



Universiteit
Leiden
The Netherlands

Community Archaeology and Climate Change

Gunnarsdóttir, Klara Ósk

Citation

Gunnarsdóttir, K. Ó. (2023). *Community Archaeology and Climate Change*.

Version: Not Applicable (or Unknown)

License: [License to inclusion and publication of a Bachelor or Master Thesis, 2023](#)

Downloaded from: <https://hdl.handle.net/1887/3639993>

Note: To cite this publication please use the final published version (if applicable).

Community Archaeology and Climate Change

Klara Ósk Gunnarsdóttir

Community Archaeology & Climate Change

Klara Ósk Gunnarsdóttir s34227722

Course and course code

Prof.dr. J.C.A. Kolen

Leiden University, Faculty of Archaeology

Leiden, final version

Table of Contents

<i>Table of Contents</i>	3
<i>Table of Figures</i>	5
<i>List of Tables</i>	6
<i>Chapter 1: Introduction</i>	7
1.1 Archaeological heritage, coastal erosion and climate change	7
1.2 Community archaeology	10
1.3 Aim of the project and research questions	12
1.4 Structure of the thesis.....	12
<i>Chapter 2: Methodology</i>	13
2.1 General approach	13
<i>Chapter 3: Case Study 1: The Nunalleq Project</i>	16
3.1 Introduction.....	16
3.2 Methodology	18
3.3 Evaluation	21
3.4 Discussion.....	24
<i>Chapter 4: Case Study 2: SCAPE & SCHARP</i>	26
4.1 Introduction.....	26
4.2 Methodology	27
4.3 Evaluation	28
4.4 Discussion.....	32
<i>Chapter 5: Case Study 3: HMS Florida</i>	33
5.1 Introduction.....	33
5.2 Methodology	34
5.3 Evaluation	36
5.4 Discussion.....	38

<i>Chapter 6: Case Study 4: Australian Indigenous Rangers</i>	39
6.1 Introduction.....	39
6.2 Methodology.....	40
6.3 Evaluation.....	44
6.4 Discussion.....	46
<i>Chapter 7: Case Study 5: ALeRT & ALOA</i>	48
7.1 Introduction.....	48
7.2 Methodology.....	49
7.3 Evaluation.....	52
7.4 Discussion.....	54
<i>Conclusion</i>	56
8.1 Comparison of the sub(components) of the model.....	56
8.2 Lessons learned from the case studies.....	60
<i>Abstract</i>	64
<i>Reference List</i>	65

Table of Figures

Figure 1 Map of Case Studies. By Klara Ósk Gunnarsdóttir.....	7
Figure 2 The Sonkoré Mosque in Timbuktu. The drain pipes show the height difference between 1952 and today. Figure by A. Ould Sidi.....	8
Figure 3 Shows a Map of Alaska. The Figure in the Map Shows the Nunalleq Site in 2017, South View (Knecht & Jones, 2019, p. 38).	16
Figure 4 Shows a Sod House Interior with Clickable Objects Within the Scene and the Artefact Viewer with a Selection of Soundbite Icons on the Computer-Based Learning Program (Watterson & Hillerdal, 2020, p. 205).	19
Figure 5 Showing Wooden Artefacts Being Conserved at the Nunalleq Culture and Archaeology Center (Knecht & Jones, 2019, p. 47).	22
Figure 6 Showing a Map of Scotland. The Figure in the Map Shows Volunteers Excavating the Meur Burnt Mound (Dawson, 2016, 01:51).	26
Figure 7 Showing the Review Process Workflow (Hambly, 2017a, p. 10).	27
Figure 8 Shows Volunteers Excavating Meur Burnt Mound (Dawson, 2016, 11:27).....	32
Figure 9 Shows a Map of Florida. The Figure in the MAP Shows Archaeologists from BAR Map Stratigraphy Exposed After Erosion (Miller & Murray, 2017, p. 251).	33
Figure 10 Shows HMS Florida Volunteers Monitoring Sanchez Mound (Miller & Murray, 2017, p. 247).	36
Figure 11 Shows a Map of Australia. The Figure Shows an Eroding Coastline on an Indigenous Protected Area (Carmichael, 2018b, p. 129).....	39
Figure 12 Showing Map of Guadeloupe. The Figure Shows Archaeologists Excavating the Cemetary of Anne-Sainte Marguerite, in the Municipality of Moule. By Patrice Courtaud (ALOA, n.d.b).....	48
Figure 13 SHowing the Tip of Pointe des Châteaux, town of Saint-François. By Edwige Motte (ALOA, n.d.b).....	52

List of Tables

Table 1 Showing the Component Scores for the Case Studies	15
Table 2 Showing the Nunalleq Project Component Score.....	23
Table 3 Showing the SCAPE & SCHARP Component Score	30
Table 4 Showing the HMS Florida Component Score.	37
Table 5 Showing the Australian Indigenous Rangers Component Score	45
Table 6 Showing the ALeRT & ALOA Component Score	53
Table 4 Showing the HMS Florida Component Score.Table 6 Showing the ALeRT & ALOA Component Score.....	53
Table 7 Showing the Component Score of the Case Studies.....	56
Table 7 Showing the Component Score of the Case Studies.....	56

Chapter 1: Introduction



Figure 1 Map of Case Studies. By Klara Ósk Gunnarsdóttir

1.1 Archaeological heritage, coastal erosion and climate change

The Intergovernmental Panel on Climate Change continues to predict major changes in the climate by the end of this century due to continued greenhouse gas emissions. These emissions are predicted to lead to increases in extreme weather events and its variability, such as global monsoon precipitation, very wet and very dry weather, heatwaves and tropical cyclones. With the rising temperatures, the likelihood of irreversible loss increases, with extinction of species, loss in biodiversity in forests, coral reefs and especially in Arctic regions. With warming levels between 2 °C and 3 °C, the ice sheets of Greenland and West Antarctica will continue to disappear leading to a rise in global sea levels. However, due to the unpredictability of ice sheets, these predictions should be considered with caution (IPCC, 2023, pp. 13-18). These diverse changes will cause significant damage to the world's archaeological heritage in a multitude of ways. For this study, the definition of archaeology and archaeological heritage includes archaeological sites, structures and materials as an integral part of the historical cultural landscape. Fluctuations in temperature can have a disastrous impact on the stratigraphy of archaeological sites. For an example, the 2 °C temperature increase is leading to thawing of the 1,500-year-old Scythian burial mounds in the southern Siberian Altai Mountains. The

mosques of Timbuktu are under threat of sand encroachment and desertification, which justified Timbuktu's inscription on the List of World Heritage in Danger between 1990 and 2005. To combat the sand encroachment, the walls of the Sankoré mosque was raised perpetually raised and today a 1 m difference can be seen in Figure 2, between the height of the roof in 1952 and its height today. The temperature in Timbuktu increased by 1.4 °C in the 20th century, with droughts having a serious impact and decreasing rainfall will only further enhance the desert encroachment (Colette, 2007, pp. 62-63, 74-75).

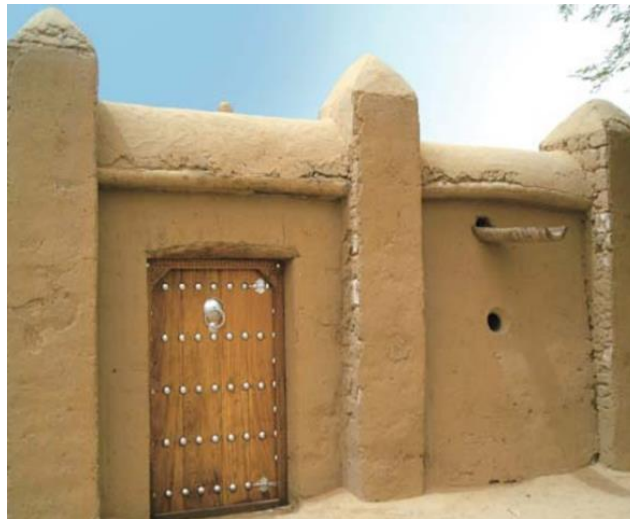


Figure 2 The Sankoré Mosque in Timbuktu. The drain pipes show the height difference between 1952 and today. Figure by A. Ould Sidi.

The climate change of the Anthropocene has led the International Council on Monuments and Sites (ICOMOS) to declare a Climate and Ecological Emergency for archaeological sites and heritage (ICOMOS, 2020). Coastal erosion is a major threat to cultural heritage sites, even without influence from climate change. However, with exacerbation from climate change, rising sea levels become an increasingly prominent threat to cultural heritage situated at coastlines around the world (Rick & Fitzpatrick, 2012, p. 135; Erlandson, 2008, pp. 167-168). Erosion can destroy coastal heritage gradually over some decades or all at once with single a catastrophic event (Dawson et al., 2020, pp. 8281-8282). For an example, the UNESCO World Heritage archaeological sites of Sabratha and Leptis Magna on the Libyan coast are already being critically affected by erosion and flooding which is caused by surges and long-term sea level rise (Reimann et al., 2018, pp. 1-3). Severe storms can erode tens of meters in one event, like the 2005 storm where as much as 50 m of the sandy coast at the island Baile Sear in the Outer Hebrides of Scotland retreated overnight. This led to structures collapsing, cultural material being dispersed along the beach and archaeological deposits becoming exposed (Dawson, 2015b, pp. 90-95).

Some early studies focused on enumerating possible impacts climate change could have on particular types of archaeology (e.g., Chapman, 2002; Daly; 2011), while some also considered global response strategies (Cassar et al., 2006). Only recently have discussions shifted from possible impacts to possible methods of mitigation and adaptations. However, as clearly stated by Hambrecht and Rockman (2017), the impacts of climate change are happening so quickly and within so many different physical and socio-cultural contexts, that it is impossible for any single organization or discipline to tackle (p. 627) For this reason, many researchers have developed various methods and options in engaging the public's help through community-based and citizen science research, including community archaeology and community-based heritage projects to better preserve our cultural heritage.

In most countries, there is no legal responsibility to manage and protect sites threatened by climate change. The international gold standard in recent decades has been to protect sites *in situ*, or to preserve it in place for research at a later date. Most often, commercial developments threaten this preservation resulting in the *polluter pays* principle, where developers must pay for any archaeological rescue fieldwork needed (Council of Europe, 1992). This becomes rather complicated in the face of climate change when there is no legal responsibility to manage a site and not one or even a set clearly identifiable polluters disrupting *in situ* preservation. When *in situ* preservation is still possible, one option may be to stop the decay and construct either seasonal or permanent barriers. These types of shelters have been constructed all around the world, like the sea wall at Skara Brae in the Orkney islands for an example (Jones et al., 2019). However, these types of barriers need to be regularly maintained, are unsustainable and expensive. The case studies of SCAPE in Scotland (Hambly, 2017b), the Heritage Monitoring Scouts in Florida (Miller & Murray, 2018) and the ALERT and ALOA Project (Motte et al., 2022a) in France and Guadeloupe enlisted the public's help to monitor and document the erosion process at archaeological sites that are being severely impacted. However, when *in situ* preservation is no longer possible, an *ex situ* approach, to fully excavate and document all findings, may be the next viable option as was the case for the Nunalluq Project (Knecht & Jones, 2019), but these are extremely dependent on the available access, funding, expertise and time. Relocating sites is another option, like in the case of the Cape Hatteras lighthouse in North Carolina (Kowlok, 2015), but extremely uncommon. The last possible option was chosen by the Australian Indigenous Rangers (Carmichael, 2018b, pp. 141-145) which is to simply accept the loss and let it go, where it is accepted that natural processes will destroy the site, with some form of documentation taking place before allowing natural processes to destroy or remove the resource.

1.2 Community archaeology

Community archaeology is a form of archaeology that gives the public an opportunity to co-design and take part in the archaeological research of their community and reflect upon it, with the aim to create and preserve certain values within the community in relation to its heritage and the past. These values can be both tangible (physical) or intangible (social, psychological), educational, economic, political or cultural/ethnic (Simpson & Williams, 2008, p. 75; Simpson, 2008, p. 3-4). The growth of socio-political discussions within archaeology in the 80s and 90s (e.g., Pinsky & Wylie, 1989; Gero, 1985; Franklin, 1997) prompted archaeologists to reconsider the ethical responsibility of the discipline when practicing archaeology within communities they themselves are not a part of. This is particularly prevalent in indigenous areas, where indigenous rights movements forced archaeologists to consider their indigenous communities' rights to have access to and be a part of the conversation regarding their heritage (Scarre & Scarre, 2006, pp. 8-9; Simpson, 2008, p. 4). Community archaeology focuses on establishing a two-way dialogue between the archaeologist and the community to create new ways of interpreting the past that is more relevant to the community itself, instead of solely contributing to academic interests (Marshall, 2002, p. 218; Simpson 2008, p. 5).

In recent years, community archaeology has claimed to have many benefits, such as a powerful educational tool, for both younger and older audiences. By including the public in various stages of research, like for an example in excavations, it brings an engaged social and emotional attitude to the subject in a way other forms of interpretive media, such as exhibitions and educational books, cannot (Davis, 1997, p. 87). Community archaeology believed to have the ability to precipitate social cohesion, by bringing the community together through a sense of ownership and increasing their sense of place and belonging (Simpson & Williams, 2008, p. 77, Simpson, 2008, p. 6; Henson, 2011, pp. 121-122). Numerous archaeologists have also proven the benefits of involving the public in the investigation/excavation process, which inspires site preservation (e.g., Hoffman, 1997, p. 74-75; McManamon, 2000, pp. 13-14). Simpson & Williams (2008) point out the enormous benefits of including the community in the archaeological process, as it creates awareness and provides economic support and social acceptance (p. 73).

When questioning if the theoretical values community archaeology claims to achieve is successful in practice, Simpson (2008) found that the reason it is so difficult to meet the theoretical aims of community archaeological projects was related to the balance of power

exchanges and different goals that the community and the archaeologist might have. Another need was to find sustainable long-term approaches where, as soon as the excavation was done, interest quickly faded (pp. 13-14). Simpson (2009) found that short-term funding was the reason community archaeological projects often failed to balance the wishes of all stakeholders and that lack of sustainability hindered the project's ability to generate and fulfill the desired values. Nevertheless, the research showed the clear potential community archaeology has in impacting the community's understanding of archaeological research and values, but that it was necessary for archaeological theories to be re-assessed in line with the society's values interweaving with professional views and values (p. 263, 285-289).

Belford (2014) believes that for a community archaeology project to have a long-term value within the community and the archaeological profession, it must attain three types of sustainability (p. 27):

- 1) *Social sustainability*, relating to the „harmonious evolution of civil society, fostering an environment conducive to the compatible cohabitation of culturally and diverse groups“ but also “encouraging social intergration” and “improvements in the quality of life for all segments of the population” (Stren & Polèse, 2000, pp. 15-16);
- 2) *Intellectual sustainability*, defined as “ability to actually do archaeology properly” (p. 33) and are split into two main areas: *practice* and *theory*;
- 3) *Economic sustainability*, referring to how the project will receive long-term funding (p. 38).

Economic sustainability is the hardest type to achieve and therefore it is crucial to make it clear to all stakeholders involved why training volunteers is important and why it is vital to meet professional archaeological standards during post-excavation. Most community archaeology relies on public funding, state agencies, local authorities or grants from Research Councils, which have so far been sustainable. Other community archaeology projects have been fortunate enough to be privately funded and some have achieved funding by charging volunteers to participate. However, that option would be incredibly hard to achieve for smaller projects (p. 39).

Community archaeology projects offer communities to engage with their archaeological heritage and gain archaeological knowledge, a range of new skills, develop social connections and gain a new fresh outlook on their community and the world. In return, the community can offer archaeologists an alternative perspective and enhance public support for its archaeological heritage. Without the public's support, archaeology as a discipline will soon dwindle.

1.3 Aim of the project and research questions

The aim of this thesis is to present examples of archaeologists and the community coming together in different parts of the world to tackle the effects climate change is having on their cultural heritage in their respective regions and bring awareness to creative ideas already in development. The effects of coastal erosion on the archaeological heritage and historical cultural landscape, due to climate change are studied and more specifically what available options there are.

The main research question is: What solutions are being developed to tackle threats archaeological sites (recorded or unrecorded) and heritage is under and are they effective, sustainable and deployable worldwide?

There are four sub-questions that will be considered as well:

1. What are the main threats to archaeological sites and heritage due to climate change?
2. Which regions are threatened the most?
3. How sustainable are these solutions in the long-term?
4. Can we implement these solutions in other regions facing similar problems?

1.4 Structure of the thesis

To answer this question, I will compare five case studies of community archaeology projects, comparing each to the list of five category components and their sub-components individually before comparing together. In the end I will determine the most common factors attributing to a successful community archaeology project and discussing how we can enlist the public's help in our battle against climate change.

Chapter 2: Methodology

2.1 General approach

The general methodology adopted is a comparative case-study approach, based on literature study. The case-studies chosen are:

1. Nunalleq “The Old Village”, based in Alaska,
2. the SCAPE & SCHARP projects, based in Scotland,
3. Heritage Monitoring Scouts in Florida,
4. Australian Indigenous Rangers’ Management of Cultural Sites in the Northern Territory of Australia,
5. the ALeRT project in France,
6. the ALOA project, based in Guadeloupe

The case studies examined here were chosen because they were some of the most widely cited examples in available literature on archaeological sites under threat by the impacts of climate change and where archaeologists came up with community-based options, falling under the definition for Community Archaeology. The case studies were also chosen to be geographically diverse, in order to highlight the similarities and the differences of how climate change impacts archaeological sites and how effective community archaeology is in different types of communities and different parts of the world (climate, landscape, ecosystems). They also clearly state that the main reason for the project’s establishment is a result of climate change. In this analysis the various methodologies utilized are examined and compared on the basis of the five component categories.

In this thesis the various methodologies for community archaeology in the case study projects are examined. To make a comparison of each case study, certain key phrases and aspects were chosen and then compared systematically. Each study is individually summarized in a table along with their key components and their sub-components. The components were inspired by the methodology composed by Moser et al. (2002) which was then adapted to fit the context of this thesis. As Moser et al. (2002) mentions, the components are not meant as a “recipe” for conducting community archaeology, but are rather meant to provide some “useful ideas for others seeking to undertake work of this nature” (p. 229). By highlighting these factors, a detailed picture can be drawn of the components that appear most frequently as can

be seen in Table 1 and should potentially be made priorities when community-based archaeological research in the context of climate change is considered.

