

Chapter 17

Climate Change and World Heritage: An Introduction



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Abstract The rapid acceleration of science and technology has enabled people to make unprecedented changes to their environment and to alter the global climate. The changing climate, together with biodiversity loss, now pose significant threats to people and their heritage. This chapter provides an introduction to the impacts that climate change is having on World Heritage and how those impacts are being addressed. It considers the conflict that can be created between interventions to protect against climate change and the conservation of heritage values. Effective on-site management is an important tool in addressing climate change impacts and should be supported by states parties together with local engagement and national and international collaboration. World Heritage sites should not be viewed in isolation from their surrounding environment, and a strong World Heritage Climate Change policy is required to guide future management and implementation of the World Heritage Convention.

Keywords Climate change · Mitigation · Adaptation · Monitoring · Adaptive management

17.1 A Global Challenge

The adoption of the UNESCO *Convention Concerning the Protection of the World Cultural and Natural Heritage* (otherwise known as the World Heritage Convention) by the General Conference of UNESCO in 1972 occurred at a time of increasing political and public awareness of global environmental problems. That year, the UN hosted the first major intergovernmental conference on international environmental issues, which produced a declaration that proclaimed, “We see around us growing evidence of man-made harm in many regions of the earth: dangerous levels of

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pollution in water, air, earth and living beings; major and undesirable disturbances to the ecological balance of the biosphere; destruction and depletion of irreplaceable resources; and gross deficiencies, harmful to the physical, mental and social health of man [...]” (UN, 1972, Chap. 1.3). Climate change was not on the global agenda. The World Heritage Convention acknowledged the scale of the environmental challenges by noting the need to protect the world cultural and natural heritage not only from neglect but from the formidable phenomena of damage or destruction caused by changing social and economic conditions (UNESCO, 1972, Preamble). Fifty years later, the magnitude of global environmental problems has not diminished, and climate change has become one of the most significant and fastest-growing threats to people and their heritage.

The 2015 Paris Agreement, a legally binding international treaty on climate change under the 1992 United Nations Framework Convention on Climate Change (UNFCCC), aims to limit global warming to well below 2, preferably to 1.5 °C, compared to pre-industrial levels, i.e., relative to the period 1850–1900. To achieve this temperature goal, the treaty sets out objectives in line with the UNFCCC to stabilise greenhouse gas concentrations in the atmosphere “at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system” (UN, 1992, Art. 2). The concentration of greenhouse gases (GHGs) is driven by human activities such as burning fossil fuels for electricity, heat, and transportation, producing methane and nitrous oxide through farming activities including management of livestock and use of fertilisers, and through deforestation and land-use change. Human-induced warming reached approximately 1 °C above pre-industrial levels in 2017 and is increasing at 0.2 °C per decade (Allen et al., 2018). The effects of heightened GHGs include an increase in land and ocean temperatures, resulting in more frequent heatwaves, an increase in the frequency and intensity of heavy precipitation events at the global scale and an increase in extreme weather events. These effects intensify regional droughts and water stress, flooding events and storms, and cause a reduction in sea-ice, glaciers, and ice sheets and an increase in sea levels. The associated risks include forest fires, expansion of desert terrain, declining ocean productivity, biome shifts, and the spread of invasive species, pests, and diseases (Hoegh-Guldberg et al., 2018). Already the impacts are affecting human health and wellbeing through reduced access to safe drinking water, reduced crop yields and food security, and socio-economic losses related to damaged infrastructure and industry. Climate change is not something that is happening in the future but is a phenomenon that is being felt by societies all around the world today.

The impacts of climate change also contribute to the biodiversity crisis, which similarly affects human wellbeing. A global assessment report of biodiversity and ecosystem services estimates that the natural extent of ecosystems has decreased by 47% due to human activities and continues to decline by at least 4% per decade (IPBES, 2019, p. 24). Land-use change is one of the major drivers of habitat loss, leading to an escalation in extinction rates such that approximately 25% of animal and plant species are now threatened with extinction (IPBES, 2019, p. 24). Other direct drivers of biodiversity loss include direct exploitation of species by humans,

pollution, invasive alien species, and climate change. The loss of habitats and species impedes the capacity of ecosystems to provide services which benefit humanity. Such services include the supply of water, food, and soil maintenance; regulatory services including pollination, flood control, and carbon sequestration; and cultural services such as spiritual experience, cultural identity, and recreation. Biodiversity loss and climate change are both driven by human economic activities and mutually reinforce each other. Neither will be successfully resolved unless both are tackled together, and both will jeopardise progress in achieving the UN 2030 Sustainable Development Goals (SDGs) (Pörtner et al., 2021).

