster and the time when the disaster-affected area is declared safe and salvage operations can begin.

In the case of a fire, the disaster-affected area will remain hot and dangerous for some time.

Recovery projects are expensive and time-consuming, taking weeks, months or years.

Items have to be handled and recovered one by one, and the recovery of just one photograph can require days of aqueous treatment and hours of painstaking separation.



1. Heat-affected photographs fused together, with a charred edge
2. The fused 'brick' with the edges sawn off
3. Soaking the photographs
4. Separating each layer of photographs by hand and brush

Case study

Family-owned heritage in post-disaster recovery

Widiatmoko Adi Putranto

Kotagede, Yogyakarta, Indonesia
2006 - present

Keywords: earthquake, community, post-disaster recovery, Kotagede, heritage town

Kotagede is a small city in Yogyakarta, Indonesia, where the ancient Javanese Mataram kingdom was first built. Most of the families in the community live in heritage houses passed down through the generations. The majority of the houses are over a century old and are therefore considered significant heritage assets.

The city and the surrounding area, which are densely populated, were nearly completely destroyed during a massive earthquake in 2006. In the aftermath, many houses and buildings in the area were sold, renovated or abandoned, in spite of their heritage value.

This case study describes the experience of community members in Kotagede and reveals the complexities of community dealings with historical assets. It also discusses the collaborative efforts undertaken by local governments and other stakeholders in Kotagede during the post-disaster recovery process.

Key issues

Scattering and loss of family archives and possessions

During and after the 2006 Yogyakarta earthquake, many people fled their houses. My grandmother, who was eighty-seven years old at the time, lived alone in her heritage house and escaped in time before witnessing her house collapse brick by brick.

After the earthquake, many people were afraid of returning home because of the aftershocks and rumours of a tsunami. They left their houses empty, making the buildings vulnerable to theft. Looting happened in some areas.

Before the 2006 Yogyakarta earthquake, it was common for young adults, even those married with children, to live with their extended family in the same house. This was the case for my family. The earthquake caused great damage to our shared house and after the earthquake the various family members retrieved items from the house. Some decided to save documents, while others chose furniture, electronics and even the original heritage window frames. As a result, the family records, possessions and heirlooms became scattered and dispersed. The window frames were never returned to the house.

Shared ownership of heritage assets

For large families that live together, the passing of elderly parents can lead to issues related to the ownership of their houses. There are generally three options to choose from when parents pass away: divide the ownership of the house equally among the children; sell the house and share the money from the sale equally; or demolish the old house and replace it with a new shared structure.

In my family's case, the ideal, yet difficult, option was to divide the house equally between my grandparents' twelve children. It was considered ideal because that way the ownership would remain within the family, but it was difficult because everyone in the family

was expected to cooperate to preserve the house as their shared cultural legacy, but the various family members did not have equal means to support the restoration. Discussions of how to preserve the house often reached an impasse because of disagreements, diverging ideas and personal conflicts between various members of the family. The issues were compounded during the earthquake recovery period, as it is a complex process to restore a heritage house back to its original state and it is even harder without any external support.

Families often choose the second option, which is to sell the house and share the money equally. However, this often means that these families lose parts of their cultural legacy. In some cases, the new owners demolish the old houses to create new buildings or remove traditional features of the house and either install them in other houses or sell them.

When families choose the third option, which is to replace their old houses with a new structure, they often do so because it is cheaper than restoring a heritage house, but in this case, like in the second option, they and their communities lose invaluable heritage.

Distrust of external assistance

During the post-disaster recovery process, my family was offered funding support from international organizations to restore our heritage house. Unfortunately, the family's opinions were divided. While some members of the family wanted to accept the support, others refused. Suspicion and distrust were the main reasons behind the refusal. They worried that that the funding organizations had hidden agendas and the house would be taken away from the family. Despite repeated discussions, the family never reached an agreement, so did not receive funding for renovations. A few members of the family began renovating the house with their own funds, but after their passing the house was abandoned and left in ruins. As of 2023, my family's heritage house still has not been renovated and its condition continues to deteriorate.



1. Family archive document saved following the earthquake
2. Restored Joglo house at Between Two Gates
3. Traditional house destroyed by the earthquake
4. Ruins following the earthquake
5. Pre-restoration discussion about Between Two Gates

Solutions

Support from experts in conservation

Through a year-long community service programme, scholars and experts regularly held events and projects to help communities recover from the earthquake, including by providing conservation and preservation support. In Kampung Celenan, the Universitas Gadjah Mada (UGM) restored the traditional house belonging to a family that was struggling financially and could not afford to restore their property. This house, known as [Omah UGM](#) (the House of UGM), is now open to the community and general public as an example of traditional architecture and local cultural heritage.

