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The Ilulissat Icefjord: Local Stewardship and Global Responsibility in a Changing Climate

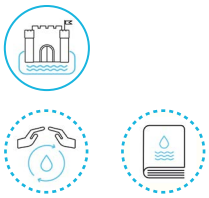
Bo Albrechtsen

Abstract
The Sermermiut archaeological site at the Ilulissat Icefjord contains cultural remnants from three Inuit cultures spanning nearly 4000 years. This unique site is now under threat from climate change and oceanic forces. The permafrost layer, which has long supported the site, including the cultural-historical ruins located on it, is thawing, causing destabilization of the ground and severe erosion of the slopes. A fieldwork initiative conducted in the summer of 2024 by collaborative teams from Greenland's cultural and heritage institutions, in partnership with international technical assistance programs, studied these impacts using advanced monitoring techniques and community involvement, setting an example for adaptive management strategies that align with the UN 2030 Agenda. This article highlights how climate change is affecting both cultural heritage and contemporary life at the Ilulissat Icefjord, and emphasizes the importance of combining scientific research, responsible site management and local community engagement to safeguard this UNESCO World Heritage property. Through adaptive management, integration of local knowledge and strong collaboration across sectors, the Ilulissat Icefjord can remain both a globally significant natural site and a resilient, living Arctic community in a changing climate.

KEYWORDS

UNESCO World Heritage
Sermermiut
permafrost
erosion
cultural heritage

WATER ICONS

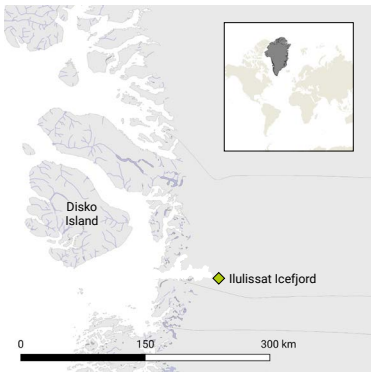


CLIMATE

ET: Tundra climate

Policy Recommendations

- Integrate local knowledge: Develop management strategies that combine traditional Inuit ecological expertise with modern scientific methodologies.
- Involve the local population in decision-making processes and address their concerns about the practical implications of living near a UNESCO property.
- Secure long-term funding and commitment from local and national governments to ensure the Icefjord's sustainable management and preservation.
- Promote equitable benefits: Ensure that the site's global significance translates into meaningful economic and social opportunities for the local community.



< Fig. 1 This green plain within the Ilulissat UNESCO property holds 4,000 years of Inuit history. Now, erosion is accelerating as the permafrost beneath it melts (Source: Bo Albrechtsen, 2025).

Introduction

The Ilulissat Icefjord, a UNESCO World Heritage property, spans a total area of 4,024 km² on the west coast of Greenland and is one of the most remarkable natural heritage sites in the world. Recognized by UNESCO in 2004, this vast protected area includes over 3,000 km³ of inland ice and glaciers, alongside coastal and marine zones. Its immense scale, along with climate change, poses significant challenges for effective management and conservation.

Within the World Heritage property, the Sermermiut archaeological site holds invaluable remnants of three distinct Inuit cultures spanning nearly four thousand years, including remains of Inuit housing, artifacts and tools. The site appears today as a grass-covered meadow with the scattered square outlines of ancient house ruins, beneath which lie the layered remains of earlier Inuit cultures preserved in the earth. This rich cultural heritage, situated at the shoreline, faces escalating threats due to oceanic forces and the pervasive impacts of climate change. The cultural layers of Sermermiut rest atop permafrost, which historically provided a stable foundation for the site. However, as global temperatures rise, particularly in the Arctic, where warming is amplified due to feedback mechanisms such as reduced sea ice, changes in cloud cover and increased atmospheric heat transport (Previdi et al. 2021), this frozen foundation is thawing (fig. 1), leading to catastrophic soil erosion and increased site vulnerability.