17.2 The Need for Change

Climate change impacts World Heritage sites not only directly by triggering shifts in habitats or through damage caused by incidents of extreme weather but also indirectly by the exacerbation of existing stresses such as unsustainable use, development pressures, and ineffective management. These threats are often interrelated, increasing the vulnerability of World Heritage sites. Furthermore, the destabilisation of social and environmental conditions caused by climate change and biodiversity loss will impact peoples' ways of life and their relationship with World Heritage. For example, people may be forced to migrate, and their former interaction with heritage sites and the associated cultural knowledge will dissipate. As well as peoples' dislocation from culturally important places, the distinctive dynamic of living World Heritage sites and their long-term maintenance and sustainability will be affected. Climate change is forcing change at an unprecedented scale across economic, environmental, political, and social spectrums. It poses a severe challenge to current conservation strategies and traditional heritage policies.

The general outlook for cultural and natural World Heritage is not positive. IUCN identified climate change as the most prevalent current threat and the largest potential threat to natural World Heritage sites (Osipova et al., 2020, p. viii). The same quantitative analysis has not been carried out for cultural sites, but the World Heritage Committee in 2019 urged all states parties to “step up action toward better understanding the climate vulnerability of World Heritage properties and put in place adaptation strategies that strengthen the resilience of properties” (UNESCO WHC, 2019, Para. 18.). However, cultural and natural heritage should not be considered only as a passive victim of natural and human-induced disasters but also as a tool that can be used proactively to develop and foster resilience and mitigate the threat of climate change and other stressors. Natural World Heritage sites protect large intact ecosystems, and this rich biodiversity offers carbon storage, soil stabilisation, water preservation, and flood prevention (Osipova et al., 2014). By its very nature, World Heritage encourages a sustainable approach to its stewardship and is often the product of an age-old interaction between humans and their environment. As iconic places, World Heritage sites have the potential to set standards in best practice conservation in tackling the impacts of climate change through planning,

adaptation, and mitigation strategies. Rather than relying on top-down policies, engagement at the community level offers the opportunity for bottom-up commitment, to support and raise awareness of the deep and rapid shifts in human behaviour needed to address climate change. Apart from the need for a public commitment at global, national, and local levels to achieve such potential, it is important that issues of conflict, both likely and existing, regarding how World Heritage is managed, protected, and used in the face of climate change are recognised and addressed.

The World Heritage Convention has focussed heavily on the tangible aspects of heritage, but it is essential to recognise that heritage is more than individual structures and sites. Heritage exists within a human environment supported by an intangible dimension. Intangible heritage encompasses intangible “practices, representations, expressions, knowledge, skills” and associated artefacts and spaces. These expressions are transmitted from generation to generation, are constantly recreated in response to interactions with the changing environment, and give communities and groups a sense of identity and continuity (UNESCO, 2003, Art. 2). Linking intangible with cultural heritage, therefore, identifies cultural heritage as a cultural process, a product of traditions and shared beliefs and values that influence the attitudes, behaviour, and habits of people. This would indicate that heritage conservation should be understood as management of change to enable continuity in an ever-changing world.

The need to reduce GHG emissions to net zero, as highlighted in the Paris Agreement, demands change. It requires societal transformation involving fundamental reform of our way of living, land and water use, consumption patterns, and production processes. This, in turn, requires a cultural shift to adapt behaviours to accommodate nature friendly, sustainable, and climate-resilient development. As indicated by the 2030 Agenda for Sustainable Development and the 2015 Paris Agreement, the global community has the appetite to endorse ambitious and systematic targets for change, but whether it will enact the changes required remains to be seen. Looking to the future of the World Heritage Convention, we must examine how the implementation of the Convention can support such change while avoiding conflict.