Guidance for homeowners via a conservation manual

In 2007, UNESCO published a detailed manual on the conservation of traditional buildings. Titled the [Homeowner's Conservation Manual](#) (2007), it was developed in cooperation with various stakeholders, including the [Jogja Heritage Society](#) and Kotagede Heritage District Local Organization, in response to the 2006 earthquake. The manual emphasizes the importance of architectural conservation in post-disaster contexts and serves as an important reference for conservation works. It also includes a glossary of specific Javanese architecture vernacular and local terms.

Archive restoration training programme

Following the tsunami of 2004, which devastated Aceh, the National Archives of Indonesia introduced an [archive restoration initiative](#). The programme remains active today, with high public demand, especially in the Jakarta area. The National Archives team visits sites and trains communities following disasters. The programme has helped to raise people's awareness regarding the preservation of personal archives, especially in anticipating the risk of disasters and preventing damage. Unfortunately, the programme has not been applied nationwide as regional archival institutions have not been instructed to offer the service. In response to the COVID-19 pandemic, however, the National Archives team developed online training sessions, which offer people in dispersed geographical areas opportunities to learn about archive restoration (Putranto, Sari and Mayzana, 2022).

Lessons learned

Messages should be adapted to local contexts

An awareness of the importance of heritage preservation is crucial not only to preserving significant tangible heritage but also to sustaining cultural traditions and a community's identity. Heritage workers and other stakeholders, including disaster teams, need to find the most appropriate approaches to communicate with communities to share perspectives and ensure effective community outreach. This requires adapting and contextualizing approaches to local settings. Many people who live in traditional heritage areas are often familiar with the concept of holy places or sacred objects, based on oral traditions, and language and local knowledge can play an important part in ensuring mutual understanding. In addition, locally appropriate guidelines for the preservation and conservation of archives, in local languages, are beneficial to local institutions.

Community leaders are a key to successful outreach

Community leaders can be a bridge between governments, heritage workers and local communities. Communities are willing to listen to their leaders, so disaster teams from memory institutions can often approach local communities successfully when they involve such leaders. These well-respected, trusted community figures communicate in a way that is in line with community values. For example, the *Between Two Gates*, an alley at Kampung Alun-Alun with rows of traditional houses decorated with Javanese and Dutch architecture, was rebuilt with the participation of a highly respected community leader. That person was not the official head of the village, but was trusted by the community and understood the historical value of the area as well as local values.

Greater awareness of record preservation and management is necessary

There is an urgent need to address the overall lack of awareness among local communities of the importance of preserving and managing records. In the [Between Two Gates](#) project, for example, digital copies of the documentation of the recovery process were given to the community, but members of the community were not aware of how best to preserve and manage the files. With technological advancements and the democratization of media and documentation equipment, the government and

academic sectors should improve efforts to enhance information management at the community level, starting with providing an introduction to general disaster prevention concepts and ways to protect personal documents in the event of a disaster.

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Case study

Lifecycle of disaster plans for Artlab Australia

Heather Brown

Keywords: disaster plan, Artlab Australia, risk assessment, updating, training, preventive conservation

Located in Adelaide, South Australia, Artlab Australia is an organization that preserves cultural heritage collections. Artlab is funded by the state government to provide a centralized conservation service to safeguard the unique collections of South Australia's major cultural organizations, including the Art Gallery, the South Australian Museum, the State Library, History Trust and Carrick Hill Historic House. Artlab also provides specialized risk assessments and disaster planning for major exhibitions. In addition, Artlab delivers commercial conservation services to other organizations and to the general public at the local, national and international levels. A major focus area of its services is disaster risk management and training.

Disaster plans and training

Artlab is responsible for preparing the disaster plans for the state's major cultural organizations. The structure of all of the disaster plans is the same, in order to ensure a common approach to disaster management across all the major cultural institutions, but the plans are individually tailored to each organization's context.

The disaster plans are based on risk assessments, which have identified vulnerabilities in the organizations' buildings, infrastructure, security, environmental conditions and storage. The risk assessments also highlight the vulnerabilities of cultural items, which include paintings, rare manuscripts, historical clothing, audiovisual materials and Aboriginal and Torres Strait Islander cultural objects. A number of these organizations have collections stored in off-site locations.