<p><u>1. Two-way Communication</u></p> <ul style="list-style-type: none"> » A clear two-way partnership that is based on open communication and cooperation between the researchers and the local community through every stage of research continuously leading to full collaboration in interpreting and presenting the project to the larger public. » Communication and partnerships are initiated before the start of the project and the community is involved in defining the questions.
<p>1.1. Regular project updates and reports available to the wider public</p> <ul style="list-style-type: none"> » Regular project updates and reports for the wider public informing them of the structure of the project, how it develops and any news related to the project compiled in collaboration with the local community. » Serves to remind the community of the project and its importance. » Updates are plain and easy to understand to make the results accessible to all stakeholders.
<p>1.2. Transparency and willingness to share information regarding the project.</p> <ul style="list-style-type: none"> » Including the project's initial goals and limitations, in case something proposed is not possible. » Acknowledging barriers and difficulties when it comes to misrepresentation, cultural differences, colonialism, especially concerning past encounters with archaeologists/researchers in the area to help reduce any negative views that may have been conjured by previous research.
<p><u>2. Active Participation</u></p> <ul style="list-style-type: none"> » Members of the community receive training and participate in every stage of the project. » Including the project's initial goals and limitations, in case something proposed is not possible.
<p>2.1. Untrained participants receive formal training to instill proper research methods, identification and work ethics among the community.</p> <ul style="list-style-type: none"> » Field et al. (2000) has shown that giving the members of the community formal training gives them a better understanding of archaeology, its objectives and inspires them to relay information to the general public regarding community's heritage and the project itself (p. 43).
<p>2.2. Allows for diverse areas of community participation so there is something to do for any member of the community who wishes to contribute.</p> <ul style="list-style-type: none"> » Every member of the community should be given the opportunity to participate in the conservation of their cultural heritage.
<p>2.3. Working with the same individuals (when possible)</p> <ul style="list-style-type: none"> » Ensures long-term incentive of the project
<p>2.4. Partnering with local organisations</p> <ul style="list-style-type: none"> » These organisations reach a wider audience and are likely to draw attention to the project, bringing in more members of the community. » Ensures the archaeological heritage is integrated into future management.
<p><u>3. Educational Resources</u></p> <ul style="list-style-type: none"> » Researchers and the local community facilitate and collaborate in ensuring fully accessible and easily operated educational resources for the wider public.
<p>3.1 Allowing the public access to all reports and official documents regarding the project.</p>
<p>3.2. Involving the younger members of the community to inspire an appreciation of their cultural heritage</p>
<p><u>4. (Re)presentation by the Community</u></p> <ul style="list-style-type: none"> » Members of the local community have full or at least partial control of communicating and representing the project to the wider public to share its significance to the region and effects of climate change.

» Ensuring (culturally) appropriate methods for presentation.
4.1. The community has a clear role in terms of organisation, representation and outreach of the project along with the control of a specific site where applicable.
» If the local community is not involved in the presentation of their heritage, their sense of ownership is lessened and subsequently, their willingness maintain it lessens.
4.2. Encourages the development of facilities where the community's history and cultural heritage is shared and the impacts of climate change.
5. Sustainability
» The project is sustainable and can be maintained for the next years providing the community's willingness to do so.
5.1. Collaboration between researchers and the local community to ensure the sustainability of the cause.
5.2. Encouraging and advocating to ensure protection of unknown sites and further sites that may need protection.

Table 1 Showing the Component Scores for the Case Studies

		NUNALLUQ PROJECT	SCAPE & SCHARP	HMS FLORIDA	AUSTRALIAN INDIGENOUS RANGERS	ALeRT & ALOA
1. TWO-WAY COMMUNICATION						
	1.1.	x	x			x
	1.2.	x	x			x
2. ACTIVE PARTICIPATION						
	2.1.	x	x		x	x
	2.2.	x	x	x	x	x
	2.3.	x				x
	2.4.	x	x	x		x
3. EDUCATIONAL RESOURCES						
	3.1.	x	x			x
	3.2.	x				
	3.3.	x	x			x
4. (RE)PRESENTATION BY THE COMMUNITY						
	4.1.	x			x	
	4.2.	x	x			
5. SUSTAINABILITY						
	5.1.	x	x	x	x	x
	5.2.	x		x	x	x

Chapter 3: Case Study 1: The Nunalleq Project



Figure 3 Shows a Map of Alaska. The Figure in the Map Shows the Nunalleq Site in 2017, South View (Knecht & Jones, 2019, p. 38).

3.1 Introduction

The Arctic is one of the most affected regions feeling the repercussions of climate change, having warmed at a rate of more than twice the global average since the 1980s. Although some changes in the climate have natural causes and variations, current trends clearly indicate that human actions have become a dominant component in these changes (ACIA, 2004, p. 8; Bindoff et al., 2013 pp. 868, 887-891). Melting glaciers, rising sea levels and air temperatures, permafrost thaw and fluctuations in precipitation are just some of the changes affecting the natural system in the Arctic (ACIA, 2004, pp. 2-8) and causing physical and chemical damage to archaeological sites and materials which, up until now, have been remarkably well preserved. The archaeological and geological record of the Arctic regions are gradually decomposing with the retreating permafrost, and we are running out of time to research and recover data from these sites.

Increased thawing of permafrost along coasts and rivers is bringing significant erosion and flooding, causing the ground to become unstable and unpredictable which has become a serious threat to Native Alaskan coastal villages (Bennett et al., 2014, p. 298). In the area, archaeological fieldwork cannot begin until the snow melts away in mid-May, only lasting until torrential winds and rain starts in August, leaving little time to research the landscape. It can also be very challenging to identify archaeological remains visually with ground surveys and

aerial photography (Lim et al., 2020, pp. 340-341), making it extremely difficult to carry out landscape-scale archaeological fieldwork in the area and the reason a vast amount of Alaskan territory is still unsurveyed with the archaeological record remains mostly uninvestigated. The need to document the archaeological record has become increasingly more critical as time runs out (Hillerdal et al., 2019, p. 5).

The Yukon-Kuskokwim (YK) Delta in southwestern Alaska is the traditional homeland of the Yupiit, or the Yup'ik Eskimos, with the current population of more than 23,000 people, the largest Native population in Alaska. The Yupiit live in 56 villages of between 200 and 1,000 persons each (Fienup-Riordan & Reardon, 2012, pp. 10-11). The village of Quinhagak lies on the southern edge of the YK Delta and is the home of approximately 700 people, almost all of them Alaska Natives. The village is only accessible by plane or boat to the other communities, so supplies have to be flown or expensively shipped by barge (Hillerdal et al., 2019, p. 6).

When the residents of Quinhagak noticed artefacts washing up on the beaches of the Bering Sea in 2007, Quinhagak's Alaska Native Claim Settlement Act (ANCSA) Village Corporation, Qanirtuuq Inc., contacted both state and federal archaeologists of Alaska for help but they, like many others, are underfunded and stretched to their limits, tasked with managing enormous sections of land (Knecht & Jones, 2019, pp. 26-27). This situation is not unique only to Alaska, but includes the entire Arctic and beyond. Few government agencies have funds or programmes designated to archaeological mitigation and excavations in permafrost are expensive and arduous but is currently the only applicable solution for deteriorating archaeological deposits (Hollesen et al., 2018, p. 583). After the state and federal archaeologists' rebuffal, archaeologist Richard Knecht and Warren Jones, then President of Qanirtuuq Inc., began discussions on a working partnership. It was decided that community-based efforts to recover artefacts from the eroding sites would be the best way to honour the past but also an effective way to engage the younger generation in learning about their cultural traditions, heritage and preserving it, a concern widely shared by other villagers in the Yup'ik region (Knecht & Jones, 2019, pp. 26-27).

The site is located about 5 km south of Quinhagak and had been known by the locals who called it "Nunalleq", meaning "The Old Village" in Yup'ik. Nunalleq's main occupation transpires during one of the coldest phases of the Little Ice Age, a global climatic cooling period, during the 16th-17th centuries (Mann, 2002, p. 505). Therefore the site has also the potential to give researchers a unique insight into previous adaptations to climatic stress, informing current and future responses to climate change.

3.2 Methodology

Fieldwork has taken place at Nunalleq since 2009 and in the next 10 years the volume of the site deposits removed exceeded 750 m³. Along with small travel grants from the University of Aberdeen and the Carnegie Trust for the Universities of Scotland, the project was largely supported by the village corporation, showcasing the communities huge commitment to the project. Knecht & Jones (2019) emphasise the importance of the unwavering support from the people of Quinhagak and Qanirtuuq Inc., with the village providing cars and vans to transport crew members and gear, office buildings and the community centre for housing, local carpenters setting up sifting screens, shelters, the outbuilding and stairways at the beginning and taking it back down at the end of every season. The crew received help from volunteers and the staff of Qanirtuuq Inc. during the shudder-inducing and difficult process of removing the backfill of the site at the beginning of each excavation and then refilling it again at the end, as well as volunteering at the excavation itself or during field laboratory work while others would show up to offer warm soup and smoked salmon (pp. 30-31).

The community-based nature of the project has not only directly facilitated the research – archaeological fieldwork would be neither possible nor desirable without the support of the local community in Quinhagak – but has also greatly enriched it. (Knecht & Jones, 2019, p. 45)

Sites like Nunalleq are casualties of today's climate change, the communities engagement with the research and Yup'ik's reconnection to its heritage can act as a tool to discuss and even mediate some of the socio-cultural impact climate change has on the next generation.

An archaeological Yup'ik heritage and an appreciation for the complexity of Yup'ik culture has taken root in Quinhagak and the project has gained attention both locally and in nonacademic media with the neighboring villages looking to start similar projects. Furthermore, the archaeological remains and artefacts have encouraged the people to interact with the heritage and inspiring the community to reintroduce traditional Yup'ik dancing to Quinhagak (Hillerdal, 2013). The Nunalleq Culture and Archaeology Center opened its doors in 2018 and there the majority of the collection of approximately 100,000 artefacts recovered from the excavation have been returned since their initial study and conservation in Aberdeen, Scotland. It is also being used to teach traditional Yup'ik arts, skills, dancing and songs (Knecht & Jones, 2019, pp. 36, 45-48). Multiple educational and public outreach projects have been

created beyond the Nunalleq project. Oral tradition has been a longstanding tradition in many cultures (Anderson, 2010, pp. 277-281), including Arctic and Subarctic regions (Mustonen & Lehtinen, 2013, pp. 49-51), and with this in mind an interactive computer-based learning package was released called Nunalleq: Stories from the Village of Our Ancestors, narrated by Quinhagak residents and archaeologists to be distributed throughout the Lower Kuskokwim school district (Watterson & Hillerdal, 2020, pp. 198-200). A scene from the learning program can be seen in Figure 4. The short film *Children of the Dig* was released in 2018 about the project has been widely distributed on national film festivals and won an award in 2019 at the Alaskan Film Awards (Branstetter, 2018). Nunalleq was also chosen among the top 100 archaeological discoveries in National Geographic in the year 2021. (Lawler, 2021). Quinhagak has already lost large amounts of land used for corporations, infrastructure and cultural sites to erosion, with some villages being forced to relocate to further inland (Agnew Beck Consulting, 2011) and being described as “the world’s first climate change refugees” (Pilkington, 2008).

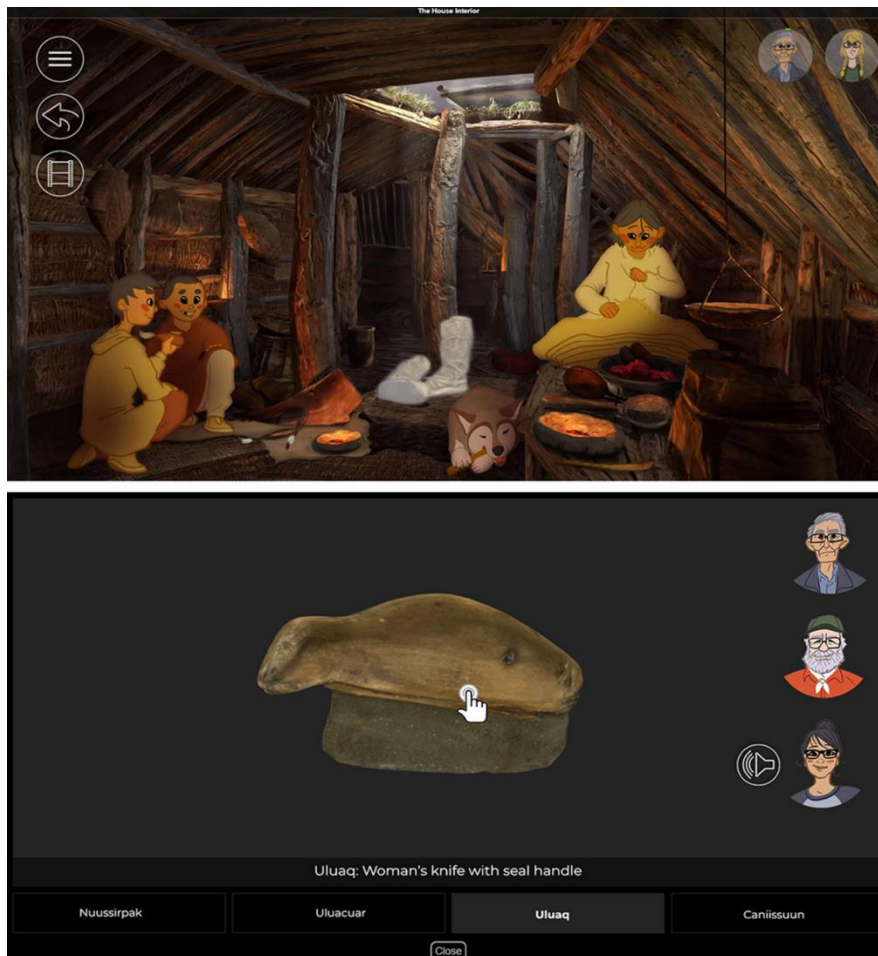


Figure 4 Shows a Sod House Interior with Clickable Objects Within the Scene and the Artefact Viewer with a Selection of Soundbite Icons on the Computer-Based Learning Program (Watterson & Hillerdal, 2020, p. 205).

In an effort to assess the damage on cultural lands caused by coastal and riverine erosion, Lim et al. (2023) have employed high-precision measurement technology and archival spatial datasets to demonstrate this fast pace of erosion. Qualitative data was gathered during interviews with Elders during community meetings in 2021 and 2022 and after the sites were located with GPS, a preliminary database became available for the community to use in 2022 (p. 1-5). An interesting note is that these sites are situated either close to or on ANSCA allotments (land that is administered by village corporate leadership or subdivided into individual native allotments as a result of the 1971 Alaska Native Claims Settlements, (Hanson, 2007, pp. 2-3)) which contain knowledge about the environment that has been passed down through generations in the Yup'ik community. Many place names can be a record of how to obtain important knowledge needed for survival, like for an example *Meqsarturyaraq* (engl. “place where one gets freshwater”), or how best to navigate the landscape, like for an example the Agalig river has bends that are extremely difficult to navigate because of low water levels and are thus named to warn travellers of the waterways, like *Angyarrairyaraq* or “the place where boats barely get through”. Therefore, the place names and allotments offer a physical connection to the past for many Yupiit in the YK Delta and an important part of their cultural heritage. In order to mitigate some of the damage, Yup'ik coastal villages can receive grants from the government but they have to pay external consultants to quantify and map the impact of the recent erosion in order to qualify, and the cost following these environmental reports can be high (Lim et al., 2023, pp. 4-5). Using precise, high-resolution geospatial datasets from archival satellite images and drone (UAVs) surveys, Lim et al. (2023) were able to show how erosion has damaged the allotments in recent decades by introducing a new Python script to use in geographic information systems (GIS) software to make the process of aerial imagery interpretation automatic. Other communities that need to conduct similar analyses to produce documentation of erosion damage can now do so with this method. The local residents contributed to this project during community meetings to determine which areas should be examined and during GIS-based interviews where GIS layers of specific allotments in Quinhagak's Traditional Land Use Area (TLUA) were assessed along with composite orthomosaics and UAV footage. Preliminary findings were presented during meetings with community leadership for additional feedback (pp. 6-7).

Lim et al. (2023) have shown that the allotments within Quinhagak's TLUA have experienced increased coastal and riverine erosion since 1976, forcing barges to traverse increasingly shallower waters at the risk of being stranded ashore. Along with having a severe impact on the health and safety of Alaskan native communities, erosion is causing irrevocable

damage to their traditional cultural and ecological knowledge. The authors also hope to inspire a dialogue between Alaska Native communities and lawmakers in order to compensate Native allotment owners, by allowing them to redefine the allotment boundaries while taking the impact of erosion into consideration (pp. 15-16).

3.3 Evaluation

The Nunalleq Project shows a clear two-way partnership between researchers and the community of Quinhagak as can be seen in Table 2 through every stage of the project and they continue to be an integral part of research in their area, like for an example the research conducted by Lim et al. (2023). Researchers also provide regular updates regarding the project throughout its blog, discussing the upcoming/concluding fieldseason (Gleason, 2019) showcasing the project's finds (Hillerdal, 2014) and the impact climate change is currently having on Alaska (Hillerdal, 2020). The residents of Quinhagak have frequently volunteered their time not only with the excavation itself, but also in the field lab with many volunteers volunteering on a yearly basis (Knecht & Jones, 2019, Hillerdal et al., 2019, p. 31), while some were regularly employed as camp managers during the course of the project (Sloan, 2021, p. 71). Lim et al. (2021), believes that "...fieldwork should always be done in conjunction with community volunteers, which empowers them with the technical skills needed to protect cultural landscape and allows them to direct heritage protection efforts with their own voices and protection" to avoid creating an imbalance when community-based knowledge is shared outside of the Indigenous context (p. 346). A unique aspect of the Nunalleq Project is their dedication to teach and encourage the next generation to participate. The schoolchildren regularly visit the excavation when it coincides with the school term and during the summer, sessions have been arranged at the local school and lab to teach the children archaeology (Hillerdal, 2019, p. 9). Several workshops have also been organised to teach the children practical skills such as carving techniques while simultaneously teaching them about their heritage using the archaeological material found during the excavations (O'Rourke et al., 2018, p. 11).