17.3 Addressing Climate Change Impacts on World Heritage

Disasters are occurring more frequently. People and heritage are increasingly exposed because of unplanned and rapid urbanisation, the decline of ecosystems, and poor land management. These, in turn, are compounded by factors such as weak governance, poor administration, and poverty. Most disaster risk is now climate related (UNDP, 2002). Long-term planning and prevention in the form of heritage risk preparedness is being promoted by both national and international organisations to help reduce the risks to heritage sites. The World Heritage Committee adopted a strategy for reducing risks from disasters at World Heritage sites in 2007 (UNESCO WHC, 2007), and the UN Office for Disaster Risk Reduction (UNISDR)

produced the Sendai Framework for Disaster Risk Reduction in 2015. These documents emphasise a shift from disaster management to disaster prevention and mitigation. The importance of preventing new risk, reducing existing risk, and strengthening resilience as well as global, regional, national, and local collaboration and participation is highlighted. This is an important message as government funding in disaster management is typically skewed towards response and recovery rather than prevention and mitigation (de Vet et al., 2019). However, the increased scale and frequency of disasters is acting as a catalyst to promote a change in culture. In 2021, the Australian government announced substantial investment in resilience and mitigation following the 2019/2020 Australian megafires, which caused an estimated economic cost of 100 billion Australian dollars (Libatique, 2021). The Australian government has traditionally only dedicated 3% of disaster spending towards prevention (de Vet et al., 2019).

Local management interventions at heritage sites could be very effective at reducing climate sensitivity and improving resilience. For example, wildfires in the Tasmanian Wilderness, Australia, and the Oaudi Qadisha (the Holy Valley), Lebanon, although on the increase because of increased lightning strikes and droughts, respectively, are also influenced by the loss of traditional practices such as Aboriginal patch burning in Tasmania (Styger et al., 2018) and traditional cultivation systems and land management in Lebanon (Centre G.F.M., 2010). The loss of these practices has allowed a build-up of live and dead vegetation, which acts as ready fuel when a fire ignites. Recognition of these factors is an important element of risk preparedness and prevention. However, as the fire at Notre Dame in April 2019 has demonstrated, risk preparedness may be a balancing act between preservation of heritage values and safety. The cathedral's ancient oak attic, where the fire started, did not have a firewall or a sprinkler system in place because of concerns about how they would impact the integrity of the historic structure. Greater input from personnel from a range of disciplines could have helped in the risk assessment and questioned the assumption of the low risk of fire versus damage to integrity (Tannous, 2019).¹

The extent of a disaster depends on the ability of the affected community to cope using available resources. Therefore, the identification of both hazards and vulnerabilities is important in risk preparedness. The diversity of World Heritage sites, e.g., monumental, urban, agricultural, archaeological, geological, aesthetic, and biodiverse, makes it very difficult to provide guidelines for vulnerability assessment. In answer, the Climate Vulnerability Index or CVI has been developed as a rapid assessment tool by John Day and Scott Heron of James Cook University. Critically it is based on the risk assessment approach and assesses both the "Outstanding Universal Value (OUV) vulnerability" and the "Community vulnerability" to climate change. The community vulnerability considers the economic, social, and cultural dependencies of the community (local residents and

¹ Nevertheless, because disaster management plans were in place the firefighters were prepared and knew how to protect the stain glass windows of Notre Dame from the fire and which works of art to rescue and in which order (Lesté-Lasserre, 2020).

visitors, both national and international) on the World Heritage and the capacity of the community to adapt (<https://cvi-heritage.org/about>). The emphasis on community vulnerability helps to ensure the inclusion of diverse groups of participants with different perspectives and to increase the level of awareness of the potential impacts of climate change. It is of mutual benefit if residents and other stakeholders appreciate the adaptive capacity required to cope with climate change. Ultimately, the aim of the tool is to make it possible to downscale climate scenarios to inform site management, regardless of the type of site, and to provide a practical and transparent approach to ensure wide participation and repeatability over time. Pilot projects are in the process of testing the tool's applicability across regions and states parties.

