The Future of Our Pasts: Engaging cultural heritage in climate action

Outline of Climate Change and Cultural Heritage
Climate change will increase desertification, which will in turn affect the use of traditional nomadic pastoral landscapes and will displace communities.

Shifting Sahara sand dunes near Zagora, Morocco (Photo credit R. Allaway, 2010)

The Future of Our Pasts:
Engaging Cultural Heritage in Climate Action

Heritage and Climate Change Outline

prepared by:
Climate Change and Heritage Working Group of ICOMOS
July 1, 2019
In 2017, the 19th Triennial ICOMOS General Assembly meeting in New Delhi laid out a vision for mobilizing the cultural heritage community for climate action. Now we must act on these words into action. But how?

Of the many cultural dimensions of climate change, which have the greatest potential to support climate action and what elements of heritage practice are most relevant to these efforts? How is climate change impacting cultural heritage and what can be done about it? Building on work from numerous fields, ICOMOS’s Outline of Climate Change and Cultural Heritage offers answers to these questions. In so doing, it takes an important step towards achieving the ambitions of New Delhi.

This is not ICOMOS’s first engagement with the topic. Over a decade ago, an ICOMOS Workshop recommended that climate change adaptation strategies be mainstreamed into the existing methodologies for conservation of sites, buildings, landscapes, movable objects and living heritage. A landmark ICOMOS Scientific Council Symposium on Global Climate Change held in 2008 in Pretoria concluded ominously that climate change portended ‘loss and destruction as much as preservation’ for cultural heritage. Meeting in Quebec later that year furthered efforts to mainstream climate change into heritage practice.

These efforts were correct, even visionary – and yet their promise has not been realized. Today, many heritage managers still lack the capacity to downscale climate scenarios to inform site management. Many national climate adaptation plans still miss the potential of heritage. Despite profound connections between climate change and cultural heritage, there are too many heritage officials, professionals, organizations and advocates not yet engaged in climate action – even in frontline communities and even in cities and regions with robust climate action pledges.

This must change – and urgently. It would be foolish to imagine the practice of heritage remaining static while the world goes through the rapid and far-reaching transitions discussed in the IPCC’s recent Special Report on Global Warming of 1.5°C. Responding requires adjustments in the aims and methodologies of heritage practice. Achieving the ambitions of the Paris Agreement requires dismantling the barriers to full recognition of the cultural dimensions of climate action.

The great value of the Outline is that it systematically catalogues the needs and opportunities for #climateheritage action. It leaves no doubt what must be done. So now is the time to act on climate. Now is that time for wisdom to be summoned, skills to be used, research to be applied. Succeeding is the shared responsibility of everyone who cares for the planet’s communities and ecosystem and aspires to safeguard them in a changing climate.

Toshiyuki Kono
President of ICOMOS
Fukuoka, June 5, 2019

Preface

I would like to congratulate the ICOMOS Climate Change and Heritage Working Group for this outline and for the vision on how climate change can affect cultural heritage and how cultural heritage can contribute to climate solutions through risk management, adaptation and resilience strategies, and mitigation, projecting from the past into the future.

The recent Special Report of the Intergovernmental Panel on Climate Change (IPCC) on Global Warming of 1.5°C has highlighted that every half a degree and every fraction of global warming matters in terms of climate change impacts and risks; that every year matters for climate action; and that every choice matters to build ethical and fair transitions towards climate resilient, low carbon, sustainable development pathways.

There is an immense and untapped potential for mobilization of society through active engagement of local communities and visitors of cultural heritage sites – if these intersections are actively promoted, made visible and designed to be part of an ambitious education project. Education is crucial for the scale of societal transformation needed to address climate change. Designing education perspectives building on both cultural heritage and forward looking, based on climate and climate change sciences and grounded in the territory and cultural identity, could be instrumental in shaping climate action within community identity, through a ‘sense of belonging’.

The vision developed by the Climate Change and Heritage Working Group also has the potential to provide major contributions to the agenda for research and action on cities and climate change science (https://sites.ipcc.org/beyond-global-research-and-action-agenda-on-cities-and-climate-change-science/). To address climate change challenges, we all need to think and act differently in order to support systemic and societal transformation. Cooperation, building on multiple forms of knowledge, will be essential. This vision document is also designed to help create bridges and cooperation between experts and decision makers involved in the sectors of heritage, culture, sustainability, climate science and climate action and to inspire and stimulate new approaches. I hope that you will enjoy reading this document as much as I enjoyed reviewing it.

Valérie Masson-Delmotte
Paleoclimateologist, co-chair of IPCC Working Group I (physical sciences) for the 6th IPCC Assessment cycle
Saclay, June 5, 2019

I hope that you will enjoy reading this document as much as I enjoyed reviewing it.

Preface
Preface ............................................................... ii
Background .......................................................... 1
Introduction ............................................................ 5
   Outlining the Intersection of Cultural Heritage and Climate Change......... 5
   Theory and Practice: The Gap Between Heritage and Climate Change ........ 6
   Responding to the Gap ........................................................................... 6
   Raising Ambition: Mobilizing for Climate Action .................................. 6
Thematic Essays ................................................................. 9
   Heritage, Climate Action and the Sustainable Development Goals .......... 9
   Heritage as a Climate Action Asset ...................................................... 11
      Stressing Urgency ........................................................................ 11
      Adaptation and Mitigation Strategies ............................................ 11
      Cultural Heritage and Social Resilience ....................................... 12
   Integrating Cultural Heritage and Climate Science ................................ 14
   The Role of Good Conservation Practice .......................................... 16
      Identification and Documentation ................................................... 16
      Conservation and Protection ......................................................... 16
      Management and Adaptation ........................................................ 16
      Presentation: Telling Climate Stories ............................................. 17
      Advice and Guidance .................................................................. 17
   Equity and Climate Justice ............................................................... 19
   Heritage Tools and Methodologies .................................................. 21
Part I ................................................................................. 26
   Categorizing Climate Action ........................................................... 27
   Establishing the Core Competencies of Cultural Heritage Practice ....... 27
   Correlating Heritage Competencies to Climate Action Priorities .......... 28
   Correlating Heritage Competencies to Climate Action Priorities .......... 29

Division 1 ............................................................................. 32
   High Ambition ............................................................................... 32
      1.1 Heritage Places and Climate Action Communication ................. 32
      1.2 Heritage, Research and Climate Science .................................. 32
      1.3 Climate Change, Heritage and Education .................................. 33
      1.4 Integration of Cultural Heritage Management with Climate Science in policy .. 33
Division 2 ............................................................................. 35
   Adaptation .................................................................................. 35
      Knowledge and Understanding .................................................... 35
      Planning and Implementation ....................................................... 39
      Opportunities, Constraints and Challenges .................................. 41
Division 3 ............................................................................. 47
   Mitigation ................................................................................... 47
Division 4 ............................................................................. 59
   Loss and Damage ........................................................................ 59
      1. Slow Onset Events ................................................................ 59
      2. Non-Economic Losses .............................................................. 60
      3. Comprehensive Risk Management Approaches ......................... 61
      4. Migration, Displacement and Human Mobility ......................... 61
      5. Action and Support ................................................................. 62
Part II ................................................................................... 65
   Table 6: Correlating Climate Change to Cultural Heritage .................. 71
Glossary ................................................................................ 91
Acknowledgements ...................................................................... 107
Invited Reviewers ....................................................................... 108
Concrete blocks acting as wave breakers are the only protection against rising sea-levels.

15th century Qaitbey Castle, Alexandria, Egypt
(Photo © Siam Diab)

Background

Climate Change was not on the agenda in 1966 when ICOMOS was founded with the mission to work for the conservation and protection of cultural heritage places. More traditionally understood threats to heritage, like conflict, rapid urban development and disasters loomed large then. Yet today, climate change has become one of the most significant and fastest growing threats to people and their cultural heritage worldwide (ICOMOS, 19GA 2017/30). Unequivocal scientific evidence shows that unprecedented concentrations of greenhouse gases (GHGs), driven by human activities such as burning of fossil fuels and deforestation, are contributing to climate changes including warming of the oceans and atmosphere, sea level rise and diminished snow and ice. The impacts of these changes are already damaging infrastructure, ecosystems, and social systems – including cultural heritage – that provide essential benefits and quality of life to communities.
The changing climate is creating new risks even while it exacerbates existing vulnerabilities and multiplies traditional threats. Rapid urbanization, wealth inequality, globalization and the attendant loss of cultural diversity, together present grave threats to the well-being of communities. Excessive and irreversible development, the abandonment of sustainable patterns of land use, consumption and production, developed over centuries if not millennia of human history, are threats to communities and their environment. In tandem, the ecosystems that underpin human well-being are declining globally at rates unprecedented in human history. One million species are now threatened with extinction with grave impacts on people around the world, warned a landmark 2019 report from the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES).

The severity and urgency of the problem is underscored by the 2018 findings of the Intergovernmental Panel on Climate Change’s (IPCC) Special Report on Global Warming of 1.5°C. According to the IPCC, humankind has already made the 1 degree Celsius (°C) warmer since pre-industrial times. Warming is likely to reach 1.5°C around 2040 and 2°C by 2065 if emissions continue unchecked. The report highlights multiple climate change impacts that could be avoided or made significantly less severe by limiting Global warming to 1.5°C compared to 2°C, or more. For instance, by 2100, with Global warming of 1.5°C, global sea level rise would be 10 cm lower than with Global warming of 2°C. The likelihood of an Arctic Ocean free of sea ice in summer would be once per century with global warming of 1.5°C, whereas virtually all (> 99 percent) would be lost with a 2°C rise. Coral reefs would decline by 70-90 percent with Global warming of 1.5°C, whereas virtually all (≈ 99 percent) would be lost with a 2°C rise.

The 2015 Paris Agreement signed by 195 countries around 2040 and 2°C by 2065 if emissions continue unchecked. The report highlights multiple climate change impacts that could be avoided or made significantly less severe by limiting Global warming to 1.5°C compared to 2°C, or more. For instance, by 2100, with Global warming of 1.5°C, global sea level rise would be 10 cm lower than with Global warming of 2°C. The likelihood of an Arctic Ocean free of sea ice in summer would be once per century with global warming of 1.5°C, whereas virtually all (> 99 percent) would be lost with a 2°C rise. Coral reefs would decline by 70-90 percent with Global warming of 1.5°C, whereas virtually all (≈ 99 percent) would be lost with a 2°C rise.

The 2015 Paris Agreement signed by 195 countries under the auspices of the United Nations Framework Convention on Climate Change (UNFCCC) seeks to keep global temperature rise well below 2°C this century, and to pursue efforts to limit it to 1.5°C. The IPCC report finds that limiting global warming to 1.5°C would require rapid and far-reaching transitions in the way we use land, energy, industry, buildings, transport, agriculture, fishing and forestry. Global anthropogenic emissions of carbon dioxide (CO2) would need to fall by about 45 percent from 2010 levels by 2030, reaching net zero emissions around 2050. This means that any remaining emissions would need to be balanced by decarbonization initiatives – by removing carbon dioxide (CO2) from the air.

This decarbonization imperative exists alongside the global aspiration for sustainable development embodied in the 2030 Agenda for Sustainable Development adopted by the countries of the world in 2015. With its 17 Sustainable Development Goals (SDGs) and attendant 169 targets, these ‘Global Goals’ (as the SDGs are sometimes known) are arguably the most ambitious and holistic development framework that has ever been conceived. The Sustainable Development Goals together with companion documents like the Sendai Framework for Disaster Risk Reduction and the Paris Agreement on Climate Change. The Urban Agenda contemplate a paradigm shift to a concept of development that views sustainability and climate change as inseparable, consistent with the reality that we live in a world of complex, interdependent systems and acknowledges that changes to these systems can either enhance or degrade our resilience in the face of these changes. As with the Paris Agreement, they point to the need for profound and urgent transitions in how human society’s patterns of living, production and consumption.

These global goals also give unprecedented, explicit recognition to the fundamental role that culture and heritage can play in these transitions. The SDGs and the Paris Agreement recognize that cultural heritage can guide choices that promote human action in ways that support resilience and sustainability and by extension climate-resilient development pathways. Cultural factors shape the enabling context for adaptation and mitigation including whether and how people respond to appeals for Climate Action. The recognition given at the highest levels of policy making to the role of heritage, together with the urgency of the challenges of climate change, creates both a profound opportunity and a challenging responsibility for all those connected to heritage.

Key to understanding this potential is an appreciation of the breadth of the concept of cultural heritage. Over time, the meaning of cultural heritage in professional practice has expanded from single monuments and sites identified as objects of art and cultural landscapes to intangible cultural and natural properties. Contemporary practice further extends the concept of heritage beyond ‘tangible heritage’, to the intangible dimensions of heritage as well. This means the entirety of knowledge derived from the development and experience of human practices, representations, capabilities, knowledge and skills and associated objects and spaces that communities recognise as part of their cultural heritage.

The unique power of exceptional, iconic heritage sites – including the tangible and intangible values they carry – to stir people’s souls, drive human responses and galvanize public opinion cannot be doubted. The World Heritage program embodies these narrative, global reach, integrated nature-culture approach and broad mix of heritage typologies. Adopted in 1972, the World Heritage Convention contemplates that the sites inscribed on the World Heritage List will act as laboratories of ideas with the potential to set international standards in heritage management. Developing responses to climate change is just such a case, where World Heritage Sites have an important role to demonstrate and share their climate action work with all communities. Indicative of this is the Policy Document for the Integration of a Sustainable Development Perspective into the Processes of the World Heritage Convention adopted by the General Assembly of States Parties to the World Heritage Convention in 2015, which recognized increasing disaster risks and the impact of climate change, and called on the member states to recognise that World Heritage represents both an asset to be protected and a resource to strengthen the ability of communities and their properties to resist, absorb, and recover from the effects of a hazard.

Cultural heritage is of course far more than World Heritage Sites. In order to understand the relationship between cultural heritage, climate action and resilience, the idea of heritage must be understood and acted upon in its broadest sense. Physical conservation of selected buildings and artefacts will not realize heritage’s potential to catalyse climate action or promote social cohesion, inclusion or equity, but rather can the promotion of resilience and sustainability be removed from the conservation of these properties. Culture and place are often closely tied, and this remains so even as both have become increasingly trans-nationalized through globalization. Embracing in historic conservation practice the multiplicity of heritage values that support the attachment that people have to their places and community is one of the important predictors of how well they will respond to the responsibilities assigned to it in the Sustainable Development Goals (SDGs).

The cultural and social values carried by the planet’s land and seascape are closely interlinked with its natural values (and affiliated bio-cultural practices). Facing a changing climate puts a premium on bridging the divide between nature and culture practitioners and policies. It demands from conservation communities integrated nature-culture approaches on a global scale to help address the challenge of climate change and the planet’s other looming crises. This imperative is given recognition in the Preamble to the Sustainable Development Goals which reads: We acknowledge the natural and cultural diversity of the world. This emphasis is borne out across the SDGs. In so doing, the SDGs recognize that integrated nature-culture approaches can advance sustainability objectives by improving conservation outcomes, fostering bio-cultural understanding and the well-being of contemporary societies and future generations in both urban and rural areas.

The document Malama Honua – To care for our island Earth is one roadmap to realizing the promise these approaches hold. An outcome of the Nature-Culture Journey at the 2016 IUCN World Conservation Congress, Malama Honua includes a sobering recognition that cultural and natural diversity and heritage are seriously threatened around the world by a number of challenges including climate change. It goes further, arriving at the conclusion that the very culture/nature divide that has characterized some aspects of conservation practice is itself a symptom of larger processes that have put the Earth on an unsustainable path.

Climate change multiplies not only threats but also the urgency of enhancing good conservation practice. Malama Honua similarly called for new working methods that bring together nature and culture to achieve Conservation outcomes on a landscape scale, while promoting the leadership, participation, resilience and well-being of associated communities. Other innovations, including Historic Urban Landscape and rights-based approaches, also seek to make heritage practice more holistic, interdisciplinary and grounded in a concern for resilience and sustainability. Together, they lay the foundation for a new approach to heritage that responds to the unprecedented, systemic threat to people and their cultural heritage that is climate change.
Resolution 19GA 2017/30 ENCOURAGES all ICOMOS Members to strengthen their efforts to aid in implementing the Paris Agreement, emphasizing cultural heritage and landscape-based solutions, noting the need for rapid and deep reductions in emissions to reverse the increase in the global average temperature to well below 2°C; that adaptation efforts should take into consideration vulnerable communities and ecosystems, and enhance understanding and action with respect to loss and damage from climate change; and the need for solidarity with those nations most impacted by, or least able to bear the cost of, climate change to enable them to safeguard their heritage.

The CCHWG was formed to advance the Resolution's ambitious mandate. It soon became clear, however, that there was no ready map of this terrain. To some, documenting the knowledge found in coastal archaeology sites threatened by sea level rise or conserving traditional wood, stone and earthen architecture facing changing temperature and precipitation patterns is paramount. Others are championing sensitively retrofitting historic buildings for energy efficiency to mitigate greenhouse gases (GHGs), or the role of culture in Disaster Risk Reduction to build adaptive capacity. Leveraging the attachment to place that heritage engenders to raise ambition and galvanize Climate Action is often mentioned. Valuing and promoting Indigenous Knowledge, Local Knowledge and the heritage of marginalized communities is also a core aim of heritage work. Indeed, culture touches every facet of human endeavour, and from these complex intersections flow a multiplicity of approaches.

As discussed in the Background section of this Outline, the ambitions of the Paris Agreement are similarly cross-cutting, giving voice to the imperative for society-wide transformation in order to address climate change. Transformational responses to environmental change are generally defined as change that, by its scale or reach, alters the interplay of a given system. Such significant levels of change are likely to involve multiple social processes. Assessing and understanding the capacity of various factors for driving transformative change is critical to designing effective climate action.
The Future of Our Pasts

1 July 2019

Heritage and Climate Change Outline Report

Heritage and Climate Change Outline Report

Theory and Practice: The Gap Between Heritage and Climate Change

ICOMOS believes that cultural heritage contributes both qualitatively and quantitatively to Transformative Change. This view is supported by analysis from a range of disciplines, including environmental history, anthropology, geography, human ecology, and sociology. Even so, the relationship of heritage to climate action is not well developed in climate literature. Various explanations have been advanced for this, including that the methods for studying cultural heritage tend to be narrative-based and qualitative, often including ethnography and participant observation, and that data from these methods do not sit comfortably with the quantitative approaches prevalent in other social and natural science on climate change. (Adger et al 2013)

Climate action methodologies, policy frameworks, financing mechanisms and networks have similarly sometimes not engaged cultural heritage, or have done so indirectly through proxies. These methodologies often characterize the need for transformative action as a social and technological problem whose solutions lie in individual behavioural change and innovation. Such approaches tend to ignore cultural or political considerations and often omit culture and heritage entirely.

The general absence of cultural heritage from the climate discourse has a practical, cumulative reality: while the culture and heritage sectors are important institutions in most communities, they often are not directly engaged in the work of climate action (although there are notable exceptions). Despite the profound connections between climate change and cultural heritage, today there are thousands of archaeologists, architects, historians, and engineers; scientists, researchers, teachers and scholars; carriers of Indigenous Knowledge and Local Knowledge, and heritage advocates, whose talents have not yet been mobilized on climate change issues. Perversely, this lost opportunity is often greatest in cities and regions with ambitious climate action pledges.

Responding to the Gap

This Outline responds to that gap. In so doing, it attempts to take account of all types of cultural heritage and to account for variations in approaches to heritage across different cultures and belief systems. While any taxonomy of cultural heritage is bound to have shortcomings, this Outline categorizes heritage into the following six typologies: (1) movable heritage; (2) archaeological resources; (3) buildings and structures; (4) Cultural Landscapes; (5) associated and traditional communities, (6) intangible heritage.

The Outline is divided into two main parts. Part I is a ‘sectoral’ analysis that maps the core considerations and competencies of cultural heritage to the major sectors of climate action derived from the Paris Agreement. Part I aspires to be a heritage conversation in a climate change framework. Part II catalogues the ways that climate change drivers are impacting cultural heritage. It aspires to be a climate change conversation in a heritage framework. These two parts are preceded by a narrative discussion of various themes that cut across both these parts. A glossary of defined terms can be found in Appendix I. A short introduction explains how the glossary was developed.

Raising Ambition: Mobilizing for Climate Action

The Outline has two primary sets of audiences. It is addressed to heritage communities, including local, community, tribal and indigenous leaders; city, state, provincial and regional, and national heritage administrators and heritage organizations looking to understand the role of climate change in their heritage work; to heritage professionals and advocates exploring their relationship to climate change; and to heritage scholars. This Outline is equally addressed to climate scientists and Policy-makers; to climate change professionals and advocates exploring how collaboration with the heritage sector can deepen the impact of their work; and to public officials including Resilience and climate change officers looking to understand the role of heritage in their climate change work.