The Nunalleq Project continues to explore various methods to share the project with the wider public. In 2022 it was announced that they received funding to develop a new digital museum and catalogue for the Nunalleq collection where users will be given the opportunity to interact with a map depicting activities practiced by the people of Nunalleq, such as carving,

hunting, fishing and celebratory activities. The exhibition and catalogue will include over 500 3D scanned artifacts retrieved during the excavation (Watterson, 2022).



Figure 5 Showing Wooden Artefacts Being Conserved at the Nunalleq Culture and Archaeology Center (Knecht & Jones,

The development and opening of the Nunalleq Culture and Archaeology Center in 2018 was an monumental feat for the Quinhagak community. As Sloan (2021) mentions, the leaders of the Nunalleq Project had wanted to house the marvelous collection of artefacts from Nunalleq at the place where they came from, which led to the construction of the Nunalleq

Table 2 Showing the Nunalleq Project Component Score.

		NUNALLUQ PROJECT
1. TWO-WAY COMMUNICATION		
	1.1. Regular project updates and reports made available to the wider public	X
	1.2. Transparency and willingness to share information regarding the project	X
2. ACTIVE PARTICIPATION		
	2.1. The community is continuously kept in the center of the project	X
	2.2. Untrained participants receive formal training to instill proper research methods, identification and work ethics among the community	X
	2.3. Allows for diverse areas of community participation so there is something to do for any member of the community who wishes to contribute	X
	2.4. Working with the same individual (when possible)	X
	2.5. Partnering with local organisations	X
3. EDUCATIONAL RESOURCES		
	3.1. Allowing the public access to all reports and official documents regarding the project	X
	3.2. Providing full access to find database where appropriate	X
	3.3. Involving the younger members of the community to inspire an appreciation of their cultural heritage	X
4. (RE)PRESENTATION BY THE COMMUNITY		
	4.1. The community has a clear role in terms of organisation, representation and outreach of the project along with the control of a specific site where applicable	X
	4.2. Encourages the development of facilities where the community's history and archaeological heritage is shared along with the impacts of climate change	X
5. SUSTAINABILITY		
	5.1. Collaboration between the researchers and the local community to ensure the sustainability of the cause	X
	5.2. Encouraging and advocating to ensure the protection of unknown sites and other sites that may need protection	X

Culture and Archaeology Center. The interior of the building was made “in the Yup’ik style” by local builders and team members of the Nunalleq Project assisted with loading the artefacts into the cabinets and drawers before the big potluck opening the next day as depicted in [Figure X](#) (p. 43). By developing cultural centers Indigenous people reclaim control of their heritage and educate the wider public about Indigenous cultures and the issues they have experienced in the past but also the current issues of climate change. An example of this can be seen in Australia, where Keeping Places or Cultural Centers are developed by their local Indigenous people to house artefacts, educate, conduct research programs, host exhibitions and also provide options for employment and a meeting place for the community. This has also become a huge part of the reconciliation process between researchers and Indigenous people (Kelly & Gordon, 2002, pp. 164-165).

Residents of Quinhagak are considering the sustainability of the project and their cultural heritage with an “ecotourism” model. According to Sloan (2021), lead researchers Knecht and Hillerdal, came up with a program in the fieldseasons of 2017 and 2018 for untrained volunteers to pay a fee to learn about the archaeology of Nunalleq and take part in the excavation, leading to more awareness. The fee would go to further funding to support the preservation of the over 100,000 artefacts found during the Nunalleq Project and support the sustainability of the project and the village (p. 72).

3.4 Discussion

Archaeologists in Alaska have no chance of assessing the multitudes of archaeological sites quickly eroding away in the Arctic state without any support from the local population. Hillerdal et al. (2019, p. 13) appreciates that climate change might very well be the key to focalizing archaeology in Alaska. The melting permafrost renouncing its protective cover over artefacts might just be the motivation needed for other indigenous communities and archaeologists to join hands, with neighbouring villages already showing interest in starting similar projects.

The Nunalleq Project and the fantastic archaeological collection it has produced have sparked an interest in archaeology, previously absent in the region. Key to this interest is a combination of direct engagement and power sharing in all aspects of the work – highlighting that an archaeological project is important to a community only as long as it concerns them. It should be the task of any archaeological project to address both scientific

and local community priorities. Indigenous communities and archaeologists are natural and most effective allies in the race to preserve our collective heritage from the threats posed by global warming (Hillerdal et al, 2019, p. 13).

When the Nunalleq Archaeology Project started in 2009, it was unique to Yup'ik Alaskan communities. Over a decade later, the archaeological presence in Quinhagak continues through excavations, processing, conservation and in 2018 the Nunalleq Culture and Archaeology Center was opened, housing the over 100,000 artefacts that have been found (Knecht & Jones, 2019, pp. 26-27). Despite great challenges, the Native communities of Alaska have shown remarkable resilience in the face of climate change and erosion. The success and scale of the project can be directly credited to the residents of Quinhagak and when the excavation Nunalleq ends, the effects of it will continue throughout the region as other communities look for ways to preserve their cultural heritage.

Chapter 4: Case Study 2: SCAPE & SCHARP



Figure 6 Showing a Map of Scotland. The Figure in the Map Shows Volunteers Excavating the Meur Burnt Mound (Dawson, 2016, 01:51).

4.1 Introduction

The archaeological heritage on the coastline is one of the most vulnerable resources disciplines under threat by climate change. Rising sealevels, coastal erosion and storm surges have begun to destroy invaluable coastal archaeological sites (Erlandson, 2008, pp. 167-169; Fitzpatrick et al., 2015, pp. 16-19). All parts of the Scottish coast are experiencing sea level rise and it is expected to rise between approximately 12 and 18 cm by the 2050s, increasing the likelihood of flooding threatening assets and buildings around Scotland and contributing to erosion. Along with sea level rise, flooding has increased in frequency caused by storm events, overtopping seawalls and threatening coastal communities (CCC, 2021, pp. 2-3, 13).

At the forefront of this problem is the Scottish Coastal Archaeology and the Problem of Erosion Trust or SCAPE which is a charity that focuses on remains threatened by coastal erosion and works with the public on the archaeology of Scotland's coasts. Their projects center

around community involvement and local volunteering to research, rescue, interpret and highlight the coastal heritage on the coasts of Scotland (SCAPE, 2017).

Among SCAPE’s many innovative projects is Scotland’s Coastal Heritage at Risk, or SCHARP. Between 2012 and 2016, the SCAPE Trust recruited and trained volunteers to carry out a national survey of coastal archaeological sites that were being threatened by erosion. The data that was being built upon was from Coastal Zone Assessment Surveys (CZAS) which were commissioned by Historic Environment Scotland in between 1996 and 2010 and managed by SCAPE since 2001. Since the mid-1990s, more emphasis had been placed on understanding the archaeological resources of the Scottish coasts and the threats they face from coastal processes to so that national and regional priorities could be developed. Data on approximately 35 %, or 5,600 km, of Scotland’s 16,035 km long coastline was collected and 11,500 sites recorded, of which 3,768 were deemed to require further work either in the form of monitoring or an active intervention and to rescue information. By standardising the records and adding class value to sites, and focusing on the threat of erosion, the number of sites at risk was reduced from 3,768 to 1,115 and 322 of these received the highest priority scores for further action. Because the project was a desk-based analysis and collected by different organisation over a long period of time, a re-visit and review of condition and status was recommended for every high priority site. That is where SCHARP came in (Hambly, 2017a, pp. 1-5).

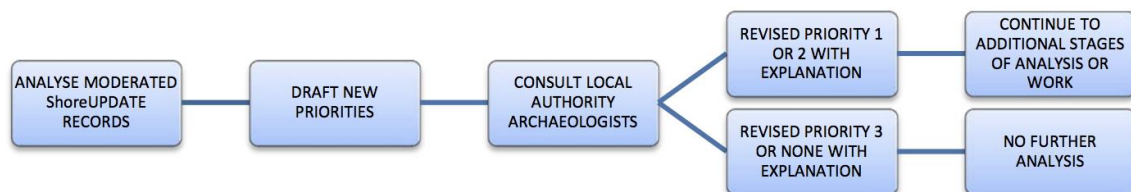


Figure 7 Showing the Review Process Workflow (Hambly, 2017a, p. 10).

4.2 Methodology

A national project was developed where volunteers were able to update and improve information on eroding coastal heritage called ShoreUPDATE. First, a web-based interactive map was created using existing coastal heritage records, the [Sites at Risk Map](#), which formed the basis of the ShoreUPDATE app. By using this app, the volunteers did not need to own cameras, GPS equipment or even paper maps (Hambly, 2017, pp. 5-6). The updated priority lists are then shared with local authority archaeologists who then continue towards the

additional stages of work or no further actions are no action is taken depending on the revised priority score as shown in Figure 7. From the years 2012 to 2016, 43 training events were held around Scotland by the SCAPE Trust where the project's goals were presented and how the volunteers could use the app and the website while also practicing surveying in the field on site. To maintain consistency in the records the volunteers submitted, eighteen of the training events involved longer periods of field surveys (called ShoreUPDATE focal surveys) so volunteers could enhance the volunteers' archaeological observation and recording skills. In total 404 volunteers trained to become ShoreUPDATE surveyors and by the end of 2016 they had completed 695 days of coastal surveying, submitting 1074 ShoreUPDATE records along with more than 400 new site records (Hambly, 2017b, pp. 5-6).

Another aim of the project was ShoreDIG, where the focus was placed on working with communities to research, excavate and interpret locally valued heritage sites. To only collect information does not save a site and the community acknowledges this. With ShoreDIG, different types of projects are undertaken, along with excavations, filmmaking, traditional surveys and 3D digital recordings (Dawson, Hambly & Graham, 2017, pp. 28-29) 11 of 14 heritage sites threatened by erosion were nominated by communities through SCHARP's volunteer recruitment process. Ten ShoreDIG sites focused mainly on surveying and recording and 4 sites were based on excavation. All of them explored various methods of interpreting the projects, such as making a blog and films. A website was also dedicated to the Wemyss Caves, while the story of Eyemouth Fort shared both on-site and in the museum and the reconstruction and relocation of the Meur Burnt Mound became a visitor attraction at the Sanday Heritage Centre. 486 volunteers contributed over 1,100 days to ShoreDIG activities and were involved in every aspect of the projects, with SCHARP training volunteers in archaeological techniques and practice (Hambly, 2017b, pp. 9-10). "The scale of what was achieved in ShoreDIGs within the four year project period was only made possible because of the local knowledge and support of volunteers." (Hambly, 2017b, p. 10).

4.3 Evaluation

As a result of these projects, new archaeological information has also been discovered. An example of this is the Meur Burnt Mound ShoreDIG project, in Orkney, where the goal was to disassemble previously investigated Bronze Age burnt mound from the beach that had been exposed and destroyed by storms. The recently formed Sanday Archaeology Group wanted to relocate what remained of the site, after its initial excavation in 2005 when it was left intact at

the request of the landowners (Toolis, 2007, pp. 33-36), to their Heritage Center to use as a tourist attraction and create awareness about the damage climate change is having on Scotland's cultural heritage (Dawson, 2015a, p. 258-260). Because of erosion, the site became more accessible than it was in 2005 during the original excavation. A community excavation was organised to uncover in 2014 and move the main components of the site, such as the flagstone walls, a paved passageway and a sunken, stonelined water trough. The erosion gave access to an almost 3 m deep prehistoric well that had inbuilt steps leading to a cistern that held a vast amount of waterlogged organic material, such as seeds, leaves, stems, beetles and snails in remarkable condition. The stonework was transported by local farmers to the Sanday Heritage Center except for the dry-stone walling of the well, which could cause the road to become impair the road, so a replica of the well was built at the reconstruction site. The community took part in the construction in various ways. For an example, stonemasons offered instructions in dry-stone building techniques, the community took part in creating an interpretation board, a local artist painted the burnt mound as what it could have looked like during use. The Sanday Heritage Center also created a display, detailing the erosion of heritage and the story of the Meur Burnt Mound and highlighting sites that were recorded during ShoreUPDATE surveys. The unexpected discovery occurred when the large horizontal slab was removed, which formed the base of the masonry trough. Beneath it, more stonework could be found, prompting the project to plan a second season of community fieldwork in 2015. The wall turned out to be a part of a Neolithic well which contained more organic materials (Dawson, Hambly & Graham, 2017, pp. 30-32). The community project at Meur contained many surprising discoveries and shed important light on environmental change in the past, even though it had been previously excavated and was believed to be in poor condition on the beach. If the site had been allowed to continue to erode and left in the state that it was, the older Neolithic stonework would never have been found and its organic material would have disappeared with the rising sea levels.

SCHARP has aimed specifically to improve information about Scotland's coastal heritage at risk through volunteering, resulting in the development of ShoreUPDATE. ShoreDIG focused on working with the local community in researching and interpreting locally valued heritage sites (Hambly 2017b, p. 4). SCHARP placed a specific aim in working to expand volunteering participation with younger people and new audiences. Surveys showed that this aim proved successful, with 32 % of participants being new audiences and 18 % of participants under the age of 26 of 1150 people. They attribute the project's success to being suitable for families to participate and the various heritage activities appealing to different

interest levels. “Our main aim for our young volunteers, some of whom have challenging daily lives, was for them to take away happy memories, learn something, and plant a seed of interest in heritage” (Hambly, 2017b, p. 17).

Table 3 Showing the SCAPE & SCHARP Component Score

		SCAPE & SCHARP
1. TWO-WAY COMMUNICATION		
	1.1. Regular project updates and reports made available to the wider public	X
	1.2. Transparency and willingness to share information regarding the project	X
2. ACTIVE PARTICIPATION		
	2.1. Untrained participants receive formal training to instill proper research methods, identification and work ethics among the community	X
	2.2. Allows for diverse areas of community participation so there is something to do for any member of the community who wishes to contribute	
	2.3. Working with the same individual (when possible)	X
	2.4. Partnering with local organisations	X
3. EDUCATIONAL RESOURCES		
	3.1. Allowing the public access to all reports and official documents regarding the project	X
	3.2. Involving the younger members of the community to inspire an appreciation of their cultural heritage	X
4. (RE)PRESENTATION BY THE COMMUNITY		
	4.1. The community has a clear role in terms of organisation, representation and outreach of the project along with the control of a specific site where applicable	
	4.2. Encourages the development of facilities where the community's history and archaeological heritage is shared along with the impacts of climate change	
5. SUSTAINABILITY		
	5.1. Collaboration between the researchers and the local community to ensure the sustainability of the cause	X
	5.2. Encouraging and advocating to ensure the protection of unknown sites and other sites that may need protection	X

The SCAPE and SCHARP projects regularly post updates on their blog and encourage anyone who wishes to contribute to sign up for annual coastal heritage surveys, while also making all reports available on their website as can be seen in Table 3 (SCAPE, 2022). They are also known for partnering with multiple local charities, historical societies and administrations (Hambly, 2017a, p. 35; Hambly, 2017b, p. 30). However, the first component category, Two-Way Communication, requires them to establish partnerships with the community before the start of the project, and that could not be seen through the available literature. The other requirement is to be in full collaboration in interpreting and presenting the project to the larger public and even though interviews are conducted with the volunteers describing their experiences with SCAPE and SCHARP, they are directed and produced by a staff member of SCAPE (Freke, 2017). During the SCHARP Project, SCAPE provided training opportunities for all volunteers to instill proper research methods and work ethics amongst the community. As of now, participation is heavily based on participants being mobile to monitor the archaeological sites they are assigned, making it difficult for community members with mobility difficulties or other restrictions to participate. There were also multiple opportunities for the younger members of the community to participate in various ways, such as creating a film about the impacts of climate change on coastal on coastal heritage in Scotland (Hambly, 2017b, pp. 6-7).

The most common problem when conducting a community archaeology project, is how to sustain it for an extended period of time, especially considering the limited amount of timing and funding they often receive. As Belford (2014) points out, “Community archaeology must achieve social sustainability, intellectual sustainability and economic sustainability if it is to be of lasting value both within the archaeological profession and outside of it” (p. 27). He goes further to suggest that, because community archaeological projects are often based on limited timescales and grant funding, communities come up with ways to diversify its funding sources to ensure their sustainability (p. 38). Individual ShoreDIG projects were established with this in mind, and although the community does not have a clear role in the organisation, representation and outreach of their cultural heritage, it was still under the initiative of a local community group, the Sanday Archaeology Group, to relocate the Meur Burnt Mound to Sanday Heritage Center, with the assistance and support of SCAPE as Figure 8 shows. The community continues to ensure the sustainability of the cause, by regularly hosting events, creating online contents, interpretation boards and videos (Dawson, Hambly & Graham, 2017, pp. 30-32).



Figure 8 Shows Volunteers Excavating Meur Burnt Mound (Dawson, 2016, 11:27)

4.4 Discussion

Dawson, Hambly and Graham (2017) attribute SCHARP's success to two decades of work experience, creating connections with various collaborators and protecting Scotland's coastal heritage, and even though SCHARP has ended as a project, the impact it had for almost 500 people in 4 years will remain as a longlasting reminder within the community (p. 32). They continue to add that the considerable amount of the Scottish coast that have not yet been surveyed, would be obtainable by community coastal surveys and continuous ShoreUPDATES. Hundreds of sites would benefit from similar projects, not just at the Scottish coast but around the world. For an example, Heritage Monitoring Scouts Florida, another volunteerred-centred coastal heritage project and the next case study, was inspired SCAPE and the SCHARP project (Miller & Murray, 2018, p. 238). However, in order to apply such an approach in other countries, they would need to adapted to the specific cultural, geographical, demographic, and legal contexts of each country, a process undertaken by the 5th case study, by the ALeRT and ALOA projects. Jensen (2017) mentions an application like ShoreUPDATE would be the ultimate goal for the coastal archaeological heritage of North Slope, the northernmost borough of Alaska, there are a new set of challenges to consider such as limited cellular coverage and United States law restricting site locations to the public (p. 134). This will be further discussed in the next chapter.