In terms of climate change policy, mitigation refers to the measures and activities that are put in place to reduce GHG emissions or enhance the sinks of such gases, e.g., forests and wetlands are carbon sinks in that they absorb more carbon than they release (UN, 1992; Sesana et al., 2018). Similarly, adaptation in terms of climate change refers to “adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts” (UNFCCC, 2021). There has been a greater focus on mitigation strategies in climate change research and policy than on adaptation (Sesana et al., 2018). In the field of cultural heritage, for example, reducing the GHG emissions of sites is typically associated with improving the energy efficiency of buildings, reducing the carbon footprint associated with the production and transport of building materials and encouraging and reducing the production of waste (Sesana et al., 2019). Comparable to the risk preparation strategy for Notre Dame, however, there is a delicate balance to be made between refurbishing or retrofitting historic buildings and preserving the cultural values. The conflict exists where the heritage value may be compromised when, for example, historical elements are removed and replaced in the name of energy efficiency or where features are affected, such as wall paintings covered by insulation. Consequently, heritage values can be seen as a barrier to mitigation strategies, and, to counteract this perception, it would be useful to have accessible examples of high profile, built heritage that have been effectively refurbished without compromising their integrity and authenticity (Sesana et al., 2019; Department of Culture Heritage & the Gaeltacht, 2019). As a first step, the ICOMOS Climate Change and Heritage Working Group (ICOMOS CCHWG, 2019) have put together a comprehensive outline of cultural heritage actions which support win-win scenarios where the safeguarding of heritage values is compatible with climate mitigation and adaptation strategies.

Adaptation solutions may also cause problems for the preservation of the authenticity and integrity of heritage sites. For example, the construction of shelters and roofs over monuments to protect them from adverse environmental conditions could impact the visual integrity of the sites and the authenticity of their form and design, materials, and location and setting. At the Megalithic Temples of Malta WHS, protective shelters were installed over three archaeological sites in response to a serious structural collapse caused by exposure to temperature fluctuations, rainwater, salts, and anthropogenic pollution (Cassar et al., 2018). Considering the impacts on integrity and authenticity, temporary, lightweight shelters were raised, which could be

easily removed without impacting the surroundings and were designed in such a way as to maximise passive environmental control. An unexpected side effect was that visitors reported that the protection from the sun and rain made the site visit more comfortable and that the diffused light effect enhanced their experience (Becherini et al., 2016). However, the most important lessons learned were that environmental monitoring was required to observe whether the shelter improved the situation and to inform decisions about further adaptation strategies and that the need for a shelter depends on the unique circumstances of a particular site (Becherini et al., 2016; Cassar et al., 2018). To disseminate information about adaptation strategies at World Heritage sites, ICOMOS has partnered with Google and CyArk to produce an innovative online project “*Heritage on the Edge*” which “tells the story of climate change” at five diverse cultural World Heritage sites from Africa, Europe, South America, and South Asia. Using 3D models and infographics, the case studies highlight the climate change pressures and adaptation strategies happening at the sites and outline how straightforward approaches such as monitoring and maintenance can maximise conservation efforts (Google Arts & Culture, 2020).

Monitoring to understand change at heritage sites forms the basis of adaptive management. The adaptive management approach incorporates monitoring into a system of evaluation and revision, which allows for continuous updating of the management plan in line with changing circumstances and an expanding knowledge base (Cave & Negussie, 2017). Adaptive management is applicable to both cultural and natural sites. The Operational Guidelines for the implementation of the WH Convention promote adaptive management through a “cycle of planning, implementation, monitoring, evaluation and feedback” (UNESCO, 2019, Para 111c). This reflects the need to manage for change, not only for climate change but for other external pressures such as environmental degradation, urbanisation, and rising social and economic inequalities. While World Heritage sites are typically nominated with fixed boundaries, they are increasingly understood in the context of linkages to their surrounding environment, both in terms of their physical setting and the environmental, social, and economic sustainability of the wider area. This makes management planning a more challenging and complex process, from identifying the myriad factors that could impact a site to employing participatory approaches and communicating across different jurisdictions and administrative systems within and beyond heritage site boundaries. Limited resources and lack of finances create further obstacles. Perry (2019, p.4) advocates a triage approach, together with the forward-looking method inherent in adaptive management, to deal with the “wicked problem” of climate change. Triage is a method of prioritisation, where guidelines help to establish how scarce resources should be allocated to maximise the conservation of those attributes that might otherwise disappear. The “wicked problem” refers to the difficulty of managing the uncertainty of how climate change will impact a specific site together with the changing demands of politics, stakeholders, external threats, and competing public interests (Perry, 2019, p. 4). The important point is that there is no conclusion, all solutions are provisional, and managers must continually monitor the impact of their interventions so that they can further improve