This Outline is not a scholarly research document or a professional guide. In the near term, ICOMOS intends to use this Outline to organize the inputs of ICOMOS constituencies into a proposed update of the World Heritage Committee’s 2007 Policy Document on the Impacts of Climate Change on World Heritage sites, to develop a roadmap for heritage organizations to engage on climate change issues, to support the creation of new a doctrinal heritage text on climate change and cultural heritage, and to organize outreach to the scientific community on research gaps and opportunities. While the CCHWG has collected a vast quantity of both references and case studies, the publication of a bibliography and an atlas of good practice awaits a later phase of ICOMOS work.

Beyond these immediate programmatic uses, the members of the CCHWG hope the outline will feed the new interdisciplinary #ClimateHeritage movement that has begun to blossom:

- While the Outline aims to be as broad as possible, it is not an exhaustive accounting. We hope others will accept the challenge of building on this work and take this analysis forward.
- Climate change necessitates new approaches to heritage, and it is hoped this Outline will support such shifts.
- Climate change must become a baseline competency of heritage management; this Outline provides a benchmark against which heritage communities may measure their engagement.
- Equally, climate change actors are encouraged to use this Outline to increase their understanding of and engagement with cultural heritage.

The Outline is also addressed to policy-makers, scholars and scientists with the hope that it will stimulate attention to existing research gaps and promote opportunities for collaboration.

Cultural heritage is both impacted by climate change and a source of resilience for communities. This Outline endeavours to advance the understanding of these dynamics and in so doing to increase the ambition and effectiveness of diverse actors and constituencies in the urgent work of safeguarding our planet and its heritage amidst a changing climate.
Thematic Essays

Heritage, Climate Action and the Sustainable Development Goals

The United Nations 2030 Agenda for Sustainable Development, with its 17 Sustainable Development Goals (SDGs), is conceived as an evidence-based framework for promoting a systemic understanding of the synergies and dynamics between the economic, social and environmental dimensions of sustainable development. In this regard, nature and culture connect the various SDGs and aspects of sustainability to each other. Their integration often finds form in the rich biocultural diversity of the world’s heritage, defining our spiritual and physical relationships with the planet in harmonious ways.

Goal 11 advocating for inclusive, safe, resilient and sustainable cities and human settlements and Goal 13 calling for urgent action on Climate Change are supported with their own global agreements and commitments. The New Urban Agenda, the Paris Agreement and the Sendai Framework for Disaster Risk Reduction, in their strategic arenas each consider the urban context and recognize the importance of heritage conservation. These instruments provide an unusually explicit alignment between heritage and these key policy areas. Heritage, however, is as diverse as its settings and linked to broader systems than cities alone. Rural areas, the polar regions and life underwater, are just a few examples of the variety of cultural heritage contexts. The breadth of the heritage sector allows for meaningful connections with all 17 SDGs. For instance, SDG7 (Affordable and Clean Energy), SDG14 (Life Below Water), SDG12 (Sustainable Consumption and Production Patterns) in reference to sustainable tourism, and SDG15 (Life on Land) have straightforward intersections with heritage, although this is not explicitly mentioned in the wording of the targets. Moreover, the integrated system expressed in the SDGs implies that the policies and resulting strategies are interdependent, thus discouraging their implementation within any single sector or discipline.

This important momentum in the shift of global development requires an expansion of current concepts in all disciplines and sectors impacting human life and the planet. In this regard, at a global level, heritage conservation practice is increasingly endorsing innovative tools that promote adaptive and systemic approaches to better manage change. Other sectors are advancing practices by widening their sustainability discourse to include heritage. For instance, good governance, impact assessment and the circular economy all emphasize the role of legal frameworks that ensure the conservation and regeneration of local resources, including heritage. As such approaches are increasingly localized across the globe, it should follow that the valuing and promoting of cultural heritage in sustainable development will also increase. Yet it remains challenging, particularly in those contexts where strong governance institutions, accountability and the rule of law and human rights are in early stages of development.

The urgency for Climate Action demands an assessment of the wider implications of heritage as a driver and/or constraint for development. This requires identifying, understanding and assessing those interactions between heritage and development sectors that contribute to positive or negative impacts on climate action. Co-benefits arise from strategies that concurrently promote both mitigation or adaptation, and preservation of cultural significance. For example, mitigation can include the use of low-carbon,

Coastal Forts around the world are at risk from sea level rise, worsening storms and coastal erosion.

Fort George, Scotland (Photo credit A. Markham 2014)
climate-adapted traditional agricultural knowledge to achieve food security, sustainable reuse and retrofitting of built heritage for energy efficiency. Negative trade-offs can arise when mitigation actions threaten traditional practices and cultural resources and undermine heritage protection as it has been conventionally understood. Examples of such tensions include banning the traditional harvesting of peat; retrofitting of historic buildings for energy efficiency in ways that disregarde heritage values; destructive resource extraction for renewable energy arrays; and implementing carbon sequestration models without regard to local or indigenous forest management practices and land tenure. In some, but not all cases, these negative trade-offs will constitute Maladaptation.

Changing environments can also bring new development opportunities and expose new resources. For example, polar heritage, where melting ice and the degradation of polar cultural landscapes are negatively impacting traditional cultural practices and ways of life, at the same time facilitate access to natural resources for exploitation and tourism development (Barthel-Bouchier 2013, 115-7).

To achieve progress on the Sustainable Development Goals and climate action, the heritage sector must consider the whole picture and the nature of climate impacts and opportunities, and develop and implement new development strategies. For example, heritage-driven tourism and urbanization, whilst providing opportunities for economic and social development, can also contain unsustainable practices including greenhouse gas emissions, which need modification.

The wide range of interactions taking place in a variety of settings creates both complexities and opportunities for heritage management systems and the threshold for recognizing losses and damages to cultural significance. To bridge these uncertainties, heritage management now more than ever needs to develop frameworks that allow for the identification, regulation and reaching of consensus on co-benefits and trade-offs, in order to achieve win-win outcomes whilst at the same time facilitate access to natural resources for exploitation and tourism development (Barthel-Bouchier 2013, 115-7).

Heritage as a Climate Action Asset

Adaptation and Mitigation Strategies

Through physical impacts on places and people, the world’s diverse cultures mediate our responses to climate change. Yet, much of contemporary adaptation and mitigation practice is most strongly influenced by the natural sciences. While very effective at identifying and quantifying the problem, these responses ignore the wealth of information and knowledge afforded to us by cultural heritage, and its value to help find solutions. Current IPCC reports underrepresent the role of culture in climate action, yet these reservoirs of past experience and knowledge, which have accumulated over time, are an untapped asset in developing both adaptation pathways and mitigation pathways. Interdisciplinary studies of past cultural adaptation to paleoenvironmental, climatic and landscape changes, can be used to set baselines and identify tipping points based on past evidence-based scenarios. Endogenous Ways of Knowing and past agricultural adaptations such as the utilisation of resilient crops feeds into climate-smart agriculture policy. Cultural heritage is a resource for the future. Communities over time have developed strategies to respond to local conditions and landscape change including architectural and agricultural adaptations and settlement patterns. These Endogenous Ways of Knowing support contemporary mitigation options, from low-carbon, locally adapted approaches to decarbonizing buildings and practices to pointing the way to low-carbon models for developing peri-urban areas. The experience of communities living in marginal coastal and riverine areas feeds into current flooding adaptation strategies. Through recognition of Endogenous Ways of Knowing and by embracing past human experience, the direction of solution-making can be rooted in the values of communities, and become the heart of decision and policy-making. Through this, culture and heritage become a powerful asset in developing contemporary adaptation and mitigation strategies.
Cultural Heritage and Social Resilience

As a tangible and intangible asset, cultural heritage offers climate services and can build resilience in the face of climate change. Community and societal responses to climate change vary widely, but all can benefit from the participatory governance models found in the cultural heritage field. In some cases, citizen science approaches utilise technology to deputise the public in the monitoring and recording of heritage at risk. Cultural heritage inventories and participatory cultural mapping initiatives, serving as a knowledge-gathering process as well as a platform for citizen mobilisation. Both traditional approaches like oral histories and new technologies such as low cost non-invasive and non-destructive tools and technologies like photogrammetry and mobile GIS assist in this task.

In other cases, community engagement, participation and empowerment involving the transfer of Endogenous Ways of Knowing within and outside communities can invert traditional top-down institutional capacity-building models and improve Climate Governance by placing communities at the heart of their own decision-making processes. In such cases, it is essential to acknowledge and respect traditional rights and to obtain free, prior and informed consent. In both cases, putting the values of communities at the core of the response, treating cultural heritage an asset, encourage community involvements and builds more durable outcomes in support of social resilience.

Figure 1. A map of the intersection between heritage conservation and the Sustainable Development Goals and Climate Action.

Intersections between Climate Action and SDGs through Heritage Conservation

13.1 Resilience

Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.

13.2 Institutional Framework

Integrate climate change measures into national policies, strategies and planning.

13.3 Education and Capacity

Improve education, awareness-raising, and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

13.4 Supporting developing countries

Mitigating jointly USD1 trillion annually by 2030, then all sources to address the needs of developing countries in the context of meeting their climate action, mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible.

13.5 Developing countries capacity

Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including financing on women, youth and local and marginalized communities.
The Future of Our Pasts • 1 July 2019

Integrating Cultural Heritage and Climate Science

Cultural heritage is a composite of human experience, developed over generations of trial and error, learning and successes. Science is governed by the same principles. To date, however, with respect to climate change, cultural heritage has had limited representation in the reports of the Climate Change IPCC, which are the world standard in climate science and research. Reasons for this disconnect are not yet fully described but appear to be diverse and deep. They come from how we use language, how we divide nature and culture in modern society, and how we allocate financial and social value. This means that fixing this situation will require appropriate and far reaching solutions. At the same time, climate change has developed from human activity and the solutions also clearly lie in the realm of human action. Correspondingly, the benefits of fully engaging with the range of human experience and related environmental information that is inherent in cultural heritage also appear diverse and deep. This essay briefly outlines points of connection between heritage, climate science, and the next steps for improving integration of heritage with the work of the IPCC.

All heritage, from well-visited World Heritage Sites to indigenous languages, and practices to small archaeological sites that may not yet have been recorded, holds information integral to understanding climate change, and impacts of climate change. Cultural heritage sites hold materials that describe past climates, sites, landscapes, and Indigenous Ways of Knowing hold information about past human understandings and uses of environments and past human impacts on environments. Combined, these help to describe the environmental baselines from which modern conditions are shifting. Further, as all communities hold some forms of tangible and intangible heritage, the scientific processes of identifying, tracking, and monitoring climate impacts on heritage are keys for understanding the effects of climate change on the components of human society. In turn, collectively, cultural heritage tracks the social, political, economic, technological, and philosophical trends that have combined over time to create modern climate change. Heritage sciences and social sciences show what patterns of social change and development have looked like throughout modern society. Modern society is not the past, but the difference is of degree, not kind. Past societies did all the things that we do in our society – they had political structures, social relationships, trade, language, provided food and shelter, and senses of meaning. None of those societies is an exact replica of our own, but we can learn from how past societies organized and adapted the connections between parts of their societies. Therefore, evidence from the past and the diversity of living cultures today is an essential basis for analysis of modern assumptions about how societies can function and adapt in changing conditions.

As well, all types of heritage have power to connect people to place, anchoring senses of identity and community. What climate science tells us is that adaptation and mitigation are necessary. What climate science cannot tell us is what adaptation options are most workable within any given human system. Cultural heritage is a source of creativity and inspiration that can answer this question including shaping the acceptability of policy or system change. In this way, cultural heritage is a source of creativity and inspiration for adaptation and mitigation actions that are responses to the findings of climate science. To date, these connections of cultural heritage to climate change are not highly visible at the global scale of climate science as captured by reports of the IPCC. In 2018, an analysis by the Heritage Futures Programme of University College London identified 193 mentions of heritage and related concepts in the IPCC Fifth Assessment Report (AR5) (table 1). Without comparative data from other fields, this total has limited utility on its own, but does provide an important starting point for assessing what we know and should the incorporation and representation of cultural heritage in reports of the IPCC look like? What topics have been addressed and where are gaps? What is the nature of these gaps; for instance, are they due to lack of analysis in literature or other factors such as bias in report authorship, or a combination of these? How can these gaps best be filled?

As part of assessment and response to these questions, and in light of the urgency of human action detailed by the September 21st report of Global Warming of 1.5°C, the following steps are proposed to build bridges between cultural heritage practice and climate science:

- **Heritage support of IPCC reports.** In this step, heritage experts are organized and encouraged to serve as peer reviewers for IPCC reports to ensure that a range of heritage fields support existing IPCC authors with relevant concepts, analyses and references. As future IPCC reports are scoped and prepared, heritage experts need to organize at a global scale to submit author nominations.

- **Heritage-Climate Science Education and Outreach.** In this step, dialogue is fostered between the many areas of cultural heritage and climate science to identity common questions and build research and publications to connect or fill gaps in relevant literatures. Topics may include (see also High Ambition: Heritage Research and Climate Science) but are not limited to:
  - Documentation of climate Impacts on heritage and consequences for associated communities.
  - Specific application of heritage experience and research findings to climate change challenges such as water management, fire management, drought response, Disaster Risk Reduction, conflict, and individual and community migration.
  - Connections of energy efficiency, embodied carbon, community cohesion and economic development in historic buildings and local and traditional land use practices.
  - Heritage as a basis for sharing experiences of change, understanding roots of existing vulnerabilities, and source of inspiration for shaping meaningful responses to change.

- **Direct heritage engagement with the IPCC.** This step follows the 2016 adoption of a decision of the World Heritage Committee at its 40th annual meeting in Istanbul that requests the States Parties, the World Heritage Centre and the Advisory Bodies to work with IPCC, with the objective of including a specific chapter on natural and cultural World Heritage in future IPCC assessment reports. Response to this request includes tasks such as coordination between supporting parties; an IPCC expert meeting to summarize key issues for and from heritage practice with respect to climate change and the state of relevant literature; organization of a request for an IPCC special report or chapter on heritage; and diverse additional activities that will support preparation of an IPCC special report or chapter on heritage and climate change.

Taken together, these steps will bring the current combined understandings we have of and from human experience through time, and the questions and methods used to explore that experience inherent in heritage more fully into climate science, thereby improving the support IPCC reports provide to modern climate policy and response.

### Table 1: Instances where cultural heritage is mentioned in the IPCC AR5

<table>
<thead>
<tr>
<th>Themes Used for Analysis</th>
<th>Heritage Mentions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limitations, barriers and cultural differences</td>
<td>36</td>
</tr>
<tr>
<td>Benefits of natural/cultural heritage</td>
<td>29</td>
</tr>
<tr>
<td>Risks</td>
<td>27</td>
</tr>
<tr>
<td>Practices and knowledge</td>
<td>38</td>
</tr>
<tr>
<td>Adaptation, assessments and responses</td>
<td>34</td>
</tr>
<tr>
<td>Prehistoric or past society references</td>
<td>7</td>
</tr>
<tr>
<td>Gaps in our understanding</td>
<td>22</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>193</strong></td>
</tr>
</tbody>
</table>

Climate Change will have unprecedented impact on what is now considered to be good Conservation practice. Modifications will be required, both to better position heritage as an asset in Climate Action and to address the anticipated Impacts of climate change – large scale human displacement and migration, loss of existing communities, flooding, desertification, wind damage and major changes to cityscapes, landscapes and all types of heritage buildings, sites and places.

Many conservation management and assessment standards, such as the constructs of authenticity and integrity, will need to be rethought. As circumstances change and the world goes through rapid and far-reaching transitions in the environment, land area, land use, ecology, energy, economic, and political and social systems, alternative ways and means of understanding the significance of heritage places will continue to evolve.

Climate change will take us beyond the delicate balance between Conservation and development, to fundamental questions of human rights and the role of culture in facilitating difficult social Transitions. Heritage practitioners, scholars, educators and civil society have a central role and urgent responsibility to support communities in safeguarding and advocating for the important roles of cultural heritage in climate action. The multiple and interconnecting layers of climate change Impacts must become a baseline competency of heritage management, as are sustainable development principles.

Identification and documentation

Identifying and documenting the full range of Places with heritage values has been at the core of heritage management for decades, acknowledging that contested identities and diverse values are an integral part of that process. These practices will need to expand and modify to focus on values that support climate action and to improve support for traditional and associated communities as they prepare for losses and damage, making use of culturally appropriate documentation tools and searching traditional practices for wisdom and information about enhancing Resilience.

Conservation and protection

The consistent application of good basic conservation practices – especially routine maintenance, the continuous protective care of a place and its setting – is itself often an adaptation and/or mitigation strategy. Preparing and implementing preventive maintenance plans which have built into them an emphasis on adaptation and mitigation will provide owners and managers with the conservation actions, management decisions and required timing, of critical maintenance work.

Regular maintenance of heritage places can also ensure preservation of or modifications for carbon mitigation. These will increasingly include adaptation to climate Impacts management in accordance with those policies to both assess its associations, integrity and authenticity. Indeed, in most cases maintenance constitutes the simplest, most cost-effective and readily achievable energy conservation step. Well maintained buildings and landscapes are more resilient to frequent and intense rain events. Regular cleaning and maintenance of water and drainage systems and mechanical systems; regular painting of timber doors and frames; use of traditional construction materials and methods; maintenance of vegetation cover of urban areas and private lots; and aeration all can contribute to adaptability to climate change.

Management and adaptation

Conservation management requires a clear understanding of the significance of a place to develop the right policies to conserve it. Proactive management in accordance with those policies will increasingly include adaptation to climate Impacts or modifications for carbon mitigation. These will become drivers of heritage conservation management policies. Simple monitoring of change to provide data that can be used to achieve accountability in governance is a good starting point. Using and understanding the embodied energy and the carbon sink of existing heritage infrastructure, adapting it rather than constructing new infrastructure is of fundamental importance, assisted by using tools like Life Cycle Assessment.

Presentation: telling climate stories

Every place has a climate change story and using heritage places to broadly communicate these stories to their communities – and indeed globally – is both an opportunity and a responsibility for promoting awareness. Best practice heritage conservation not only interprets and presents the many stories of heritage places, but also expands public understanding and engagement in issues.

The monitoring of sites and data gathering to establish the rate and extent of climate change Impacts on heritage places as they occur is vital for the analysis of Impacts and mitigation efforts. There will be cases where stabilizing, documentation, monitoring and acceptance of controlled decay of a heritage place may be the only valid conservation process; it will eventually be lost. The processes of farewell, validation and documentation will increasingly be part of heritage practice, with digital recording techniques and virtual reality used to record and interpret heritage stories and convey them to future generations as places are progressively lost.

Advice and guidance

Globally, ICOMOS has developed a range of charters and good conservation practice guidance documents about heritage site management. Standard methodology approaches are useful reference points and can be regionally and locally adapted by associated communities, such as the Birra Charter: The Australia ICOMOS Charter for Places of Cultural Significance (ICOMOS 2013) and practice notes and the Approaches for the Conservation of Twentieth Century Cultural Heritage (ICOMOS ISC20C 2017). The European Committee for Standardisation (CEN) Technical Committee for Cultural Heritage (CEN/TC 134) established in 2003 has produced, and is continuing to produce, standards concerning specific items but also methodological approaches concerning conservation, refurbishment, energy efficiency and many other issues.

Moveable Heritage (including Museums & Collections)

In the field of museums and collections standard operating processes and best practices are being rapidly updated to face the challenges of climate change. Depending on the IPCC Emission Scenario, issues such as current object conservation standards based on target temperature and relative humidity level in climate-controlled buildings will change. Such impacts will be differentially felt in museums and collections which are not climate controlled.

Archaeological resources

All heritage places are vulnerable to sea level change and violent weather events, but perhaps archaeological sites are the most vulnerable of all. Archaeological sites which are particularly subject to severe winds/sun and sea spray/wave action will require documentation and active support upon to salvage excavation as necessary. Before excavation, most archaeological sites were in a naturally protected environment where they could survive for millennia. After excavation they are exposed to weather, or to minimal protection, e.g. a roof to protect against rain, but with impacts such as overheating their environmental conditions have been dramatically changed and thus their conservation needs have been changed. The changing patterns of rain, storms and temperature will further impact exposed archaeological remains, and their stabilisation, protection and use by their associated communities makes it all the more important to conduct and record archaeological research in order to understand the changing environments of the past.