The effects of climate change extend beyond the archaeological remnants and into the nearby town of Ilulissat, located just 2 km from Sermermiut, which serves as both the physical gateway and administrative hub for this World Heritage property. As Greenland's main tourist destination and a vibrant modern Inuit community, Ilulissat plays a key role in facilitating access to and interpretation and stewardship of the Icefjord, while facing its own climate-related challenges. Here, the thawing of permafrost layers disrupts daily life, causing significant infrastructural challenges. Houses once secure on frozen ground are now losing their stability as the thawing permafrost undermines their foundations, leading to tilting structures that eventually become uninhabitable (Harmsen et al. 2018; fig. 2). Asphalt roads develop cracks, bumps and potholes, creating hazards for both pedestrians and vehicles. These visible and tangible impacts highlight the broader societal and cultural implications of a warming Arctic, underscoring the urgent need for integrated conservation and adaptation strategies that address both heritage preservation and community resilience.

Historic Continuity: Connecting Past and Present

The archaeological site of Sermermiut provides a unique window into the entirety of Greenland's Inuit history, offering access to cultural material from all main periods of settlement. Within its approximately 2.5-meter-thick midden, stratified layers reveal evidence from three distinct cultural periods. The two deepest and oldest layers belong to the prehistoric Saqqaq and Dorset cultures, named after their original discovery sites. The Saqqaq culture inhabited Greenland from around 2400 BCE to approximately 800 BCE, succeeded by the Dorset culture, which arrived from the west around 600 BCE and persisted until approximately 0 CE.

The next wave of settlement occurred in southern Greenland, where Norse and Scandinavian settlers, primarily from today's Iceland and Norway, established themselves around 1000 CE. Although the Norse are believed to have sailed

^ Fig. 2 The Ilulissat Cultural History Museum is sinking as thawing permafrost undermines its foundations (Source: Bo Albrechtsen, 2025).

past the uninhabited Sermermiut, no evidence of permanent Norse settlement has been found this far north. It was the Thule culture, the ancestors of the modern Inuit people who migrated from Alaska arriving in the thirteenth century, that established a lasting presence at Sermermiut. From approximately 1300 to 1850, the site was continuously inhabited, at least seasonally, as the semi-nomadic Inuit moved in rhythm with the region's hunting and wildlife patterns. This lifestyle was structured around the annual cycle of subsistence activities, with families relocating according to the seasonal availability of game. During autumn, people would travel inland to temporary camps to hunt caribou, while the winter months were spent in more permanent coastal dwellings, such as those at Sermermiut, where access to marine resources like seals was critical. This pattern of seasonal movement remained central to Inuit life until the mid-colonial period, when the introduction of institutions like schools, churches and trading posts began anchoring families to year-round settlements, gradually reducing their mobility.

By 1850, the last inhabitants of Sermermiut had relocated to the Danish trading post of Jakobshavn, the present-day town of Ilulissat. Such trading posts included not only merchants but also churches, schools and other institutions, and offered services and opportunities that increasingly drew people away from traditional sites like Sermermiut. Since then, and likely even before its abandonment, erosion along the coastline has revealed remnants of the site's long history. While much of this material has

been claimed by the sea, some artifacts have been collected by passersby, providing invaluable insights into the lives of Sermermiut's former residents.

While the collection at Ilulissat's Cultural History Museum predominantly comprises objects from archaeological excavations, it is supplemented by these chance finds recovered from the shoreline next to the cultural site. Their preservation makes the artifacts from the two oldest cultures, Saqqaq and Dorset, particularly remarkable. Typically, only the stone blades and tools from these cultures are found, as organic materials, such as handles and shafts, have long decayed in other regions. This is largely due to differing preservation conditions. Elsewhere, organic components have been exposed to oxygen, moisture and seasonal temperature fluctuations, often because they were buried under only a thin protective layer of soil. Without the stable, low-oxygen environments found in permafrost or deep, compact layers of earth, organic materials tend to decompose rapidly, leaving behind only the more durable stone elements. However, in the frozen layers of Sermermiut, these organic components remain intact, offering an unprecedented glimpse into the craftsmanship and daily life of these early Arctic cultures. The permafrost that preserved these artifacts has acted as a natural freezer, keeping organic materials intact for thousands of years. Despite this, the majority of the museum's archaeological collection comprises artifacts from the more recent Thule culture. This predominance reflects the larger and more substantial nature of Thule settlements, which were more extensive and complex than those of their predecessors.