Chapter 5: Case Study 3: HMS Florida



Figure 9 Shows a Map of Florida. The Figure in the MAP Shows Archaeologists from BAR Map Stratigraphy Exposed After Erosion (Miller & Murray, 2017, p. 251).

5.1 Introduction

In the state of Florida, effects of climate change mirror those in other countries characterized by coastal habits. Increased flood frequencies are already being felt in the region due to the combined effects of extreme rainfall events and rising sea levels. As the climate continues to get warm, hurricane wind speeds and rainfall rates are likely to increase as well causing major damage to infrastructure. Tropical storms and hurricanes have become intense in recent decades and water supplies, coastal cities and towns and ports are particularly vulnerable to the impacts of storms and sea level rise (Carter et al, 2018, pp. 18-19, 758, 766).

Of the recorded archaeological sites along the Atlantic and Gulf Coast, almost 20,000 currently recorded archaeological sites will be submerged below the sea level by the end of the century if current projections by IPCC (2023) hold according to Anderson et al. (2017, p. 7). This does not include a prediction of the number of sites yet to be recorded. Furthermore, erosion and inundation are not the only threats to these coastal resources, but they will also be threatened by attempts to delay or prevent the coastal loss through infrastructure like sea walls to protect the population and economic assets (Anderson et al., 2017, p. 18).

Like many archaeological organisations around the world, the Florida Public Archaeology Network (FPAN), began turning their attentions to the rising concern of climate change in the last decade. This led to the development of the Heritage Monitoring Scouts (HMS Florida), which began as a series of sea-level rise (SLR) workshops but, under the influence of SCAPE's SCHARP project and other successful FPAN citizen science-based programs like Cemetery Resource Protection Training (Miller, 2015) and Heritage Awareness Diving Seminars (Scott-Ireton, 2011), FPAN launched the Heritage Monitoring Scouts program statewide in 2016, focusing on tracking changes to heritage that was mainly under risk from climate-related threats, such as erosion and sea level (Miller & Murray, 2018, p. 238; Miller & Murray, 2021, para. 1).

5.2 Methodology

In the United States locations of archaeological sites are restricted from public access for fear of looting or damage (Florida Statutes, 2019), unlike the United Kingdom where site locations are public knowledge following Scotland's Land Reform Act of 2003, otherwise known as "right to roam" (Scottish Government, 2005). In Florida, sites are owned by the federal government, various state agencies, county, municipal governments or private land owners and many land managers prefer to restrict access to specific locations either to protect the site from damage or visitors from venturing to potentially unsafe environments. To overcome this, FPAN sends information of safe sites directly to approved volunteers to monitor targeted locations rather than releasing their locations on the website (Miller, 2018, pp. 239-240; Dawson et al., 2021, p. 378). When volunteers monitor a site, they simply fill out a monitoring form, take photos and upload them to the HMS Florida Arches Monitoring Database (Florida Public Archaeology Network, 2020). In the first year 233 volunteers representing 87 communities applied for the programme and submitted 312 monitoring forms, at a rate of 26 sites per month since the launch of the program. In addition to the sites monitored volunteers also reported 19 sites that were not previously listed on the Florida Master Site File (FMSF) (Miller & Murray, 2018, p. 241).

FPAN staff explored various methods of spreading awareness and encouraging the public to participate during the program's first year. The first Tidally United: Cultural Resources Shoreline Monitoring and Public Engagement Summit was planned before they launch of the program, where archaeologists across Florida were invited to present their works. However, when it came closer to launching HMS Florida, the summit's audience became more

community-based instead of being mainly academically-based, with volunteers being invited to participate in the summit. The second day of the summit offered informal tours of selected sites at risk along with workshops (Miller & Murray, 2018, pp. 242-243). In 2017, FPAN staff from different regions in Florida put together a traveling exhibit for Florida Archaeology Month, which is celebrated every March. With the exhibit, FPAN aimed to raise awareness of the effects climate change is having on Florida's archaeology and attract volunteer engagement from across Florida to monitor their respective areas. The original exhibit was organized by the Destination Archaeology Resource Center (DARC) at the FPAN Coordinating Center in the city of Pensacola in Florida, traveling and displayed artefacts Heritage Monitoring Scouts are likely to come across during monitoring activities. The exhibit also contained two portable banners, one defining the problem of climate change to cultural heritage and the other describing the program's process and the tools scouts use for monitoring. Visitors were also able to monitor a mounted iPad that showed the HMS reporting page, where a 3D image of the Shell Bluff Landing site, a dense marine shell midden with evidence of some 6000 years of human occupation, was displayed. The midden is located along the Intracoastal Waterway and suffered extreme damage during Hurricane Matthew in October 2016 and the subsequently Hurricane Irma in September 2017, less than a year later (Miller & Murray, 2018, pp. 243, 249-250).

HMS Florida has grown and can be found in various forms around the state of Florida, for example as an aid for land managers and disaster responders like the Guana Tolomato Matanzas National Estuarine Research Reserve. The Reserve is one of 29 National Estuarine Research Reserves around the United States and covers some 74,000 acres of coastal conservation lands in north-east Florida. With the Reserve, FPAN initiated a pilot programme to monitor sites and record threats and impacts to help the Reserve staff manage their archaeological resources. The Reserve and FPAN co-hosted four training events over 6 months where volunteers were introduced to archaeology, where the importance of site-monitoring was discussed and instructions were given on how to fill out the appropriate forms as can be seen in Figure 10. The training sessions were split into a classroom portion and a visit to an archaeological site. During the classroom portion, volunteers received presentations and hands-on training on identifying the most common artefacts found in the north-eastern region of Florida like ceramics, shells, glass and faunal remains. When the classroom portions of the training events were completed, volunteers visited an archaeological site to practice monitoring, photographing conditions and defining the boundaries of the sites, how to identify various threats and mapping (Miller, 2018, pp. 244-245).



Figure 10 Shows HMS Florida Volunteers Monitoring Sanchez Mound (Miller & Murray, 2017, p. 247).

5.3 Evaluation

The HMS Florida pilot program at the Reserve was a success and became a helpful tool for the Reserve to manage and spread awareness of their archaeological resources at risk due to climate change. Along with tracking changes over an extended period of time, scouts also helped recognize and solve other management issues and assisting the Reserve with disaster responses after two major hurricanes in less than a year, causing severe damage to Shell Bluff Landing, a shell midden in St. Johns County. While scouts evaluate impacts to threats and document cultural resources, Reserve staff were able to address other damage caused by the storms. HMS Florida documented severe site loss which also inspired further studies to be conducted at Shell Bluff Landing shell midden. FPAN and HMS Florida scouts worked alongside Florida Bureau of Archaeological Research (BAR) to map the stratigraphy of the recently exposed shoreline, taking samples of the shell midden and excavating shovel tests to better identify the eastern part of the site. FPAN hopes the project leads to a standard response plan for sites experiencing damage caused by the storms, such as systematic mapping and select sampling at sites under the most threat (Miller, 2018, pp. 252-253). The program was used to document impacts 68 sites might have suffered in the weeks following Hurricane Irma. FPAN expanded its partnerships and created a partnership with the Heritage Emergency National Task Force (HENTF) and were co-funded by the Federal Emergency Management Agency and the Smithsonian Institution, leading to improved storm alerts for cultural heritage sites and training (Miller & Murray, 2019, para. 14). Heritage Monitoring Scouts Florida were given funding from the Florida Department of State Division of Historical Resources and the project plans to monitor 500 sites across Florida and 3D scan at least 12 sites to document baseline levels and show of they change with digital data (Miller & Murray, 2021, para. 15).

FPAN created HMS Florida in response to the depletion of cultural resources by the effects of climate change in the summer of 2016. The public showed a clear interest in helping and in the first year monitored 312 sites. By 2019, over 900 sites had been monitored with more than 600 people signing up to become Heritage Monitoring Scouts and agreeing to the ethics statement that they would do no harm to the sites (Miller & Murray, 2021, para. 1).

Table 4 Showing the HMS Florida Component Score.

		HMS Florida
1. TWO-WAY COMMUNICATION		
	1.1. Regular project updates and reports made available to the wider public	
	1.2. Transparency and willingness to share information regarding the project	
2. ACTIVE PARTICIPATION		
	2.1. Untrained participants receive formal training to instill proper research methods, identification and work ethics among the community	X
	2.2. Allows for diverse areas of community participation so there is something to do for any member of the community who wishes to contribute	
	2.3. Working with the same individual (when possible)	X
	2.4. Partnering with local organisations	X
3. EDUCATIONAL RESOURCES		
	3.1. Allowing the public access to all reports and official documents regarding the project	
	3.2. Involving the younger members of the community to inspire an appreciation of their cultural heritage	
4. (RE)PRESENTATION BY THE COMMUNITY		
	4.1. The community has a clear role in terms of organisation, representation and outreach of the project along with the control of a specific site where applicable	
	4.2. Encourages the development of facilities where the community's history and archaeological heritage is shared along with the impacts of climate change	
5. SUSTAINABILITY		
	5.1. Collaboration between the researchers and the local community to ensure the sustainability of the cause	X
	5.2. Encouraging and advocating to ensure the protection of unknown sites and other sites that may need protection	X

Like some of the case studies, HMS Florida posts updates regarding the project on a dedicated blog, which belongs to the Florida Public Archaeology network. However, there have only been 3 updates and none since 2021 and therefore cannot fulfill sub-component 1.1. HMS

Florida is met with unique challenges when it comes to being able to be completely transparent and regularly sharing information regarding the projects (sub-components 1.1. and 1.2), allowing the public access to all reports, official documents (sub-component 3.1) and finds database (sub-component 3.2), because of the law restricting public access to archaeological sites (Florida Statutes, 2019). Therefore, they cannot receive points for those components. As mentioned in the previous chapter, community participation in HMS Florida is mainly based on participants being completely mobile to monitor the sites and very few opportunities for other methods of participation and there have been no programs established to include the younger members of the community in the project or introduce them to the archaeological heritage of Florida. Similarly to SCAPE's SCHARP project, even though the project is centred around the community and community participation, the organisation, representation and outreach of the program has solely been conducted by the researchers, with the community solely participating as surveyors. HMS Florida conducted training opportunities in tandem with various local organisations, such as Guana Tolomoto Matanzas National Estuarine Reserve and the Florida Fish and Wildlife Conservation Commission for an example (Miller & Murray, 2018, pp. 235, 253). HMS Florida continues to attract more volunteers each year (Miller & Murray, 2021, para. 1), spreading awareness of the impacts of climate change to Florida's cultural heritage and ensuring its long-term sustainability.

5.4 Discussion

By partnering with other organizations like SCAPE, FPAN managed to overcome challenges and develop solutions to our common ever-approaching annihilation. We no longer have the luxury of gradual or independently developed solutions and it is becoming increasingly important to develop ways to include the public in research. A apt solution to both problems has been found by SCAPE and FPAN, to enlist the local community to record and monitor coastal heritage sites. Nevertheless, this case study gives a glimpse into some of the challenges that can occur when adapting methods to other countries. FPAN managed to overcome the issues related to site locations by sending locations to approved volunteers (Miller & Murray, 2018, p. 240). The fear of sites being looted if locations are made more widely available is valid. However, Dawson et al. (2020) argue that "In the light of the eventual destruction of some sites, it may worth risking some threatened sites in order to save others" (p. 8285).

Chapter 6: Case Study 4: Australian Indigenous Rangers



Figure 11 Shows a Map of Australia. The Figure Shows an Eroding Coastline on an Indigenous Protected Area (Carmichael, 2018b, p. 129).

6.1 Introduction

The climate change impacts Northern Australia is vulnerable to include sea level rise, extreme precipitation events that exacerbates inland flooding, increasing extreme temperatures rainfall events and subsequent storm surges (Watterson et al, 2015, pp. 20, 26-27, 34). Since national records began in 1910, Australia's climate has warmed by 1.4 ° C and every decade has been warmer than the one before since 1950. Australia's warmest year on record was in 2019, which lead to the worst bushfire season on record where 33 individuals died as a direct result of the bushfires, 19 million hectares burnt, an estimate of over 1 billion wild animals lost their lives and over 3000 houses were destroyed (Filkov et al., 2022, pp. 44-45; Dickman & McDonald, 2020, pp. 86-87).

For Indigenous peoples, cultural landscapes and archaeological sites, have a fundamental role in traditional cultural practices and way of being. In 2022, 129 Indigenous ranger groups managed 81 Indigenous Protected Areas (IPAs) covering over 85 million hectares of land. Rangers manage various environmental concerns such as wildfires, weeds and

feral animals and cultural sites (National Indigenous Australians Agency, n.d.). According to Carmichael et al. (2017) the rangers were bound to protect the sites by traditions and many deplored their inability to reverse the damage caused by climate change (p. 1206). One ranger says:

I would like [sites] to be there in the future for my great, great grandchildren, for them to know that, yes, they were strong, proud Indigenous people that lived on this land; the stories are about how we lived off the land, and some of them may point to how we still need to care for the land. (Carmichael et al., 2017, p. 1207)

Two Australian Indigenous Ranger groups, the Djelk IPA (Djelk Rangers) and rangers from Kakadu National Park (KNP) Rangers manage an area in the Northern Territory of Australia. KNP Rangers manage an area of over almost 20,000 square kilometres within the Alligator Rivers region in western Arnhem Land which received almost 200,000 visitors in 2019 (Parks Australia, 2020, p. viii). Djelk Rangers manage approximately 14,000 square kilometres of land and sea country in north central Arnhem Land. The Djelk IPA does not experience the same significant amount of tourism like the KNP and although some archaeological and rock art studies have been conducted in the Djelk territory (Brandl, 1988; Brockwell et al., 2005) there is no complete list of heritage, which Carmichael et al. (2017, p. 1201) believes could be in the thousands.

6.2 Methodology

Only recently has the conversation moved from assessing what impacts climate change could have on cultural heritage to developing management methodologies. These methods consist of generating vulnerability assessments of specific sites with an archaeological significance rating often refining the vulnerability rating, such as can be seen in Shi et al. (2012), Bickler et al. (2013) and Daly (2014). These frameworks for heritage adaptation are usually top-down, meaning that academics and heritage practitioners formulate a plan and work down, establishing a partnership with the local community. Dawson (2015a) constructs a “middle path” approach, where, after the initial prioritisation and risk analysis, local community members are recruited to help with monitoring the sites. Dawson (2015a) stresses the importance of local knowledge and their ability to provide researchers with significant information of extreme climatic events and the vulnerability of specific sites. With the “middle

path” approach, the information, knowledge and ideas move in both directions between researchers and the local community (p. 599).

In order to create a bottoms-up method, where the full control of the process lies in the hands of non-professionals, Carmichael (2015) constructed an adaption guide to support Indigenous rangers in managing heritage sites that were feeling the impact of climate change. The Cultural Site Adaption Guide is split into five phases: (1) the scoping phase (split into a further seven steps), (2) risk analysis, (3) option analysis, (4) planning and implementation, (5) review. The Djelk Rangers and KNP Rangers, had previously expressed deep concerns for the impact of climate change on cultural sites and considered them a management priority, and agreed to participate in workshops to test the adaption guide (pp. 63-66).

The first phase of the Guide, the scoping phase, focused on discussing group expectations for cultural site adaption, considering methodological options and assess and anticipate certain challenges that might occur. The aim of testing the scoping was to see if the discussion points comprising the scoping phase were effective in generating comprehensive responses from rangers, but also to determine if the rangers were able to carry out the requirements of the scoping phase and answer to rangers’ questions or assumptions within the scoping phase (Carmichael et al., 2017, p. 1200). Carmichael et al. (2017) stresses the importance of this first step and quotes Jones and Preston (2011, p. 304) that an assessment is more likely to fail if the system boundaries are not defined beforehand and apposite questions not asked in the initial assessment stages (p. 1200). The fourth element, conducting a stockade of resources, and the fifth element, conducting a stockade of barriers, of the scoping phase, discuss certain resource shortages and barriers that might jeopardise the project and if the rangers were able to overcome these barriers. Primary issues differed from each group. Along with lack of finances and equipment, Djelk rangers considered a lack of data and data storage as a primary barrier. An example being that six sites on the upper Cadell river being nominated as being vulnerable, but these sites were not registered in the Djelk heritage site database. To address this issue, a plan was devised on the spot to visit these vulnerable sites later in the dry season. In contrary to the Djelk rangers, one of KNP’s greatest assets is data, since a digital database with thousands of site registers has been in operation since 2014. KNP rangers identified insufficient staffing and the Park’s financial constraints as being a primary issue. In their view, financial resources are being focused mainly on tourism, which eventually comes at the expense of site maintainance and Indigenous rangers spending too much of their time on tourism duties, like tourist camp maintainance, but they were also not optimistic that their government body would be very inclined to transfer resources from tourism (Carmichael et al.,

2017, pp. 1209-1210). The KNP rangers identified autonomous planning as a significant barrier, mentioning that rangers have addressed their concerns to Parks Australia about increasing the number of sites managed but no action was taken. Carmichael et al. (2017) quotes one ranger as saying they were: "... sick and tired of talking about problems, because not many things end up happening." (p.1210).

During the second phase of the Guide, the risk analysis phase, rangers perceived that sea level rise and more extreme storm surge was increasing the erosion of coastal middens and middens on borders of floodplains. The rangers mentioned a specific deflated, large earth midden where recent substrate flood erosion and mangrooves encroachment caused human skeletal remains of two individuals to be exposed, along with a stone head axe, ochre cache and numerous stone artefacts (Carmichael et al., 2018a, p. 242). Along with increased erosion of middens, the rangers also perceived inland riverine rock art to be eroding due to a more extreme storm surge and more frequent precipitation events. Arnhem Land contains Australia's oldest archaeological site (Clarkson et al., 2017) and some of its most exceptionally preserved painted rock art imagery, but research (although limited) has shown that due to increasing intensity of tropical cyclones as a result of climate change is dramatically impacting rock art conservation in Australia (Taçon et al., 2021). Australia is not alone in this issue, similar concerns have been raised in England (Giesen et al., 2014), the island of Sulawesi, Indonesia (Huntley et al, 2021), Mongolia (Vanwezer et al., 2021) and the United States (Wright, 2018).

