Monitoring and mapping cultural heritage - Toolkit for community engagement

(2025) Monitoring and mapping cultural heritage – toolkit for community engagement

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Content

Introduction to Monitoring and Mapping Toolkit

Cultural heritage and climate change adaptation

Both material and immaterial heritage may be endangered by the consequences of climate change. Rising sea levels, land erosion, and a warmer and damper climate with bigger risks of mould and rot are some of the risks facing archaeological sites, historical buildings and cultural landscapes. Not to mention changed vegetation which may affect biological heritage and lead to overgrown sites and changed landscapes. A changed climate may also change how certain places are used and understood, meaning that customs, stories, beliefs and traditions connected to these places are at the risk of being lost.

Given these risks, there is a growing need to understand how they might affect both material and immaterial heritage in our local communities as well as safeguard heritage at risk of being lost. Digital tools may be of use in both these processes, as well as in bringing the public's attention to climate change and its impact on heritage.

Who is the toolkit for?

This toolkit is directed towards organisations who are interested in the cross section of heritage, climate change adaptation, and digital tools. It is mainly written for organisations with small resources in terms of staff and funding – the focus is on solutions which are cheap and easily managed. We also envision that the theme of community engagement is particularly important for small organisations. Communities are key to preserving and communicating the heritage of their regions and to understanding the risks of climate change.

The toolkit is directed towards organisations who are at a starting point in your work, both in terms of the theme of climate change, and digital tools. We intend to keep information on a basic level, and to guide you in figuring out your needs and possibilities.

The toolkit is mainly written with heritage organisations in mind, even though we believe that the content can be used by climate action organisations who are new to the theme of heritage and cultural environments.

What does the toolkit consist of and how is it supposed to be used?

We know that when you work with community engagement, there is no one size fits all solution. You must adapt your methods to your own community and context. However, we hope that you can find inspiration and guidance in the methods that we have used and use them as a starting point.

The toolkit consists of two guides:

1. Guide to collect, preserve and communicate intangible heritage
2. Guide to using digital technology to preserve archaeological sites, landscapes and artifact collections.

They can be used independently from each other depending on your interest and needs.

Glossary

AR (augmented reality) is a technology that overlays computer-generated images, sounds, or text onto a user's view of the real world, creating an enhanced, interactive experience.

Citizen science is the collection and analysis of data relating to the natural world by members of the public, typically as part of a collaborative project with professional scientists.

Climate change is the long-term shift in global temperatures and weather patterns, driven primarily by human activities like burning fossil fuels since the 1800s.

Climate change adaptation – In a heritage context, climate change adaptation involves taking measures to try to predict and limit the ways that climate change may cause damage to immaterial and material heritage. Examples of actions may include XX.

Community engagement is a collaborative process of working with groups of people who share an interest or location to address issues that affect them. It involves active participation, dialogue, and decision-making to empower individuals and foster a shared sense of ownership in finding and implementing solutions for community well-being.

Intangible heritage includes traditions or living expressions inherited from our ancestors and passed on to our descendants, such as oral traditions, performing arts, social practices, rituals, festive events, knowledge and practices concerning nature and the universe or the knowledge and skills to produce traditional crafts.

Loss and damage – The process of dealing with the actual effects of climate change on heritage, which may cause permanent damage. Land erosion may for example damage cultural environments and changed vegetation can affect biological heritage and cultural landscapes. Immaterial heritage connected to places may be lost when the places change. Strategies to safeguard heritage at the risk of being lost can include documentation efforts.

Tangible heritage is the physical, touchable legacy of the past, including buildings, monuments, artefacts, and objects that hold historical, cultural, or artistic significance.

VR (virtual reality) is a computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors.

XR (extended reality), is an umbrella term for technologies that merge the physical and digital worlds through computer-generated environments and interactions.

The Case Studies

DACCHE will develop solutions to empower heritage organisations and local communities to motivate behavioural changes and digital action on climate change. Sites from three countries in Northern Europe were used as case studies.

County Donegal, Ireland

In Ireland Donegal County Museum worked at 3 sites along with community groups and interested individuals:

- Inishkeel Island, Portnoo + local group of interested individuals
- McSwyne's Castle, St. John's Point, Dunkineely + Dunkineely Community Ltd
- Portbane/Tonduff, Dunree, Inishowen + West Inishowen History and Heritage Group

Norway and Sweden

- Jämtland county in Sweden and Hansmyra in Trøndelag, Norway.

Case Study - Donegal

Donegal County Museum is part of Donegal County Council's Culture Division and has been in operation since 1987. The Museum collects, records, preserves, communicates and displays the material heritage of County Donegal to the widest audience possible. The Museum cares for a collection of circa 8000 artefacts and communicates with its communities through an active exhibition and events programme.