Climate change is already having an impact on maritime heritage both beside and within inland and inshore waters, shallow seas and deep oceans. The ICOMOS Charter on the Protection and Management of Underwater Cultural Heritage (ICOMOS 1996) provides principles and guidance. Management options which are being implemented, and the change that negatively impact underwater cultural heritage have developed and utilized techniques of preservation (conservation) in situ, and the sharing of experience internationally are welcome and needed.

Buildings and structures

Good heritage conservation practice always begins with a clear understanding of the cultural significance of the place, the needs of its stakeholders and includes the development of policies to both assess risks and manage change. This understanding goes beyond a physical condition and fabric analysis to understand the history of development of the site, to assess its associations, integrity and authenticity.
These assessments form the basis of Conservation Management Plans which are the standard methodological approach for systematically managing change to heritage places. Recording the conservation process and works are part of the archives for future reference.

Increasingly, those who care for built heritage will be required to understanding the carbon footprint of the resources. Lifecycle Assessment tools should be promoted. The mitigation benefit of maximising the use of existing fabric and minimizing introduction of new and sometimes incompatible materials whose production requires additional carbon emissions will be key. Active engagement by heritage professionals in ensuring that GHG mitigation become a factor in heritage and heritage become a factor in GHG mitigation is critical, especially regarding building codes. Sustainability rating schemes and construction processes is an urgent task.

Cultural Landscapes

Cultural landscapes demonstrate an evolving land use that may be living or past, and perform a variety of functions; for example, some are managed to guarantee and sustain biological diversity, some embody the spiritual relationship of people with nature, some are religious sites or sites of prehistoric and historic landscape modification. Such values have over time promoted resilience, biodiversity, social identity, cohesion and community resilience, and these values can all be exercised to support local climate adaptation and greenhouse gas mitigation.

The spirit, integrity and traditional uses of cultural landscapes are subject to subtle incremental alterations caused by local Impacts of climate change – from the distribution and intensity of rain, to the broader climate change impacts, such as the pressure of tourism and urbanization.

As most cultural landscapes constitute critical resources for developing and sustaining local economies and communities, these communities may need support to develop and implement good conservation management and sustainability practices that are adapted to climate change, new landscape functions complementary with adaptation and mitigation may be necessary. For example, landscape managers should understand the carbon sequestration potential of the places they work with.

In historic urban landscapes, the practice of good conservation concerns in particular the administration of planning and development controls. The principles of Historic Urban Landscape (HUL) practice correlate well to the needs of climate action including Adaptation Planning should be adopted as part of urban policies.

Associated communities and traditional custodians

The role of associated communities and traditional custodians in best practice conservation management planning is fundamental, to ensure social inclusion and social cohesion, and a understanding of the values of the place. A key reference resource is the Operational Directives for the Implementation of the Convention for the Safeguarding of the Intangible Cultural Heritage (UNESCO 2018), which includes in a section on Environmental Sustainability and a subsection on ‘Community-based resilience to natural disasters and climate change’.

Meaningful public participation is needed to ensure the legitimacy of climate change adaptation planning and implementation. Associated communities, and custodians who know in depth the historical roots and cultural tradition that sustain this heritage must be engaged. Similarly, administrators and town planners have the obligation to do good and comprehensive Conservation action plans, supporting the community and the surrounding historic urban landscape.

Intangible Heritage

Best conservation practice recognises the deep relationship between tangible and intangible cultural heritage; and that for intangible heritage places, the traditional custodians and associated communities of users must be involved in conservation actions on multiple levels. Other stakeholders may be institutionally responsible for conserving intangible cultural heritage - curators, museums etc, who support recording, safeguarding, and fostering the performing arts, oral traditions, dances, stories, folklore, rituals, festive events, language and histories.

Intangible skills and techniques that support climate change action need to be highlighted while some traditions contrary to climate action (like burning peat) may need to be modified.

As governments accept their obligations to address the impact of climate change on heritage places to identify where damage may be likely, to assist building community resilience, implementation action will rest with multiple stakeholders. NGOs like ICOMOS, and civil society more generally, have responsibilities to make powerful contributions through providing guidance, framing and implementing effective policies and action for best practice heritage management as climate change advances.

Equity and Climate Justice

Principles of Equity and Climate Justice are fundamental to understanding and addressing the challenges of climate change. Ethical and political considerations must guide Climate Action alongside environmental and natural science drivers. The centrality of these considerations is evidenced by the frequency with which they arise in the discussions under the United Nations Framework Convention on Climate Change (UNFCCC) and in other climate bodies.

A growing amount of research also supports this conclusion. The 2017 UNESCO Declaration of Ethical Principles in relation to Climate Change provides that justice in relation to climate change requires fair treatment and meaningful involvement of all people. It calls for relevant actors at all levels to work together in a spirit of justice, global partnership, inclusion, and in particular in solidarity with the poorest and most vulnerable people.

While anthropogenic climate change has largely been caused by the cumulative greenhouse gas (GHG) emissions of Industrialized Countries over centuries, its impacts are affecting all the peoples of the world. Research shows that the poorest and most vulnerable groups will disproportionately experience the negative Impacts of climate change in this century. Often these frontline communities are among those who have contributed the least emissions, including marginalized urban communities, rural inhabitants and migrants.

Indigenous people are among the most vulnerable to the adverse effects of climate change because, among other reasons, their existence is often inextricably tied to the land. As a result, indigenous advocates have been among the first to make the point that climate change threatens not only landscapes but also cultural identity.

Inter-generation equity requires that all people take measures to safeguard and protect Earth’s terrestrial and marine ecosystems, for present and future generations. The interaction of people and Ecosystems is particularly important given the high dependence of one upon the other. Fairness requires attention to principles of Distributive justice and the notion that the benefits and burdens associated with climate change and its resolution be allocated fairly. This implies the acceptance of responsibilities for the reduction of Greenhouse Gas emissions.

In addition, those who have benefited and still benefit from emissions in the form of continuous economic development and greater wealth, mainly in industrialized countries, noting agricultural emissions, and traditional operations as well (Cassar 2016), have an ethical obligation to share the benefits with those who now suffer the effects of these emissions, mainly people vulnerable in developing countries. At the same time, all countries should continue enhancing their mitigation efforts, including a focus on agricultural emissions and emissions from other activities like brick making.

Not only have indigenous or aboriginal people been poorly represented in climate action, but there are also other marginalized populations that should be better integrated into Adaptation and mitigation planning (Appler and Rumbach 2016). The UNFCCC’s Local Communities and Indigenous Peoples Platform is one response to this gap.

Solidarity is needed from heritage professionals with those communities most Impacted by, or least able to bear the cost of, climate change, including communities in Least Developed Countries and Small Island Developing States (SIDS), in order to enable them to safeguard their heritage. This solidarity must be a two-way process with all participants learning from each other’s experiences. South-South and Triangular Cooperation should be supported.

Relevant actors should facilitate and encourage public awareness, and participatory governance and procedural equity in decision-making and actions touching upon climate action, including in heritage processes. This should occur by making information and knowledge on climate change, including how to pursue mitigation Pathways and adaptation Pathways, widely available. This should be done in a timely manner, taking into account the differentiated

The Future of Our Pasts - 1 July 2019

Heritage and Climate Change Outline Report

Heritage and Climate Change Report

The Future of Our Pasts - 1 July 2019
needs and access to resources of the most vulnerable. In this context, measures should take into account the contribution of women in decision-making, since women are disproportionately affected by climate change. Measures should involve lower access to resources and yet play a vital role in achieving inclusive sustainable development.

Populations in frontline and marginalized communities in the global south must have access to opportunities to adapt to the impacts of climate change and to address loss and damage. Knowledge related to the causes, modalities and impacts of climate change and responses to it should be shared equitably and in a timely manner in order to increase the adaptive capacity and improve the mitigation behaviours of all, and to increase the resilience of people and ecosystems. At the same time, every such community has a unique culture and heritage that represents Endogenous Ways of Knowing including Endogenous Capacities that can be leveraged for climate action. Valuing and promoting these capacities and supporting their ongoing, practical use should be encouraged. The development of Policies and plans related to climate change should be culturally appropriate and participatory, transparent and accountable to all voices.

Climate Justice links Human Rights and development to achieve a human-centred approach to climate change, safeguarding the rights of the most vulnerable; taking into account the needs of those at greatest Risk, particularly the poorest and the most vulnerable; and sharing the burdens and benefits of climate change and their resolution in an equitable and just manner. The growing field of Rights Based Approaches (RBAs) to heritage offers a useful set of tools for ensuring that the cultural heritage considerations are incorporated into climate action in a manner consistent with these principles.

As noted in the Recommendations from the Scientific Council Symposium Cultural Heritage and Global Climate Change (GCC) held by the ICOMOS Scientific Council in Pretoria, South Africa on 7 October 2007, climate change requires difficult choices. The sheer scale of loss and damage threatened by climate change must be considered in the context of Climate Justice and Equity. For example, priorities must be established to determine which sites can be saved or protected and those in which documentation or archaeological salvage and research can be carried out. There is a danger that climate action may be undertaken in ways that perpetuate existing Inequalities, including in the contest of heritage. There is also danger that climate impacts and response may be overly ‘expert/scientific-driven’ choices, imposed upon communities. There is a need to provide the resources and programs so that communities can take part equitably in discussions about these choices. Anchor points for cultural memory should be evaluated; there is a need to recognize that even after severe impact or loss of place, ‘memory’ needs to be considered.

The intersection of Climate Change and heritage is complex and the scale and nature of impacts are uncertain. Although existing heritage methodologies may provide an effective response, in many cases it is likely that slight adaptations or entirely new multimedia and interdisciplinary approaches will be required (see table 2).

As climate change is a cross-cutting issue, adopted methodologies should, where possible, be able to be translated beyond the heritage sector allowing the swift and effective communication of information between individuals, countries and disciplines. For example, global approaches to assessing Disaster Risk Reduction (DRR) exist and are being applied to heritage resources (see Part 1, Division 2: Adaptation). Exploring the use of open-access databanks, and links between existing tools should also be encouraged with a focus on increasing collaborations that cross disciplinary boundaries. Landscape-based management approaches may be particularly relevant for promoting Climate Action. One of the complexities of climate change from a management perspective is that it involves multi-scale planning, from the global to the local. Tools and methodologies therefore need to be scale appropriate e.g. downscaling Climate Projections to the site level.

Monitoring is a key requirement for understanding both the impacts of climate change and the effectiveness of adaptation activities. Creating a data bank of Monitoring outputs and developing a suite of tools based on appropriate and sustainable monitors and indicators will require a coordinated and systematic approach. Data gathering across sites should be harmonised as much as possible so that analyses can be made and the rate of climate change can be demonstrated. In many but not all cases, this could be accomplished through either an addition to, or minor tweak of, current documentation systems and would enable the sharing of good practice and understanding of common hazards and impacts. Between natural and cultural heritage there is a wealth of data and experience in this arena.

Heritage Tools and Methodologies

Historic records, community stewardship, palaeoenvironmental and archaeological evidence also provide a wealth of evidence both of climate impacts and coping mechanisms; and acquiring knowledge from the past is a well-honed skill within the sector. Possible fresh approaches should be constantly explored, embracing multi-disciplinary approaches and new technologies. Long-established archaeological techniques, encompassing excavation and post excavation methods used to create a record of physical remains before they are removed, are likely to become increasingly important alongside geospatial mapping and modelling. In addition, art-based methodologies may provide creative, holistic interpretations that can engage wider audiences. In the face of uncertainty over climate change impacts, maintenance should always be the first line of defence for heritage managers, i.e. selecting actions that enhance resilience to a range of possible climatic outcomes that may have additional benefits. Existing tools and methods that enable adaptation and minimise loss of cultural significance need to be shared and promoted and new ones designed and tested. Despite uncertainty, difficult decisions will have to be made as climate change impacts outweigh our ability to protect some sites. There is an urgent need to survey and carry out assessment of cultural significance and environmental risks, to determine the scale of recording, salvage or conservation that might be needed. This process should fully involve, and ideally be driven by, the relevant communities in concert with experts in the relevant fields. As not everything can or needs to be saved, it is vital that the creation of priorities is informed and transparent.

Suitable approaches, both ethical and practical, are also needed to enable the heritage sector to play its part in mitigating climate change (i.e. reducing Greenhouse Gas emissions) without incurring an unacceptable loss of cultural significance. This requires processes to define what is unacceptable, both to stakeholders and within policy. New models should be developed to evaluate conservation and adaptation measures from the perspective of Circular
Economy processes, such as Life Cycle Assessments, which centre on materials, energy and waste minimization. Management Plans may be the vehicle through which much of this work can be documented and achieved.

### Table 2: Suggested requirements for a 'methodological toolkit.'

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heritage Inventory</td>
<td>Preparing an inventory of cultural heritage provides a basis for other methodological advances. Consequently, inventory preparation is in itself a climate strategy, especially when it takes account of heritage values as climate action assets and is sensitive to climate vulnerability and adaptive capacity. The level of detail will vary with the scale, nature and complexity of the heritage resource. For example, it could include participatory cultural mapping – identifying, documenting and recording tangible and intangible cultural heritage, place-based narratives of change, and local knowledge specific to place and the communities who live there.</td>
</tr>
<tr>
<td>Heritage Values Assessment</td>
<td>Taking a values-based approach and incorporating tangible and intangible heritage throughout, including but not limited to statements of Cultural Significance (or Outstanding Universal Value if a World Heritage Site). Understanding current values is a prerequisite to assessing risk from Climate Change.</td>
</tr>
<tr>
<td>Impact Assessment (HIA)</td>
<td>Adopting/adapting existing methodologies for assessing the Impacts of Climate Change on cultural heritage and the effects of those impacts on associated communities. A revision of the Heritage Impact Assessment (HIA) process as proposed by ICOMOS in 2011 will support the evaluation of impacts focusing on heritage and Climate Change in the circular economy perspective.</td>
</tr>
<tr>
<td>Vulnerability Matrix</td>
<td>A matrix of possible climate change impacts based on the best available climate science and established Cultural Significance/heritage value.</td>
</tr>
<tr>
<td>Vulnerability Indicators</td>
<td>A selection of indicators, quantifiable proxies measuring aspects of vulnerability to climate change, providing reference points at multiple scales to guide policy and planning.</td>
</tr>
<tr>
<td>Heritage Documentation and Monitoring</td>
<td>Gathering and sharing standardized data, both nationally and internationally, presents challenges but is highly desirable. Utilizing as appropriate the full range of traditional techniques and new technical solutions to enable multi-scale analysis of the progress of climate change.</td>
</tr>
<tr>
<td>Conservation Management Planning</td>
<td>Should include managing, adapting and mitigating climate change for sites through integrated Policies. Requiring short, medium and long-term perspectives and actions.</td>
</tr>
<tr>
<td>Risk Assessment (macro)</td>
<td>Considering likelihood vs severity of a potential hazard makes it possible to undertake Risk Assessment reasonably rapidly on a national and/or regional scale. This process can often utilize data from other sectors e.g. flood management, biodiversity etc. The information this provides can be utilized in setting priorities and developing Disaster Risk Management plans.</td>
</tr>
<tr>
<td>Vulnerability Assessment (micro)</td>
<td>Considering sensitivity, exposure and Adaptive Capacity of tangible and intangible heritage. Requiring a holistic local scale assessment of Impacts and Resilience that is best undertaken at site level. Tangible heritage tends to be static, however when analysed as part of a human system, Adaptive Capacity (largely residing in the human element) can be assessed.</td>
</tr>
<tr>
<td>Climate Vulnerability Index (CVI)</td>
<td>The CVI is a rapid assessment tool that focuses on climate Impacts to the Cultural Significance of a site and can be done for a site or for a ‘thematic group’ of sites. It is currently being developed by a network of partners including ICOMOS.</td>
</tr>
<tr>
<td>Adaptation Planning</td>
<td>Based on an informed assessment of Vulnerability, Adaptation planning can be approached at site level in order to design adaptation Pathways that best protect the identified Cultural Significance. Inputs to regional/national level adaptation strategies in response to macro assessment of Risk will be important and should follow an established multi-sectoral, interdisciplinary methodology for planning which ensures that heritage is considered within the strategies of cross-cutting sectors e.g. agriculture, tourism etc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heritage Inventory</td>
<td>Preparing an inventory of cultural heritage provides a basis for other methodological advances. Consequently, inventory preparation is in itself a climate strategy, especially when it takes account of heritage values as climate action assets and is sensitive to climate vulnerability and adaptive capacity. The level of detail will vary with the scale, nature and complexity of the heritage resource. For example, it could include participatory cultural mapping – identifying, documenting and recording tangible and intangible cultural heritage, place-based narratives of change, and local knowledge specific to place and the communities who live there.</td>
</tr>
<tr>
<td>Heritage Values Assessment</td>
<td>Taking a values-based approach and incorporating tangible and intangible heritage throughout, including but not limited to statements of Cultural Significance (or Outstanding Universal Value if a World Heritage Site). Understanding current values is a prerequisite to assessing risk from Climate Change.</td>
</tr>
<tr>
<td>Impact Assessments (HIA)</td>
<td>Adopting/adapting existing methodologies for assessing the Impacts of Climate Change on cultural heritage and the effects of those impacts on associated communities. A revision of the Heritage Impact Assessment (HIA) process as proposed by ICOMOS in 2011 will support the evaluation of impacts focusing on heritage and Climate Change in the circular economy perspective.</td>
</tr>
<tr>
<td>Vulnerability Matrix</td>
<td>A matrix of possible climate change impacts based on the best available climate science and established Cultural Significance/heritage value.</td>
</tr>
<tr>
<td>Vulnerability Indicators</td>
<td>A selection of indicators, quantifiable proxies measuring aspects of vulnerability to climate change, providing reference points at multiple scales to guide policy and planning.</td>
</tr>
<tr>
<td>Heritage Documentation and Monitoring</td>
<td>Gathering and sharing standardized data, both nationally and internationally, presents challenges but is highly desirable. Utilizing as appropriate the full range of traditional techniques and new technical solutions to enable multi-scale analysis of the progress of climate change.</td>
</tr>
</tbody>
</table>
Sustainable drainage systems - SUDS - are flood defence measures that mimic natural processes. They are critical for protecting cultural heritage and communities in flood-prone areas.

Part I
Correlating Heritage to the Paris Agreement

Part I of this Outline provides a framework for systematically acknowledging the importance of the cultural heritage dimensions of responding to Climate Change. Responding to climate change is about adjusting to Risks, either in reaction to or in anticipation of a changing climate. Key elements of this response are referred to here as ‘Climate Action’. But what specifically is the remit of cultural heritage practice in climate action?
Elsewhere in this Outline, some of the theoretical foundations for treating heritage as an asset in climate action are sketched, noting also how contemporary responses to climate change sometimes fail to address culture. This Part I outlines a positive, Policy-based vision of the role of cultural heritage in responding to climate change. Key categories or ‘sectors’ of climate action form the basic structure of this analysis. Those sectors of climate action are then correlated to the core competencies and considerations of cultural heritage. The intention is to discuss heritage using the logic and vocabulary of climate action and climate science.

Categorizing Climate Action

There are numerous ways to categorize the key elements of climate action. Mitigating Greenhouse Gases is a key – if not the – key priority. Climate change is largely a result of Anthropogenic Emissions. Mitigating these emissions has the potential to reduce the magnitude of future climate change. However, because the planet is already committed to a certain level of climate change, it is also important to address the negative consequences of climate change. As a result, climate action priorities also include strengthening Resilience and Adaptive Capacity to climate-induced Impacts and preparing for Losses and Damages. Improving education, awareness-raising and building human capacity and Institutional Capacity with respect to climate change are important climate action tactics.

This outline categorizes climate action into four sectors: (1) High Ambition; (2) Greenhouse gas (GHG) Mitigation; (3) Adaptation; and (4) Loss and Damage. The Paris Agreement provided the starting point for the construction of these four sectoral categories. The Paris Agreement represents a global consensus on how to combat climate change and to accelerate and intensify climate action. It charts the course for global climate effort.

In order to arrive at these four sections, the contents of the Paris Agreement were synthesized and condensed. Greater attention was paid to those elements of the Paris Agreement deemed to correlate more strongly to cultural heritage. In other words, elements of climate action were weighted based on the perceived altitude of cultural heritage actors to engage on them. For example, the topic of loss and damage is treated here as one of four sections of climate action although it does not enjoy such prominence in the Paris Agreement. The topic is given this elevated emphasis because of the strong correlation between its various dimensions and the concerns of cultural heritage.

The approach to climate action used here, also takes account of developments since the adoption of the Paris Agreement in 2015, many of which were themselves contemplated in the Paris Agreement. These include the publication in 2018 of The Special Report on Global Warming of 1.5°C by the IPCC and the rolling roadmap of the Executive Committee of the Warsaw International Mechanism for Loss and Damage.