During the third phase, option analysis, a series of workshops were conducted to review the series of option gathered beforehand by Carmichael et al. (2020). On the list were ten options and those were:

- Defend the coast (i.e. comprehensively, with sea walls);
- Surface documentation of high-risk sites generally for a local museum or database;
- Relocate cultural sites;
- Give sites protective legal designation;
- Eradicate feral animals, especially water buffalo
- Fence sites against feral animals;
- Conduct fire management at sites;
- Introduce a routine risk assessment and monitoring program by digitising the Risk Field Survey (tested during the second phase of the Guide, the risk analysis) and making it available on rangers' I-Tracker GPS data collection tablets;
- Establish partnerships with archaeologists and regional stakeholders;
- Give training to local stakeholders;

- Address governance issues;

During the workshops Carmichael et al (2020) suggested the additional option of developing an augmented reality application to create 3D models of sites to be experienced again after they have been lost on their original rock-face with an ocular headset (pp. 9-10). In recent years, Augmented Reality (AR) and Virtual Reality (VR) as a communication tool for sharing archaeological information and cultural heritage data with the public has been increasing rapidly. Numerous historical locations and cultural sites are already available as free to play, VR experiences; for an example Guidford Castle in England (Historical VR, 2022), the Palace of Versailles (Google Arts and Culture, 2019) and even cave paintings like ones at Chauvet cave (Atlas V, Novelab & Google Arts and Culture, 2020). Archaeological sites have also been made available for archaeologists to stand in the middle of a virtual reconstruction of an excavation while writing their interpretations, digital reconstructions enable remote analysis from all angles and students are able to walk through archaeological sites during classes (Katz & Tokovinine, 2017, p. 1). Virtual reconstructions have even been made available for destroyed sites, like the Temple of Bel in Palmyra, Syria, by combining generic tourist photos collected online and panoramic images from 2010 (Wahbeh, Nebiker & Fangi, 2016, p. 81).

Climate change has also made itself known in the world of virtual archaeology. A collaboration between CyArk, Google Art and Culture and the International Council for Monuments and Sites (ICOMOS) has produced the Heritage on the Edge project, a project utilising a range of techniques to highlight the impacts of climate change and local experiences at five cultural World Heritage Sites in Tanzania, Scotland, Bangladesh, Rapa Nui and Peru. Each of these sites has been experiencing different impacts of climate change and adapting to these impacts in unique and locally appropriate ways (Megarry & Hadick, 2021). Rangers were enthusiastic about the idea of making 3D models of the most vulnerable riverine rock art sites and once they were lost, they could be seen at their original location via an ocular headset. However, strict cultural protocols would have to be maintained in consultation with traditional owners and the community. Rangers also expressed concerns with ensuring that culturally sensitive material does not get misused or appropriated on the internet or reveal the locations of the sites (Carmichael, 2018b, p. 149-150).

Rangers ranked six options as primary priorities: cultural site documentation via 3D photogrammetry for a VR application, giving sites protective legal designation, introduce a routine risk assessment and monitoring program, establishing partnerships, providing local stakeholders with training and addressing governance issues.

After the options analysis workshop was conducted, the US National Parks Service's *Cultural Resources Climate Change Strategy* by Rockman et al. (2016) was published highlighting 'interpret the change' as one of seven adaption options. "Climate change is the heritage of the future. Interpreting the Change is an action or set of actions that acknowledges and then serves to engage people in the future with the effects of climate change on a resource (p. 37)". Because the rangers viewed communicating the threats to cultural heritage as one of the most important and therefore the option was retrospectively added to the options list. Carmichael et al. (2017) quotes one ranger saying:

We have to involve other indigenous people, Indians, Muslim, not only Aborigines. Indigenous people from all over the world; they have got the same problem, with climate change ... it is making culture drop down really quickly, all over the world, not only us mob (p. 1208).

The documentary was implemented immediately and was mostly complete before the options analysis workshops took place. It features coastal sites from both Kakadu National Park and the Djelk Indigenous Protected Area but also coastal sites from Scotland and the Orkney Islands (Carmichael, 2018b, pp. 163, 167).

6.3 Evaluation

Similar to HMS Florida, the previous case study, there are certain challenges with sharing site locations with the wider public, due to access to sites being restricted to non-Aboriginals (Aboriginal Land Rights (Northern Territory) Act, 1976, Part VII, Section 69), making it not possible for them to fulfill sub-components 1.1., 1.2. and 3.1. in Table 5.

Table 5 Showing the Australian Indigenous Rangers Component Score

		AUSTRALIAN INDIGENOUS RANGERS
1. TWO-WAY COMMUNICATION		
	1.1. Regular project updates and reports made available to the wider public	
	1.2. Transparency and willingness to share information regarding the project	
2. ACTIVE PARTICIPATION		
	2.1. Untrained participants receive formal training to instill proper research methods, identification and work ethics among the community	X
	2.2. Allows for diverse areas of community participation so there is something to do for any member of the community who wishes to contribute	
	2.3. Working with the same individual (when possible)	X
	2.4. Partnering with local organisations	
3. EDUCATIONAL RESOURCES		
	3.1. Allowing the public access to all reports and official documents regarding the project	
	3.2. Involving the younger members of the community to inspire an appreciation of their cultural heritage	
4. (RE)PRESENTATION BY THE COMMUNITY		
	4.1. The community has a clear role in terms of organisation, representation and outreach of the project along with the control of a specific site where applicable	X
	4.2. Encourages the development of facilities where the community's history and archaeological heritage is shared along with the impacts of climate change	
5. SUSTAINABILITY		
	5.1. Collaboration between the researchers and the local community to ensure the sustainability of the cause	X
	5.2. Encouraging and advocating to ensure the protection of unknown sites and other sites that may need protection	X

The community is continuously kept in the center of the project and because training was considered by the rangers to be a necessary component for the risk field survey, they fulfill sub-component 2.2., that untrained participants will receive formal training to instill proper research methods, identification and work ethics among the community (Carmichael, 2018b, pp. 141, 146). Because the rangers are an organisation, not a group of volunteers, there are

certain components that may not fit in as well as the other case studies, such as sub-component 2.3., allowing for diverse areas of community participation so there is something to do for any member of the community who wishes to contribute. The same can be applied to sub-components 3.3., where the project makes an effort to involve the younger members of the community to inspire an appreciation of their cultural heritage, and 4.2., where the development of facilities is encouraged where the community's history and cultural heritage is shared and the impacts of climate change. However, the collaboration between researchers and the rangers is clear, with both parties emphasizing the long-term sustainability of the cause and how to include other types of sites into the Risk Field Survey and what actions can be taken to protect them (Carmichael, 2018b, p. 193).

6.4 Discussion

After completing the first three phases of Carmichael's (2018b) Cultural Site Adaption Guide, (1) the scoping phase, (2) risk analysis, (3) options analysis, the rangers were eager to continue on to the last two phases of the guide, (4) plan/implement and (5) review. The assessment of the implementation phase drawn up by the rangers would span over a course of some years and is the proposed subject of future research, followed by the review phase. During the implementation phase, research would be conducted on the nature of partnerships with organisations such as Aboriginal Areas Protection Authority, neighbouring ranger groups, ranger coordinating bodies, heritage managers and Indigenous cultural IT development companies, and their role within the Guide explored. Creating a digital version for I-Tracker (the GPS controlled tablet to use in remote areas without mobile connections) for the Risk Field Survey to create real-time maps displaying cultural sites that have been identified as priority sites would also be explored for future research and the practicality of this. How to incorporate other site types (such as historic or Dreaming sites) and their unique features into the Survey and also filtering data specific to diverse types of sites would also be considered in future research (Carmichael, 2018b, p. 192-193).

Rangers also prioritised digital 3D documentation of vulnerable sites on monitors, as well as for AR and VR applications, allowing them to see the lost sites while standing in their original location. Future research would explore 3D photogrammetry appropriate for rangers, since cultural protocols and resources did not allow this approach to be explored at the time. Further research will also include how to incorporate input from more female rangers, how it would be best to use the Guide in the context of a single site and adding an additional step into

the scoping phase allowing rangers to calibrate the Survey with the level and the threat types according to the area it is being used in along with the last phase of the Guide, the reviewing phase (Carmichael, 2018b, p. 193-195).

Carmichael's (2018b) research into assisting Indigenous rangers with managing cultural heritage sites at risk because of climate change makes important points in placing the management of these sites into the hands of local community custodians. While research has been done on risk analysis and significance ratings (see Shi et al, 2012; Bickler et al, 2013; Daly, 2014), the Cultural Site Adaption Guide takes the next step considering site management of climate change impacts. Carmichael (2018b) explains this as being because research is focused on developing the risk analysis with a top-down or middle-path, being managed by heritage professionals and involving community stakeholders. Here, the rangers in the end control the whole process, while heritage professionals take the role of consultants (p. 175). This research shows that climate change adaption policies controlled and managed by local stakeholders are a very real possibility, especially where government agencies do not have the funding or resources to cover the management of large areas.

Chapter 7: Case Study 5: ALeRT & ALOA



Figure 12 Showing Map of Guadeloupe. The Figure Shows Archaeologists Excavating the Cemetery of Anne-Sainte Marguerite, in the Municipality of Moule. By Patrice Courtaud (ALOA, n.d.b).

7.1 Introduction

Despite emitting the lowest amounts of greenhouse gasses compared to other regions (Crippa et al., 2022, p. 251), the Caribbean Islands and other Small Island Developing States (SIDS) are likely to feel the effects of climate change ahead of other regions. The effects of increasing amounts of tropical cyclones (TCs), storm surges, changing precipitation patterns, sea level rise (SLR) and coral bleaching are already being felt in both the environment and the everyday lives of the islands' residents. These effects are having severe impacts on the islands' biodiversity, their infrastructure and settlements, health and water security, with an estimated 22 million people living below 6 m elevation in the Caribbean as of 2017 (Mycoo et al., 2022, p. 2045).

An overwhelming majority of current knowledge of ancient settlements and past environments of the West Indies is derived from coastal sites. However, climate change is already having a devastating effect on these important cultural heritage sites on the shoreline (Perdikaris et al., 2017; Hofman & Hoogland, 2016; Boger, Perdikaris, & Rivero-Collazo, 2019). These threats are often accelerated or induced by human impacts such as sand mining, construction activities and looting, causing many archaeological sites to disappear or become

severely damaged without any research or documentation (Hofman & Hoogland, 2016, p. 2). This compelled researchers to choose intervention in favor of conservation, by studying and recording the site according to the general principle of “preservation-by-record”.

In Guadeloupe, an overseas department of France in the southern Caribbean, the Regional Archaeology Service of Guadeloupe through the Ministry of Culture, set up the “National Archaeological Map”, a database of known sites in the French West Indies, combined with a geographic information system (GIS) which is updated each time a new site is identified (Bérard & Stouvenot, 2011, p. 85-86). With three sites per linear kilometer having been identified on average in 2022, continuous monitoring in the face of climate change seems to be an impossible challenge. With this in mind, the Center for Research in Archaeology, Archaeosciences and History (CReAAH) has developed the ALOA Project within the framework of the ALeRT Project (Motte et al., 2022a, par. 3).

The ALeRT Project was started in France in 2006 by a group of researchers who created an interdisciplinary approach to create a vulnerability model, with assessment and monitoring maps to evaluate research strategies and making it adaptable for cultural heritage sites on the coastline. The result of this was the Vulnerability Evaluation Form (VEF), which creates a standardised grid to review the current state of preservation at archaeological sites on the coastline (Daire et al., 2012, pp. 177). After the development of VEF, there became a need to improve field collection and data management strategies, which led to the creation of the ALeRT app. With the app, a user can submit the necessary information for specific sites while also standardising data collection and improving the quality of the application, making it more accessible to researchers and heritage managers from different fields along with the wider community. Administrative users can add information requiring desk based research with a classic web version of the application. The display is purposefully designed to be operated easily and simplified so that all participants and volunteers can fill out information without any specific training (Barreau et al., 2013, pp. 612).

7.2 Methodology

Assessments of coastal vulnerability were tested after a particularly difficult season of winter storms in between December 2013 and March 2014 which had a drastic effect on the Atlantic and Channel coasts. Substantial rain, combined with windstorms and wave surges caused extreme damage to recorded coastal archaeological sites, while also exposing previously unknown archaeological sites and cultural remains. Researchers were faced with

the impossibility of physically preserving all sites under threat, leading them to base their methodology on the “preservation-by-record” strategy. According to Olmos Benlloch, López-Romero, & Daire (2017) this is where the role of coastal managers, local authorities, volunteers and ALeRT reporters became essential in alerting researchers of the erosion and damage of coastal heritage sites in the spring of 2014, which was followed by an intensive fieldwork campaign in close partnerships with local groups (pp. 83-84). After the successful implementation of the VEF grid and ALeRT in Western France (Shi et al., 2012) and Northwest Iberia (López-Romero et al., 2012), the project’s next stage was to expand fieldwork collaboration and communicate the effects of coastal erosion on cultural heritage sites as a result of climate change. The publicity was successful in raising awareness and creating an interest in public archaeology in Brittany and in the winter of 2015 a specific training program was developed for coastguards in collaboration with *Conservatoire du Littoral*, with the aim of strengthening the ALeRT network and the quality of coastal heritage vulnerability monitoring (Olmos Benlloch, López-Romero, & Daire, 2017, pp. 83-85).

In 2017, ALeRT (2017) announced that they intend to extend their knowledge to the islands of the Caribbean. The ALOA project aims to remobilise the successes, experiences and tools of the ALeRT project and adjust them to the regional and climatic context, specifically the islands of the archipelago of Guadeloupe and Saint-Martin. The ALOA project works in collaboration with a multitude of institutions both in archipelago such as the the University of the Antilles in Guadeloupe, Guadeloupe Natinal Park, the Archaeological Association of the Lesser Antilles (I’AAPA), the Edgar Clerc Museum, the Regional Council of Guadeloupe, but also in the mainland of France such as the Department of Underwater Archaeological Research (DRASSM), the Ministry of Culture (mainly through the Department of Cultural Affairs, Regional Archaeology Service (DAC) Guadeloupe) and the Conservatoire du Littoral, the French National Center for Scientific Research (CNRS) and the National Institute for Preventive Archaeological Research (INRAP) (Motte et al., 2022a, par. 9).

The primary ambition of the ALOA project is to raise awareness within the local community and provide them with the necessary tools to inspire long-term sustainability within the region. With these goals in mind, the first stage of the project, observation and data collection, involves participation from various groups, such as scientists, managers and the public such as local residents, associations and schoolchildren. The groups participate in monitoring and reporting discoveries, which may have occurred by chance or as a result from research or field surveys and is reported through the ALOA app. On the app, users fill out a form, giving general information on the site, describing its circumstances and conditions and

evaluating their vulnerability according to a criteria index grid. The grid is specifically designed for the ALOA project, integrating both potential hazards on the site but also elements of resistance for a vulnerability index. Once the form has been filled, new reports appear on the project's interactive map and after it has been confirmed, an alert is automatically sent to the relevant authorities with the power to decide the next course of action in response. The vulnerability assessment grids have the additional role of establishing vulnerability that can then be broken down into different scales, either regional, municipal or local, to help decide and prioritise the next steps (Motte et al., 2022a, par. 21).

Alongside monitoring, the project includes training workshops to raise awareness amongst different audiences and involve them in the project to enrich and diversify the network of participants likely to continue the approach in other territories. Hosted by State services and members of the project team, the modules include both a theoretical component (legislative frameworks and scientific contexts: historical, cultural, geomorphical, tools, principles and methods of the project) and a practical component (field training, observation methods and surveys). The components are easily adaptable to different types of audiences such as managers, coastguards, schools and public associations (Motte et al., 2022a, par. 23).

A third initiative of the ALOA project is the launching of an iconographic collection of photographs to document the history of the shores and how they have evolved through past decades. An approach initiated within the framework of the Arch-Manche project (Satchell & Tidbury, 2014) and further developed by research conducted in Northwest Iberia (López-Romero et al., 2017) and on the north coast of Brittany (Motte, 2019). This initiative is aimed at individuals who may be in possession of photographs, postcards, engravings, paintings, sketches, drawings and even videos, that depict the coastal environment and would be willing to share them to document the evolution of the shore. This makes it possible to create an interactive map through the digital photo library and showcase the nature and intensity of the dynamics at play on the coast and the effect of climate change on the coastal heritage (Motte et al., 2022a, par. 22).

In addition to the commune of Le Moule showing great enthusiasm in preserving its cultural heritage, the town also covers 21 kilometers of coastline and represent a diverse geomorphological context including a sandy beach, medium and high cliffs and having significant human occupation since the Mesoinian period. With the collaboration of the local municipality, alongside the Edgar Clerc Museum, systematic coastal survey campaigns of the coast were conducted in 2021, commissioned and supported by the Ministry of Culture. Training modules for schoolchildren and students were also held for observation and recording

of archaeological data (Motte et al., 2022a, par. 30-32). The actions carried out made it possible to start archiving the archaeological sites that are at most risk with the use of photogrammetry and conduct a complete survey of the commune's archaeological heritage (Motte et al., 2022b, p. 4). These first stages made it possible to draw up an initial idea of the current state of the archaeological heritage as well as a vulnerability map of the coastal heritage within the municipality, both for sites already known and for new sites discovered during the prospection campaigns or reported by the local inhabitants while also creating a solid network of local participants (Motte et al., 2022a, par. 33-35).



Figure 13 Showing the Tip of Pointe des Châteaux, town of Saint-François. By Edwige Motte (ALOA, n.d.b).