For the DACCHE project, Donegal County Museum appointed a project facilitator who partnered with 3 local communities to gather heritage information associated with local heritage sites affected by climate change and communicate heritage stories using digital technology.

It was decided that site selection must include a minimum of three sites/groups, each in different county Municipal Districts to achieve greatest geographical spread. To choose the most suitable sites and groups to work with the following selection criteria were used:

Heritage site selection: desirable criteria

1. An archaeological monument/structure/landscape with a coastal and/or riverine geographical location. This will focus project outputs on climate-related issues including but not limited to:
    a. Rising sea levels
    b. Coastal erosion
    c. Sea-water exposure
    d. Extreme storm weather effects (wind, wave)
    e. Sand dune shifting/erosion
    f. Freeze/thaw action
    g. Rising temperatures

2. An established community group with heritage interest/focus within the archaeological monument/structure/landscape geographic locale, that have an active interest in researching, documenting and protecting our Donegal heritage.

3. Diversity of site type across each selected monument/structure/landscape, and in turn diversify the range of climate risks and digital actions that can be applicable to the project.

4. Dramatic and/or remote picturesque and scenic locations, with heritage research opportunities and unique stories to tell.

5. Heritage monuments/structures/landscapes that are located on publicly accessible lands. (In cases of private landownerships, in whole or in part, permissions must be agreed in advance).

6. Opportunities for project collaboration such as:
    a. Statutory/non-statutory stakeholders (future funding opportunities)
    b. Academic research programmes (new approaches and critical thinking)
    c. Museums (artefact assemblages including digitisation)
    d. Natural heritage organisations (to address biodiversity and ecological inputs)
    e. Youth audiences (future advocates)

Sites Chosen

The 3 sites/local communities selected using these criteria were:

1. Inishkeel Island, Portnoo + local group of interested individuals

2. McSwyne's Castle, St. John's Point, Dunkineely + Dunkineely Community Ltd

3. Portbane/Tonduff, Dunree, Inishowen + West Inishowen History and Heritage Group

Following the site selection, the following work was undertaken:

- Group meetings and site visits.

- Collation of research materials on each site

- Liaison with statutory agencies and other organisations working at the sites and sharing of information

- Organisation of a programme of community events

- Production of 3 short videos which tell the story of each site including interviews with community members.

The three sites chosen for the case study in Donegal:

Cross slabs on Inishkeel Island, Portnoo

McSwyne’s Castle, St. John’s Point, Dunkineely

Portbane/Tonduff, Dunree, Inishowen

Case Study - Norway/Sweden

For the Swedish and Norwegian case study in the DACCHE project, we chose to include several subcases. One heritage site, Hansmyra, was chosen to function as a symbol for the wider context of the mountainous region on the border between Norway and Sweden. In a workshop series developed by the project, Berättarland, the participants got to choose their own cases and sites that they wanted to focus on in the Jämtland regional context. Here we give an overview of the regional context which the cases are part of.

The Jämtland county is characterized by the mountainous region on the border to Norway. It is one of Sweden's most sparsely populated counties with only 2,6 inhabitants per square km. The climate is somewhat harsh, with snowy winters and tempered summers. Tourism is a major industry in the county, and the mountains have attracted tourists for more than a century.

Some of the main effects of climate change on the county is warmer winters and more rainfall during both winter and summer. The weather becomes more instable with big fluctuations in temperatures resulting in unstable snow layers and ice layers on lakes and rivers, unstable seasons, and more extreme weather.

The mountains have for long been portrayed and viewed as a landscape untouched by human interference, and as wilderness. It is however a landscape which has been shaped by people for a long time, who have used it for their livelihood. For the Sámi, Europe's only recognized indigenous people, the mountains have been the grounds for hunting, fishing and nomadic reindeer husbandry. Reindeer herding is one of the activities which has shaped the environment the most as the reindeers' grazing has kept the grounds open and fertilised them resulting in a specific flora. In recent years, new archaeological findings suggest that there has been a Sámi presence since at least 800 AD.

Reindeer husbandry is still practiced within the Sámi community today and is a crucial part of the Sámi culture and society. However, the practice is being hemmed in by a growing exploitation pressure from the tourism industry, wind power development, and large-scale forestry in the lowlands.

The reindeer husbandry practices are also already highly affected by climate change – unstable winters makes it more difficult for the reindeers to find pasture under hard layers of snow crust, and lakes and rivers which are normally used as transportation routes in the lowlands become more insecure as the ices gets instable. During the summer, high temperatures and heat waves causes the reindeers to focus on keeping cool rather than grazing which make them less prepared for the winter months. The increasing unpredictability of the seasons also makes it more difficult to time important occasions such as calving.