Each of the four sections of this Part I is preceded by a brief summary of the scope of that Section. The following table provides a concordance between those four sections and the Paris Agreement itself:

### Table 3: The four sections of the Paris Agreement, and the Outline Report.

<table>
<thead>
<tr>
<th>Outline of Climate Change and Cultural Heritage</th>
<th>Sectoral Outline Division</th>
<th>Paris Agreement Concordance</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Ambition</td>
<td>Finance, technology and capacity-building support (Paris Agreement Articles 9, 10 and 11)</td>
<td>International cooperation on climate-safe technology development and transfer, and building capacity in the developing world are strengthened; a technology framework is established and capacity-building activities will be strengthened.</td>
</tr>
<tr>
<td>Mitigation</td>
<td>Long-term temperature goal (Article 2); Reaffirms the goal of limiting global temperature increase to well below 2 degrees Celsius, while pursuing efforts to limit the increase to 1.5 degrees Celsius.</td>
<td></td>
</tr>
<tr>
<td>Adaptation</td>
<td>Adaptation (Article 7); Establishes a global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change in the context of the temperature goal of the Agreement. It aims to significantly strengthen national adaptation efforts, including through support and international cooperation.</td>
<td></td>
</tr>
<tr>
<td>Loss and Damage</td>
<td>Loss and damage (Article 8); Recognizes the importance of assessing, minimizing and addressing loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events, and the role of sustainable development in reducing the risk of loss and damage; Parties are to enhance understanding, action and support with respect to loss and damage.</td>
<td></td>
</tr>
</tbody>
</table>

The symposium concluded that key roles of heritage in sustainable development include driving social cohesion, wellbeing, creativity, economic appeal, and understanding between communities.

Other heritage doctrines and texts have also been used to establish the relevant competencies of cultural heritage including those drawn from Historic Urban Landscape and (bio-) Cultural Landscape practice as well as Human Rights-based approaches (BRAs) and the principles of material science and the theory and practice of Conservation.

Correlating Heritage Competencies to Climate Action Priorities

At a basic level, the methodology of this Sectoral Outline consisted of moving section-by-section through the content of the Paris Agreement and correlating that content to the competencies of cultural heritage. As to the bases for those correlations (i.e. the cultural dimensions of climate action), the
The symposium concluded that key roles of heritage in sustainable development include driving social cohesion, wellbeing, creativity, economic appeal, and understanding between communities.

Other heritage doctrines and texts have also been used to establish the relevant competencies of cultural heritage including those drawn from Historic Urban Landscape and (bio-) Cultural Landscape practice as well as Human Rights-based approaches (RBAs) and the principles of material science and the theory and practice of Conservation.

**Correlating Heritage Competencies to Climate Action Priorities**

At a basic level, the methodology of this Sectoral Outline consisted of moving section-by-section through the content of the Paris Agreement and correlating that content to the competencies of cultural heritage. As to the bases for those correlations (i.e. the cultural dimensions of climate action), the Paris Agreement itself provides a handful of clues, as when it calls out the role of landscapes, ecosystems and sustainable land use. The treatment of indigenous peoples provides an important entry point for culture won through the efforts of local communities and indigenous persons. Perhaps that most explicit attention to heritage in the Paris Agreement comes in the section on adaptation which notes that adaptive action … should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems, with a view to integrating adaptation into relevant socioeconomic and environmental policies and actions, where appropriate.

Culture is indeed central to understanding and implementing adaptation: the identification of Risks, decisions about responses, and means of implementation are all mediated by culture. Culture is important for understanding mitigation as well.

Culture is embedded in the dominant modes of production, consumption, lifestyles and social organization that either give rise to emissions of Greenhouse Gases (GHGs) or provide a blueprint for traditional, low-carbon technologies and lifestyles. Cultural interpretations of science and Risk frame the ways humans understand the causes and meaning of climate change and their response to calls for climate action (Adger et al 2013).

Each sector of climate Action was outlined by dividing the section into subsections using the following levels:

- 1. Key Concept/idea/theme
- 1.1. Significant issues/sub-topic
- 1.1.1. Relevant issues but of narrower significance/relevance

The broad categories of cultural heritage actions, investigations and connections relevant to advancing that subset of climate action are then summarized. Situations in which ignoring the cultural dimensions of a given climate action might cause the action to fail or lead to Maladaptive Actions were prioritized for treatment in the Outline.

It is possible with culture-based approaches to climate action to combine climate change mitigation and adaptation with heritage Conservation and the safeguarding of cultural values. Many such approaches reflect ‘no-regret’ or ‘win-win’ options. Heritage co-benefits are often present in climate action, as when the reuse of existing buildings is valorised. At the same time, not all cultural practices readily harmonize with Climate Action. Cultural patterns and practices give rise to Greenhouse Gas (GHG) emissions; some groups of people may have enhanced Adaptive Capacity as a result of factors like Inequality but also perhaps because of culture. This Sectoral Outline attempts to comprehensively address the intersection of climate change and cultural heritage, emphasizes win-win approaches that advance climate action and heritage safeguarding while also acknowledging areas of real or perceived conflict between the two.

Traditional building and construction materials will have to change as materials are either no longer available or not adapted to changing climate conditions.

© Adam Markham 2019.
Cultural landscapes, particularly historic gardens, are vulnerable to changes in climate and the resulting loss of plants, many hundreds of years old.

Levens Hall in England’s Lake District. © Adam Markham

**1.1 Heritage Places and climate action communication**

Every place has a climate story. Some are positive, others not, but they are a powerful way to communicate urgency, build social cohesion and Resilience and communicate the significance of Climate Change Impacts on heritage places. Heritage actions include:

1.1.1 Using iconic heritage to promote a sense of urgency about climate change and climate action, relatable to other heritage sites, places and communities.

1.1.2 Using global and national stock-takes of the current state of World Heritage Sites to assess current status and future vulnerability.

1.1.3 Promoting the power of Place, past and narrative to enhance understanding of climate-society complexities and potentials; documenting and interpreting the heritage of the Anthropocene and the impacts of the Industrial Revolution.

1.1.4 Using heritage sites as exemplars of climate mitigation and adaptation.

1.1.5 Encouraging participatory, community-based prioritization, documentation and recording of Endogenous Ways of Knowing: Cultural Significance, Narratives of change, with related (tangible and intangible) cultural elements.

1.1.6 Establishing and maintaining connections between heritage Place managers and researchers in Climate science, adaptation, mitigation and communications fields.

1.1.7 With heritage as a base, building and maintaining means of listening to communities and providing open opportunities to inspire voluntary participation in advocacy, and collective climate action.

**1.2 Heritage, research and climate science**

Using the diverse physical sciences and humanities fields of heritage research and the distributed observing networks afforded by heritage sites to support climate science and understanding of short-term and long-term environmental change at local, regional, and global scales; using science, endogenous knowledge and history of heritage sites to track past human interactions with, and effects on environments, and to assess climatic, environmental and social baselines from which contemporary...
climate and society are shifting; establishing and upholding Ethical and just use of information from and about the past.

1.2.1 Using Palaeoenvironmental climate data from heritage sites, museums and other curated collections to explore climate trends and shifting climatic baselines.

1.2.2 Collating and synthesizing existing Palaeoenvironmental and archaeological data (from heritage sites, museums and other curated collections) to assess past baselines and tipping points of ecological and social change.

1.2.3 Promoting better understanding of existing Endogenous capacities and knowledge as a central part of heritage management, climate research and science.

1.2.4 Using archaeological data and other information from heritage places, museums and other curated collections to identify and explore past human impacts on environments over short, medium and long periods and at local, regional and global scales.

1.2.5 Exploring application of past adaptation and mitigation techniques to climate and landscape change, including agriculture and animal husbandry, architecture and land-use patterns, subsistence strategies, and use of material culture.

1.2.6 Promoting and encouraging interdisciplinary and projects and data synthesis to improve links between heritage research fields and other areas of climate science.

1.2.7. Promoting and upholding a body of Ethics with respect to just, appropriate, and equitable use of information, from and about the past, and from and with regard to Indigenous Knowledge, noting the 2017 UNESCO Declaration of Ethical Principles in relation to Climate Change.

1.3 Climate change, heritage and education

Emphasising the importance of education and knowledge exchange across a wide range of stakeholders including heritage management, transdisciplinary research, climate science and Endogenous Ways of Knowing about climate change.

1.3.1 Using heritage places as focal points tracking the impacts and implications of climate change and training diverse student bodies in these impacts and implications.

1.3.2 Promoting ongoing skills development and training for heritage professionals and communities about climate change.

1.3.3 Encouraging knowledge exchange as an ongoing process incorporating Endogenous Ways of Knowing, Cultural significance and climate science.

1.3.4 Promoting open access tools and approaches to vulnerability assessment, mitigation techniques, monitoring and damage assessment, Conservation and adaptation efforts.

1.3.5 Embedding climate change and cultural heritage knowledge in schools and higher education.

1.3.6 Encouraging the intergenerational exchange of knowledge.

1.4 Integration of cultural heritage management with climate science in policy development

Creating synergies between heritage-based knowledge and Policy relating to climate change. Promoting integrated climate change and heritage-based policy decisions by understanding the contribution of heritage to society, and the impacts of climate change on heritage places and values.

1.4.1 Developing and promoting clear principles of Cultural Significance and Conservation in relation to climate change, as a resource for legislators and organizations to assist their development of climate change related Policy.

1.4.2 Incorporating work on mitigation, adaptation, loss and damage, and partnerships with other social and physical sciences across national and global climate research into heritage Conservation practice and policy platforms.

1.4.3 Capturing and communicating contributions of heritage to measures such as quality of life, responsible tourism, Ecosystem Services, and Greenhouse Gas (GHG) emissions reductions, as a means to promote the value of the role of cultural heritage in climate action and influence Policy engagement and integration.

1.4.4 Supporting and expanding a body of Ethics, including the 2017 UNESCO Declaration of Ethical Principles in relation to Climate Change, to ensure consciousness of the ownership and appropriate engagement with Endogenous Ways of Knowing, including in the case of Indigenous Knowledge, prior, free and informed consent, as an essential resource for developing climate and heritage Policy.
Plants relied on by traditional craftsmen may be impacted by changes in the climate, or become vulnerable to new pests or invasive species. Manama, Bahrain.

Photo: ©Adam Markham

Climate Change Adaptation in Human Systems aims to minimise the adverse consequences of actual or expected climate change and maximise the opportunities it presents. Both these aspects of adaptation are correlated to the core competencies and considerations of cultural heritage in this section of the Outline. Adaptation actions can include Human Behavioural Change, Institutional change and technological adjustments.

Cultural heritage will be impacted by climate change and therefore adaptation strategies are needed to manage the Risks. The selection and implementation of adaptation measures will require the integration of Cultural Significance assessments (both relative Significance and impacts to Significance from adaptation actions) together with Risk/Vulnerability Assessments, and feasibility studies. Adaptation activities are likely to require additional resourcing, however knowledge, understanding and the provision of sectoral leadership are possibly more crucial in the early stage of the process.

Cultural heritage also has immense potential to contribute to adaptation Pathways for Human Systems. The particular worth of cultural heritage is indicated within the Paris Agreement, which states that adaptation action should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems (Article 7.5, 2015).

Knowledge and Understanding

1. Values-Based Approaches and People-Centred, Participatory Governance

Cultural heritage can support adaptation, especially when cultural Values are incorporated into adaptation Governance. Cultural Values can also guide adaptation Options and bolster the Enabling Conditions for adaptation Values-based Approaches to heritage should explore the notion of cultural and natural commons. It should be recognised that Cultural Significance reflected in different levels of designation does not necessarily provide an acceptable prioritisation for the management of heritage in the adaptation context. Also, different types of Cultural Significance (and different types of heritage) will need to be carefully considered. Links between organisations need to be developed. Ways that Values-Based Approaches can support adaptation planning and Governance include:

1.1. Using what people value about places as a guide to adaptation and Resilience planning (see 1.3).

1.1.1. Leveraging heritage communities and methodologies for social/cultural/heritage Values and narrative mapping as an input into adaptation planning.

1.1.2. Using heritage Values assessment methods (e.g. World Heritage and ICOMOS) and capacity building with community, practitioners and Policy makers to support climate adaptation. Recognizing also that what people value may change with environmental vulnerability.

1.1.3. Actively considering and engaging with the full
2. Using the Data-Collection Aspects of Heritage to Support Effective Adaptation

Before appropriate adaptation actions can be selected and applied, baseline information is required including: knowledge of projected climate change Hazards; understanding of the potential direct and indirect Impacts; understanding the type of heritage at Risk and its Cultural Significance, including movable, immovable and intangible; and assessment of vulnerability of this Cultural Significance to the predicted climate change Impacts. It is important that adaptation planning considers both slow onset (e.g. Sea level rise) and rapid onset (e.g. Extreme Weather Events) Impacts and the range in between (e.g. multi-year Drought).

The exact nature of the baseline data required will vary with the prioritisation of Impacts and heritage types/Values. For example, island states may choose to focus on coastal and estuarine sites and cities. Education and training in climate heritage skills is necessary to ensure that this baseline can be achieved.

2.1. Data

Acquiring, managing and consolidating data relating to climate Risks and vulnerabilities. Climate change is a long-term and highly complex issue, and there are challenges entailed that require strengthening of relevant systems. Ethical data collection is essential e.g. for knowledge gathered from local communities. In many cases data collected by other sectors may be of use to cultural heritage.

2.1.1. Using climate science relevant to heritage: thresholds and combinations of environmental parameters implicated in significant effects.

2.1.2. Using existing data-sets that consider inter-sectoral possibilities such as tourism, agriculture, Disaster Risk Reduction etc.

2.1.3. Creating culturally specific data-sets e.g. a georeferenced database of the main territorial Migrations or narratives of traditional peoples and communities.

2.1.4. Creating predictive and preventive georeferenced methods that consider physical attributes and Risks to landscapes and traditional communities.

2.1.5. Creating and communicating indicators that can be used as proxies for climate change Impacts.

2.2. Selecting methodological approaches to assessing Risk and vulnerability that effectively inform adaptation. The appropriate methodology will depend on local factors and in some regions, and for certain types of heritage existing reporting mechanisms may be sufficient.

2.2.1. Using macro-scale Risk Assessments to gain a broad overview at a regional level often for a specific Risk such as Flooding.

2.2.2. Using micro-scale (place based) vulnerability assessment which tend to be holistic and site-specific, to consider the Human Systems, including associated communities.

2.2.3. Using multi-scale methodologies with imperfect datasets at varying scales to build up a more holistic picture than either macro or micro scale alone.

2.3. Analysing (as appropriate to the cultural context) the Sensitivity of Cultural Significance to the potential Impacts of climate change, on:

2.3.1. Physical characteristics e.g. materials composition, location, condition and communities.

2.3.2. Values e.g. socio-economic factors, community Resilience and Cultural significance.

2.3.3. Intangible factors associated with heritage places e.g. spirituality and traditional Livelihoods.

2.4. Analysing Exposure of heritage to the Hazards associated with climate change, including direct, indirect, physical and socio-economic, by:

2.4.1. Detailed mapping of current Hazards via regular monitoring.

2.4.2. Systems mapping to pick up interaction of multiple Hazards.

2.4.3. Mapping of future climate change Risk based on Projections.

2.5. Analysing Adaptive Capacity at a Human System level i.e. including the Adaptive Capacity of people (heritage professionals and local communities), as well as of Cultural Significance. Considering Enabling Conditions for adaptation including human and financial resources, protective legislation, services, infrastructure etc.

2.6. Analysing climate Impacts of recent or historic events (including damage done, costs of response, drivers and accelerants, impacts on Livelihoods, cultural identity, etc.). Where possible identifying bench-lines, Tipping Point etc.
a substantial challenge. Maintaining monitoring systems over long periods is problematic due to human and financial costs, as can managing the data sustainably – solutions exist in terms of open data, inter-sectoral approaches, data archiving, training (where needed) and capacity building.

3.1. Data twinning – sharing data between areas with similar climates (past or future) or heritage typology

3.2. Citizen science, traditional peoples and community-based monitoring programs may not be self-sustaining without some management, but can achieve a lot with limited resources (e.g. ALERT France) and have additional social and educational benefits.

3.3. Standardising of approach and level of detail is necessary so that consistency can be achieved in the data reported for planning and climate change impacts.

4. Recognizing and sharing diverse sources of knowledge on Impacts – local community, Indigenous knowledge, experts, Institutions, citizen science, etc.

4.1. Training with and inclusion of professionals in the traditional and indigenous communities.


4.1. Identifying examples of past social adaptability to environmental change. Examples of historic or traditional: spatial Land Use, such as creating flood meadows or hedgerows; architectural, such as structures modified by local traditions in response to climatic characteristics e.g. traditional open walled housing in Samoa that permits ventilation in high winds or pile dwellings in Cuba that function during Flooding and are relatively easy to rebuild; planning and development of cities and clusters of buildings; and changing systems of food production.

4.2. Relating past adaptability to current issues, methods, and decisions. Exploration of communities’ responses to human/natural catastrophes, particularly war, mass displacement etc. in order to examine resilience and how cultural heritage has been sustained even through radical loss – e.g. colonisation, territorial demarcation etc.

4.2.1. Interpretation of cultural heritage as inspirational evidence of repeated human adaptation to past change and transformation.

4.2.2. Climate change causes abnormal patterns that may not be predicted by local knowledge and experience; however, past adaptability may be systemically applied across regions as climatic conditions shift.

4.2.3. Cultural heritage has the potential to create a common Risk culture related to Climate extremes. Historical Floods to be used as a warning for future generations. With respect to Disaster Risk reduction, historical examples of Early warning systems could be compared with today’s methods.

4.3. Helping reduce people’s vulnerability to climate change impacts by valuing Local Knowledge, Indigenous Knowledge and other Endogenous Ways of Knowing, particularly as a resource for Ecosystem-based adaptation. Examples include fire regimes that increase Biodiversity (Australia) or Forest management to reduce exposure to wildfires (Sweden). Endogenous Ways of Knowing are dynamic and changing resource and can be reflected in contemporary practices such as co-management e.g. James Bay Cree Agreements. Citizen science may also provide useful ways to help conceptualize resource management and use e.g. granting of personhood to Whanganui River, New Zealand. Free, prior and informed consent should be obtained as appropriate.

4.4. Sharing heritage science and heritage Conservation methodologies with other sectors which might benefit from them (e.g. long-term monitoring of internal climate in buildings, techniques for sustainable re-use, knowledge of traditional materials and skills).

4.4.1 Building a database of embodied energy for traditional materials to allow comparison of traditional materials to modern ones, and to assess environmental impact of conserving cultural heritage using traditional skills vs. new ‘green’ materials.

5. Sharing Good Practice Examples

5.1. Choosing a thematic approach to sharing best practice between heritage sites. Useful themes could be physical characteristics (e.g. earthen architecture), heritage type (e.g. underwater archaeology), climate Risk factor (e.g. heritage at Risk of coastal erosion), or a combination of these. For example, the Venice Declaration Building Resilience at the local level towards Protected Cultural Heritage and Climate Change Adaptation Strategies (2012) actively encourages exchanges between cities facing challenges posed by the protection of cultural heritage in extreme climates. Comparing between latitudes that will have equivalent past and future climates will be useful as climate zones shift.

5.2. Adopting Multi-Disciplinary Approaches and Considering Cross-Sectoral Synergies and Conflicts. May include establishing new networks and creating and promoting shared data sources. Public outreach and collaboration with a multidisciplinary approach as a core tenant are a vital part of this. To the degree that effective adaptation requires new ‘citizen skills’, those areas where these new citizen forms are needed, i.e. the early learning and educational sectors, should be included.

5.3. Developing a toolbox of appropriate actions (see Tools and Methodologies section). Tools and methodologies must allow for, and directly address, the uncertainty inherent in climate change. Additionally, they should embody creative solutions and include consideration of the potential for positive change. They should harness social and technological developments (digital tools, social media, crowdsourcing, remote sensing etc.) and they should be environmentally sustainable (green ecological options, low carbon options). It is likely that a mix of actions will be appropriate and necessary, and also that some actions may address more than one Impact.

5.3.1. Dissemination and communication, including education and training, online database of tools.

Planning and Implementation

6. The Role of Heritage in Supporting Disaster Risk Reduction (DRR)

6.1. Linking climate change and Disaster Risk Reduction

The impacts of climate change on cultural heritage are largely experienced through Climate Variability and Climate Extremes, with both linking climate change to Disaster Risk Reduction. Climate change and Disaster Risk Reduction are also closely linked to other drivers of change such as urbanization and water management. The combined Risk factors induced by climate and other Hazards and threats create a diverse range of vulnerabilities for cultural heritage. Disaster Risk Reduction should be recognised as a broader action methodology that encompasses the aspects of climate change.