7.3 Evaluation

As an extension of the ALeRT project, the ALOA project aims to create awareness of the effects climate change is having on the archaeological sites and the heritage of Guadeloupe. With it being impossible for a handful of researchers and managers to monitor the entire coastline effectively, but with a network of local citizens who are trained in identifying remains regularly scanning the coastline site monitoring could be much more effective in mitigating the loss of cultural heritage and scientific knowledge (Motte et al., 2022a, par. 23).

According to Motte et al. (2022a), despite initial difficulties relating to the COVID19 pandemic, the ALOA project has already laid a solid foundation in terms of methodology and means put in place since its start in 2020, in terms of collecting scientific data, establishing a network of local participants and constructing a sustainable, mobilized partnership. The work will continue through the entire coastline of Guadeloupe and Saint-Martin with until 2023 and the ALOA project will then offer assistance to state services on if/where more in-depth actions may be required such as geophysical prospecting, archaeological surveys or excavations. The authors also mention that the principles and tools of the ALOA project were designed with a

view to be adaptable to other regions, whether they be other French overseas departments or international developments (par. 37-38).

Table 6 Showing the ALeRT & ALOA Component Score

1. TWO-WAY COMMUNICATION		
	1.1. Regular project updates and reports made available to the wider public	X
	1.2. Transparency and willingness to share information regarding the project	X
2. ACTIVE PARTICIPATION		
	2.1. Untrained participants receive formal training to instill proper research methods, identification and work ethics among the community	X
	2.2. Allows for diverse areas of community participation so there is something to do for any member of the community who wishes to contribute	X
	2.3. Working with the same individual (when possible)	X
	2.4. Partnering with local organisations	X
3. EDUCATIONAL RESOURCES		
	3.1. Allowing the public access to all reports and official documents regarding the project	X
	3.2. Involving the younger members of the community to inspire an appreciation of their cultural heritage	X
4. (RE)PRESENTATION BY THE COMMUNITY		
	4.1. The community has a clear role in terms of organisation, representation and outreach of the project along with the control of a specific site where applicable	
	4.2. Encourages the development of facilities where the community's history and archaeological heritage is shared along with the impacts of climate change	
5. SUSTAINABILITY		
	5.1. Collaboration between the researchers and the local community to ensure the sustainability of the cause	X
	5.2. Encouraging and advocating to ensure the protection of unknown sites and other sites that may need protection	X

Both the ALeRT and ALOA projects regularly post updates on their websites regarding future conferences (ALeRT, 2018a; Daire, 2021), working sessions (ALeRT, 2019; Daire, 2022b) and news regarding the projects (ALeRT, 2018b; Daire, 2022a). On the websites, users can also find official reports and documents regarding the projects, as well as other educational documents and useful information (ALeRT, n.d.; ALOA, n.d.a). However, many of the scientific papers have been published in scientific journals, many of which need to be paid for

in order to access them. They also make sure to keep the community in the center of the project, providing multiple training workshops with diverse participation activities and partnering with local organisations (Olmos Benllock, López-Romero, & Daire, 2017, pp. 83-85; Motte et al., 2022a, par. 9, 20-22). The ALOA Project has also put a special emphasis on working with schoolchildren to inspire an interest in their cultural heritage (Motte et al., 2022a, par. 20-22). Despite the community's clear placement in the center of the project, all organization, presentation and outreach is planned and conducted by the researchers of the project in the case of the ALeRT project. In the case of the ALOA Project, however, some control is given to a local organisation, the Edgar Clerc Museum, where the results of the project are displayed (ALOA, n.d.b).

7.4 Discussion

In addition to their particular climatic vulnerability, the Caribbean is also faced with another disadvantage when it comes to protecting its cultural heritage from being washed away by the effects of climate change. The islands of the Caribbean are not homogenous. Their diverse geopolitical setting, resulting from complex colonial history, has given rise to varied heritage values and enforcement of legislation (Hofman & Hoogland; 2016; Hofman et al., 2021; Siegel, 2011). This makes it extremely difficult to compare situations across the islands and ultimately adapting one system to another island.

Minnis (2006) created the cynical Skeptic to pose a question to his graduate students: “you expect me to pay taxes so you can play in the dirt digging up old stuff instead of me saving more for my kid’s education or for producing more vaccines against childhood illnesses in the Third World?” In the context of this thesis, the concerns of climate change might also be added to the Skeptic’s question. How does the past compare to the legitimate problems faced by the present inhabitants of the Caribbean? In 2017, hurricanes Irma and Maria, only days apart from each other, caused catastrophic damage. The small island of Dominica is believed to have been most severely impacted, with 90% of the island’s structures reportedly damaged, with a 100% loss of crops and considerable death of livestock and productive trees (UNDP, 2017). According to Lewis (2011) “the survival of a people, depends, to a large degree, on the protection of its heritage” (p. 96), and that in order to encourage it, heritage protection must be promoted as necessary ingredient for Caribbean communities which can have a positive impact on the community’s development (p. 99). Combining community engagement with archaeological research can help interpret the indigenous history of the Caribbean and dispel

old biases, by involving local stakeholders on an equal footing to develop research questions (Sankatsing Nava & Hofman, 2018, pp. 6-7). The Caribbean continues to lose much of its archaeological record, leading researchers to look for more medium- and long-term mitigation methods. Projects like the ALOA Project, where the community and their valuable knowledge systems of the natural environment to create monitoring programs could be the answer for monitoring and preserving Guadeloupe's archaeological heritage. However, it is still in its early stages but hopefully the successes and experiences of the ALeRT project can help adapt it to different regional context.

Conclusion

8.1 Comparison of the sub(components) of the model

Climate change is having a disastrous effect on the world’s archaeological heritage. However, it is also giving us an opportunity to bridge the gap between the archaeologist and the community they are directly or indirectly researching. Here I have presented five case studies where the community has taken an active role in safeguarding its archaeological heritage.

Table 9 Showing the Component Score of the Case Studies.

		NUNALLUQ PROJECT	SCAPE & SCHARP	HMS FLORIDA	AUSTRALIAN INDIGENOUS RANGERS	ALeRT & ALOA
1. TWO-WAY COMMUNICATION						
	1.1.	x	x			x
	1.2.	x	x			x
2. ACTIVE PARTICIPATION						
	2.1.	x	x		x	x
	2.2.	x	x	x	x	x
	2.3.	x				x
	2.4.	x	x	x		x
3. EDUCATIONAL RESOURCES						
	3.1.	x	x			x
	3.2.	x				
	3.3.	x	x			x
4. (RE)PRESENTATION BY THE COMMUNITY						
	4.1.	x			x	
	4.2.	x	x			
5. SUSTAINABILITY						
	5.1.	x	x	x	x	x
	5.2.	x		x	x	x

While comparing the data in Table 7 from the case studies we can see that the Nunalleq Project is the only example to fulfill all 14 sub-components. The SCAPE & SCHARP case study fulfills 11 out of 14 sub-components, the same as the ALeRT & ALOA case study. These are followed by the Australian Indigenous Rangers case study, fulfilling 6 out of 14 sub-components, with the HMS Florida case study fulfilling 5 out 14 sub-components. The Nunalluq Project has a clear advantage over the other case studies, having been active for over a decade. The same goes for the ALeRT and ALOA projects, where the ALeRT project has

been ongoing since 2007, so the ALOA project can rely heavily on the long-time established experience and network of its French counterpart.

There are four sub-components that all case studies consider an important aspect:
Sub-component 2.1., giving untrained participants formal training to instill proper research methods, identification and work ethics among the community;
Sub-component 2.4., working with the same individuals (when possible), ensuring the long-term incentive of the project;
Sub-component 5.1., collaboration between researchers and the local community to ensure the sustainability of the cause and
Sub-component 5.2., encouraging and advocating to ensure protection of unknown sites and further sites that may need protection.

Neither HMS Florida and the Australian Indigenous Rangers case studies fulfill sub-components 1.1., regular project updates and reports available to the wider public and 1.2., transparency and willingness to share information regarding the project. The reason they cannot fulfill these components along with sub-components 3.1., allowing the public access to all reports and official documents regarding the project is most likely related to their limited ability to share certain information with the public, according to the laws in their respective regions (Florida Statutes, 2019; Aboriginal Land Rights (Northern Territory) Act, 1976, Part VII, Section 69). The laws in the US seek to prevent people from destroying important archaeological heritage and site protection by avoidance as the benchmark, where only limited excavations are allowed by under permit by professionals with demonstrated qualifications and valid research questions (Archaeological Resources Protection Act, 1979). These laws will always remain important, however, they focus on protecting sites from human actions but instead leave them vulnerable against the current natural crises. The current mantra in most countries is *in situ* preservation, but that assumes that our resources will still be there in the future. By the end of the 21st century, most of the archaeological heritage on the coastline will be lost and there is not enough funding nor enough professionals to register and monitor it all. This is why we must develop approaches to save the invaluable resources and allow the public to help protect their archaeological heritage.

One of the sub-components that all case studies are most concerned with is 2.1., giving untrained participants formal training to instill proper research methods, identification and work ethics among the community. This is an extremely important component for the project's long-term impact on its participants understanding of its archaeological heritage, as Field et al. (2000) has shown (p. 43), furthering its long-term sustainability as participants gain a better

understanding of their archaeological heritage and the importance of preserving it, proper archaeological methods and relaying it to other members of the community.

Sub-component 2.2., allowing for diverse areas of community participation so there is something to do for any member of the community who wishes to contribute, was not seen as a priority for a majority of the case studies, with only the Nunalleq Project and the ALERT and ALOA case studies fulfilling it. The Nunalleq Project has the community's undying support and in turn, the community has various ways to contribute to the project. Anyone is able to volunteer not only with the excavation itself, or in the laboratory, but also with different methods and crucial logistics and support, such as offering researchers warm food (Knecht & Jones, 2019, pp. 30-31). The ALERT & ALOA projects also offer participants different ways to contribute. Including similar methods as the other case studies, this one also includes an iconographic collection of photographs to document the history of the shores and how they have evolved through past decades which offers different members of the community a way to contribute to the knowledge of long-term processes.

Sub-component 2.4., partnering with local organisations, has a way of solidifying a project within the community and ensures that the archaeological heritage is integrated in future management, while also spreading awareness about the project. All the case studies fulfill the sub-component of partnering with local organisations, except for case study 4, Australian Indigenous Rangers which is understandable, considering their strict rules on regarding access to site locations. Multiple local organisations have taken part in the Nunalleq Project in one way or another. Outside of the overwhelming support researchers received by the local village corporation and various residents providing crew members with transport and gear, office buildings and the community centre for housing, local builders were hired to construct the Nunalluq Culture and Archaeology Center and Calista Corporation (one of the thirteen Alaska Native Regional Corporations) hosted authoritative Native allotment and corporation boundaries to determine the location of specific allotments (Lim et al., 2023, p. 7). SCAPE & SCHARP made a point of partnering with multiple local charities, historical societies and administrations throughout different areas of Scotland (Hambly, 2017a, p. 35; Hambly, 2017b, p. 30) and HMS Florida conducted training opportunities in tandem with various local organisations in Florida, such as Guana Tolomoto Matanzas National Estuarine Reserve and the Florida Fish and Wildlife Conservation Commission for an example (Miller & Murray, 2018, pp. 235, 253), while the ALOA project partners with the Edgar Clerc Caribbean Heritage Museum, local schools and the Guadeloupe National Park and Nature Reserves for an example along with government agencies in both Guadeloupe and France (ALOA, n.d.a). Community archaeology projects

should aim to collaborate and reach out to as diverse local organisations as possible, to create more awareness among different community groups.

The third component category, educational resources, focuses on the researchers and the local community collaborating to ensure fully operational educational resources available to the wider public. It is however, surprisingly, a very low-scoring category. All case studies fulfill sub-component 3.1., allowing the public access to all reports and official documents regarding the project, except HMS Florida and Australian Indigenous Rangers which can also be explained by their limited ability to share certain information with the public that have not received previous approval by them. The same applies to sub-component 3.2., involving the younger members of the community to inspire an appreciation of their cultural heritage. HMS Florida has not mentioned making any efforts to organise activities for children and because the Australian Indigenous Rangers are an organisation, with rangers receiving wages as managers of natural and cultural resources (Carmichael, 2018b, p. 17-18), there are limited participation opportunities for children and might not be applicable in this context.

Only two case studies, the Nunalleq Project and Australian Indigenous Rangers, fulfill sub-component 4.1., where the community has a clear role in terms of organisation, representation and outreach of the project along with the control of a specific site where applicable. These two case studies are at an advantage within this sub-component and are extremely focused, with the Nunalleq Project concentrating on a single site and the Australian Indigenous Rangers working within a specific organisation. Nevertheless, those case studies could have an immense impact on the discussion of climate change and the protection of their archaeological heritage in their respective regions, illustrating the benefits of sharing control of the project with the local communities. This is where case studies like SCAPE & SCHARP and HMS Florida and ALeRT & ALOA are at a disadvantage, because their communities are more culturally diverse, not focusing on a single group of people. At the same time, this has also the potential to be an advantage, making the projects more adaptable and allowing for a more diverse involvement and reaches more area. Only two case studies mentioned the development of facilities where the community's history and cultural heritage is shared and the impacts of climate change, or sub-component 4.2., with the Nunalleq Project creating the Nunalleq Culture and Archaeology Center and the Sanday Heritage Center making arrangements for the Meur Burnt Mound.

All case studies emphasize the importance of sustainability and fulfill both sub-components in the last last component category. Sustainability in community archaeological projects is very difficult to accomplish. Each of the case studies have, however, come up with

creative methods to achieve this. The SCAPE & SCHARP, HMS Florida and ALERT & ALOA case studies all rely on the public to volunteering their time, while the Nunalleq Project focuses more on the cultural and economic aspects of sustainability. The project encouraged the people of Quinhagak to reintroduce certain aspects of its culture such traditional Yup'ik dancing (Hillerdal, 2013). The opening of the Nunalleq Culture and Archaeology Center (Knecht & Jones, 2019, pp. 45-48) provides them not only with a place to conserve the artefacts within the community, but also more options for revenue. The Australian Indigenous Rangers place more focus more the policy and paperwork aspects of sustainability. They ranked giving sites protective legal designation, addressing governance issues and introducing a routine risk assessment program as primary priorities during the options analysis phase of the Cultural Site Adaption Guide (Carmichael, 2018, pp. 144-147).

8.2 Lessons learned from the case studies

All case studies are examples of archaeologists coming up with innovative ways to combat the impacts of climate change on archaeological heritage. One of the most prominent threats is rising sea levels and coastal erosion, which has the ability to destroy coastal heritage gradually over some decades or all at once with single a catastrophic event (Dawson et al., 2020, pp. 8281-8282). These impacts are happening so quickly and within so many different physical and socio-cultural contexts, that it is impossible for the archaeological discipline to monitor and manage on its own. It has become vital to form partnerships and collaborate not only with other disciplines, but the public as well. Community archaeology is still a developing field, but it is providing a possible solution to combat the rate and speed coastal erosion is having on archaeological sites by combining resources and involving local communities.

As demonstrated by the case studies included in this thesis, there are a number of factors detrimental to a successful community archaeological project to combat climate change. First and foremost, the community needs to be involved in the beginning of the project. Without the community recognising the effects that climate change is having on their archaeological heritage and without a clear desire to take action, managing the impacts/heritage will prove to be extremely difficult. It is necessary to keep the community's wishes in mind in the beginning to successfully interweave them with professional archaeological theories and approaches, and in order to make sure that all stakeholders are on the same page before the project starts, to avoid further complications and misunderstandings down the line.

As all the case studies show, taking the time and effort to provide formal training is an essential part to teach proper research methods to give a better understanding of the archaeology, identification and work ethics among the community to inspire them to relay information to the general public regarding community's heritage and the project itself. This will also have a beneficial outcome for researchers, giving them opportunity to get to know the community that they are working in better and establish long-term relationships. Conducting training and workshops can also be extended to other organisations within the community or organisations with whom climate change and the protection of archaeological heritage is concerned, as was demonstrated by FPAN who conducted training and workshops with organisations such as Guana Tolomoto Matanzas National Estuarine Reserve and the Florida Fish and Wildlife Conservation Commission for an example (Miller & Murray, 2018, pp. 235, 253). Keeping local organisations in mind during all phases of the project can help draw attention to the project, create awareness within the community and ensure that the archaeological heritage of the area is integrated into future management. Something that needs to be considered in future projects is to develop diverse options for participation. Those who wish to contribute to the protection of their archaeological heritage, but may not necessarily be able to participate in surveying and monitoring, should not be discouraged. This is of course depends on the context of each project and may not always be possible, but should nevertheless be considered when constructing a community archaeological project.

Education resources are an important aspect of each case study, but should not be limited to the younger generations but include educational resources aimed at adults as well. Organised site visits and activities can be a way to communicate the area's local heritage but also show how important it is to have the community involved and integrate into the project. Stories and oral histories are a common method of communication in many cultures (Anderson, 2010, pp. 277-281) and therefore should be promoted, but as much focus should be placed on making resources available online for those who are interested but cannot be there in person, whether they be a member of the community, tourists someone simply with a general interest in the area. The development and execution of these educational resources should be at least partially under the control of the community as per component category 4, Re(presentation) by the community, to ensure (culturally) appropriate methods for presentation.

One of the most detrimental aspects that need to be considered during any community archaeology project is the question of sustainability. Making a project sustainable for the long-term allows participants to develop skills, creating a deeper impact on the community and demonstrating the success of the project. Belford (2014) believes that initial enthusiasm for a

specific local heritage to can evolve to an all-embracing appreciation and concern for heritage in other regions, even internationally (p. 32). As mentioned previously, a common problem when conducting a community archaeology project is the limited amount time and funding allocated to them. So researchers and the community must collaborate and find ways to ensure the long-term sustainability and incentive of the project. This was achieved by the case studies in a number of ways, such as the development of facilities where the archaeological heritage is shared along with the impacts of climate change, like the Nunalleq Culture and Archaeology Center. This is however, not possible for all community archaeology projects and therefore, future projects must consider a variety of ways to ensure economic sustainability. Funding for heritage management is often extremely limited and on a short term basis. Dawson et al. (2020) attribute Scotland's over 20 years of successful community work to continuity:

Volunteering works best when it is purposeful and when the information collected is valued and used. Community groups and individuals need someone to report to and appreciate feedback, and collecting records that are not moderated or acted on soon leads to volunteers losing interest in a project (p. 8285).