The site of Hansmyra is located at the border between what is now Sweden and Norway. This cultural landscape has been shaped by reindeer husbandry for a long time. Archaeological findings suggest that it has been used for reindeer husbandry since 800 AD, and it is still used today. Apart from the importance of the site in a Sámi context, Hansmyra is also closely connected to the Karl Johan's Way, a hiking trail which has been used for centuries by pilgrims on their way to Trondheim, traders and others traveling between Sweden and Norway. This is

hence a place with rich layers of history and stories. The Hansmyra site was mainly used when we developed the digital exhibition Gaskelaante which we will dive deeper into in the toolkit on how to create climate stories.

Hansmyra, on the border of Jämtland county (Sweden) and Trøndelag county (Norway)

Guide to Collecting, Preserving and Communicating Intangible Cultural Heritage

Introduction

The aim of the DACCHE project was to empower local communities by building their capacity to understand, respond, communicate, and facilitate mitigation of the impacts of climate change and green transition on cultural landscapes and heritage sites. This involves using a community engagement approach, as well as visualising local impacts on sites, landscapes, artifacts, and intangible practices through transmedia storytelling and digital solutions.

Storytelling is a powerful means of forging connections, capturing history and preserving our rich cultural heritage. Storytelling helps us preserve old cultures and build new cultures. Stories serve as vessels for cultural heritage, preserving traditions, customs, and values passed down through generations. They also provide a sense of identity and belonging.

This toolkit will describe the methods we used to gather stories and how we communicated those stories using digital technology. It will also highlight some of the learnings from the project.

Collecting and Preserving

Storytelling is a powerful means of forging connections, capturing history and preserving our rich cultural heritage. Storytelling helps us preserve old cultures and build new cultures. Stories serve as vessels for cultural heritage, preserving traditions, customs, and values passed down through generations. They also provide a sense of identity and belonging.

In the DACCHE project we used two methods for collecting and preserving stories associated with the Case Studies:

- Story Gathering workshops which consisted of the following:
    - Train the Trainer workshop
    - Story gathering workshop
- Storytelling course

Story gathering, Dunkineely Community Centre, County Donegal, Ireland October 2024

Story Gathering Workshop with Communities:

There were 2 elements to the Story Gathering work that we undertook in the project:

- **Train the Trainer**
- **Story Gathering**

Train the Trainer Workshop

Train the Trainer workshops can be delivered to community groups or heritage organisations and will give them the skills to undertake story gathering workshops. The format of the workshop is as follows:

1. **Introduction to the Workshop (5 minutes)**
    - Purpose: Explain the importance of the upcoming community workshop and the role of facilitators in preserving the oral histories of the site/area.
    - Overview: Briefly outline what will be covered in this training session.
2. **Understanding the Role of a Facilitator (5 minutes)**
    - Facilitator's Role: Discuss the responsibilities of a facilitator, focusing on creating a comfortable and respectful environment where participants feel safe to share their stories.
    - Key Skills: Highlight the essential skills of a facilitator—active listening, empathy, patience, and the ability to guide conversations gently.
3. **Techniques for Eliciting Stories (10 minutes)**
    - Open-Ended Questions: Teach participants how to use open-ended questions to encourage storytelling (e.g., "Can you tell me about a time when the landscape changed in a way that impacted you?").
    - Memory Prompts: Introduce memory prompts to help trigger specific recollections (e.g., showing old photographs, mentioning specific local events, or referencing traditional practices).
    - Respecting Silence: Explain the importance of allowing pauses and giving participants time to think and reflect before responding.
    - Handling Sensitive Topics: Provide guidance on how to navigate sensitive topics that may arise, ensuring that facilitators are prepared to respond with care and respect.

4. **Active Listening and Identifying Key Themes (5 minutes)**

    - Active Listening: Emphasize the importance of listening attentively without interrupting and being fully present during the storytelling.
    - Identifying Themes: Teach participants how to identify key themes or patterns in the stories, such as recurring references to specific locations, events, or emotions.
    - Taking Notes: Offer tips on how to take concise notes while listening, without disrupting the flow of the conversation.

5. **Practical Recording Techniques (5 minutes)**

    - Recording Best Practices: Provide a brief overview of how to use audio or video recording equipment, including tips for positioning the recorder, ensuring good sound quality, and obtaining consent for recording.
    - Note-Taking Tips: For those who will take notes instead of recording, discuss strategies for capturing the essence of the story accurately.
    - Preserving the Context: Encourage facilitators to note any contextual information (e.g., the environment, mood, or physical reactions) that may add depth to the stories being recorded.