6.1.1. Identifying existing critical disconnects between Policies for climate change adaptation and Disaster Risk Reduction (DRR); often centred in different government departments with little or no coordination. There may be significant delay in supplying information to those responding to Disasters.

6.1.2. Assessing how slow acting deterioration and vulnerabilities accelerated by climate change will increase disaster risk for cultural heritage deserves more study.

6.2. Disaster Risk Reduction Planning

Planning for Disaster Risk Reduction should include prevention, preparedness, response (including planned retreat and recovery), following an integrated multi-Hazard Risk Assessment of cultural heritage. Combinations of prevention and adaptation are increasingly necessary for integrations between climate change and Disaster Risk Reduction planning. However there has been little emphasis on these proactive pre-Disaster measures as the majority of Disaster Risk Reduction initiatives still focus on post disaster response and recovery. The development of Disaster Risk Reduction planning is critical in changing the emphasis for communities from being simply the recipients of climate change salvage efforts, to being able to proactively protect their heritage.

6.2.1. Addressing how vulnerability increases when considering Indigenous or small/rural communities who may be disadvantaged in terms of connectivity.

6.2.2. Considering lessons for Disaster Risk Reduction, including climate change adaptation, that can be learnt from Local Knowledge as well as responses to recent Extreme Weather Events, when drawing up new policies and regulations.

6.2.3. Since biodiversity and cultural diversity are often subject to the same threats or require integrated Management Plans, linking the measures and plans to protect them e.g. an integrated approach such as Ecosystem-based Disaster Risk Reduction, ensuring that natural and cultural heritage could contribute to more comprehensive and effective Adaptation Pathways. Synergies with civil protection authorities and the incorporation of heritage into disaster planning scenarios need to be developed.

6.2.4. Supporting as a mitigation measure the integration of cultural heritage in preparing local and national plans for emergency management and implementing emergency responses.

6.2.5 Emphasising the need for Disaster Risk Management planning to incorporate cultural heritage.
6.3. Implementing the Sendai Framework for Disaster Risk Reduction

The importance of addressing Disaster Risk Reduction and climate change adaptation together has been emphasized in the Sendai Framework for Disaster Risk Reduction (SDFR), adopted in 2015, implying that Projections of climate impacts will be considered in Disaster Risk Reduction policies and programmes. The framework also puts emphasis on building resilience by investing in Disaster Risk Reduction, Disaster preparedness for effective response and ‘Build Back Better’ in recovery rehabilitation and reconstruction. For cultural heritage, this would imply reducing vulnerability with minimal impact on Cultural significance.

6.3.1. Ensuring that post-Disaster Needs Assessments cover the domain of culture as a prompt response after the Disaster is critical.

6.3.2. Coordinating internationally to ensure that poorer nations are protected, and to share specialist knowledge and capacities.

7. Adaptation Planning for Heritage – Policy and Actions

Heritage is a resource for communities and must therefore be included in Adaptation Pathway planning, along with other key community assets. Adaptation planning for heritage is required at multiple scales, from national level policy to site level Management Plans. The degree to which cultural heritage will be considered at national and regional level will vary. Ideally heritage should have a dedicated plan but consideration within cross-cutting sectoral plans (such as agriculture, culture, sport, tourism) can also be valuable. Adapting to climate change may include making tough choices to achieve the best for communities and the economy.

7.1. Managing heritage requires adopting approaches to assessing Risk/vulnerability that effectively inform adaptation climate change (see 1.1).

7.1.1. Identifying ‘new’ and indirect Risks e.g. Drought in historically humid areas

7.1.2. Developing rapid assessment methodologies – such as the Climate Vulnerability Index (CVI) – which use best available information and are transparent, repeatable and applicable across all types of heritage at Risk.

7.1.3. Prioritizing Risks and responses (and allocation of resources) according to scale and severity of Impact.

7.2. Decision frameworks for adapting historic resources in the face of climate change. There can be an imbalance between provisions for different heritage types especially where certain Values are poorly understood. This is often attributable to the number and expertise of management staff, but also to resourcing more broadly (all of which are related to the profile of these Values).

7.2.1. Taking an inter-sectoral approach: mapping and identifying relevant sectors and collating to reach shared understanding e.g. different authorities and experts such as planners, engineers, environmentalists and insurers.

7.2.2. Ensuring that heritage is considered as an important and integrated component for urban and territorial planning.

7.2.3. Using prioritization strategies and correlating to Cultural Significance and other factors e.g. prioritizing good examples from each of a diverse range of at-risk resources.

7.2.4. Promoting heritage as a key component for social and institutional reconstruction after Disasters, representing the collective memory to be reconstructed through communities’ efforts (see 8.2).


Developing methodologies for implementing adaptation actions at a macro or strategic level to provide leadership and vision for the sector with Policies that are general in scope, detailed site level solutions being developed subsequently (see 7.4.). Multilevel Governance is vital to avoid conflict and identify mutual benefits.

7.4. Methodologies for Designing Adaptation Actions (micro).

Developing methodologies for implementing adaptation actions at site level, which requires support and training with more specific and targeted Policies. It should be built in tandem with other project/Policy goals as it can be a resource and time intensive action.

7.5. Evaluating Adaptation Plans

Metrics should be representative with input from all levels and stakeholders.

7.5.1. Ensuring reduction in vulnerability (or, where inevitable, effective management of loss).

7.5.2. Learning from success and failure.

7.5.3. Ensuring accountability and Evidence-based Policy making – formal definition of criteria for measuring success and utilisation of transparent reporting systems.

7.6. Training and education for the implementation and monitoring of adaptation actions, Disaster planning and recovery. Training and capacity building to ensure the correct skills, materials and procedures (e.g. emergency evacuation of movable heritage) including inter-sectoral and inter-disciplinary cooperation. Training in recovery strategies could include heritage-based processes to foster social cohesion.

7.7. Avoiding or managing threats from Maladaptation by ensuring that heritage and impact to Cultural Significance are taken into consideration in works to adapt to climate change (e.g. Flood defence works, coastal defence works, retro-fitting of built heritage for comfort and Energy Efficiency). Requires coordinated efforts from all levels including communities and documenting and learning from instances of Maladaptation. Conserving heritage should be promoted as a viable option for ecologically sustainable design considering full Life Cycle Analysis. Maladaptation is not limited to physical interventions however, but also concerns people/Place bonds and ancestral connections.

8. Coordination of Heritage Adaptation within wider National/Regional/International Policies

Cross-cutting issues have been identified with Paris Agreement, the Sustainable Development Goals, Sendai Framework for Disaster Risk Reduction and New Urban Agenda, and at national level, climate change mitigation and adaptation planning will be relevant. Key issues are likely to be Energy Efficiency of historical buildings, design and transformation of the cultural landscape and safety of heritage under Climate Extremes (see point 6).

8.1. Benchmarking and exchanging good practices at regional, national and international level could promote the coordination of heritage adaptation within other sectoral Policies.

8.2. Considering that additional efforts may be needed for areas with shared values/history between different peoples/livelihoods/communities and for areas and sites that do not wish to divulge the full extent of information (related to data sovereignty) e.g. shared heritage, Transboundary Properties, Cultural Routes, Indigenous heritage.

8.3. Ensuring heritage is adequately factored into building and planning Policies, national building codes, and Sustainability rating schemes. These should also value the environmental benefit of conserving cultural heritage (see point 15).

9. Managing Change

Although the Values that make up Cultural Significance are dynamic and evolve over time, the speed of climate change and the potential requirement for radical interventions poses a challenge to current Conservation practice. The Sendai Framework for Disaster Risk Reduction emphasises ‘Build Back Better’ in post Disaster recovery but for heritage practitioners there are concerns around loss of Authenticity and Integrity such as avoiding replacement of traditional materials by modern materials. Taking a flexible and pragmatic approach to Conservation – such as empowering communities to record (or not) their heritage – is one way that the sector can adapt to climate change and look for new ways to bring people together.

9.1. Addressing how change and Conservation can be reconciled? The question of when interventions aimed at adaptation to environmental conditions exceed Adaptation Limits is a decision the whole community needs to participate in (see section 1 and figure 1).

9.1.1. Formulating a step-by-step approach, going from ‘least impactful’ to ‘most impactful’.

9.1.2. Creating guidance for site managers, decision makers and community and civic leaders that is flexible and responsive.

9.1.3. Utilizing the role of UNESCO World Heritage Sites as laboratories for heritage innovation in addressing how approaches to Outstanding universal value (OUV), Integrity and Authenticity may be updated due to climate change.

9.2. Preparing for loss when Adaptive Capacity is exceeded (e.g. when Conservation in situ is not possible or effective) (see Part I Division 2: Loss and Damage).

9.2.1. Developing strategies for Interpretation and presentation and other memory reservoirs (farewell ceremonies, opportunities for visiting submerged sites, maintaining traditions and creating new traditions to maintain memories and lessons learned) especially where large scale losses are expected e.g. Pacific islands have strategies for maintaining living heritage even as populations become diasporic.

9.2.2. Considering expanded use of removal,
relocation and other ex-situ strategies for the preservation of cultural heritage, including for iconic sites.

9.2.3. Ensuring that decisions to accept loss are transparent and take a people-centred approach and that local communities have a voice in deciding which sites should be prioritized and which losses are acceptable, and negotiating the loss of cultural/natural heritage values due to other prioritized needs (e.g. cultural landscape transitioned into intensive agriculture).

9.2.4. What happens when value is lost? Could sites be considered to have heritage value if they demonstrate climate change impacts, i.e. they are a clear example of a significant stage in human history (World Heritage criteria (iv)).

9.3. Raising awareness, disseminating knowledge and building capacity among community practitioners, policymakers, and networks.

9.4. Recording of sites under imminent threat of destruction. Utilising existing techniques (e.g. archaeological salvage) as well as developing new types of recording and archiving of resources. Allowing and facilitating communities to record and manage their own data e.g. recording of historical and indigenous recollections of areas and heritage sites from knowledge holders in communities, as exemplars of a significant stage in human history (World Heritage criteria (iv)).

9.5. Championing adaptive re-use. Ensuring, through careful adaptive reuse, that historic buildings and sites can evolve over time and retain their fitness-for-use value.

10. Opportunities

Adapting to take advantage of any positive impacts from climate change.

10.1. Harnessing diverse knowledge systems (traditional, indigenous, spiritual, and research), that present tools for climate response and provide a guide to climate adaptation as per Paris Agreement (Article 7.5) "...adaptation action...should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems, with a view to integrating adaptation into relevant socioeconomic and environmental policies and actions, where appropriate."
13. Existing Management and Conservation Methods and Approaches May Need to Change to Meet the Challenge of Climate Change

Climate change is an existential issue for all societies. Dramatic losses, including heritage losses, are inevitable (see Losses and Damages). Although this chapter has focused on adapting resources for the future, inevitably the profession itself will also have to adapt. Methods of organising and undertaking heritage Conservation will need to adapt, and in some cases a fundamental shift in approach may be needed. The adaptation of the heritage field in the face of climate change includes:

13.1. Aiding communities in preparing for Losses and Damages by accepting that preservation in situ may no longer be feasible for all sites. This is particularly problematic for buried archaeology and underwater heritage as changing ‘in situ’ conditions are not visible.

13.2. Supporting adaptation by addressing the fact that accepted treatments for increasingly frequent and/or severe impacts of climate may be inadequate.

13.2.1. Increasing need to be more flexible about building elevation, sheltering, relocation and reconstruction.

13.2.2. Creating innovative Policy tools such as rolling conservation protections that shift with Impacts like Sea Level Rise or planning requirements/building listings designed to protect heritage that allow for future adaptation.

13.2.3. Covering sites or introducing landscaping e.g. protective banks and other non-conventional methods will need to be explored and result widely disseminated.

13.2.4. Emphasising documentation as a management and Conservation tool of first and last resort.

13.3. Addressing the possibility that Conservation materials, including traditional constituents, may become unreliable/ineffective under new environmental conditions (e.g. increased temperatures affecting the working and long-term properties of polymers) by adapting existing Conservation practice alongside research and experimentation.

13.4. Reducing the environmental impact of both interventional and preventive Conservation measures will require modification in heritage methods and materials. Materials in Conservation may need to be replaced with more environmentally compatible options; museums may be restricted in their energy consumption and storage facility expansion as the profession Decarbonizes. Greater emphasis on preventive Maintenance and the increasing use of local materials are two likely solutions.

13.5. Moving towards a more integrated recognition of tangible heritage with intangible heritage practices in management as institutionalised and centralised heritage management systems can increase vulnerability to climate change and Disasters. Similarly, there is an urgent need to introduce safe working practices among cultural bearers who are engaged in crafts and practices which in turn increase their vulnerability to the negative Impacts of climate change.

13.5.1. Building traditional skills as Climate Extremes can cause or increase these and other barriers. Cross border planning Policies and sustainability rating schemes, (including Energy Efficiency e.g. building codes, planning Policies and sustainability rating schemes), can create barriers to adaptation. Cross border heritage, subject to Policies from more than one jurisdiction, is subject to additional barriers.

15. Sustainability

Sustainability is a key issue for addressing climate change and has been discussed elsewhere in this Outline, including in relation to the Sustainable Development Goals and heritage. It provides an important ‘cross over’ with other climate-related motivations as the sustainable reuse of structures also has economic and social implications. In relation to heritage adaptation there are two parts to this issue. Firstly, building an awareness in society of the sustainability of traditional and historic ways of living. Secondly, ensuring that any actions taken to conserve heritage are themselves sustainable.

15.1. Emphasizing the long-term view relevant to heritage, sustainable-tradition of stewardship and reuse e.g. ‘kaikakitanga’ in New Zealand (cultural responsibility to the environment). Recognising that in some places, climate change is challenging traditional ways of life dependent on specific Ecosystems.

15.2. Calculating and communicating the contribution of historic buildings to mitigation in terms of embedded carbon and avoided carbon and the benefits of sustainable re-use and sensitive adaptive reuse.

15.3. Researching and communicating information on historic adaptation and response pathways that may provide lessons in sustainability for modern societies (see section 4).

15.4. Utilizing heritage methodologies to help communities develop people centred Human Systems-based approaches to adaptation planning and implementation.

15.5. Giving importance and value to tried-and-tested approaches.

15.6. Evaluating the acquisition of collections and data from a sustainability perspective and considering Policies on storage, deaccessioning and repatriation.

15.7. Addressing tourism development with the aim of creating sustainable growth and minimizing the environmental impacts. Infrastructure associated with use of sites (particularly for tourism) to be sustainable in all regards.

Without care in siting, mitigation efforts can have negative effects on cultural heritage resources.

Photo: © Associated Press, 2016

AP Photo / Matt O’Brien

Cultural heritage with its embedded intangible and tangible values intersects both directly and indirectly with the Paris Agreement’s Decarbonisation imperative to mitigate Greenhouse Gas emissions. In its Special Report Global Warming of 1.5°C, the IPCC found that although the world will face severe climate impacts with 1.5°C of Global Warming, the effects will be significantly worse with 2°C of warming. To limit warming to 1.5°C (with no or low Temperature Overshoot) annual emissions need to be about half their current rate by 2030. Net Greenhouse Gas emissions will on average need to be reduced to zero by mid-century. The sooner emissions peak before 2030 and the lower the level at which they do so, the more manageable the challenge of Climate Change will be to people and communities.

Neither climate change impacts nor the opportunity to contribute to Greenhouse Gas Mitigation are evenly distributed across populations. While the poorest and most vulnerable groups will often disproportionately experience the negative impacts of climate change, in many cases these frontline communities are among those contributing the least Greenhouse Gas emissions. The Paris Agreement asks developing countries to continue enhancing their mitigation efforts, while calling upon developed countries to undertake absolute economy-wide reduction targets. Limiting temperature rise to 1.5°C will, the IPCC said, require widespread and rapid transitions across energy, land, industrial, urban and other systems, as well as across technologies and geographies. They expressed the view that there is no precedent in documented history for this rate of change at the scale required, and without these transitions, limiting warming to 1.5°C while achieving Sustainable Development will be exceedingly difficult, if not impossible.

Accomplishing Decarbonisation in tandem with achieving Sustainable Development goals requires pursuit of Climate-resilient Development Pathways that strengthen Sustainable Development in both rural and urban contexts while addressing the ethical and equitable aspects of the deep societal transformation needed to limit Global Warming to 1.5°C.

In many cases, win-win strategies that showcase the Social Value of Mitigation Activities (SVMAs) associated with cultural heritage-based Mitigation Measures will be available. In other cases, real and perceived tensions between GHG mitigation and heritage Conservation will need to be mediated. This Division seeks a wide perspective on the intersections between the core competencies and considerations of cultural heritage Conservation and Greenhouse Gas mitigation goals, which include:

3.1 Living Sustainably

Culture is embedded in the patterns of production, consumption, lifestyles and social organisation that give rise to Anthropogenic Greenhouse Gas emissions. To varying degrees across the globe, traditional patterns of social organisation, often developed over centuries if not millennia of slow co-evolution of human communities and their environment, are being supplanted by contemporary patterns which tend to be swifter, less place-adapted and more carbon-intensive. Approaches such as Circular Economy and Life Cycle Assessment seek to restore balance and extend the time horizon in which resource uses are considered. Cultural heritage practice intersects very directly with these approaches, and integrating heritage Values can contribute to more sustainable models for living, both from a resource efficiency perspective and in terms of Social-Ecological Systems, thus supporting...
both mitigation and Climate Resilience Development pathways by:

- Emphasising aspects of heritage practice that align with Circular Economy approaches including a focus on larger scales and horizons; integrating an ethic of stewardship, reuse and conservation; and utilising people-centred approaches.
- Identifying, documenting and interpreting traditional, resource and energy-efficient patterns of production, consumption, lifestyles and social organisation on multiple temporal and spatial scales.
- Educating consumers on the cultural heritage dimensions of sustainable consumption patterns and lifestyles, providing them with adequate information through standards and labels and other appropriate messaging.
- Utilising the competencies of heritage to refine and promote ‘Life Cycle Assessment’ methodologies to provide systematic evaluation of the environmental impact caused throughout the life cycle of products or services.
- Analysing and promoting the contemporary relevance of traditional wisdom, including Endogenous Ways of Knowing, that emphasises frugality versus waste, and which centres the non-material dimensions of human Well-being.
- Emphasising integrated nature-culture approaches that highlight the linkages between the ecological and social values and functions of land and other natural resources, and the connections between production and consumption, in ways that promote low carbon, healthy lifestyles in harmony with nature.
- Embracing, in line with guidelines for local action by United Nations Local Governments (UCLG) Culture Committee, heritage approaches for the promotion of local and traditional products that are suited to sustainable consumption and production, including gastronomy.

3.2 Carbon Mitigation Through Demand-Side Measures: Built Environment

The IPCC Special Report makes clear that the built environment, including the entire building and construction supply chain, must decarbonise. Demand-side energy measures for the built environment aim to reduce demand for electricity and other forms of energy that are required to deliver energy services for buildings. Studies indicate that while global energy-related emissions from building operations are responsible for approximately 28% of global energy-related carbon emissions, a further 11% is incurred through the materials and construction processes. Thus, while ‘operational’ carbon emissions (the carbon emissions through the operational or in-use phase of a building) are important, wider carbon lifecycle impacts must also be addressed if the sector is to reach Net Zero Emissions by 2050. This includes ‘Embodied Carbon’ which at the building level takes account of the Greenhouse-Gas emissions related to extraction, transport of materials, the construction process, maintenance and eventual demolition and waste management of the built environment. Cultural heritage considerations are involved in a wide range of Abatement Measures applicable to a variety of built environment assets and processes including:

3.2.1 Monitoring, measuring and methodology.

Using heritage expertise and perspectives to contribute to the development of accurate methodologies for monitoring and measuring the Greenhouse Gas implications of interventions in the built environment in order to gather the widest possible evidence to guide mitigation by:

3.2.1.1 Developing and widely disseminating models for use in policy processes that quantify the Embodied Carbon costs of construction versus potential operational carbon savings, including addressing the so-called time-value of carbon (e.g. embodied carbon of new construction is front-loaded while operational carbon savings are spread over time) and also calculate the environmental impact of demolition versus reuse of existing buildings.

3.2.1.2 Evaluating and quantifying ‘Avoided Carbon’ (the carbon cost of new construction avoided through the use/reuse of vacant and underutilised existing buildings) in methodologies for assessing the Greenhouse Gas implications of interventions in building conservation or rehabilitation projects at urban and building scales.