Another aspect that must be considered when adapting a community archaeology program are the laws and regulations in each country. In Scotland, the "right to roam" laws enable volunteers more freedom to monitor the country which made the SCAPE and SCHARP projects possible. This is not the case many countries and proposed a challenge in Florida, where site locations are restricted due to fear of looting, desecration, visitors potentially venturing to unsafe environments and privacy concerns (Florida Statutes, 2019). FPAN overcame this challenge by making data accessible to volunteers after they had been vetted and approved. Looting and damage are valid concerns when considering site locations being available for the public, but this does not appear to be a problem in Scotland. Nevertheless, as more sites continue to be lost to the effects of climate change, it is an angle that needs to be explored further.

The case studies mentioned here show what partnership between heritage professionals and local communities have managed to achieve and as climate change continues to have further impact, we will have to turn to our local communities more often for help. Here we have seen five case studies where the community has taken action to protect its archaeological heritage alongside researchers in various ways. Nonetheless, because communities are

constantly changing and evolving, the methods we use to collaborate with them in preserving their archaeological heritage, must also constantly be reassessed and redesigned.

Abstract

Archaeological heritage are under threat by climate change all over the world and its resulting impacts are happening so quickly and within so many different physical and socio-cultural contexts, that it is impossible for any single organization or discipline to combat. For this reason, many researchers around the world have developed various methods and options in engaging the public's help through community-based and citizen science research, including community archaeology and community-based heritage projects to better preserve our cultural heritage. This thesis presents five diverse case studies from Alaska, Scotland, Florida, Australia, France and Guadeloupe to highlight how collaboration and community archaeology are building better practices to manage coastal archaeological heritage. The case studies are compared and analyzed with a five-part methodology, based on underlying components they all share. In the end I will determine the most common factors attributing to a successful community archaeology project and discussing how we can enlist the public's help in our battle against climate change.

Reference List

- Aboriginal Land Rights (Northern Territory) Act, 191 § Part VII, Section 69 (1976). <https://www.fao.org/faolex/results/details/en/c/LEX-FAOC016819>
- ACIA. (2004). Impacts of a Warming Arctic: Arctic Climate Impact Assessment. ACIA Overview report. Cambridge University Press.
- ALeRT. (2017, June 14). *ALOA – ALeRT Outre Atlantique*. <https://alert-archeo.org/2017/06/14/aloa-alert-outre-atlantique/>
- ALeRT. (2018a, January 3). *ALeRT aux Jeudis de Menez Dregan le 13 septembre* [ALeRT at Les Jeudis de Menez Dregan on September 13]. <https://alert-archeo.org/category/colloques-et-journees-dinformation/>
- ALeRT. (2018b, June 1). *La dune raconte l'histoire de la côte des Légendes* [The dune tells the story of the Côte des Légendes]. <https://alert-archeo.org/2018/06/01/la-dune-raconte-lhistoire-de-la-cote-des-legendes/>
- ALeRT. (2019, April 2). *Alerte sur le patrimoine archéologique littoral* [Alert on the coastal heritage]. <https://alert-archeo.org/category/a-noter-dans-vos-agendas/>
- ALeRT. (n.d.). *Communication*. <https://alert-archeo.org/valorisation/>
- ALOA. (n.d.a). *Resources*. <https://aloe.blog/publications/>
- ALOA. (n.d.b). *ALOA in Guadeloupe*. <https://aloe.blog/actions/guadeloupe/>
- Anderson, D. G., Bissett, T. G., Yerka, S. J., Wells, J. J., Kansa, E. C., Kansa, S. W., Myers, K. N., DeMuth, R. C., and White, D. A. (2017). Sea-level rise and archaeological site destruction: An example from the southeastern United States using DINAA (Digital Index of North American Archaeology). *PLoS ONE* 12(11): Article e0188142. <https://doi.org/10.1371/journal.pone.0188142>
- Anderson, K. E. (2010). Storytelling. In H. J. Birx (Ed.), *21st Century Anthropology: A Reference Handbook* (pp. 277-286). SAGE Publications.
- Agnew Beck Consulting, PDC Engineers, USKH, Inc. (2011). *Relocation report: Newtok to Mertarvik*. Alaska Department of Commerce, Community and Economic Development, Division of Community and Regional Affairs.
- Archaeological Resources Protection Act, 16 U.S.C. § 470 (1979). <https://uscode.house.gov/view.xhtml?path=/prelim@title16/chapter1B&edition=prelim>
- Atlas V, Novelab, Google Arts & Culture. (2020, February 24). *The Dawn of Art*. https://store.steampowered.com/app/1236560/The_Dawn_of_Art/

- Barreau, J. B., Sachet, M., Lopez-Romero, E., Daire, M. Y., & Olmos-Benlloch, P. (2013). ALERT mobile: Managing coastal archaeological heritage in Western France. In *2013 Digital Heritage International Congress (DigitalHeritage)* (Vol. 2, pp. 611-614). IEEE.
- Belford, P. (2014). Sustainability in Community Archaeology. *AP: Online Journal in Public Archaeology*, 4(1), Special Volume 1, 21-44.
- Bennett, T. M. Bull, Maynard, N. G., Cochran, P., Gough, B., Lynn, K., Maldonado, J. K., Voggeser, G., Wotkyns, S., & Cozzetto, K. (2014). Indigenous Peoples, Lands, and Resources. In J. Melillo, T. C. Richmond, & G. W. Yohe (Eds.), *Climate Change Impacts in the United States: The Third National Climate Assessment* (pp. 297-317). U.S. Global Change Research Program.
https://nca2014.globalchange.gov/downloads/high/NCA3_Climate_Change_Impacts_in_the_United%20States_HighRes.pdf
- Bérard, B., & Stouvenot, C. (2011). French West Indies. In P. E. Siegel & E. Righter (Eds.), *Protecting Heritage in Caribbean* (1st ed., pp. 80-89). The University Of Alabama Press.
- Bickler, S., Clough, R., and Macready, S. (2013). *The Impact of Climate Change on the Archaeology of New Zealand's Coastline. A Case Study from the Whangarei District*. Department of Conservation: Te Papa Atawhai.
https://www.doc.govt.nz/documents/science-and-technical/sfc322high_res.pdf
- Bindoff, N.L., Stott, P. A., AchutaRao, K. M., Allen, M.R., Gillett N., Gutzler, D., Hansingo, K., Hegerl, G., Hu, Y., Jain, S., Mokhov I.I., Overland, J., Perlwitz, j., Sebbari R., & Zhang, X. (2013). Detection and Attribution of Climate Change: from Global to Regional. In Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (Eds.), *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 867-952). Cambridge University Press.
- Boger, R., Perdikaris, S., & Rivera-Collazo, I. (2019). Cultural heritage and local ecological knowledge under threat: Two Caribbean examples from Barbuda and Puerto Rico. *Journal of Anthropology and Archaeology*, 7(2), 1-14. <https://doi.org/10.15640/jaa.v7n2a1>
- Branstetter, J. (Director). (2018). *Children of the Dig* [Film]. Branstetter Film.
- Brockwell, S., Meehan, B., and Ngurrabangurraba, B. (2005). An-barra Archaeological Project: a progress report. *Australian Aboriginal Studies* (1), 84-89.
<https://search.informit.org/doi/pdf/10.3316/informit.434501663983131>

- Carmichael, B. (2015). Supporting Indigenous rangers' management of climate-change impacts on heritage sites: developing an effective planning tool and assessing its value. *The Rangeland Journal* 37(6), 529-635.
- Carmichael, B., Wilson, G., Namarnyilk, I., Nadji, S., Cahill, J., and Bird, D. (2017). Testing the scoping phase of a bottom-up planning guide designed to support Australian Indigenous rangers manage the impacts of climate change on cultural heritage sites. *Local Environments* 22(10), 1197-1216. <https://doi.org/10.1080/13549839.2017.1332018>
- Carmichael, B., Wilson, G., Namarnyilk, I., Nadji, S., Brockwell, S., Webb, B., Hunter, F., & Bird, D. (2018a). Local and Indigenous management of climate change risks to archaeological sites. *Mitigation and Adaptation Strategies for Global Change*, 23, 231-255.
- Carmichael, B. (2018b). *Support Indigenous Rangers Manage the Impacts of Climate Change on Cultural Sites* [Doctoral dissertation, The Australian National University]. ProQuest Dissertations and Theses Global.
- Carmichael, B., Wilson, G., Namarnyilk, I., Nadji, S., Cahill, J., Brockwell, S., Webb, B., Bird, D., & Daly, C. (2020). A Methodology for the Assessment of Climate Change Adaption Options for Cultural Heritage Sites. *Climate*, 8(8), 1-19.
- Carter, L., Terando, A., Dow, K., Hiers, K., Kunkel, K.E., Lascurain, A., Marcy, D., Osland, M., and Schramm, P. (2018). Southeast. In D. R., Reidmiller, C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (Eds.), *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment*. U.S. Global Change Research Program (Vol. II, pp. 743–808). <https://nca2018.globalchange.gov/chapter/southeast>
- Cassar, M., Young, C., Weighell, T., Sheppard, D., & Rosabal, P. (2006). *Predicting and Managing the Effects of Climate Change on World Heritage*. World Heritage Committee.
- CCC (Committee on Climate Change). (2021). *Evidence for the third UK Climate Risk Assessment (CCRA3): Summary for Scotland*. Committee on Climate Change. <https://www.ukclimaterisk.org/wp-content/uploads/2021/06/CCRA-Evidence-Report-Scotland-Summary-Final-1.pdf>
- Chapman, H. P. (2002). Global warming The implications for sustainable archaeological resource management. *Conservation and management of archaeological sites*, 5(4), 241-245.
- Colette, A. (2007). *Case Studies on Climate Change and World Heritage*. UNESCO World Heritage Center.

- Council of Europe. (1992). *European Convention on the Protection of the Archaeological Heritage (Revised)*. <https://www.coe.int/en/web/conventions/full-list?module=treaty-detail&treaty-num=143>
- Crippa, M., Guizzardi, D., Banja, M., Solazzo, E., Muntean, M., Schaaf, E., Pagani, F., Monforti-Ferrario, F., Olivier, J., Quadrelli, R., Risquez Martin, A., Taghavi-Moharamli, P., Grassi, G., Rossi, S., Jacome Felix Oom, D., Branco, A., San-Miguel-Ayanz, J. and Vignati, E. (2022). *CO2 emissions of all world countries: JRC/IEA/PBL 2022 Report*. Publications Office of the European Union. <https://op.europa.eu/en/publication-detail/-/publication/6c10e2bd-3892-11ed-9c68-01aa75ed71a1/language-en>
- Daire, M. Y., López-Romero, E., Proust, J. N., Regnaud, H., Pian, S., & Shi, B. (2012). Coastal changes and cultural heritage (1): Assessment of the vulnerability of the coastal heritage in Western France. *Journal of Island and Coastal Archaeology* 7(2), 168-182.
- Daire, M. Y. (2021, October 4). *The ALkOA project presented at the Homer colloquium*. <https://aloa.blog/author/marieyvanedaire/>
- Daire, M. Y. (2022a, May 24). *Mission May-June 2022*. <https://aloa.blog/category/actualite/>
- Daire, M. Y. (2022b, June 2). *Field animation with the “Tortues Marines” team (Kap Natirel in Saint-François)*. <https://aloa.blog/2022/06/02/animation-terrain-avec-lequipe-tortues-marines-kap-natirel-a-saint-francois/>
- Daly, C. (2011) Climate Change and the Conservation of Archaeological Sites: A Review of Impacts Theory. *Conservation and Management of Archaeological Sites*, 13(4), 293-310. <https://doi.org/10.1179/175355212X13315728646058>
- Daly, C. (2014). A framework for assessing the vulnerability of archaeological sites to climate change: theory, development, and application. *Conservation and Management of Archaeological sites*, 16(3), 268-282.
- Davis, K. L. (1997). Site Without Sights: Interpreting Closed Excavations. In J. H. Jameson, Jr (Ed.), *Presenting Archaeology: Digging for Truths* (pp. 84-98). AltaMira Press.
- Dawson, T. (2015a). Taking the middle path to the coast. In D. Harvey, & J. Perry (Eds.), *The Future of Heritage as Climates Change: Loss, Adaption and Creativity* (pp. 248-269). Routledge. <https://doi.org/10.4324/9781315724164>
- Dawson, T. (2015b). Eroding archaeology at the coast: How a global problem is being managed in Scotland, with examples from the Western Isles. *Journal of the North Atlantic*, 9(9), 83-98.
- Dawson, T. (Director). (2016). *Moving the Burnt Mound* [Project Film]. Scotland’s Coastal Heritage at Risk.

- Dawson, T., Hambly, J., & Graham, E. (2017). A central role for communities: climate change and coastal heritage management in Scotland. In T. Dawson, C. Nimura, E. López-Romero, & M. Y. Daire (Eds.), *Public Archaeology and Climate Change* (pp. 23-33). Oxbow Books.
- Dawson, T., Hambly, J., Kelley, A., Lees, W., & Miller, S. (2020). Coastal heritage, global climate change, public engagement, and citizen science. *Proceedings of the National Academy of Sciences*, *117*(15), 8280-8286.
- Dawson, T., Hambly, J., Lees, W., & Miller, S. (2021). Proposed Policy Guidelines for Managing Heritage at Risk Based on Public Engagement and Communicating Climate Change. *The Historic Environment: Policy & Practice*, *12*(3-4). <https://doi.org/10.1080/17567505.2021.1963573>
- Dickman, C., & McDonald, T. (2020). Some personal reflections on the present and future of Australia's fauna in an increasingly fire-prone continent. *Ecological Management & Restoration*, *21*(2), 86-96.
- Erlandson, J. M. (2008). Racing a rising tide: Global warming, rising seas, and the erosion of human history. *The Journal of Island and Coastal Archaeology*, *3*(2), 167-169.
- Field, J., Barker, J., Barker, R., Coffey, E., Coffey, L., Crawford, E., Darcy, L., Fields, T., Lord, G., Steadman, B., & Colley, S. (2000). 'Coming back' Aborigines and archaeologists at Cuddie Springs. *Public Archaeology*, *1*(1), 35-48. <https://doi.org/10.1179/pua.2000.1.1.35>
- Fienuip-Riordan, A., & Reardon, A. (2012). *Ellavut / Our Yup'ik World and Weather*. University of Washington Press.
- Filkov, A. I., Ngo, T., Matthews, S., Telfer, S., & Penman, T. D. (2020). Impact of Australia's catastrophic 2019/20 bushfire season on communities and environment. Retrospective analysis and current trends. *Journal of Safety Science and Resilience*, *1*(1), 44-56.
- Fitzpatrick, S. M., Rick, T. C., & Erlandson, J. M. (2015). Recent progress, trends, and developments in island and coastal archaeology. *The Journal of Island and Coastal Archaeology*, *10*(1), 3-27.
- Florida Public Archaeology Network. (2020, October 7). *HMS Florida*. <http://www.fpan.us/projects/hms-florida/>
- Florida Statutes, Title XVIII U.S.C. § 267.135 (2019). http://www.leg.state.fl.us/statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0200-0299/0267/Sections/0267.135.html
- Franklin, M. (1997). "Power to the people": Sociopolitics and the archaeology of black Americans. *Historical archaeology*, *31*(3), 36-50.

- Freke, T. (Director). (2017). *SCHARP Evaluation Part 1: Volunteers* [Film]. SCAPEArchaeology. <https://vimeo.com/channels/scharpevaluation>
- Gero, J. M. (1985). Socio-politics and the woman-at-home ideology. *American antiquity*, 50(2), 342-350.
- Giesen, M. J., Ung, A., Warke, P. A., Christgen, B., Mazel, A. D., & Graham, D. W. (2014). Condition assessment and preservation of open-air rock art panels during environmental change. *Journal of Cultural Heritage*, 15(1), 49-56.
- Gleason, S. (2019, July 3). Back in Quinhagak! *Nunalleg* 2022. <https://nunalleg.wordpress.com/2019/07/03/back-in-quinhagak-4/>
- Google Arts and Culture & makemepulse. (2019, September 11). *Versailles: The Palace is yours*. https://store.steampowered.com/app/1098190/VersaillesVR_the_Palace_is_yours/
- Hambly, J. (2017a). *A Review of Coastal Heritage at Risk in Scotland 2012-16*. The SCAPE Trust. <https://scapetrust.org/wp-content/uploads/reports/SCHARP-CoastalHeritage-REVIEW.pdf>
- Hambly, J. (2017b). *Final Evaluation Report*. The SCAPE Trust. https://scapetrust.org/wp-content/uploads/reports/SCHARP-EVALUATION_report.pdf
- Hambrecht, G., & Rockman, M. (2017). International approaches to climate change and cultural heritage. *American Antiquity*, 82(4), 627-641. <https://www.cambridge.org/core/journals/american-antiquity/article/international-approaches-to-climate-change-and-cultural-heritage/0F0B8408889E4A12817FB922397C6ED8>
- Hanson, D. K. (2007). Cultural Resource Management in Alaska. *Alaska Journal of Anthropology*, 5(2), 1-15.
- Henson, D. (2011). Does Archaeology Matter? In S. Dhanjal & G. Moshenska (Eds.), *Community Archaeology: Themes, methods and practices* (pp. 120-127). Oxbow Books.
- Hillerdal, C. (2013, April 4). The First Dance – Quinhagak dancers performing at the Cama-i. *Nunalleg* 2022. <https://nunalleg.wordpress.com/2013/04/04/the-first-dance-quinhagak-dancers-performing-in-the-cama-i/>
- Hillerdal, C. (2014, August 26). Artefact of the Day 25/8. *Nunalleg* 2022. <https://nunalleg.wordpress.com/2014/08/26/artefact-of-the-day-258-2/>
- Hillerdal, C., Knecht, R. & Jones, W. (2019). Nunalleq: Archaeology, Climate Change, and Community Engagement in a Yup'ik Village. *Arctic Anthropology* 56(1), pp. 4-17. <https://muse.jhu.edu/article/741329/pdf>

- Hillerdal, C. (2020, March 4). Climate change forces Alaska Natives to hunt for new ways to survive. *Nunalleq* 2022. <https://nunalleq.wordpress.com/2020/03/04/climate-change-forces-alaska-natives-to-hunt-for-new-ways-to-survive/>
- Historic VR. (2022, March 25). *Guildford Castle VR*. https://store.steampowered.com/app/1862880/Guildford_Castle_VR/
- Hofman, C. L., & Hoogland, M. L. P. (2016). Connecting stakeholders: Collaborative preventive archaeology projects at sites affected by natural and/or human impacts. *Caribbean Connections*, 5(1), 1-31.
- Hofman, C. L., Stancioff, C. E., Richards, A., Auguiste, I. N., Sutherland, A., & Hoogland, M. L. P. (2021). Resilient Caribbean Communities: A Long-Term Perspective on Sustainability and Social Adaptability to Natural Hazards in the Lesser Antilles. *Sustainability* 13(17), 1-21. <https://doi.org/10.3390/su13179807>
- Hoffman, T. L. (1997). The Role of Public Participation: Arizona's Public Participation Program. In J. H. Jameson, Jr (Ed.), *Presenting Archaeology: Digging for Truths* (pp. 73-83). AltaMira Press.
- Hollesen, J., Callanam, M., Dawson, T., Fenger-Nielsen, R., Friesen, T. M., Jensen, A. M., Markham, A., Martens, V. V., Pitulko, V. V., & Rockman, M. (2018). Climate and the deteriorating archaeological and environmental archives of the Arctic. *Antiquity*, 92(363), 573-586.
- Huntley, J., Aubert, M., Oktaviana, A. A., Lebe, R., Hakim, B., Burhan, B., Aksa, L. M., Geria, I. M., Ramli, M., Siagia, L., Brand, H. E. A., & Brumm, A. (2021). The effects of climate change on the Pleistocene rock art of Sulawesi. *Scientific Reports*, 11(9833), 1-10
- International Council on Monuments and Sites. (2020, December 5). ICOMOS declares a climate emergency. <https://www.icomos.org/en/focus/climate-change/85740-icomos-declares-a-climate-emergency#:~:text=This%20week%20the%2020th,a%20Climate%20and%20Ecological%20Emergency.&text=It%20calls%20for%20urgent%20collective,warming%20to%201.5%C2%B0C>
- IPCC. (2023). Summary for Policymakers. In H. Lee and J. Romero (Eds.), *Climate Change 2023: Synthesis Report. A Report of the Intergovernmental Panel on Climate Change. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 1-34). IPCC
- Jameson Jr, J. H. (Ed.). (1997). *Presenting archaeology to the public: Digging for Truths*. AltaMira Press.