6. **Role-Playing Exercise (10 minutes)**

    - Mock Storytelling Session: Divide participants into pairs or small groups for a role-playing exercise. One person will act as the storyteller (an older community member), and the other(s) as the facilitator.
    - Practice Facilitating: Each facilitator will practice guiding the conversation, using open-ended questions, and recording the story.
    - Feedback Session: After the role-play, regroup to share experiences, discuss challenges, and provide feedback. Facilitators can reflect on what worked well and what could be improved.

Story Gathering Workshop

Story gathering workshops can be delivered by community groups or heritage organisations. The aim is to work with people to capture living memories for instance - How is climate change affecting their life? The format of the workshop is as follows:

1. **Welcome and Introduction (10 minutes)**

    - Introduction to the Workshop: Briefly explain the purpose and importance of capturing these stories.
    - Community Bonding: Encourage a sense of unity and importance in preserving their shared heritage.

2. **Setting the Stage (10 minutes)**

    - Icebreaker Activity: Start with a gentle icebreaker that encourages participants to share a fond memory of their youth, particularly focusing on the landscape or natural environment.
    - Introduction to Storytelling: Explain the value of storytelling in preserving history and how their stories will contribute to the community's legacy.

3. **Guided Storytelling Sessions (45 minutes)**

    - Group Discussions: Break participants into small groups, each led by a facilitator. Ask them to share their experiences related to the following themes:
        - The Changing Landscape: How has the physical environment of the place changed over the decades?
        - Weather and Climate: What shifts in climate and weather patterns have they noticed?
        - Community and Traditions: How have the local traditions and ways of life adapted to these changes?

    - Listening and Recording: Use audio recorders, note-takers, or video to capture these stories. Ensure that all voices are heard and respected.

4. **Sharing and Reflection (15 minutes)**

    - Group Sharing: Bring everyone back together and invite each group to share one or two key stories or insights from their discussions.
    - Reflection: Discuss the importance of these stories in understanding the heritage and changes which have taken place.

5. **Story Preservation (10 minutes)**

    - Explaining the Next Steps: Inform participants how their stories will be used as a Heritage Archive. Discuss the importance of these stories in preserving the heritage of the place.

Note: If you are recording it is important to consider the ethical and legal requirements involved in the planning, collecting and processing of oral histories. Further information on oral history recording can be found at https://oralhistorynetworkireland.ie/practical-guidelines

Storytelling course - Berättarland

In Jämtland we introduced the topic of storytelling through a workshop series which we named Berättarland. The workshop series meant that a group of participants coming from both the civic sector as well as the public sector met over the course of seven months to tackle the subject of climate change and cultural heritage through the lense of storytelling.

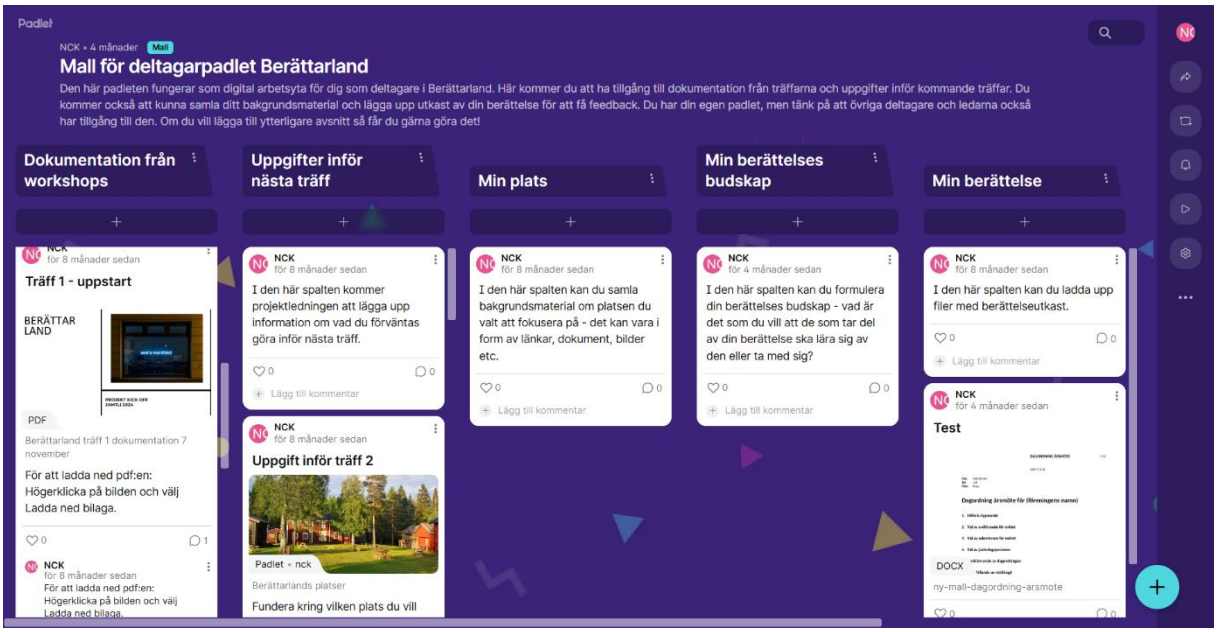
We gave the participants the task of creating a story using the themes of climate change and cultural heritage as a starting point. We wanted them to take a place in the Jämtland county as the starting point for their story. They could choose the place themselves. We said from the start that the stories would be recorded as part of the workshop series, and that they would get to perform the stories at a storytelling evening. We also emphasised that they would be free to use the stories in their own organisations as they saw fit.