3.2.1.3 Expanding the use of carbon budgeting in the management of the historic built environment and scientifically calibrating the energy retrofitting of historic buildings to relevant Greenhouse Gas reductions targets, including understanding the contributions and conflicts of recommended historic treatments and heritage standards to mitigation objectives.

3.2.2 Life Cycle Assessment. Achieving 1.5°C Pathways require a focus on ‘embodied carbon’ and this focus will become even more relevant as the electrical grid becomes ‘greener’, thereby reducing the significance of operational carbon. The evolving discipline of Life Cycle Assessment can quantify these aspects. Heritage conservation professionals, having studied the energy requirements and environmental impact of buildings and leveraging these values to help guide interventions, can lead in this process by utilising the competencies of heritage to refine and promote Life Cycle Assessment methodologies.

3.2.3 Avoided Carbon. Promoting, in a manner that safeguards heritage values, the use and adaptive reuse of existing buildings in order to avoid the carbon cost of new construction and steering activity to vacant and underutilised buildings – including time shifting (i.e. addressing building use for only part of the day, in order to reduce Greenhouse Gas emissions while producing Co-Benefits associated with heritage Conservation by:

3.2.3.1 Developing clear and effective guidance in the context of Historic Urban Landscape and other appropriate methodologies and doctrines, to facilitate adaptive reuse of existing buildings while conserving heritage values.

3.2.3.2 Researching and developing economic indicators to promote awareness and evaluation of benefits of adaptive reuse and regeneration projects including catalytic effects on future development.

3.2.3.3 Introducing and enhancing the use of criteria for conserving and encouraging the reuse of built heritage in already established green building/site standards and certifications systems, e.g. LEED, BREEAM, SITES, BEAM, etc.

3.2.3.4 Emphasising integrated nature-culture approaches that highlight the linkages between the ecological and social values and functions of land and other natural resources, and the connections between production and consumption, in ways that promote low carbon, healthy lifestyles in harmony with nature.

3.2.3.5 Researching and implementing effective building codes and energy codes that encourage the adaptive reuse of historic buildings in a manner that conserves their heritage values, as well as to guide the design of alternative code compliance regimes.

3.2.3.6 Researching and implementing effective financial incentives for adaptive reuse and for heritage-based urban regeneration projects including grants, tax credits and other incentives.

3.2.3.7 Linking inside and outside air quality and health to conservation of existing buildings and the mitigation of non-CO2 emissions such as Methane (CH4) and Nitrous Oxide (N2O).

3.2.3.8 Decarbonising the supply chain for building renovation/rehabilitation including:

3.2.3.9 Addressing the Embodied Carbon associated with the production, transportation and disposal of building materials related to rehabilitation processes through Life Cycle Assessment and other methodologies and discouraging unsuitable carbon-intensive approaches to rehabilitation.

3.2.4 Promoting research and development to bring more alternative and environmentally friendly products to the building rehabilitation and retrofit marketplace, noting that many products used in historic rehabilitation use plastic in the fabrication and come wrapped in plastic, practices which should be reduced.

3.2.4.1 Improving monitoring and measuring of building materials’ waste generated through rehabilitation and minimizing waste of material.

3.2.4.2 Emphasising reuse and repurposing of building materials (many of which in heritage buildings are now rare or no longer available) to achieve near zero waste. Promoting salvage and recycling of heritage materials which will no longer be used in situ.

3.2.5 Reducing Operational Carbon of Older and Historic Buildings. Reducing emissions from existing buildings typically has more considerable and immediate Greenhouse Gas mitigation impact than building new, high efficiency – buildings – even New Zero Energy Buildings (Nzeb). This is because of the comparatively large upfront expenditure of Embodied Carbon associated with new construction. As a result, increasing the energy efficiency of existing buildings and reducing their operational carbon is an important component of Decarbonising the building sector.

Institutions and organisations across the world are taking up this challenge by developing education and training opportunities in building sector carbon reduction, especially by educating trades and professionals in the Nzeb approach. While the contribution of the historic built environment to overall building sector operational carbon differs significantly from many, and it is considerable. Studies carried out in Europe indicate that 30% of existing housing stock was constructed prior to 1945. Adding all other construction areas and moving the date forward to 1970 increases the percentile to over 50%. As a result, the operational carbon used by older historic buildings must be addressed, including by retrofitting many buildings for energy efficiency. Win-win solutions that safeguard heritage values and reduce emissions typically exist, but where conflicts occur the broader Co-Benefits associated with conserving cultural heritage resources must be considered. Thermal management and other features of some traditional building systems are inherently efficient, making wholesale energy retrofitting unnecessary and even wasteful.

Interventions that fail to understand how older buildings ‘behave’ can degrade traditional climate-friendly features and waste precious materials and can lead to other forms of Maladaptation. Rehabilitation
and renovation projects contemplated for built heritage. Opportunities to incrementally introduce Nzeb approaches. Key ways for which competencies and considerations of cultural heritage intersect with the ambition to decrease the operational carbon of the built environment include:

3.2.5.1 Promoting an understanding of the operational Greenhouse Gas emissions associated with the historic built environment, including the thermal behaviour of each type of existing building system, through the development and use of adequate energy modelling and audit software noting that some current software misrepresents the energy efficiency of historic buildings and the performance of historic building systems.

3.2.5.2 Developing and disseminating research on energy efficiency strategies and solutions for the renovation of historic buildings. Excellent studies include NOAH’s Ark, Climate for Culture, Ellesus, Jencult, RIIbuild and PPP (EeB).

3.2.5.3 Increasing engagement on the implications of operational carbon in the built environment as part of cultural heritage policy and practice, and increasing education on the subject at all levels with appropriate projects and curricula.

3.2.5.4 Developing, enhancing, implementing and promoting energy efficiency certification, labelling, commissioning, and monitoring methodologies, standards and criteria that are adapted to historic buildings and traditional building systems, including through renovation and new-build building codes and other reporting systems.

3.2.5.5 Actively contributing cultural heritage perspectives to the broader conversation about Nzeb approaches, including promoting an understanding of the inherent efficiency of some existing traditional building systems; sharing how the Nzeb approach has been implemented around the world (for example, Nzeb will feature in Ireland’s building regulations for the first time); promoting information sessions at public and professional events (for instance, at the IPCC Cities Conference in Edmonton, Alberta, Canada in March 2018, a session on retrofitting existing buildings was included for the first time).

3.2.5.6 Developing and identifying criteria and standards for retrofitting older and historic buildings for operational energy efficiency, including providing methodologies for mediating conflicts between efficiency outcomes and the conservation of heritage values. Addressing appropriate energy retrofitting of built heritage in legislative and code frameworks; and developing, adapting and adopting Nzeb national policy frameworks standards to the historic built environment.

3.2.5.7 Encouraging and facilitating individuals and developers undertaking energy retrofitting of older and historic buildings in ways that also conserve heritage values, including implementing effective communication strategies; and developing energy complying design methods and practices that conserve heritage values, including developing heritage guidelines for the conservation of heritage values.

3.2.5.8 Utilising the competencies of heritage conservation practice to refine and promote the incorporation of energy efficiency considerations into the building sector.

3.2.5.9 Utilising culture and heritage approaches to address the ways in which buildings are used and addressing perceptions of comfort.

3.2.5.10 Reducing Greenhouse Gas emissions (as distinguished from Energy Demand) through full switching to cleaner sources of fuel (see Section 1.6.5).

3.2.5.11 Analysing and promoting an understanding of the critical role of routine maintenance and good conservation in reducing the carbon footprint of built heritage (i.e. ‘green maintenance’ – maintenance that incorporates practices that prioritise the health and safety of the users and the protection of the environment).

3.2.6 Monitoring insensitive retrofitting and Maladapted mitigation strategies that can lead to the loss of cultural heritage values as well as increasing carbon emission.

3.2.6.1 Helping projects avoid insensitive retrofits and Maladapted mitigation strategies by developing guidelines and codes for energy management through full monitoring.

3.2.6.2 Guarding against ill-conceived energy retrofits, including promoting and implementing energy efficient design methodologies that utilise the actual values of existing buildings and computer-based modelling analyses using inappropriate inputs. For example, the BER (Building Energy Rating) and the EPC (Energy Performance Certificate) give a standard default U Value of 2.2 but in research and monitoring of similar solid wall construction gives a standard default U Value of 2.2 but in research and monitoring of similar solid wall construction, most will perform at about 1 U Value or below. This results in over specifying insulation thicknesses to achieve a B1 rating or better.

3.2.6.3 Increasing understanding of the negative consequences of Maladapted mitigation strategies and promoting approaches to avoid them, including in government-sponsored efficiency initiatives. In the example above, not only does over-specification of insulation waste the Greenhouse Routes used to produce the insulation material, but it can negatively impact the performance of the building and accelerate the decay of existing, heritage materials, representing a loss of Energy Embodied Energy. In addition, using non-suitable and uncomfortable insulations on an open and breathable structure can trap moisture and create unacceptable building conditions such as mould and other health risks.

3.2.6.4 Increasing awareness of situations in which building performance can be improved by reversing earlier, inappropriate interventions that undermined the inherent energy efficiency of original building systems.

3.2.7 Promoting the use of traditional, low-carbon, climate-adapted building technologies and other Andesian Ways of Knowing, including in new construction. Traditional buildings have characteristics, sometimes called ‘inherently sustainable features’ (ISFs), that maintained occupant comfort before mechanical hardware e.g. HVAC became commonplace. Today, the use of such technologies in construction is declining in many areas and is being replaced with building approaches and construction methods that are typically more carbon intensive (for example, relying on air conditioning) but are perceived to be cheaper especially when the Social Costs of Carbon are excluded. Heritage contributions to Decarbonisation include identifying and assessing Local Knowledge relating to buildings that has contemporary use as Greenhouse Gas mitigation technology; supporting Technology Transfer of heritage building technologies; supporting further work on research and development (of the scalability of heritage knowledge as climate technology), especially in areas experiencing high rates of new construction, including by:

3.2.7.1 Prioritising the identification, documentation and preservation of learning from time-tested low-carbon, historic building and landscape technologies and techniques suited to local environments especially those with the relevance to new construction and contemporary building management; and emphasising in the interpretation and presentation of the ‘ISFs’ and technologies their relevance to Mitigation Pathways.

3.2.7.2 Showcasing innovations and Adaptations from the past that used or used lower inputs of energy; exploring culturally specific mitigation techniques in traditional societies and their value to the wider climate change dialogue, with a particular focus on building techniques and decision making processes, including databases of different techniques used in similar climates and addressing whether these can be adapted to different regions.

3.2.7.3 Encouraging a popular re-evaluation of traditional approaches to building, considering the benefits of conserving heritage and the Social Cost of Carbon associated with contemporary siting, design and construction methods.

3.2.7.4 Developing methods to optimise hybrids of traditional passive design with contemporary technologies to find better performing low-emissions solutions for new construction that promote ISFs and minimal intervention new technologies, while honouring local cultures.

3.2.7.5 Prioritising in heritage trades, education and research, an understanding of building materials through material analysis that is linked to Greenhouse Gas Mitigation goals, including earth-related building materials and traditional building systems.

3.2.7.6 Promoting traditional approaches to building design, orientation and spatial arrangements that possess ISFs, including energy-saving features such as eaves, verandahs, shutters, cross-ventilation and other passive ventilation approaches, shading devices and use of water and vegetation screens to reduce heat, sun or wind load; narrow floor plates for natural light penetration; chimney-effect natural ventilation and features found in traditional Islamic architecture.

3.2.8 Linking heritage trades, skills and education to the demands of Decarbonisation to ensure that there is a sufficient supply of skills in traditional building methods to support the roles which these methods can play in Mitigation. Addressing the availability of raw materials, such as thatch and timber, to maintain traditional buildings and apparatus and assessing the carbon impact of these materials.

3.3 Carbon Mitigation Through Demand Side Management in Agriculture, Land Use, and other Sectors.

The IPCC report finds that limiting Global Warming to 1.5°C would require rapid and far-reaching transitions in the way we use land, energy, industry, transport and cities. Traditional, low-carbon, climate-adapted Andesian Ways of Knowing can support Decarbonisation across sectors by:

3.3.1 Prioritising the identification, documentation and preservation of learning from time-tested low-carbon technologies and techniques suited to local environments, that have contemporary uses as Greenhouse Gas mitigation technology in all
Heritage and Climate Change Outline Report

3.3.2 Recognising that not all traditional practices contribute positively to Climate Action (e.g. traditional urban and territorial planning), and that integrating heritage methodologies to assess the climate compatibility of heritage practices; mediate real and perceived conflicts between heritage conservation and carbon mitigation goals; and develop alternate means to memorialise practices that will be altered by Mitigation Pathways.

3.3.3 Emphasising traditional systems of governance that have proved successful at promoting people-centred approaches, and encourage pride of place and social cohesion in ways that support Mitigation Pathways and focus on the long-term sustainability, including the sustainable use of resources such as water.

3.3.4 Promoting the use of appropriate traditional and historic settlement patterns as a Mitigation Measure by:

3.3.4.1 Prioritising the identification, documentation and preservation of learning about the Mitigation aspects of historic settlement patterns including in the urban context – patterns that promote dense, walkable, mixed-use communities and reduce distances travelled, especially vehicle miles travelled (VMTs), encourage public transit, and make walking and cycling more attractive options; and emphasising their relevance to Mitigation Pathways as part of good urban and territorial planning.

3.3.4.2 Promoting traditional approaches to water management and flood risk including traditional approaches to land use that mitigated flooding risks through traditional natural and nature-based solutions, and reduced associated Greenhouse Gas emissions by avoiding cycles of building, destruction and rebuilding.

3.3.4.3 Supporting traditional agricultural practices such as for fertilising, irrigation, tillage, arboriculture, crop rotation/compartment planting and ‘green manuring’; supporting and expanding systems like the FAO’s Globally Important Agricultural Heritage Systems (GIAHs) programme, as part of Climate-smart Agriculture.

3.3.5.1. Traditional agricultural practices such as for fertilising, irrigation, tillage, arboriculture, crop rotation/compartment planting and ‘green manuring’; supporting and expanding systems like the FAO’s Globally Important Agricultural Heritage Systems (GIAHs) programme, as part of Climate-smart Agriculture.

3.3.5.2. Traditional soils management (no-till farming, mulching, cover cropping), use of native plants where appropriate to reduce water use and enhance pest control, and traditional livestock management and animal husbandry approaches that contribute to Decarbonisation.

3.4 Heritage and Carbon Dioxide Removal. The IPCC Special Report indicates that limiting warming to 1.5°C will require the use of Carbon Dioxide Removal – methods that remove Carbon Dioxide (CO2) from the atmosphere – and the amount of CO2 that will need to be removed depends on how quickly and effectively cuts are made in global Greenhouse Gas emissions. Even with rapid mitigation efforts, research suggests that Carbon Dioxide Removal will be likely to be required to offset emissions from sectors that cannot easily reduce their emissions to zero, including air travel. Several approaches to Carbon Dioxide Removal have significant implications for heritage. Deployed at large scale, these techniques may compete with other land uses and may have significant impacts on agricultural and food systems, Biodiversity and other Ecosystem Services, including culture. Concerns also exist that a focus on Carbon Dioxide Removal could delay or replace efforts to cut Greenhouse Gas emissions. Because of the historic reliance on and unknown future of certain techniques, heritage protection around Carbon Dioxide Removal includes:

3.4.1 Undertaking research that allows for an effective cost benefit analysis of varying Carbon Dioxide Removal approaches weighing Carbon Dioxide Removal values against impacts to social systems, heritage values, governance and just land use (for example, impacts of Carbon Sequestration in Forests on indigenous land tenure; impacts of Afforestation on archaeological sites).

3.4.2 Developing capabilities within the heritage sector to assess the relevance of Local Knowledge, Indigenous Knowledge and other Endogenous Ways of Knowing to various Carbon Dioxide Removal approaches.

3.4.3 Developing heritage methodologies to mediate real and perceived conflicts between heritage Conservation and Carbon Dioxide Removal, and developing alternate means to memorialise practices that will be altered. For example, in many places bog lands have traditionally been used as a source of fuel, wherein peat was cut, repatriating and recovering bog lands by re-wetting and growing certain grasses and plants with a view to slowing the release of CH4s and over time becoming carbon neutral before becoming a Sink is widely viewed as positive step, but has heritage conservation dimensions.

3.4.4 In general, Carbon Dioxide Removal approaches that increase Carbon Sequestration in natural systems and that have other benefits which together outweigh the costs, should be prioritised provided they adhere to strict environmental and social safeguards, including safeguarding of heritage values, and consider storage permanence – i.e. they have benefits for nature, people and climate including:

3.4.4.1 Enhancement of forest carbon stocks through protection, restoration of ecological functioning of degraded forest landscapes – comprising peatlands, mangroves, coastal wetlands/estuaries or low productive land – by promoting multifunctional land-uses, including Reforestation and Afforestation, taking into account the evolutions of the landscapes in question and past human activity to avoid absurd future land-use; and natural regeneration of forests, assisted or otherwise; noting that if source trees are sustainably managed, the retaining timber used in construction has the potential to be a Sink.

3.4.4.2 Enhancement of soil carbon through Carbon Sequestration in agricultural soils, which also enhances soil health and productivity; soil sequestration using sustainable production of Biofuel.

3.4.4.3 Carbon Sequestration in building materials including bio-based-straw, wood, hemp, thatch, and potentially materials made from industrial Carbon Dioxide emissions, i.e. aggregates and cements made from power plant emission gases.

3.4.5 For the following approaches the balance between costs and benefits and the implications for cultural heritage is not yet clear. Further research and development are needed:

3.4.5.1 Afforestation at scale on non-degraded land, which may not compensate the opportunity costs of land conversion, and may produce negative social impacts, including on cultural heritage values.

3.4.5.2 Bioenergy with Carbon Dioxide Capture and Storage (BECCS) is land-intensive and limited in spatial suitability but could, in appropriate circumstances and with adequate safeguards, provide Carbon Dioxide Removal.

3.4.5.3 Direct air capture and storage is expensive and energy-intensive but has large potential and fewer and less severe land-competition impacts.

3.4.5.4 Enhanced weathering of minerals on land requires large volumes of materials implying negative impacts, but could permanently store a sizeable amount of Carbon Dioxide.

3.5. Carbon Mitigation Through Supply-Side Measures: Renewable Energy

In general, Supply-side Measures are policies and programmes for influencing how a certain demand for goods and/or services is met. In the energy sector, Supply-side Mitigation Measures aim at reducing...
the amount of Greenhouse Gas emissions released per unit of energy transferred, while avoiding long-distance travel and concentrate emissions attributable to cultural tourism, including emissions trading, carbon offsets, incentives and taxes. Exploring the use of tourism revenues as a dedicated funding source for climate change mitigation and adaptation actions. Showcasing the potential for sustainable transport solutions, and exploring the role of cultural heritage in the transition to renewable energy sources.

3.6 Promoting the use of renewable energy sources at cultural tourism destinations, consistent with the Conservation of Heritage Significance.

3.7 Heritage Sector as Driver of Mitigation Ambitions

Cultural heritage agencies, organizations, sites and constituencies can lead by example:

3.7.1 Harnessing the creativity and visibility of the heritage-sector to innovate on mitigation and showcase Mitigation Measures by:

3.7.1.1 Incorporating climate action considerations into cultural heritage governance, and enhancing participation in climate change networks and policy and planning processes.

3.7.1.2 Calculating and publicising the Greenhouse Gas emissions associated with cultural heritage sites, activities and organizations.

3.7.1.3 Adding climate change-related topics to cultural heritage curricula at all levels, and undertaking capacity building related to climate change, climate action and the intersection of cultural heritage and climate change for cultural heritage officials, professionals, staffs, volunteers and constituencies.

3.7.1.4 Conducting environmental analyses of heritage tours, events and exhibitions and identifying energy-saving opportunities, adapting green procurement (energy, waste and water) and carbon offsetting strategies, emphasizing green products, services and business models, following examples like the Arts Council of England’s Environmental Programme and Julie’s Bicycle Accelerator Programme.

3.7.1.5 Incorporating Mitigation Measures into heritage-site management and integrating energy efficient visitor infrastructure and sustainable site management.

