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Conference Review

The Future of Polar Heritage: Environmental Challenges in the Face of Climate Change. The 2014 ICOMOS International Polar Heritage Committee Conference, 25–28 May 2014, Copenhagen, Denmark. Conference hosted by The Department of Conservation and Natural Sciences, National Museum of Denmark and National Museum of Greenland

The 2014 ICOMOS International Polar Heritage Committee Conference (IPHC) was held at the National Museum of Denmark in Copenhagen from 25 to 28 May. The aim of the conference was to bring together heritage researchers and managers from different disciplines to discuss environmental challenges to polar culture heritage sites in the face of climate change. The IPHC conference in Copenhagen was the sixth since 2001. Given IPHC is a scientific committee of ICOMOS, past conferences have predominantly focused on the conservation of buildings and their contents. In order to broaden contributions — both geographically and subject wise — the conference was this time organized in cooperation with the Polar Archaeology Network (PAN). This resulted in the biggest IPHC conference to date with sixty-five delegates from Denmark, Norway, Sweden, Greenland, France, United Kingdom, Canada, China, the USA, Brazil, Australia, and New Zealand. Furthermore, the programme was geographically well balanced with thirty-six presentations from both the Arctic and Antarctic regions (Greenland, Svalbard, Alaska, Canada, Siberia, and Antarctica).

After the official opening of the conference, Professor Bo Elberling, Director of the Center for Permafrost, University of Copenhagen, made his keynote address 'Climate Changes and the Vulnerability of our Arctic Heritage: Processes and Feedback Mechanism'. Here the message was quite clear — the Arctic is warming at a rate previously unseen with great consequences for the environment as well as for heritage sites. The key note formed an excellent foundation for the following two days of presentations and discussions focusing on how to detect and respond to threats induced by climate change.

Most settlements of the ancient cultures in the Arctic region are close to the sea. Rising sea level and storm surge impacts increase coastal erosion rates and represent a great threat for these heritage sites. Examples of this were given in several of the presentations: on the northern coast of Alaska several sites are eroding away (Pingusugruk, Ukkuqsi, Ipiutaq, Nuvuk, Walakpa) and in the Western Canadian Arctic the most important settlements of the Inuvialuit, the original inhabitants of north-westernmost Canada, are endangered by erosion. The same picture is being observed in several parts of Greenland, e.g. the site of Lita in North-west Greenland where 1000 years of human history is rapidly eroding into the fiord, and at Herjolfnes in South Greenland where ruins from the Norse culture are highly threatened by coastal erosion (Figure 1).

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FIGURE 1 The ruin of the Herjolfsnes Church in South Greenland is threatened by erosion from the sea. *Photograph K. Raahauge*

Air photos, satellite images, old maps, and previous archaeological surveys are currently the most used methods to detect and quantify changes to sites. Furthermore, the use of Geographic Information Systems (GIS) and 3D scanners are also becoming more widespread. Two of the presentations discussed the challenges when evaluating where and when to expect coastal erosion. The impact of an increased sea level is expected to be most dramatic in coastal soft-rock deposits (sedimentary coast types) but local factors such as wave dynamics, sea ice cover, the presence of protective dunes or gravel ridges, and glacial rebound need to be considered.

Air temperatures are increasing with direct and indirect effects on the preservation of heritage sites. In recent years, perennial high-mountain snow/ice patches have been melting and receding in many parts of the world, revealing important archaeological sites and fragile finds and subjecting them to exposure and deterioration. Examples of this were given from Norway, where great efforts are being made to detect newly exposed artefacts before they are degraded. The discovered artefacts not only provide valuable insight into material culture and human adaptation but are also used in taphonomy studies to get insight into the burial environment and the changes that the environment may have experienced over time.

In Antarctica great efforts are currently being made to preserve historic expedition bases and their artefact collection from the heroic age of exploration, particularly on Ross Island (Figure 2). Increasing outside air temperatures and relative humidity are constant challenges for maintaining optimal building microclimates. Two of the presentations showed how mitigation and monitoring programs are currently being carried

FIGURE 2 At Captain Scott's historic hut and the other historic huts on Ross Island, Antarctica, an annual monitoring programme of temperature, relative humidity, snow, and building movement is in place following a major programme of conservation of the buildings and artefact collections. *Photograph* (*nzaht.org*)

out in order to cope with existing problems and to establish environmental baselines, making it possible to detect future environmental issues as soon as they appear.