The persons forming the team behind Berättarland were Kevin Denham from Jamtli and Helena Kuhlefelt from NCK, representing the project partners. We took help from Johan Eriksson, facilitator at Hyper Island who helped us with general workshop layout and facilitation. Iñaki Escudero became our main guest lecturer, who made workshops on storytelling as well as individual coaching with the participants. We also invited other experts on climate change, archival sources and transmedia storytelling.

We used our respective networks to find participants and had 11 participants in the start. Not all participants could participate in all workshops, and in the end five stories were recorded and one more was written down.

The idea of the workflow was that we would spread out the workshops over a couple of months' time to give the participants time to do research and to write their stories. We wanted to consider that the participants had a lot of other things on their schedules and to make sure that they could participate anyway. We did however get the feedback that it might have served some better with a shorter time span, see more below.

We set up a Padlet for each participant, a sort of digital mind map tool to help them to collect their sources but also as a guiding tool in the creative process. They were also asked to upload drafts of their stories to their Padlet to get peer feedback from each other. This was also where the notes from each workshop were shared with the participants. The Padlet did not require any login, as we wanted to keep it as simple as possible for the participants to use it. We can now see that some of the participants used their Padlet a lot, while others did not.



Session overview

Agenda meeting 1 - Introduction (Early November 2024)

- Introduction of the day and the project
- Two things that has shaped me
- Cultural heritage as a tool for change
- Storytelling as a tool for change
- Workshop overview and expectations

Agenda meeting 2 – Climate change and archival sources (Late November 2024)

- Lecture: Climate change in Jämtland
- Group discussion on the lecture's themes
- Sharing session about possible places and themes
- Lecture: Archives and what to find in them
- Workshop: Interpreting archival sources
- Preparations for next workshop

Workshop on interpreting archival sources

Agenda meeting 3 – The basics of storytelling (January 2025)

- Check-in – tell the story about how you got your name
- Reflection about the storytelling task
- Lecture: Storytelling techniques
- Workshop: What kind of moral or message do we want to convey?
- Lecture: Building a story
- Workshop: Storyboarding
- Check-out

Agenda meeting 4 – Storytelling deep-dive (March 2025)

- Reflection: What do you like best about your story so far? And what are you struggling with?
- Exercise: Tell your story as it is now in 2 minutes – let the others share their thoughts: What's clear, what do you want to know more about, what do you like about the story.
- Exercise: Summarise your story in one word

- Exercise: The main character's transformation
- Summarising

Digital coaching sessions

Agenda workshop 5 – Transmedia storytelling (April 2025)

- Workshop: Where are we at?
- Workshop: Listen, mirror, deepen
- Workshop: Integrate feedback into your story
- Lecture: Transmedia storytelling
- Discussion: How can the use of different media deepen my story?

Digital coaching sessions

Agenda meeting 6 (June 2025)

- Recording of stories in pod studio (done individually)

Agenda meeting 7 - Conclusion (June 2025)

- History map
- Feedback on the process

How to use the stories

As explained before, it was up to the participants to use the stories as they saw fit in their organisations. One example of how the stories have been used so far is the story called “En öde fäbodvall berättar” (The tale of an abandoned summer farm) which was written by Inga-Lis Bromée from the village of Klövsjö. She wrote her story as a way of commemorating the practice of fäbod summer farming, a form of farming where animals are taken for summer grazing to a summer farm at a long distance from the main farm. The story entailed both descriptions of the everyday life at the summer farm as well as folklore and beliefs connected to the fäbod practice. It ended with looking into the future, where she saw hope in people returning to the fäbod practices, laying a foundation for more sustainable and small-scale farming practices in the future.

The story was audio recorded, but Inga-Lis wanted to visualise it as well. This was done through making a slideshow using photographs of fäbod farming from the local heritage association (hembygdsförening in Swedish) of Klövsjö as well as Jamtli’s collections.