3.7.2 Increasing messaging on climate change matters by cultural heritage agencies, organizations, sites and constituencies, including developing climate change communications strategies; showcasing case studies and better communication practices related to climate action and climate change; and leveraging the visibility of cultural heritage by, for example, publicising energy efficiency measures undertaken by museums and cultural institutions or the retrofitting of iconic heritage buildings for energy efficiency, thereby sending a signal on addressing climate change beyond the energy conserved through conservation processes and retaining the embodied energy of heritage sites.
3.7.3 In view of the outstanding universal value, high profile, global reach, and broad mix of heritage typologies included within the World Heritage programme; and the programme’s stated goal of acting as a ‘laboratories of ideas’ with the potential to set international standards in heritage management, addressing climate change through the World Heritage programme by:

3.7.3.1 Fostering the incorporation of mitigation considerations based on science into World Heritage site management planning.

3.7.3.2 Working at different levels to implement policy frameworks that accounts for carbon mitigation, renewable energy and protection of cultural heritage in World Heritage sites and their buffer zones.

3.7.3.3 Supporting state parties to the World Heritage Convention implementing effective carbon mitigation strategies compatible with the Outstanding Universal Value at World Heritage sites.

3.7.3.4 Leveraging World Heritage Sites to demonstrate how cultural heritage can be an asset in climate action; establishing targeted programmes to raise awareness among tourists, guides, site managers and local communities about climate change, including the Greenhouse Gas implications of cultural tourism and the capacity of World Heritage sites to contribute to Carbon Sequestration and other Mitigation Measures.

3.7.3.5 Leveraging the role of World Heritage Sites as exceptional case studies, in educating public, professionals and trades on appropriate Mitigation Measures.

3.7.3.6 Enhancing solidarity by undertaking climate action collaboration with World Heritage sites in the Global South, Small Island Developing States and other sites on the frontlines of climate action.
Coastal flooding driven by sea level rise is increasing and increasingly affecting residents, businesses and tourists.

1. Slow Onset Events

This division correlates the core competencies and considerations of cultural heritage to the key elements of Losses and Damages, which is one of the workstreams of the UNFCCC’s Adaptation and Resilience topic. The 2013 Warsaw International Mechanism for Loss and Damage associated with Climate Change impacts, is subject to and guided by the Paris Agreement. The Warsaw Mechanism addresses loss and damage associated with impacts of climate change, including Climate Extremes and slow onset events, in developing countries that are particularly vulnerable to the adverse effects of climate change. By promoting approaches to address Losses and Damages in general, its principles are applicable to cultural heritage around the world.

The scope of the topic of Losses and Damages used in this division aligns with the strategic workstreams of the Warsaw International Mechanism for Loss and Damage identified in the rolling workplan of the Executive Committee of the Warsaw Framework. In so doing, this Division intersects with Division 2 of this Outline on Adaptation, particularly in terms of managing change, and is applicable in cases where adaptation is no longer an option and loss occurs or where Maladaptation could lead to loss.

Climate change-related Losses and Damages are experienced at the local level as the outcomes of Climate Extremes or slow-onset events arising from climate change processes. These Hazards and the projected Impacts are detailed in Part II of this Outline. Losses and Damages include not only specific material Impacts to heritage resources, but also Impacts to intangible heritage, most significantly through the process of climate-related displacement and human mobility.
attrition.

1.2 Identifying heritage most at Risk from slow onset events

1.2.1 Identifying how slow onset events could impact the environment and identified cultural heritage.

1.2.2 Distinguishing between cultural heritage typologies – archaeological, urban, rural, landscape, etc. including any associated intangible heritage such as language, cultural practices and place names.

1.2.3 With respect to tangible heritage, identifying the key material elements (wood, stone, etc.) and how changing climate conditions specifically affect these materials. Also noting nuances related to loss of cultural memory, knowledge and management systems, as well as lifestyle changes and other impacts on living heritage. Materials used to make heritage objects/structures are often sourced from the immediate surroundings; they could also serve as good indicators of local weather and climate conditions. For example, Indian Buddhist Thankas and human mobility. Others, like drought, make it impossible for people to support themselves. The systemic nature of the problem points to the need to supplement emphases on individual resettlement and humanitarian concerns with planning for the relocation of entire at-risk communities. The Paris Agreement recognized this and assigned one of the Warsaw International Disability Frameworks to the need to supplement emphases on individual resettlement and humanitarian concerns with planning for the relocation of entire at-risk communities. The Paris Agreement recognized this and assigned one of the Warsaw International Disability Frameworks to

2. Non-economic losses

The United Nations Framework Convention on Climate Change (UNFCCC) makes the distinction between economic and non-economic losses. Economic losses can be understood as the loss of resources, goods and services that are commonly traded in markets. Non-economic losses are those that are not commonly traded in markets, including the values of, inter alia, life, health, displacement and human mobility, cultural heritage, indigenous/local knowledge, biodiversity and ecosystem services (UNFCCC 2013). Many countries and organizations currently do not have robust methods for assessing Losses and Damages and this is particularly the case for non-economic losses including loss of Cultural Significance. The development of methodological approaches that identify and measure what is damaged by Climate Impacts advances the understanding of the vulnerability of communities and clarifies the dynamic and complex interaction between adaptation and other preventive and reactive measures. In all, these illustrate the cost of Climate Inaction. The Sendai Framework for Disaster Risk Reduction embodies a similar concern for accounting for disaster losses. Heritage practice addresses non-economic loss by:

2.1 Developing methodological and mechanism to systematically identify, evaluate, record, share and publicly account for Loss and Damage to cultural heritage from Climate Impacts.

2.2 Identifying and documenting knowledge systems likely to be lost or damaged due to climate change. This includes loss of Local Knowledge and Indigenous Knowledge and measurement of associated Impacts. The disappearance of landscape features and relative elements on which knowledge systems are based could lead to the loss of cultural practices. Further, intangible heritage such as language could be affected through the loss of words or expressions linked to elements of landscape. Other points to identify loss of pride of Place, consequent rise in vandalism and anti-social behaviours; loss of historic character and Setting.

2.3 Improving the measurability of Impacts and eventual loss of cultural heritage – tangible and intangible – and improving understanding of the economic, social, health, education, and environmental cost of losses and damages to cultural heritage, in the context of specific Hazard, Exposure and Vulnerability information (including effects on social cohesion and identity). This and the Warsaw International Disability Frameworks to the need to supplement emphases on individual resettlement and humanitarian concerns with planning for the relocation of entire at-risk communities. The Paris Agreement recognized this and assigned one of the Warsaw International Disability Frameworks to the need to supplement emphases on individual resettlement and humanitarian concerns with planning for the relocation of entire at-risk communities. The Paris Agreement recognized this and assigned one of the Warsaw International Disability Frameworks to the need to supplement emphases on individual resettlement and humanitarian concerns with planning for the relocation of entire at-risk communities. The Paris Agreement recognized this and assigned one of the Warsaw International Disability Frameworks to the need to supplement emphases on individual resettlement and humanitarian concerns with planning for the relocation of entire at-risk communities. The Paris Agreement recognized this and assigned one of the Warsaw International Disability Frameworks to

3. Comprehensive Risk Management approaches

The Warsaw Framework identifies four comprehensive Risk Management approaches: emergency preparedness, including Early Warning Systems; measures to enhance recovery and rehabilitation; social protection instruments, and transformational approaches (UN Climate Change 2019e). These can be operationalized through heritage in the following ways:

3.1 Identifying and prioritising the various Risks to heritage resources from climate change according to the typology of resources.

3.2 Mobilising Indigenous Knowledge and Local Knowledge (with prior, free and informed consent as appropriate) to manage risks to cultural heritage associated with climate extremes and slow onset events.

3.3 Building long-term resilience by learning from cultural practices/vulnerable populations and communities, including:

3.3.1 Developing recovery plans built on cultural precedents while also employing the tools of digital technology.

3.3.2 Learning from similar experiences elsewhere in the world.

3.3.3 Developing the role of heritage in community-based strategies for enhancing coping capacity and developing stakeholder-driver strategies for managing climate risk to heritage resources, including trade-offs.

3.4 Expanding engagement with insurance sector to identify how insurance and other risk transfer mechanisms could be deployed for cultural heritage. This would build upon recent attempts in places like New Orleans (USA) and Christchurch (New Zealand).

3.5 Managing climate risks to heritage through impact assessment and associated regulatory frameworks.

3.5.1 Addressing heritage in national (regional and local, as applicable) strategies for Disaster Risk Management and national adaptation plans and other related plans.

Working with disaster response authorities (local, regional, national); to make them aware of heritage sites and issues and discuss appropriate response plans and coordinated Risk Assessments; to develop protocols for risk preparedness and responses to events on heritage sites and to reduce adverse effects from the response i.e. wholesale demolition in response to earthquake and fire damage; to plan risk preparedness. While historical data and past experiences could be helpful, they may not be enough in the face of the speed of Global Warming and the associated climatic changes. Thus, modelling projected climate change impacts needs to be carried out at heritage sites (particularly iconic sites such as World Heritage Sites) to identify risks and allow for planning for Risk Mitigation, especially within the framework of Risk Management. For example, heritage identification and vulnerability assessment are addressed in the 2016 National Adaptation Plans of Sri Lanka and Pakistan.

4. Migration, displacement and human mobility

While estimates vary, credible studies indicate that millions of people face multi-faceted challenges associated with climate change-related migration and displacement in the coming decades. A number of communities are already seeing these impacts with Small Island Developing States and other Indigenous and marginalized communities often on the frontlines. Some climate impacts, such as sea level rise, can put land completely under water, making it uninhabitable. Others, like drought, make it impossible for people to support themselves. The systemic nature of the problem points to the need to supplement emphases on individual resettlement and humanitarian concerns with planning for the relocation of entire at-risk communities. The Paris Agreement recognized this and assigned one of the Warsaw International Disability Frameworks to the need to supplement emphases on individual resettlement and humanitarian concerns with planning for the relocation of entire at-risk communities. The Paris Agreement recognized this and assigned one of the Warsaw International Disability Frameworks to

4.1 Role of Heritage before displacement in climate contexts. As people leave their homes, what becomes of their historic and sacred sites? When whole communities are displaced, how can their cultures be conserved? How can their traditional knowledge be retained? How can heritage support individuals and communities that are facing climate mobility? A starting point involves developing heritage methodologies to identify at-risk communities and populations and to assess likely impacts to their heritage as a result of disruption due to displacement and human mobility.

4.1.1 Creating frameworks for identifying
communities at risk for displacement into heritage planning and for engaging culturally adaptive strategies for managing the change brought about by displacement and Migration. Measures taken should address the need to conserve and perpetuate the collective scientific and intangible heritage Values of displaced communities amidst relocated populations and the diaspora.

4.1.2 Using collaborative community processes to:
- identify heritage Conservation priorities; and develop strategies for reducing the rate of deterioration, recording, minimizing loss of important scientific information, preserving examples of past technologies, and commemorating, representing and interpreting the sites, places and cultural land and seascapes left behind for future generations.

4.1.3 Identifying sites most at risk of abandonment and developing proactive resettlement strategies, which incorporate cultural issues. Recording heritage that would most likely be left behind and developing priorities for managing heritage in displacement and human mobility, especially permanent displacement, through consultation with relevant stakeholders.

4.1.4 Bringing a cultural heritage perspective to the process of identifying sites to welcome displaced communities. For some Small Island Developing States (SIDS), cultural considerations have been cited in the choice of relocation sites.

4.1.5 Considering climate Risk Perception of communities facing climate change Impacts likely to lead to significant population displacement. Some communities may value maintaining their social and cultural capital higher than the possible loss in Livelihoods and related distress. For example, despite experiencing total land subsidence probably greater than the central value of the climate change IPCC’s Fifth Assessment Report’s projected Sea Level Rise by 2100 (0.26 m-0.98 m), some small-island communities in the Philippines, with medium Flooding severity, are refusing to relocate, contradicting the Sea Level Rise mass Migration theory that suggests that worsening Floods will always lead to Migration.

4.1.6 Developing implementation guidelines to include heritage considerations, related to climate-related displacement, in national adaptation plans and in alignment with the Sendai Framework for Disaster Risk Reduction.

4.2 Recognizing the role that culture and heritage play during displacement and in planning effective resettlement strategies.

4.2.1 Maintaining heritage, tangible and intangible, throughout the moving process.

4.2.2 Developing engagement strategies that consider the impacts on the cultural heritage of receiving communities that arise from receiving displaced communities, as well as the impact on the cultural heritage of the displaced community on the relocation and resettlement process.

4.3 Role of Heritage after displacement in climate contexts

This includes the use of heritage to help displaced communities, whether temporary or permanent, to create a sense of the familiar, and maintain familiar practices and social relationships by modifying their environment; and the use of the heritage associated with the place of relocation to help create inclusion for the new arrivals.

4.3.1 Identifying and implementing heritage-based emplacement strategies, such as reuse of names of landmarks.

4.3.2 Using heritage to support Social Integration.

4.3.3 Considering heritage and identity of the displaced community in its new location.

4.3.4 Consulting traditional owners of lands and other stakeholders of host communities, before, during and after the resettlement process, to ensure Equity and Justice for all.

5. Action and Support

Cultural heritage perspectives and methodologies can be contributed to broader initiatives to provide action and support around Loss and Damage.

5.1 Incorporating heritage considerations including accessing finance to support loss and damage strategies for cultural heritage e.g. green climate fund (GCF).

5.2 Providing Capacity Building support, skills transfer and knowledge sharing regarding the cultural heritage dimensions of Loss and Damage, with an emphasis on Least Developed Countries (LDCs), Small Island Developing States (SIDs) and other front-line and vulnerable communities.

5.3 Leveraging and enhancing heritage methodologies to support culturally appropriate, stakeholder engagement with relevant parties around loss and damage issues.
Part II

Part II of this Outline provides a framework for systematically cataloguing the impacts of climate change drivers on six cultural heritage typologies. As noted in the Introduction to Part I, responding to climate change is about adjusting to risks, either in reaction to or in anticipation of a changing climate. Understanding the impact of climate change on natural and physical systems, human communities and cultural heritage is essential in evaluating and managing not only the risks to cultural heritage and its adaptive capacity, but also the positive role cultural heritage can play as a source of resilience for ecosystems, cities, neighbourhoods, sites and cultural landscapes.
While climate change is already impacting communities globally, these trends are predicted to worsen; and the adverse Impacts to heritage are likely to be perceived as negative by dependent communities. However, in some cases landscapes, intangible heritage and associated and contingent). These Impacts result in damage and loss of Cultural Significance (Adger op cit.). Part I, Division 4 Loss and Damage speaks to the challenge.

In most cases climate change Impacts on cultural heritage are likely to be perceived as negative (although such assessments themselves are culturally contingent). These Impacts result in damage and degradation, and in many cases loss and destruction of monuments, historic sites, museums, collections, libraries, archaeological resources, cultural landscapes, intangible heritage and associated and dependent communities; and intangible heritage. UNESCO’s 2007 publication Climate Change and Cultural Heritage: Report on predicting and managing the impacts of climate change on World Heritage and strategies to assist States Parties to implement appropriate management responses was the first attempt to present an overview of the threat to cultural heritage from climate change. Table 4 in the present report attempts to summarize and update material from the 2007 report, identifying some of the physical and mechanical mechanisms by which aspects of cultural climate change (and climate in combination with air pollution) can affect materials, artefacts, collections and cultural Landscapes. In 2016, UNESCO, UNEP and UCS published a new assessment of climate impacts to World Heritage (World Heritage and Tourism in a Changing Climate), which included recommendations for monitoring, actions and policy responses. Table 5 draws from the analysis and case studies in that report, and from the most recent IPCC reports, to provide an updated overview summary of the main types of climate change impacts that will affect cultural heritage together with illustrative examples. Also, in 2016, the U.S. National Park Service published its Cultural Resources Climate Change Strategy which included a detailed matrix of climate impacts on various types of cultural heritage. Table 3 builds upon and expands on this matrix. Its goal is to highlight potential climate impacts to cultural heritage in five key categories: museums and collections; archaeological resources; buildings and structures; cultural landscapes; associated communities; and intangible heritage. For the sake of simplicity, individual climate drivers (such as increased temperatures and increased storminess) have been highlighted in the table, but it is recognized that many of these climate drivers act in combination, and that the complexity of these interactions has been difficult to capture here. For example, wildfire intensity and frequency are driven by a combination of changes in temperature, precipitation change, rainfall and relative humidity (and wildfire is also related to land-use management changes); storm damage results from a complex dynamic of Sea Level Rise, storm surge, winds, waves (and coastal development); and coastal erosion on sensitive coasts is driven by Sea Level Rise, storminess, wave height, wind direction and storm surge (and in some cases in the Arctic, loss of seasonal Sea Ice and Permafrost thaw). As a result of these complex interactions there may be some repetitiveness in the table, because Impacts are covered under multiple climate drivers.

Table 6 is not meant to be an exhaustive review of all climate Impacts on every aspect of cultural heritage, but rather a reasonably comprehensive indicative guide to the many ways in which cultural resources will be impacted. The reader of these tables should keep in mind that they represent only the state of current knowledge and provide qualitative information without any ranking of severity or priority. Together, the materials in Part II of the Outline provide an initial overview of the myriad ways in which climate change will affect heritage across all categories.
Table 4: Summary of key climate factors and mechanisms of impact on heritage materials, sites and landscapes.

<table>
<thead>
<tr>
<th>Climate Driver</th>
<th>Mechanism of Impact</th>
</tr>
</thead>
</table>
| Increased Temperature | • Influence on risks linked to frost  
| | • Heat-waves and days of extreme heat  
| | • Urban Heat Island Effect  
| | • Thawing of permafrost (destabilization of buildings, foundations and infrastructure)  
| | • In cold and wet regions, the risk of damage to materials by chemical degradation is weak, while the risk of mechanical degradation is relatively high.  
| | • In warm and dry regions, there would be a high risk of chemical degradation, but the mechanical degradation would be reduced.  
| Sea Level Rise | • Coastal erosion leading to the destruction of landscapes, structures and archaeological sites.  
| | • Submersion of the littoral zone by overflow flooding, crossing and rupture of protective structures.  
| | • Invasion and salt inundation of continental zones by marine waters.  
| Climate Change (e.g. temperature, precipitation, humidity and wind) and air pollution combined (outdoor) | • Erosion of façades in stone, rendering and brick.  
| | • Degradation of concrete: carbonation, corrosion of steel rebars.  
| | • Soiling and colour change of façades  
| | • Alteration of ancient stained glass windows  
| | • Corrosion of metals  
| | • Bio-degradation of façades  
| | • Wind damage  
| Climate Change (e.g. temperature and humidity) and air pollution combined (indoor) | • Biodegradation of wood.  
| | • Bio-infestation and chemical degradation of collections and archives.  
| | • Bio-infestation and chemical degradation of decorated caves  
| | • Degradation of polymers, papers, films and contemporary artworks  
| Precipitation and humidity | • Intensity and duration of extreme precipitation events or Droughts  
| | • Recurrent fluvial flows and flash-floods: damages by the force of flood water, debris, sediments; release of pollutants  
| | • Rising of salt loaded moisture (i.e. efflorescence) by capillary action in walls, frescoes, wall paintings, mosaics and statues  
| | • Effects of wet-frost on porous materials  
| | • Swelling-shrinkage of clay minerals in soils endangering the stability of buildings.  
| | • Landslides  
| Permafrost thaw, ice patch melt and warming soils | • Melting permafrost in mountain or polar environments exposes frozen archaeology to erosion. Warmer soil temperatures accelerate microbial decay of buried organic materials; melting ice patches may expose previously frozen archaeology. Foundations of buildings and structures in permafrost areas will be damaged by softening and subsidence of substrate.  
| | • Warmer winters increase the frequency of freeze/thaw cycles in some areas thereby increasing likely structural damage to materials such as brick and stone.  
| | • Increased ocean temperatures affect ecosystems that form important parts of cultural landscapes and provide livelihoods for coastal communities and traditional practices. Warmer seas also have implications for underwater archaeology, for example the increased prevalence of organisms that damage wooden structures, such as shipworm species.  
| Increased storm intensity and/or frequency | More intense or more frequent storms increase rates of coastal erosion and damage to or loss of historic buildings and districts, cultural landscapes, archaeology and sacred sites. Risk from flooding and wind damage increases.  
| More extreme rainfall | Worsened and more damaging floods and landslides are caused by more rain falling in shorter periods of time. Historic buildings can be damaged or completely lost. Tourist footfall at high visitation heritage sites can cause more damage and erosion in wet conditions.  
| Increased humidity | Increased humidity is a major threat to indoor collections unprotected by air conditioning or dehumidifying technology; humidity in caves and semi-enclosed archaeological sites can damage pigmented rock art and plastered surfaces.  
| Increased wind or changes in wind direction | Wind can increase abrasion and degradation of rock art and underwater archaeological sites, cause damage to historic buildings, changes in the dynamics of sand dune systems, loss of agricultural topsoil, and increased wave height and erosion at the coast.  
| Drought | Drought affects agro-ecological cultural landscapes, may cause loss of forests important for traditional foods or building materials, and may also cause damage to built structures due to cracking or splitting. Drought exacerbates issues of water scarcity and conflict, and it causes internal displacement and migration.  