- Jensen, A. M. (2017). Threatened heritage and community archaeology on Alaska's North Slope. In T. Dawson, C. Nimura, E. López-Romero, & M. Y. Daire (Eds.), *Public Archaeology and Climate Change* (pp. 23-33). Oxbow Books.
- Jones, R., Hyslop, E., Lyall, A., Day, J., Heron, S. F., Markham, A., Downes, J., & Gibson, J. (2019). Climate Vulnerability and the Heart of Neolithic Orkney World Heritage Property. *The Archaeologist*, (108), 21-23.
- Jones, R. N., & Preston, B. L. (2011). Adaptation and risk management. *Wiley Interdisciplinary Reviews: Climate Change*, 2(2), 296-308.
- Katz, J., & Tokivinine, A. (2017). The past, now showing in 3D: An introduction. *Digital Applications in Archaeology and Cultural Heritage* 6, 1-3.
- Kelly, L., & Gordon, P. (2002). Developing a community practice: museums and reconciliation in Australia. In R. Sandell, (Ed.), *Museums, Society, Inequality* (pp. 153-174). Routledge.
- Knecht, R., & Jones, W. (2019). "The Old Village": Yup'ik Precontact Archaeology and Community-Based Research at the Nunalleq Site, Quinhagak, Alaska. *Études Inuit Studies*. 43(1-2), 25-52. <https://www.erudit.org/en/journals/etudinuit/1900-v1-n1-etudinuit05546/1071939ar.pdf>
- Kowlok, J. (2015). Case Study 8: Relocating the Lighthouse. In C. A. Schupp, R. L. Beavers, & M. A. Caffrey (Eds.), *Coastal Adaption Strategies: Case Studies* (pp. 20-21). National Park Service
- Lawler, A. (2021, October 21). 100 Wonders of the World. *National Geographic*, https://www.nationalgeographic.com/magazine/article/these-archaeological-findings-unlocked-the-stories-of-our-ancestors-feature?cmpid=org=ngp::mc=crm-email::src=ngp::cmp=editorial::add=History_20211025::rid=B4E99C5A2FE1C3AFEF4E6A9D6D7CBFAF
- Lewis, P. E. (2011). St. Vincent and the Grenadines. In P. E. Siegler & E. Righter (Eds.), *Protecting Heritage in the Caribbean* (pp. 96-105). University of Alabama Press.
- Lim, J. S., Gleason, D., Jones, W., & Church, W. (2021). Nuna Nalluyuituq (The Land Remembers): Remembering landscapes and refining methodologies through community-based remote sensing in the Yukon-Kuskokwim Delta, Southwest Alaska. *Archaeological Prospection*, 28(3). <https://doi-org.ezproxy.leidenuniv.nl/10.1002/arp.1840>
- Lim, J. S., Gleason, S., Strehlau, H., Church, L., Nikolai, C. Jr., Church, W., & Jones, W. (2023). Alaska Native Allotments at Risk: Technological Strategies for Monitoring Erosion and Informing Solutions in Southwest Alaska. *Land*, 12(1), 1– 19. <https://doi.org/10.3390/land12010248>

- López-Romero, E., Ballesteros-Arias, P., Daire, M. Y., & Güimil-Fariña, A. (2012). Les Îles Atlantiques De Galice (Nord-Ouest Ibérique): Archéologie et Vulnérabilité [The Atlantic Islands of Galicia (North-West Iberia): Archaeology of Vulnerability]. *Bulletin de l'A. M. A. R. I.* (25), pp. 5-19.
- López-Romer, E., Vásquez, X. I. V., Mañana-Borrazás, P., & Güimil-Fariña, A. (2017). Recovering information from eroding and destroyed coastal archaeological sites: a crowdsourcing initiative in Northwest Iberia. In T. Dawson, C. Nimura, E. López-Romero, & M. Y. Daire (Eds.), *Public Archaeology and Climate Change* (pp. 72-80). Oxbow Books.
- Mann, M. E. (2002). Little Ice Age, In M.C. MacCracken, & J.S. Perry (Eds.), *Encyclopedia of Global Environmental Change, Volume 1, the Earth System: Physical and Chemical Dimensions of Global Environmental Change*, John Wiley & Sons (pp. 504-509).
- Marshall, Y. (2002). What is community archaeology?. *World archaeology*, 34(2), 211-219.
- McManamon, F. P. (2000). Archaeological messages and messengers. *Public Archaeology*, 1(1), 5–20.
- Megarry, W., & Hadick, K. (2021). Lessons from the Edge: Assessing the Impact and efficacy of digital technologies to stress urgency about climate change and cultural heritage globally. *The Historic Environment*, 12(3-4), 336-355.
- Miller, S. (2015). Cemeteries as Participatory Museums: The Cemetery Resource Protection Training Program across Florida. *Advances in Archaeological Practice*, 3(3), 275-290. <https://www.cambridge.org/core/journals/advances-in-archaeological-practice/article/cemeteries-as-participatory-museums/E31C0C0F156A09B290135411BC46E95F>
- Miller, S. E., & Murray, E. J. (2018). Heritage monitoring scouts: Engaging the public to monitor sites at risk across Florida. *Conservation and Management of Archaeological Sites*, 20(4), 234-260.
- Miller, S. & Murray, E.J. (2019). *Heritage Monitoring Scouts (HMS Florida) Annual Report August 1, 2017-July 30, 2018*. Florida Public Archaeology Network. <https://fpangoingpublic.blogspot.com/2019/03/annual-report-for-heritage-monitoring.html>
- Miller, S. & Murray, E.J. (2021). *Heritage Monitoring Scouts (HMS Florida) Annual Report August 1, 2018-July 30, 2019*. Florida Public Archaeology Network. <https://fpangoingpublic.blogspot.com/2020/01/annual-report-for-heritage-monitoring.html>
- Minnis, P. (2006). Answering the Skeptic's Question. *Society for American Archaeology* 6(5), 17-20.

- Moser, S., Glazier, D., Phillips, J. E., El Nemr, L. N., Mousa, M. S., Aiesh, R. N., Richardson, S., Conner, A., & Seymour, M. (2002). Transforming archaeology through practice: strategies for collaborative archaeology and the Community Archaeology Project at Quseir, Egypt. *World Archaeology*, 34(2), 220-248.
- Motte, E., Daire, M., Ariza Pareja, M., López-Romero, E., Bonnissent, D. & Stouvenot, C. (2022a). Les sciences participatives au service du patrimoine côtier menacé par les changements globaux dans les îles françaises de la Caraïbe: la démarche du projet ALOA. [Participatory sciences at the service of coastal heritage threatened by global changes in the French Caribbean islands: the approach of the ALOA project]. *L'Information géographique*, 86, 54-71. <https://doi-org.ezproxy.leidenuniv.nl/10.3917/lig.862.0054>
- Motte, E., Daire, M. Y., López-Romero, E. (2022b, March). Climate Change and Cultural heritage: Atlantic challenges and experience. In *Colloque Heritage for the future. Science for heritage. A European Adventure for research and innovation*. Ministère de la Recherche, 1-6. <http://hdl.handle.net/10261/279860>
- Mustonen, T., & Lehtinen, A. (2013). Arctic earthviews: cyclic passing of knowledge among the indigenous communities of the Eurasian North. *Sibirica*, 12(1), 39-55.
- Mycoo, M., Wairiu, M., Campbell, D., Duvat, V., Golbuu, Y., Maharaj, S., Nalau, J., Nunn, P., Pinnegar, J., Warrick, O. (2022). Small Islands. In H. O. Pörtner, D. C. Roberts, M. Tignor, E. S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (Eds.), *Climate Change 2022: Impacts, Adaption and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (2043-2121)*. Cambridge University Press. https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter15.pdf
- National Indigenous Australians Agency. (n.d.). *Indigenous Ranger Programs*. Australian Government: National Indigenous Australians Agency. <https://www.niaa.gov.au/indigenous-affairs/environment/indigenous-ranger-programs#introduction>
- Olmos Benlloch, P., López-Romero, E., & Daire, M. Y. (2017). Coastal erosion and public archaeology in Brittany, France: recent experiences from the ALeRT project. In T. Dawson, C. Nimura, E. López-Romero, & M. Y. Daire (Eds.), *Public Archaeology and Climate Change* (pp. 82-89). Oxbow Books.
- O'Rourke, S. R., Turner, J. J., Ritchie, K. (2018). Key to the Past: Community Perceptions of Yup'ik Interaction with Culturally Relevant Education Inspired by the Nunalleq Archaeology Project. *Journal of Archaeology and Education*, 2(4), 1-35.

- Parks Australia. *Kakadu Tourism Master Plan 2020-2030*. Australian Government: Parks Australia. <https://parksaustralia.gov.au/sl/files/kakadu-tourism-master-plan-2020-2030-final.pdf>
- Perdikaris, S., Bain, A., Boger, R., Sandrine, G., Faucher, A. M., Rousseau, V., Persaud, R., Noël, S., Brown, M., & Medina-Triana, J. (2017). In T. Dawson, C. Nimura, E. López-Romero, M. Y. Daire (Eds.), *Public Archaeology and Climate Change* (pp. 138-148). Oxbow Books.
- Pilkington, E. (2008, September 28). The village at the tip of the iceberg. *The Guardian*. <https://www.theguardian.com/environment/2008/sep/28/alaska.climatechange>
- Pinsky, V., & Wylie, A. (Eds.). (1989). *Critical Traditions in Contemporary Archaeology: essays in the philosophy, history and socio-politics of archaeology*. Cambridge University Press.
- Stren, R., & Polèse, M. (2000). *The Social Sustainability of Cities: Diversity and the Management of Change*. University of Toronto Press.
- Reimann, L., Vafeidis, A. T., Brown, S., Hinkel, J., & Tol, R. S. (2018). Mediterranean UNESCO World Heritage at risk from coastal flooding and erosion due to sea-level rise. *Nature communications*, 9(1), Article 4161. <https://doi.org/10.1038/s41467-018-06645-9>
- Rick, T.C., Fitzpatrick, S.M. Archaeology and coastal conservation. (2012). *Journal of Coastal Conservation* 16(2), 135–136. <https://doi-org.ezproxy.leidenuniv.nl/10.1007/s11852-010-0121-4>
- Sankatsing Nava, T., & Hofman, C. L. (2018). Engaging Caribbean island communities with indigenous heritage and archaeology research. *JCOM: Journal of Science Communication*, 17(4), 1-10.
- Satchell, J., & Tidbury, L. (Eds.). (2014). *Arch-Manche: Archaeology, Art and Coastal Heritage – tools to support coastal management and climate change planning across the Channel Regional Sea: Technical Report*. (n.p).
- SCAPE. (2017). *About SCAPE*. <https://scapetrust.org/who-we-are/>
- SCAPE. (2022). *Join us in coastal heritage surveys of your area*. <https://scapetrust.org/coastarch-surveys/>
- Scarre, C., & Scarre, G. (Eds.). (2006). *The ethics of archaeology: philosophical perspectives on archaeological practice*. Cambridge University Press.
- Scott-Ireton, D. A. (2011). Heritage awareness diving seminars: Teaching divers about protecting the underwater cultural environment. *NAUI Sources*, 23(3), 11.

- Scottish Government. (2005, February). *Part 1 Land Reform (Scotland) Act 2003: Guidance for Local Authorities and National Park Authorities*. <https://www.gov.scot/publications/part-1-land-reform-scotland-act-2003-guidance-local-authorities-national-park-authorities/pages/1/>
- Shi, B., Proust, J. N., Daire, M. Y., Lopez-Romero, E., Regnauld, H., & Pian, S. (2012). Coastal changes and cultural heritage (2): An experiment in the Vilaine estuary (Brittany, France). *The Journal of Island and Coastal Archaeology*, 7(2), 183-199.
- Sloan, A. C. (2021). *Gender, Identity, and Belonging: A Community-Based Social Archaeology of the Nunalleq Site in Quinhagak, Alaska* [Doctoral dissertation, University of Oregon]. ProQuest Dissertations and Theses Global.
- Siegel, P. E. Protecting Heritage in the Caribbean. In P. E. Siegel & E. Righter (Eds.), *Protecting Heritage in Caribbean* (1st ed., pp. 152-162). The University Of Alabama Press.
- Simpson, F. (2008). Community archaeology under scrutiny. *Conservation and management of archaeological sites*, 10(1), 3-16.
- Simpson, F. (2009). *The Values of Community Archaeology: A comparative assessment* [Doctoral dissertation, University of Exeter]. ProQuest Dissertations and Theses Global.
- Simpson, F., & Williams, H. (2008). Evaluating community archaeology in the UK. *Public archaeology*, 7(2), 69-90.
- Simpson, F. (2011). Shoreditch Park Community Excavation: A Case Study. In G. Moshenska, & S. Dhanjal (Eds.), *Community archaeology: Themes, methods and practices* (115-119). Oxbow Books.
- Taçon, P. S., May, S. K., Wesley, D., Jalandoni, A., Tsang, R., & Mangiru, K. (2021). History disappearing: The rapid loss of Australian Contact Period rock art. *Journal of Field Archaeology*, 46(2), 119-131.
- Toolis, R. (2007). Excavation of a burnt mound at Meur, Sanday, Orkney. *Scottish Archaeological Journal*, 29(1), 31-49.
- UNDP. (2017). Regional Overview: Impact of Hurricanes Irma and Maria. United Nations Development Program: Latin America and the Caribbean. <https://www.undp.org/latin-america/publications/regional-overview-impact-hurricanes-irma-and-maria>
- Vanwezer, N., Taylor, W. T. T., Bayarsaikhan, J., Breitenbach, S. F., Amano, N., Louys, J., del Val, M., Boivin, N., & Petraglia, M. (2021). Hunting, herding, and people in the rock art of Mongolia: New discoveries in the Gobi-Altai Mountains. *Archaeological Research in Asia*, 26(100267) 1-15.

- Wahbeh, W., Nebiker, S., & Fangi, G. (2016). Combining public domain and professional panoramic imagery for the accurate and dense 3D reconstruction of the destroyed bel temple in Palmyra. *ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, 3(5), 81-88.
- Watterson, A., & Hillderdal, C. (2020). Nunalleq, Stories from the Village of Our Ancestors: Co-designing a Multi-vocal Educational Resource Based on an Archaeological Excavation. *Archaeologies*, 16(2), 198-227.
- Watterson, A. (2022, May 24). Back to Quinhagak. *Digital Dirt Virtual Pasts*. https://digitaldirtvirtualpasts.wordpress.com/2022/05/24/back-to-quinhagak/?fbclid=IwAR0BCjWfAdCnoa-z8w9SmCOoAfzFFu6j_Ls3iN5AGwbUOncdO7Plx4FW6a0
- Watterson, I., Abbs, D., Bhend, J., Chiew, F., Church, J., Ekström, M., Kirono, D., Lenton, A., Lucas, C., McInnes, K., Moise, A., Monselesan, D., Mpelasoka, F., Webb, L., & Whetton, P. (2015). Rangelands Cluster Report. In M. Ekström, P. Whetton, C. Gerbing, M. Grose, L. Webb, & J. Risbey (Eds.), *Climate Change in Australia Projections for Australia's Natural Resource Management Regions: Cluster Reports* (pp. 20, 26-27, 34). CSIRO and Bureau of Meteorology.
- Wright, A. M. (2018). Assessing the Stability and Sustainability of Rock Art Sites: Insight from Southwestern Arizona. *Journal of Archaeological Method and Theory*, 25, 911-952.