The process of reviewing and updating disaster plans is a continuous cycle. A dimension of the disaster plan cycle is in responding to major changes, such as infrastructure activities (e.g. building maintenance).

Moreover, Artlab receives reports of disaster incidents across all of the major cultural organizations, which provides a guide to disaster trends and areas of risk within the different organizations, allowing Artlab to identify the need to review disaster plans and/or to refresh staff training.

Training and updating the disaster plan go hand in hand in the lifecycle. Training enables the disaster plan to be put into practice effectively. Without this training, the disaster plan is just theoretical. The training enables disaster teams to put their tailored disaster plans into practice. Thus, the ongoing process of reviewing and updating disaster plans is closely linked to the training of the disaster teams.

For example, in working in partnership with organizations such as the History Trust, Libraries South Australia and ALIA, Artlab has delivered disaster training to the staff of selected community museums (Nicholls, 2023) and public libraries, funded

by grants from South Australian Fire and Emergency Services (SAFECOM). As a core part of the training, the organizations develop their own disaster plans and they learn the critical importance of keeping these plans up to date.

Key elements of Artlab's work

Systematic update of disaster plans

A core part of Artlab's role of safeguarding the state's major cultural collections is delivering disaster planning and training services that are tailored to each organization. In its central role, Artlab is responsible for managing and scheduling the annual systematic update of the various disaster plans.

When updating disaster plans, Artlab gives special attention to areas that are likely to change, such as staff contact details, emergency service numbers, members of the disaster team and their roles, changes to collection access, and the list of external suppliers. The updated list of external suppliers and supplies can be shared across the plans for all of the cultural organizations.

During the annual review, another important factor that Artlab considers is updating the salvage priority list. This includes checking whether the locations of any priority items have changed, or whether significant new items have been acquired.

Reviewing when there are major changes in the organization

Artlab reviews disaster plans when there are major changes in the organization, such as alterations to the building. For example, during the renovations of Carrick Hill Historic House, Artlab staff conducted a risk assessment and made changes to sections of the disaster plan to help protect the collections (Keen, 2020).

Another example is when a new digital collection management system was introduced at Artlab. The technological change was a major driver for Artlab to upgrade its own disaster plan into an integrated disaster plan that includes both digital and physical collections. The digital collection management system has since been incorporated into Artlab's salvage priority list.

Reviewing plans during exhibitions

Artlab prepares special purpose disaster plans

when there are major new exhibitions, particularly when loaned items of significant value are part of those exhibitions. In such disaster plans, special attention is given to risk mitigation strategies such as crowd control and security. For example, Artlab conducted a detailed risk assessment for the Colours of Impressionism exhibition at the Art Gallery of South Australia, which featured priceless works that travelled from the Musée d'Orsay in Paris, and at the same time Artlab also reviewed the salvage priority list and disaster plan (Keane, 2018).

Disaster planning involves being prepared for the unexpected. In the case of the Colours of Impressionism exhibition, despite the comprehensive risk assessment, the implementation of risk mitigation strategies and a review of the disaster plan, an unexpected incident occurred. A bird flew through the open glass doors into the exhibition gallery (ABC, 2018). Fortunately, in this case, the bird was quickly caught and released outdoors, and it caused no damage.

Embedding cultural protocols in disaster plans

Some collection materials, especially Aboriginal and Torres Strait Islander collection objects, are secret, sacred or sensitive in nature. They therefore can have restrictions or protocols around who can access, handle or view them. Artlab's conservators respect and follow the AICCM Code of Ethics (2002) and the Aboriginal and Torres Strait Islander Protocols for Libraries, Archives and Information Services, which provide guidance on informed and respectful handling of cultural materials (ATSILIRN, 2012). In relation to culturally sensitive materials, Artlab's conservators work closely with curators and representatives from the Aboriginal and Torres Strait Islander communities to ensure that secret, sacred or sensitive materials are appropriately identified on the disaster plan, together with cultural requirements such as viewing and handling instructions.

Embedding disaster planning in Artlab's management framework

Artlab's disaster plan is referenced in the broader management framework that includes the business unit reports. Whenever Artlab's disaster plan is updated, it is reviewed and endorsed by the Director, and this ensures that the plan is recognized as an integral and continuous part of Artlab's management framework.