The museum serves as a bridge between past and present, linking the artifacts of the Sermermiut settlement to the modern inhabitants of Ilulissat. Descendants of Sermermiut's last residents now walk the town's streets, attend its schools, and, as part of their education, view their ancestors' tools and household items with curiosity and pride. But they are not only students, many are also inspectors, leaders and directors at key institutions across the town, continuing to shape Ilulissat's future while staying rooted in its past.

In an era of accelerating globalization, where the identity of smaller communities can be easily diluted in the fast pace of digital media, the museum plays an essential role in maintaining cultural continuity. By connecting younger generations with their heritage, it strengthens a sense of belonging and pride in local history, helping to ensure that the knowledge, traditions and values of this Arctic community are not lost, but carried forward.

Climate Change: Local and Global Implications

In Greenland, the impacts of climate change are evident in rising air and sea temperatures, as well as shorter periods of sea ice cover (Selyuzhenok et al. 2020). Popularly, the effects of climate change can be linked to "moving south"[1] within the country, ushering in a slightly warmer climate where winter ice may no longer form reliably on the sea. While many of the same fish, marine mammals and land animals remain, their abundance and distribution are shifting, altering the ecological balance.

1. As climate change progresses, regions are experiencing weather patterns that historically occurred hundreds of miles closer to the equator. This means cooler areas are becoming warmer and experiencing the temperature ranges, precipitation patterns, and seasonal cycles that were once typical of locations further south.

^ Fig. 3 Sermermiut East, 2023: The cultural site of Sermermiut, a former winter settlement inhabited by Inuit for millennia (Source: Bo Albrechtsen, 2025).

Inuit cultures are renowned for their remarkable adaptability to changing circumstances. Even as Greenland draws journalists and filmmakers eager to document the visible effects of climate change, it is rare to hear residents speak negatively about the issue. This may be because climate change is not generally perceived as an existential threat within the Greenlandic population. People here have adapted to environmental shifts for millennia and have learned to respond with resilience and pragmatism to major changes. Today is no exception as many continue to adjust to the evolving conditions without overt complaint, drawing on long-standing knowledge and flexibility.

Nevertheless, some challenges are undeniable. As hunter and fisherman J. Kristensen explained to me in September 2023, capturing the essence of the changes being experienced, the absence of reliable winter ice is akin to the collapse of a bridge, cutting off access to traditional hunting grounds. Additionally, the unpredictable ice conditions have led to accidents, where previously reliable sea ice proves too thin for safe travel.

Hence, locally, the thawing of permafrost compromises the preservation of archaeological artifacts, destabilizing the frozen soil that has protected them for thousands of years. Entire ruins of winter houses (fig. 3) from the Thule culture, dating from approximately 1300 to 1850, have collapsed into the sea and are now lost forever. Additionally, modern infrastructure and buildings are increasingly threatened by retreating permafrost, leading to structural instability.

The thawing of permafrost presents challenges that extend far beyond Greenland, with profound implications globally. Alongside the artifacts preserved in the permafrost lie vast stores of organic material. As permafrost thaws and this material decomposes, it releases significant quantities of carbon dioxide and methane, potent greenhouse gases, into the atmosphere, exacerbating climate change (Elberling et al. 2010; Harmsen et al. 2018).

However, despite these significant climatic shifts, the values that underpin Ilulissat Icefjord's inclusion on the World Heritage List and its Outstanding Universal Value (OUV) remain intact. The property continues to stand as an outstanding example of important stages in the earth's history, encompassing the record of life, significant ongoing geological processes and remarkable geomorphological features (UNESCO 2004). These enduring qualities ensure that Ilulissat Icefjord remains a site of unparalleled natural and cultural heritage, resilient in its ability to inspire global recognition and conservation efforts.