Permafrost thaw was an issue discussed in several of the presentations (Figure 3). Increasing active layer depths (the upper part of the soil that thaws each summer) are exposing long-frozen deposits to accelerated erosion, wet/dry and freeze/thaw cycles, and microbial activity. In Arctic Siberia destabilization of the permafrost is leading to severe erosion and landscape change with dramatic effects on the preservation of archaeological sites. Here the speed of the retreat (up to 5 m $year^{-1}$) has been shown to be highly dependent on the ice content of the soil, the mean summer temperature, and the solar radiation influx. While decay by physical erosion is relatively easy to see and document (for instance, by repeated visits to sites or even using remote sensing) it is more difficult to discover, quantify, and predict ongoing microbial or chemical degradation. Here knowledge is needed, both on the current state of preservation of the remains and on the environmental processes that affect preservation conditions. Results from projects in Greenland and Svalbard showed that it is possible to get a good proxy of the current decay rate by combining on-site environmental monitoring data with decay experiments. Currently, the most common methods used to quantify degradation rates are by measuring O2 consumption or CO2 production on samples (wood, bone, soil) in the laboratory or by placing modern samples in the soil for one or two years and analysing them microscopically.

In many polar areas the development of tourism is increasing due to improved accessibility. Cultural heritage sites are often considered as integrated parts of the wilderness experience. This confronts heritage managers with severe dilemmas concerning the balance between protection and use. It is important to safeguard the heritage sites, but at the same time tourism is an important means of ensuring economic growth and increasing public awareness of cultural heritage. Several of the presentations dealt with this anthropogenic threat and showed examples of how vulnerable heritage sites are to human use. It was acknowledged that more knowledge is needed

FIGURE 3 Erosion and permafrost thaw often exposes archaeological artefacts as exemplified here at the Kangeq midden in Western Greenland. *Photograph J. Hollesen*

regarding how to monitor the effects of human use and how to detect which types of use are the most damaging.

The preservation of World Heritage sites using digital technology is emerging as an effective way of accurately documenting heritage at risk. Laser scanning, in particular, has been used successfully to rapidly capture 3D images of buildings and artefacts (Figure 4). While laser scanning has been deployed to record heritage sites in some of the most remote areas of the world, its use in the Arctic and Antarctic is still somewhat limited. Several of the presentations gave examples of how laser scanning provides a means of documenting polar heritage at risk. With a data resolution of approximately 3 mm, it is possible to produce datasets with high levels of scalability allowing a wide range of elements to be interpreted or analysed: it can be used to measure ongoing rates of degradation and structural deformation or be used to develop accurate representative three-dimensional virtual models for remote interpretation. This is an important aspect of documenting and presenting polar heritage sites where accessibility issues greatly limit the number of people who can visit. However, operating these instruments in Arctic and Antarctic environments provides many challenges. Proximity of sea ice, snow or rock cover, prevailing winds, low temperatures, and even clouds of insects are a few of the factors that can impact results.

The conference ended with a roundtable discussion of the two main subjects, detection and response. There was general agreement that more knowledge is needed on site formation processes and degradation rates of materials. New standards and protocols would be valuable in order to define vulnerability and to provide heritage managers with guidelines to identify threatened sites. However, it is not only a question of

FIGURE 4 Laser scan of one of the South Georgia Whaling Stations, Leith; made by R. Gibb and D. McCurdy.

vulnerability. Effective management requires the acceptance that all sites cannot be saved and that resources must be guided toward sites of relatively high significance. It is therefore essential to find effective methods to evaluate the significance and potential of sites in order to prioritize. The possibilities for digitally registering threatened sites are rapidly improving at the moment and already it is possible to document sites at a high resolution before they disappear. However, these methods are expensive and may not be easily applicable in many of the remote parts of the polar regions. Therefore, it is also important to focus on low tech solutions, for example involving local residents in surveys and excavations in order to improve the capacity to respond.

Considering current climatic changes, it is inevitable that parts of the polar heritage will be lost in future years. Therefore adequate strategies and operational frameworks for coping with the situation need to be developed or the result will be that too little is done too late. The 2014 ICOMOS IPHC conference in Copenhagen showed that steps are being taken in the right direction, and provided a vital opportunity for geographically dispersed researchers and heritage managers to share best practices.

The conference book of extended abstracts is available for download at the IPHC webpage (<www.polarheritage.com>). We would like to thank all delegates for their contributions and for some very interesting days in Copenhagen. We should also mention the other members of the organizing committee, Mads Chr. Christensen and Vibeke Rask from the National Museum of Denmark and Pauline Kleinschmidt Knudsen from the Greenland National Museum who helped organising a successful and well-run conference.

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