This story alongside with the slideshow was then used as a starting point for a storytelling evening, where Inga-Lis and the local heritage association invited locals to come and take part of the story as well as listening to a fäbod farmer of today talking about how he is keeping the culture alive. Afterwards, the participants were invited to tell their own stories either among each other around their tables or to the whole audience. The event gathered 30 participants (in a village with about 340 inhabitants) who happily shared their stories with each other. The local heritage association are now in the starting phase of collecting more stories about fäbod farming which they will use together with their rich photo archives related to fäbod farming.

Learnings

Donegal Case Study - What did we learn?

Working with communities is both rewarding and challenging. Often those you are working with are acting in a voluntary capacity because they have an interest in and love of their area or their heritage or their culture or their community – or all of these. While you may be working on the project full-time, they may have full-time jobs and/or other responsibilities. A project will always take longer than you plan. The community members you started working with may not be the people who are with you at the end. You are not always the only expert in the room – and in fact may not know anything about the history or heritage of this community – but they do. Any work with communities will have its challenges but for successful community co-production to work there are some key points to consider.

1. Remember people have lives. Everything will take longer than you planned.

2. Research, research, research. Know your subject backwards but remember you are not the only expert in the room.

3. Proper Preparation Prevents Poor Performance. Make sure you are prepared for the journey – even if this means bringing the right footwear.

4. Find your gatekeepers. Find those who can introduce you to the community. Knock on doors, make phone calls, have as many cups of tea or coffee as necessary!

5. Whoever gets involved, they are the right people. If it's only 5 or if it's 50, they are the right people.

6. Be human. Smile, make small talk, pass compliments, drink lots of tea or coffee.

7. Expect the unexpected, it will happen.

8. Plan proactively, practice reactively. Improvise and don't worry

9. It's OK to be attached. And it's OK to care

10. Listen. Above everything else, listen.

And perhaps most important: The journey that you take with the community is as important - if not more so - than the end result

Jämtland case study – What did we learn?

The workshops became a space for exploring your creativity in a new way, but also to raise important and existential questions about where we are going as a society. How does climate change affect us as individuals and as society, and how can we deal with these changes both socially and culturally? There was an eagerness among the participants to share with each other, and we felt that these kinds of spaces are quite rare today. To explore how to create these kinds of spaces for our communities feels like an important role for museums or other heritage organisations in the light of climate change.

Do not be afraid of narrowing down the task you give to the participants. We wanted initially to leave it up to the participants to decide the format and subject of their story as we wanted to leave room for them to adjust to their own needs within their organisations. However, the feedback afterwards was that this had made the task feel a bit unclear and too big for some. To give restraints can also spark creativity!

There are pros and cons to keeping the process short and intense, or longer with more time for reflection and time to work independently. Think about what suits the reality of your participants and what you try to accomplish.

Resources

1. A Guide to Community Coproduction - https://cinecommunities.org/pdf/CINE%20Co-production%20Field%20Manual.pdf

2. The Oral History Network of Ireland https://oralhistorynetworkireland.ie where you will find:

    - a list of material for Recommended Reading to help you learn more about oral history.
    - a Sample Interview Pack with examples of Participation and Recording Agreements, which can be downloaded.
    - a list of Oral History Organisations

Guide to using digital technologies to preserve landscapes, archaeological sites and artifact collections

Introduction

In the DACCHE project we utilised several new and emerging digital technologies to enable communities to preserve and communicate their heritage. With these tools heritage organisations can create richer, more engaging content that immerses audiences in their heritage like never before. There are a range of advantages and disadvantages to using technology within the cultural heritage sector that need careful consideration to ensure it enhances rather than detracts from the visitor experience. Here we will explore photogrammetry and how it can be utilized by heritage organisations. Later in this toolkit we outline the advantages and disadvantages.

Photogrammetry

Photogrammetry is the science and technology of obtaining reliable information about physical objects and the environment through the process of recording, measuring, and interpreting photographic images. It involves capturing multiple photographs of an object or a scene from different perspectives and using them to create accurate and detailed 3D models. It opens up exciting possibilities for creating immersive and experiential stories by transforming physical objects and environments into detailed 3D models. Here's how:

Bringing Objects to Life

Photogrammetry allows us to capture physical objects in fine detail. By photographing an object from various angles and processing the images to create a 3D model, we can present historical artifacts, or unique objects in a way that allows audiences to explore them from all perspectives. This can be particularly effective in stories about archaeology or cultural heritage within museum exhibits.

Reconstructing Environments

Entire environments can be digitized using photogrammetry, enabling the creation of virtual tours or interactive maps. For example, an archaeologist might capture a historical site or a natural landscape and turn it into a navigable virtual environment. This approach can be used in entertainment, virtual tourism or for educational purposes, allowing audiences to virtually visit locations they might never see in person.