While climate change poses threats to the management of the site, it compounds social and economic factors. One pressing challenge lies at the interface between the protected area and human habitation. Ilulissat is the largest settlement near the UNESCO World Heritage property and is located within its designated buffer zone. While there is also a smaller settlement nearby, Ilulissat is experiencing the greatest pressure for urban expansion due to its growing population and increasing tourism. However, the ability to expand Ilulissat's boundaries is constrained by the protected status of the site, frustrating local residents and politicians, who perceive the restriction as unnecessary. At the same time, World Heritage designation status implies limited human activity within the designated area, with only local hunters and fishermen possessing the skills and knowledge necessary to navigate the challenging conditions of the icefjord. With the increase in tourism in recent years, some of these individuals have be-

gun offering guided experiences, such as dog sledding trips, allowing a select number of visitors to venture into the icefjord. However, the majority of tourists experience the area from its periphery, viewing its grandeur from designated viewpoints or trails. The core protected area's limited accessibility further exacerbates local discontent.

In the face of the challenges involved in managing this unique site, collaboration between local authorities, scientists and international stakeholders is crucial. The collaborative effort can be further strengthened by leveraging modern technologies, such as satellite monitoring and climate modeling, alongside traditional ecological knowledge to ensure that the Ilulissat Icefjord continues to inspire and educate future generations while maintaining its extraordinary natural and cultural heritage.

Fieldwork in 2024: Monitoring and Community Engagement

As the impacts of climate change on the Ilulissat Icefjord continue to unfold, my colleagues and I remain steadfast in our commitment to protecting this unique World Heritage property. Recognizing the magnitude of the challenges ahead, we prioritize an adaptive management approach informed by the latest scientific research and local knowledge.

As erosion and the potential loss of objects to the sea become increasingly urgent concerns, multiple strategies can be employed to address these issues. One approach is to prioritize documentation, such as through archaeological excavation, to rescue and document artifacts within their cultural context. In this context, in the summer of 2024, a collaborative fieldwork initiative spearheaded by the World Heritage Office of Ilulissat, the National Museum of Greenland, and the International Technical Assistance Program under the US Department of the Interior sought to assess the impact of climate change on Greenland's cultural heritage. The project focused on understanding the long-term consequences of climate change, particularly the tangible effects of permafrost retreat. A range of scientific and community engagement strategies were employed (Bonsell et al. 2025):

1. Soil and vegetation survey: Researchers conducted a comprehensive analysis of the soil and vegetation types at the site, documenting the depth of the permafrost and establishing baseline data for future comparisons.

2. Frost tube installation: To monitor year-round changes in the frozen ground, frost tubes were installed, enabling local staff to track permafrost movement and better understand seasonal variations over a year.

3. Temperature monitoring: Temperature loggers were embedded in drilled holes along the exposed erosion face to gather continuous soil temperature data, which will be analyzed in 2025 to provide insights into subsurface warming trends.

4. Citizen science station: A unique public engagement initiative was launched to raise awareness and gather data. Visitors were invited to measure the depth of frozen ground in wet tundra, which fluctuated in response to the warming and cooling of seasons. A measuring stick and QR code system allowed for easy data submission, fostering greater interest in climate change's effects on heritage sites. This engagement with the local community is particularly important. By incorporating traditional knowledge

into our management practices and fostering public participation through citizen science initiatives, we aim to create a resilient and inclusive framework for preserving the site's universal values. Additionally, we are exploring opportunities to increase public awareness of the Icefjord's role as a barometer of global climate change, enhancing its importance not only as a local heritage site but also as a symbol of the interconnectedness of our planet.