Lessons learned

Advantages of the central coordinating role

There is a major benefit to Artlab's coordinating role: it facilitates a consistent structure, terminology and approach that is used across all of the disaster plans. This supports a common understanding and approach to disaster management across all the major cultural institutions. In practice, this means that in the event of a major disaster or an incident that affects multiple organizations, the common approach, shared understanding and training experience supports collaboration by staff across the major collecting organization.

In its coordinating role, Artlab manages the shared North Terrace precinct disaster store, which has a stockpile of emergency materials and equipment that can be used to respond to disasters. The various disaster teams can access the resources in the precinct store to supplement their own emergency supplies in the event of major disasters. Thus, the centrally located store provides additional 'surge capacity' for the cultural organizations during a disaster. Supplies are replenished by the relevant organizations. Artlab also trains the various disaster team members in accessing and using the disaster store equipment.

An example of the practical benefits of Artlab's common approach to disaster plans and training is that staff members from cultural organizations were able to work together to protect their collections quickly and effectively when leaks affected their collections (located next to each other in a shared off-site storage area).

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Glossary

Conservation profession

The profession devoted to the preservation of cultural property. Conservation activities include examination, documentation, treatment and preventive care, supported by research and education.

Conservator

A professional engaged in the practice of conservation and who, through specialized education, knowledge, training and experience formulates and implements all the activities of conservation.

Personal protective equipment (PPE)

Clothing and equipment that is worn or used to provide protection against hazardous substances or pathogens.

Contamination

A state of containing unwanted, damaging or dangerous substances.

Insect frass

The excreta of insects. Dust-like debris left behind by pests.

Degradation

Deterioration caused by biological, chemical or physical factors.

Relative humidity

The amount of water vapour held by a volume of air relative to the maximum amount that air at that temperature could hold.

Foxing

Light to reddish-brown spots associated with paper decay.

Loss

Area that is damaged, physically detached or missing.

Mould

A surface growth of fungus of varying colour, shape and configuration. It generally proliferates in damp conditions (60 per cent relative humidity or greater) and where there is little air circulation.

Tideline

A stain that occurs when a liquid dries. It is characterized by a discrete edge (caused by deposits of dissolved material), which is often darker than the remainder of the associated stain.

Vital record

An electronic or paper record that is essential for preserving, continuing or reconstructing the operations of an organization and protecting the rights of an organization, its employees, its customers and its stakeholder.

Digital preservation

Checksum

A digit representing the sum of the correct digits in a piece of stored or transmitted digital data, against which later comparisons can be made to detect errors.

Data ingestion

The process of importing large assorted data files from multiple sources into a database, cloud-based storage, data warehouse, where it can be accessed.

Detachable

Media that can be plugged into a computer and read. For example, a USB thumb drive is detachable media because it can be stored separately from another device (a computer) required to read the data on the drive.

Metadata

A set of data that describes and gives information about other data such as a document or article.

Network-attached storage device (NAS)

A storage device holding at least two hard drives, that computers can access on an internal network. This is different from a server. While servers can also store data, a server can also run applications.

Obsolete / obsolescence

When a device, software or format can no longer be used because the required supporting hardware, software or operating system is no longer manufactured.

Digital definitions can be found in the Digital Preservation Coalition (DPC). 2023. Digital Preservation Handbook. Glossary <https://www.dpconline.org/handbook/glossary> (Accessed 21 March 2024)

Online data

Data that is stored so it is immediately accessible. For example, data that is stored on a server or network-attached storage (NAS) that a computer can access.

Offline data

Data is stored on media that is not powered on, so the files cannot be accessed until the media is inserted in a drive or turned on.

Transcoding

A digital to digital conversion of one type of encoded data to another (video or audio).

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Disaster risk management to safeguard archives and access to information

Today, more than half of memory institutions worldwide lack a comprehensive Disaster Risk Management (DRM) plan. This concerning situation is often due to a persisting gap in skills and resources. The lack of disaster preparedness and the accumulation of related challenges pose a threat to the preservation of unique records and their accessibility, particularly in the most vulnerable contexts.

In response to this concerning situation, UNESCO has produced a Training Toolkit covering a range of essential themes in relation to DRM for documentary heritage and digital collections, with the intention of supporting institutions that may be seeking to address this critically important subject.

The originality of the UNESCO DRM Training Toolkit lies in its practicality as a curriculum, comprising a comprehensive set of six training modules covering, in turn, risk assessment, collection policies, storage management, community involvement, digital preservation, and climate change. It also presents 23 informative case studies from Asia and the Pacific, offering stewards of memory institutions robust examples and scenarios from over a dozen countries.



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