Enhancing Interactivity

By integrating 3D models into digital platforms, stories become more engaging and interactive. Audiences can click, drag, and explore 3D objects and environments directly on a touch screen or in an immersive virtual reality (VR), making the storytelling experience more dynamic. This level of interactivity helps to capture and maintain the audience's attention, making the story more memorable and impactful.

Expanding Storytelling Techniques

Photogrammetry enables the use of augmented reality (AR) and virtual reality (VR) in storytelling. Content creators can design AR experiences where users can place digital objects in their own environment through a smartphone camera or VR experiences where users can immerse themselves completely in a recreated space. These techniques can be used to tell stories in a more immersive and engaging way, whether it's walking through the reconstruction of an ancient city or examining a delicate artifact up close.

Providing Detailed Analysis

The detailed and accurate 3D models produced by photogrammetry can also be used for monitoring and analysis; for instance, to document environmental changes. The data captured during a photogrammetry workflow can be analysed to provide empirical evidence of changes over time.

Enhancing Accessibility

3D models created through photogrammetry can make content more accessible to people with disabilities. For example, interactive models can be used with screen readers or other assistive technologies to provide a richer experience for visually impaired users. This ensures that stories reach a wider audience and can be experienced in diverse ways.

Workflow

Photogrammetry is based on the principle of triangulation. Common points are identified on a subject between multiple images taken from different angles. A line of sight (or ray) is then made between the camera location and the point on the subject. The intersection of these lines of sight (rays) then determines a three-dimensional (3D) coordinate for that point. Repeated for many points, it builds up a collection of points in 3D space (a point cloud) that is then used to create a digital representation of the real-world subject.

Large- and small-scale photogrammetry follow the same basic principles but differ in the equipment and techniques used: the scale of the subject dictates the specific requirements to capture the necessary data.

Large Scale Photogrammetry:

- Typically involves capturing large structures or landscapes.
- Often requires the use of drones to capture images from various angles, especially for areas that are difficult to reach manually, such as rooftops.
- Autonomous drone flying can be used to efficiently cover large areas with overlapping images.
- Requires careful planning of flight paths and settings to ensure adequate coverage and avoid obstacles.
- Example: Reconstructing a house or a landscape using a DJI Mavic Pro 2 drone.

Small Scale Photogrammetry:

- Involves capturing smaller objects, such as a shoe or a piece of furniture.
- Can be done using handheld cameras or mobile devices.
- Requires capturing images from multiple angles with significant overlap to ensure all surfaces are covered.
- May use additional equipment like a ring flash for better lighting or plexiglass to capture the underside of objects.
- Example: Reconstructing a shoe by taking many images from various perspectives using a Sony a6400 digital camera.

Both scales require:

- High overlap (70-80%) between images.
- Proper lighting and camera settings to ensure clear, detailed images.
- Ensuring the subject remains stationary during the capture process.
- Scaling the reconstruction using real-world measurements to maintain accuracy.

Things to consider

These practical tips should help you get started with photogrammetry and ensure you capture high-quality images for accurate 3D models:

Capturing Images

- Overlap: Ensure each photo overlaps with the previous one by about 70-80%. This helps the software stitch the images together accurately.
- Lighting: Use consistent, even lighting to avoid shadows and highlights. Overcast days or midday sun can be ideal for outdoor shoots.
- Camera Settings: Use a high resolution and a low ISO to minimize noise. Keep the aperture consistent across all shots.
- Stability: Keep the camera steady and avoid moving the object or camera during the shoot. A tripod and turntable can be very helpful.
- Angles: Capture images from multiple angles, including top, bottom, and sides. This ensures a complete model.
- Avoid Reflective Surfaces: Shiny or reflective objects can cause issues with photogrammetry. If possible, cover them or use a matte spray. Alternatively, use cross-polarization techniques to minimise or eliminate reflections.

Processing Images

- Software: Use photogrammetry software like Agisoft Metashape, RealityCapture, or Meshroom.
- Importing: Import all your images into the software and let it align them automatically.
- Point Cloud: Generate a point cloud from the aligned images. This is a 3D representation of the object.
- Mesh Creation: Create a mesh from the point cloud. This forms the basic 3D model.
- Texturing: Apply textures to the mesh using the original images. This gives the model a realistic appearance.
- Refinement: Refine the model by removing unnecessary points and optimizing the mesh.

Summary

By leveraging photogrammetry, storytellers can create richer, more engaging content that immerses audiences in the story like never before. Whether it's for news reporting, educational content, or cultural preservation, the use of 3D models can significantly enhance the way stories are told and experienced.

Communicating Cultural Heritage Stories Using Technology

There are a range of advantages and disadvantages of using technology within the cultural heritage sector that need careful consideration to ensure it enhances rather than detracts from the visitor experience.