Over the years, the Ilulissat Icefjord Office has collaborated with a wide range of scientists, contributing to a diverse portfolio of research projects. These collaborations have played a key role in advancing scientific understanding of the Ilulissat Icefjord World Heritage property and its surrounding environment, thereby supporting evidence-based decision-making in conservation planning. This summer's fieldwork focuses on the extent and impact of permafrost thaw across the area. The results will feed directly into the Icefjord Office's ongoing management work and strategic assessments. Findings will also support partner institutions such as the National Museum of Greenland in prioritizing conservation efforts at culturally significant sites, including Sermermiut.

In addition to scientific collaboration, the Icefjord Office maintains close and continuous dialogue with local fishers and hunters. These long-standing relationships ensure that the Office stays attuned to current developments within these key livelihoods, and that local knowledge and perspectives are integrated into daily management practices.

As local site managers, the staff of the Icefjord Office are committed to facilitating and applying both scientific and traditional knowledge to strengthen the long-term protection of this unique and vulnerable Arctic heritage landscape. Future efforts will focus on expanding monitoring systems to better understand the dynamics of permafrost retreat and coastal erosion. Collaborations with academic institutions and international research programs will also play a crucial role in refining our strategies, ensuring that decisions are grounded in robust data and cutting-edge methodologies. For example, ongoing partnerships with the National Museum of Greenland and the US Department of the Interior are helping us explore innovative conservation techniques, such as advanced documentation technologies and mitigating erosion through planting or building protective barriers.

Conclusion

The Ilulissat Icefjord exemplifies both the challenges and opportunities climate change poses for World Heritage properties. While the accelerating thaw of permafrost in Greenland and the increasing frequency of erosion events highlight the fragility of this unique environment, these events also underscore the urgent need for innovative, science-based solutions to better protect the Ilulissat Icefjord site.

The managers at the local Icefjord Office are not passive observers of these changes. In our collaborations with leading researchers and institutions, the my colleagues and I are developing actionable strategies that prioritize both conservation and adaptation. By integrating traditional ecological knowledge with advanced scientific methods, we strive to protect the Icefjord's extraordinary natural and cultural heritage while supporting the resilience of the local community.

This proactive approach ensures that the Ilulissat Icefjord remains a beacon of Arctic heritage,

capable of inspiring future generations while contributing valuable insights to global discussions on climate change and cultural preservation. The challenges are significant, but with determination, collaboration and innovation, we are confident in our ability to address them.

At the same time, effective management of the Ilulissat Icefjord requires policies that prioritize local knowledge while addressing the unique challenges of maintaining a UNESCO World Heritage property within a living community. Recognizing the value of traditional Inuit ecological knowledge is essential for developing strategies that are both sustainable and culturally appropriate. This local expertise provides invaluable insights into the dynamic environment of the Icefjord, complementing scientific research and enhancing adaptive management approaches.

Equally important is a genuine responsiveness to the experiences and perspectives of the local population, who live near the protected area. The restrictions and obligations associated with managing a UNESCO site can sometimes feel burdensome, particularly when they limit urban development or traditional practices. Policymakers must ensure that the benefits of World Heritage designation, including global recognition and increased tourism, are balanced by tangible improvements in local living conditions and opportunities.

To achieve this, strong political support is required at both the municipal and national levels. Local and national leaders must work together to secure adequate funding for conservation and management efforts. This includes financing for infrastructure improvements, scientific research and community engagement programs. Economic investment in sustainable tourism initiatives and local capacity-building will not only help preserve the site but also foster a sense of shared stewardship among residents.

By fostering a collaborative, well-funded, and inclusive approach, we can ensure the Ilulissat Icefjord continues to thrive as both a natural wonder and a living, culturally vibrant community.

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Bo Albrechtsen holds a master's degree in Arctic anthropology, linguistics and social science. His previous positions include museum director at Upernavik Local Museum (1999–2009), curator and deputy director at the National Museum of Greenland (2009–2018), director at The Greenlandic House in Aalborg, Denmark (2018–2022), and site manager at Avannaata Kommunia (2022–current).

Contact: boal@avannaata.gl