or adapt them to changing climate and environments (both biological and socio-economic) (Perry & Falzon, 2014).

With an urgent need to collect data to monitor change but limited funding, citizen science approaches offer heritage site managers an opportunity to better manage threatened heritage. Citizen science is a means to engage the public in the collection of scientific data to support long-term environmental monitoring. The process has some drawbacks, such as the need to supply training to ensure data is collected to the required standard, the need to manage the data collected, and the possibility of biases where certain times or locations are more popular with members of the public than others for example. However, technology in the form of smartphones and mobile data and free software such as Gmail, social media, and WordPress makes the process widely accessible and allows people to submit observations along with photos and videos easily. Furthermore, if developed properly, a citizen science partnership gives the public the opportunity to be proactively involved in protecting their heritage, raises awareness among the public of the impacts of climate change and biodiversity loss, and helps to build consensus on how to address the threats (Dawson et al., 2020; Donnelly, et al., 2014). Long-term, meaningful involvement of the public requires quality engagement in co-creation, monitoring, and evaluation as the project progresses (European Commission, 2017).

17.4 Outlook

In looking forward to the next 50 years of the World Heritage Convention, the priorities are related to how change is managed. Change may include loss of heritage sites and loss of Outstanding Universal Value (OUV), one of the principal concepts under the Convention. Climate change threatens the very existence of heritage sites, particularly terrestrial sites in vulnerable locations such as coastal areas exposed to increased erosion and sea level rise. Changing climate may also cause the displacement of the values that make up OUV, such as the agricultural and cultivated species in cultural landscapes and biological communities and threatened species in terrestrial and marine parks. Simultaneously, heritage sites are part of dynamic, socio-cultural processes and the attributes which communities value may change with the impacts of increasing stressors from climate change and biodiversity loss. Therefore, the Convention is faced with managing OUV in a world of fast-paced change while also recognising the principle of equity and the respective vulnerabilities and capabilities of states parties. Where disaster does occur, building resilience and capacity for disaster risk management are essential as highlighted in the Warsaw Recommendation on Recovery and Reconstruction of Cultural Heritage (UNESCO, 2018). The principles and strategies for implementing the WH Convention are contained in the Operational Guidelines, which are regularly revised to incorporate new knowledge and concepts in the context of heritage values and conservation. The evolving nature of these guidelines allows the Convention to adapt to change. However, a comprehensive World Heritage policy on climate change is required,

together with a critical evaluation of how the tools and procedures of the Convention can continue to be effective and implemented. Collaboration is needed at global, national, and local levels. The WH Convention needs to pursue continued and meaningful interaction with other global multilateral environmental and cultural agreements at the level of the Secretariat and the states parties to exploit opportunities for synergistic activities and increased coordination between conventions in tackling the current crises. This collaboration will assist states parties in recognising the contribution that World Heritage sites can make in addressing national targets under these agreements, including the Paris Agreement. Furthermore, greater collaboration among governing authorities at a national level will support adaptation and mitigation strategies which are sympathetic to heritage values and help avoid maladaptive and conflicting policies. A poorly managed tourist industry, for example, creates many problems at heritage sites; tourism is also estimated to account for approximately 8% of global greenhouse gas emissions and, therefore, directly influences climate change (Lenzen et al., 2018). Emphasis should be placed on the conservation and effective management of existing World Heritage sites at a local level and the role World Heritage can play in generating changes in human behaviour in favour of nature-friendly, climate-resilient, sustainable development.

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