Advantages of using technology to communicate cultural heritage:

1. **Enhanced Engagement and Immersion:**
    - Technologies like VR and AR create immersive experiences that emotionally connect visitors with cultural heritage, making the experience more engaging and memorable.
    - Gamification elements and interactive storytelling can stimulate curiosity and active participation, enhancing the educational value of exhibits.
2. **Accessibility and Inclusivity:**
    - Technology can make cultural heritage more accessible to people with disabilities and those who cannot visit in person, through virtual tours and online experiences.
    - It allows for the democratization of cultural heritage, enabling a broader audience to experience and appreciate it.
3. **Educational Value:**
    - VR and AR can provide new ways of teaching and deepening visitors' understanding of cultural heritage by offering detailed reconstructions and interactive learning experiences.
    - Gamified learning can make the educational process more engaging and effective, especially for younger audiences.
4. **Preservation and Documentation:**
    - Digital technologies can help in the preservation and documentation of cultural heritage by creating detailed 3D models and virtual reconstructions, which can be used for research and restoration purposes.
    - They provide a means to safeguard cultural heritage against physical deterioration and loss.
5. **Attracting New Audiences:**
    - The use of cutting-edge technology can attract new visitors, particularly younger generations, and change the perception of museums from old-fashioned to innovative and exciting.
    - Interactive and immersive experiences can increase visitor numbers and engagement.

6. **Detailed Reconstruction:**
    - Technologies such as VR and AR can vividly reconstruct and restore intricate details of cultural heritage, making it more accessible and engaging.
7. **Dynamic Inheritance:**
    - These technologies can help in promoting the dynamic inheritance of cultural heritage by making it more relatable and connected to daily life.
8. **Interdisciplinary Collaboration:**
    - The integration of immersive technologies attracts attention from various disciplines, fostering interdisciplinary research and innovation.
9. **Customized Experiences:**
    - Technology can personalize visits and offer customized experiences.
10. **Reliability:**
    - VR is considered robust and reliable, having been in the market for a while.

Disadvantages of using technology to communicate cultural heritage Preservation:

1. **High Costs:**
    - The initial investment in equipment, software, and maintenance for technologies like VR and AR can be prohibitively expensive for many non-profit organizations.
    - Additional costs include hiring and training staff to manage and operate these technologies.
2. **Technical and Practical Issues:**
    - Technologies like VR can cause practical issues such as dizziness, motion sickness, and hygiene concerns, limiting the time and quality of usage.
    - Technical malfunctions and the need for regular updates and maintenance can disrupt the visitor experience.
3. **Lack of Social Interaction:**
    - VR experiences are often designed for single users, which can be isolating and hinder social interaction during museum visits.
    - This can be a significant drawback for museums that focus on family learning and group experiences.
4. **Accessibility Challenges:**
    - While technology can enhance accessibility, it can also pose challenges for users with certain disabilities, such as visual or hearing impairments.
    - Age restrictions on the use of VR by children can limit its applicability in family-oriented museums.
5. **Content and Cultural Sensitivity:**
    - Ensuring the cultural sensitivity and accuracy of digital reconstructions and narratives requires in-depth research and collaboration with cultural experts.
    - There is a risk of oversimplifying or misrepresenting cultural heritage, which can lead to a loss of authenticity and meaning.
6. **Distraction from Physical Objects:**
    - The use of technology can sometimes overshadow the actual museum objects and narratives, leading to a focus on the technology itself rather than the cultural heritage being presented.
    - Balancing the use of technology with the preservation of the physical experience is crucial to avoid diminishing the value of the original artifacts.

7. **Superficial Applications:**
    - Current applications often rely heavily on technological novelty without deep integration of content, leading to a lack of enduring content appeal and user engagement.
8. **Privacy Concerns:**
    - As interactive technology applications deepen, privacy issues and user engagement present new ethical and legal challenges.
9. **Technological Constraints:**
    - Access to, and competence within, both hardware and software can restrict the creation and presentation of virtual environments.
10. **Graphics Quality:**
    - The quality of VR graphics may not always meet the high aesthetic standards required, especially in art museums.
11. **Exhibition Flow:**
    - Managing queues and dealing with malfunctions can disrupt the flow of exhibitions.
12. **Technology Acceptance:**
    - Not all visitors are enthusiastic about the use of emerging technologies in museums, requiring a balance to meet diverse visitor needs.

Summary

In summary, while technology offers significant advantages in enhancing engagement, accessibility, and educational value in cultural heritage preservation, it also presents challenges related to cost, technical issues, social interaction, and cultural sensitivity. Careful integration and thoughtful design are essential to maximize the benefits and mitigate the drawbacks.