Table 5: Summary of the types of climate impacts which can be expected to affect heritage and some examples of those effects.

<table>
<thead>
<tr>
<th>Climate Impacts</th>
<th>Examples of expected effects on heritage</th>
</tr>
</thead>
</table>
| Sea level rise | Sea level rise worsens coastal flooding, storm surge and coastal erosion (see below). Threats include permanent inundation of low-lying coastal communities and displacement of populations. Rising sea levels can cause freshwater drinking supplies for traditional communities to become salinized, especially on islands, rising water tables can cause underground archaeology to be damaged; and buildings and statues may be damaged by capillary action in porous materials. Permanent inundation of low-lying coastal cave art and tidal zone archaeology is likely.  
| Coastal flooding | Flooding exacerbated by sea-level rise will permanently inundate some areas and increase storm surge damage in others, resulting in damage to or loss of historic buildings and districts, cultural landscapes, archaeology and sacred sites.  
| Coastal erosion | Coastal erosion impacts are also increased by sea level rise and more intense or more frequent storms, resulting in damage to or loss of historic buildings and districts, cultural landscapes, archaeology and sacred sites.  
| Loss of sea ice | Culturally important ice-dependent species may lose habitat and their populations decline; shipping access to sensitive areas may increase. Loss of seasonal ice can expose eelgrass to winter storm damage, accelerating loss of archaeological resources.  
| Glacial melt | Glacial melt lakes can overflow, threatening villages and communities; Loss of glacierspopulates vital water supplies for cities, villages and rural areas.  
| Permafrost thaw, ice patch melt and warming soils | Melting permafrost in mountain or polar environments exposes frozen archaeology to erosion. Warmer soil temperatures accelerate microbial decay of buried organic materials; melting ice patches may expose previously frozen archaeology. Foundations of buildings and structures in permafrost areas will be damaged by softening and subsidence of substrate.  
| Changed freeze/thaw cycles | Warmer winters increase the frequency of freeze/thaw cycles in some areas thereby increasing likely structural damage to materials such as brick and stone.  
| Increased ocean temperatures | Increased ocean temperatures affect ecosystems that form important parts of cultural landscapes and provide livelihoods for coastal communities and traditional practices. Warmer seas also have implications for underwater archaeology, for example the increased prevalence of organisms that damage wooden structures, such as shipworm species.  
| Increased storm intensity and/or frequency | More intense or more frequent storms increase rates of coastal erosion and damage to or loss of historic buildings and districts, cultural landscapes, archaeology and sacred sites. Risk from flooding and wind damage increases.  
| More extreme rainfall | Worsened and more damaging floods and landslides are caused by more rain falling in shorter periods of time. Historic buildings can be damaged or completely lost. Tourist footfall at high visitation heritage sites can cause more damage and erosion in wet conditions.  
| Increased humidity | Increased humidity is a major threat to indoor collections unprotected by air conditioning or dehumidifying technology; humidity in caves and semi-enclosed archaeological sites can damage pigmented rock art and plastered surfaces.  
| Increased wind or changes in wind direction | Wind can increase abrasion and degradation of rock art and underwater archaeological sites, cause damage to historic buildings, changes in the dynamics of sand dune systems, loss of agricultural topsoil, and increased wave height and erosion at the coast.  
| Drought | Drought affects agro-ecological cultural landscapes, may cause loss of forests important for traditional foods or building materials, and may also cause damage to built structures due to cracking or splitting. Drought exacerbates issues of water scarcity and conflict, and it causes internal displacement and migration.  

The Future of Our Pasts - 1 July 2019

Heritage and Climate Change Outline Report

68

Heritage and Climate Change Outline Report

69

1 July 2019 - The Future of Our Pasts
Table 5 continued: Summary of the types of climate Impacts which can be expected to affect heritage and some examples of those effects.

<table>
<thead>
<tr>
<th>Climate Impacts</th>
<th>Examples of expected effects on heritage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aridification</td>
<td>Long-term transformation of regions to drier conditions alters cultural landscapes, often drives internal displacement, Migration and abandonment, and can drive conflict. Culturally important species can be lost and water and irrigation systems and structures lose effectiveness.</td>
</tr>
<tr>
<td>Heatwaves</td>
<td>Heatwaves are an increasing threat to human health in all types of communities, especially when accompanied by increased relative humidity. Heatwaves can affect agricultural productivity and disrupt traditional festivals.</td>
</tr>
<tr>
<td>Changes in seasonality</td>
<td>Changes in season affect agriculture and traditional management in cultural landscapes, disrupt traditional festivals and planting cycles and affect the migration and breeding of culturally important species. Longer summers combined with drier conditions can cause more and larger wildfires. Shorter winters can enable pests to more successfully survive cold spells. Historic gardens and plantings may lose the coherence of their planting plans.</td>
</tr>
<tr>
<td>Changes in species distribution driven by climatic changes</td>
<td>Culturally important species used for traditional building, food or spiritual practices may become scarce or be lost. Pests, invasive weeds and insect-borne diseases may move into new areas. Planned landscapes and gardens may lose important species.</td>
</tr>
</tbody>
</table>
### Heritage and Climate Change Outline Report

Tact in combination with each other, or with other reductions in the number of species, and damage to the built environment. The reader can note that the table is intended only as an example of the potential impacts of climate change on various types of cultural heritage. The table does not include all possible impacts, and it is important to consider the specific characteristics and vulnerabilities of each site.

The table is structured to highlight the main types of cultural heritage and the associated impacts of climate change. The table includes the following categories:

- **Archaeological Resources (including underwater archaeology)**
- **Buildings & Structures**
- **Cultural landscapes**
- **Associated & Traditional Communities**
- **Intangible Cultural Heritage**

Each category is further divided into subcategories to provide a more detailed view of the potential impacts of climate change.

### Table: Potential Impacts of Climate Change on Cultural Heritage

<table>
<thead>
<tr>
<th>Category</th>
<th>Potential Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Archaeological Resources</td>
<td>Micro-cracking of site contexts from thermal stress, loss of specimen plantings in storage facilities, inadequacy of current guidelines for addressing temperature changes, increased need for environmental controls (without appropriate climate controls).</td>
</tr>
<tr>
<td>Buildings &amp; Structures</td>
<td>Damage from increased biological and physical events (i.e. especially in the acute and chronic flooding, and wave; coral reefs, etc.)</td>
</tr>
<tr>
<td>Cultural landscapes</td>
<td>Micro-cracking of site contexts from thermal stress, loss of specimen plantings in storage facilities, inadequate condition of archaeological and cultural landscapes, parks and gardens.</td>
</tr>
<tr>
<td>Associated &amp; Traditional Communities</td>
<td>Micro-cracking of site contexts from thermal stress, loss of specimen plantings in storage facilities, inadequate condition of archaeological and cultural landscapes, parks and gardens.</td>
</tr>
<tr>
<td>Intangible Cultural Heritage</td>
<td>Micro-cracking of site contexts from thermal stress, loss of specimen plantings in storage facilities, inadequate condition of archaeological and cultural landscapes, parks and gardens.</td>
</tr>
</tbody>
</table>

### Notes

- All references are to IUCN categories for species and habitats.
- Climate change impacts are listed under the appropriate subcategory, and impacts are highlighted in bold.
- The table is intended only as an example of the potential impacts of climate change on various types of cultural heritage.
- The table does not include all possible impacts, and it is important to consider the specific characteristics and vulnerabilities of each site.

---

*The Future of Our Passes: 1 July 2019*
The Future of Our Pasts

Cultural Landscapes

- Decline/disappearance of some vegetation species due to recurrent freezing and thawing of back due to increased soil porosity
- Damage to foundations due to increased frost action
- Spalling and collapse of stonework and brickwork from frost action
- Increased frequency of salt stains and salt crusts which can lead to efflorescence, staining, and spalling, etc.
- Structural damage to walls

Facilities

- Loss of infrastructure from extreme weather events
- Simultaneous loss of buildings and loss of organic materials (e.g. fabrics, animal skins, wood, etc.)
- Destruction of stratigraphy from changed soil structure
- Soil chemistry/bedding loss of content and dating capabilities
- Appearance of vegetation in polar regions expanding into the tundra
- Increased thawing of permafrost

Archaeological Resources (including belowground archaeology)

- Structural Deterioration
- Dilapidation of buildings
- Structural damage to historic sites and monuments from soil erosion
- Changes in hydrologic systems
- Coastal and riverine communities
- Loss of access to wildlife corridors

Buildings & Structures

- Increased risk of abandonment due to changes in access as the surrounding permafrost becomes more unstable
- Changes in access to roads and tracks used as emergency evacuation routes for disasters or medical emergencies

Cultural Landscapes (including submerged cultural, landsape, and Historic Urban Landscapes, parks, and gardens)

- Decline in traditional practices for local knowledge, practices, and rituals
- Decline in traditional cultural plantings
- More rapid deterioration of constructed materials and/or landscape features
- Increased mobile ice physically damaging land and buildings due to increased coastal and riverine communities
- Increased looting and/or theft
- Increased disease risk from increased erosion
- Destruction of archaeological resources

Archaeological Resources

- Decline in traditional practices for local knowledge, practices, and rituals
- Decline in traditional cultural plantings
- More rapid deterioration of constructed materials and/or landscape features
- Increased mobile ice physically damaging land and buildings due to increased coastal and riverine communities
- Increased looting and/or theft
- Increased disease risk from increased erosion
- Destruction of archaeological resources

Culturally Relevant Species

- Loss of access to wildlife corridors
- Decline in traditional cultural plantings
- More rapid deterioration of constructed materials and/or landscape features
- Increased mobile ice physically damaging land and buildings due to increased coastal and riverine communities
- Increased looting and/or theft
- Increased disease risk from increased erosion
- Destruction of archaeological resources

Place Attachment

- Naturalistic environmental changes should be maintained in the changed cultural landscape

Moveable Heritage (including Museums & Collections)

- Decline in traditional practices for local knowledge, practices, and rituals
- Decline in traditional cultural plantings
- More rapid deterioration of constructed materials and/or landscape features
- Increased mobile ice physically damaging land and buildings due to increased coastal and riverine communities
- Increased looting and/or theft
- Increased disease risk from increased erosion
- Destruction of archaeological resources

Archaeological Resources

- Decline in traditional practices for local knowledge, practices, and rituals
- Decline in traditional cultural plantings
- More rapid deterioration of constructed materials and/or landscape features
- Increased mobile ice physically damaging land and buildings due to increased coastal and riverine communities
- Increased looting and/or theft
- Increased disease risk from increased erosion
- Destruction of archaeological resources

Culturally Relevant Species

- Loss of access to wildlife corridors
- Decline in traditional cultural plantings
- More rapid deterioration of constructed materials and/or landscape features
- Increased mobile ice physically damaging land and buildings due to increased coastal and riverine communities
- Increased looting and/or theft
- Increased disease risk from increased erosion
- Destruction of archaeological resources

Place Attachment

- Naturalistic environmental changes should be maintained in the changed cultural landscape

Intangible Cultural Heritage

- Decline in traditional practices for local knowledge, practices, and rituals
- Decline in traditional cultural plantings
- More rapid deterioration of constructed materials and/or landscape features
- Increased mobile ice physically damaging land and buildings due to increased coastal and riverine communities
- Increased looting and/or theft
- Increased disease risk from increased erosion
- Destruction of archaeological resources
<table>
<thead>
<tr>
<th>Climate Change Impacts</th>
<th>Moveable Heritage (including Museums &amp; Galleries)</th>
<th>Archaeological Resources (including underwater archaeology)</th>
<th>Buildings &amp; Structures</th>
<th>Cultural Landscapes (including submerged cultural landscapes and Historic Urban Landscapes, parks and gardens)</th>
<th>Associated &amp; Traditional Communities</th>
<th>Intangible Cultural Heritage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilities</td>
<td>Increased air pollution due to ultrafine particles that irritate lungs and eyes</td>
<td>Increased penetration of pollutants into and out of materials</td>
<td>Increased wear on HVAC systems, leading to increased energy use and associated costs</td>
<td>Increased impacts on cultural landscapes and historic urban landscapes, parks and gardens</td>
<td>Increased local knowledge, practices and rituals</td>
<td>Increased local knowledge, practices and rituals</td>
</tr>
<tr>
<td></td>
<td>Effects of air pollution on buildings, such as increased maintenance costs and decreased efficiency, can be significant</td>
<td>Increased penetration of pollutants into and out of materials</td>
<td>Increased wear on HVAC systems, leading to increased energy use and associated costs</td>
<td>Increased impacts on cultural landscapes and historic urban landscapes, parks and gardens</td>
<td>Increased local knowledge, practices and rituals</td>
<td>Increased local knowledge, practices and rituals</td>
</tr>
<tr>
<td></td>
<td>Increased warping and cracking of organic materials due to increased humidity and temperature fluctuations</td>
<td>Increased penetration of pollutants into and out of materials</td>
<td>Increased wear on HVAC systems, leading to increased energy use and associated costs</td>
<td>Increased impacts on cultural landscapes and historic urban landscapes, parks and gardens</td>
<td>Increased local knowledge, practices and rituals</td>
<td>Increased local knowledge, practices and rituals</td>
</tr>
<tr>
<td></td>
<td>Increased warping and cracking of organic materials due to increased humidity and temperature fluctuations</td>
<td>Increased penetration of pollutants into and out of materials</td>
<td>Increased wear on HVAC systems, leading to increased energy use and associated costs</td>
<td>Increased impacts on cultural landscapes and historic urban landscapes, parks and gardens</td>
<td>Increased local knowledge, practices and rituals</td>
<td>Increased local knowledge, practices and rituals</td>
</tr>
<tr>
<td></td>
<td>Increased warping and cracking of organic materials due to increased humidity and temperature fluctuations</td>
<td>Increased penetration of pollutants into and out of materials</td>
<td>Increased wear on HVAC systems, leading to increased energy use and associated costs</td>
<td>Increased impacts on cultural landscapes and historic urban landscapes, parks and gardens</td>
<td>Increased local knowledge, practices and rituals</td>
<td>Increased local knowledge, practices and rituals</td>
</tr>
<tr>
<td></td>
<td>Increased warping and cracking of organic materials due to increased humidity and temperature fluctuations</td>
<td>Increased penetration of pollutants into and out of materials</td>
<td>Increased wear on HVAC systems, leading to increased energy use and associated costs</td>
<td>Increased impacts on cultural landscapes and historic urban landscapes, parks and gardens</td>
<td>Increased local knowledge, practices and rituals</td>
<td>Increased local knowledge, practices and rituals</td>
</tr>
<tr>
<td></td>
<td>Increased warping and cracking of organic materials due to increased humidity and temperature fluctuations</td>
<td>Increased penetration of pollutants into and out of materials</td>
<td>Increased wear on HVAC systems, leading to increased energy use and associated costs</td>
<td>Increased impacts on cultural landscapes and historic urban landscapes, parks and gardens</td>
<td>Increased local knowledge, practices and rituals</td>
<td>Increased local knowledge, practices and rituals</td>
</tr>
</tbody>
</table>
Facilities
- Damage to strategic facilities and services
- Increased stress on existing museum facilities and deficits in added level of protection and operational costs
- Smaller change or downgrading of HVAC systems; reduced staff health
- Flash flood risk and flooding in areas that have been modified by vegetation

Collections
- Damage to items not designed or modified for vulnerability and potential evacuation
- Loss of objects and contents to fire
- Smoke damage
- Damage from water or fire extinguishers

Drying Out
- Damage or destruction of objects and infrastructure
- Heat alteration of artefacts
- Heating of objects and artefacts
- Increased physical and thermal processes from atmospheric heat
- Heat alteration of objects caused by a fire and/or heat
- Damage from fire and flooding
- Increased susceptibility to erosion and flood
- Increased stress on buildings and materials due to increased range of temperature swings during seasonal transitions
- Changes to length of peak visitor season, alterations to visitor patterns, including seasonal and/or regional visitor practices
- Changes to length of peak visitor season and patterns of evacuation and travel
- Increased stress from boarding animals

Strain and Tension
- Longer growing season to lead to increased growth of invasive vegetation
- Increased stress on existing infrastructure
- Increased stress on existing infrastructure
- Changes in site or regional accessibility
- Changes in site or regional accessibility
- Changes in site or regional accessibility

Infrastructure
- Changes in peak visit seasons; alterations in visitor patterns, including seasonal and/or regional visitor practices
- Increased stress on existing infrastructure
- Changes in site or regional accessibility
- Changes in site or regional accessibility
- Changes in site or regional accessibility

Cultural Landscapes (including submerged cultural landscapes, parks and gardens)
- Changes in stream patterns that can be restored and/or stabilized
- Increased risk to streams and riparian zones
- Changes in irrigation patterns and traditional terracing

Associated with Traditional Communities
- Changes in stream patterns that can be restored and/or stabilized
- Increased risk to streams and riparian zones
- Changes in irrigation patterns and traditional terracing

Culturally relevant species
- Loss of biodiversity between cultural and non-cultural species
- Loss of biodiversity between cultural and non-cultural species
- Potential loss of cultural practices
- Potential loss of cultural practices
- Potential loss of cultural practices
- Potential loss of cultural practices

Local Knowledge, Rituals and Practices
- Local knowledge, rituals and practices
- Local knowledge, rituals and practices
- Local knowledge, rituals and practices
- Local knowledge, rituals and practices
- Local knowledge, rituals and practices
<table>
<thead>
<tr>
<th>Change in Range &amp; Distribution &amp; Populations of Species</th>
<th>Archaeological Resources (including museums and collections)</th>
<th>Buildings &amp; Structures</th>
<th>Cultural Landscapes (including submerged cultural, landscapes and parks, and gardens)</th>
<th>Associated &amp; Traditional Communities</th>
<th>Intangible Cultural Heritage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilities</td>
<td>Submerged sites, sea-level rise, and erosion</td>
<td>Buildings vs. structures</td>
<td>Cultural landscapes vs. traditional communities</td>
<td>Intangible cultural heritage</td>
<td></td>
</tr>
<tr>
<td>Collection (without appropriate climate control)</td>
<td>Damage to edible plants, loss of genetic diversity</td>
<td>Effects on plant diversity</td>
<td>Significant changes to landscape</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collection (without appropriate climate control)</td>
<td>Damage to edible plants, loss of genetic diversity</td>
<td>Effects on plant diversity</td>
<td>Significant changes to landscape</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collection (with appropriate climate control)</td>
<td>Damage to edible plants, loss of genetic diversity</td>
<td>Effects on plant diversity</td>
<td>Significant changes to landscape</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Damage to edible plants, loss of genetic diversity</td>
<td>Damage to edible plants, loss of genetic diversity</td>
<td>Effects on plant diversity</td>
<td>Significant changes to landscape</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Facilities:**
- Submerged sites, sea-level rise, and erosion
- Buildings vs. structures
- Cultural landscapes vs. traditional communities

**Archaeological Resources (including museums and collections):**
- Damage to edible plants, loss of genetic diversity
- Effects on plant diversity

**Buildings & Structures:**
- Effects on plant diversity

**Cultural Landscapes (including submerged cultural, landscapes and parks, and gardens):**
- Significant changes to landscape

**Associated & Traditional Communities:**
- Intangible cultural heritage

**Intangible Cultural Heritage:**
- Intangible cultural heritage
### Heritage and Climate Change Outline Report

**Archaeological Resources**
- Buildings & Structures
  - Including underwater landscapes and communities
- Landscape

**Cultural Landscapes**
- Including submerged foreshore, landscapes and historic urban landscapes, parks and gardens

**Associated & Traditional Communities**
- Local knowledge, practices and rituals
- Indicators and impacts on human health and well-being during emergency evacuation and recovery
- Environmental change and its impacts on natural environments

**The Future of Our Pasts**
- Increased coastal flooding and erosion
- Increased salinity
- Loss of species and habitats
- Loss of cultural heritage

**Climate and Change Report**

<table>
<thead>
<tr>
<th>Movables</th>
<th>Archaeological Resources</th>
<th>Cultural Landscapes</th>
<th>Associated &amp; Traditional Communities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historic</td>
<td>Buildings &amp; Structures</td>
<td>Heritage and Climate Change Outline Report</td>
<td>Local knowledge, practices and rituals</td>
</tr>
<tr>
<td>Buildings</td>
<td>Historical landscapes and communities</td>
<td>Increased coastal flooding and erosion</td>
<td>Indicators and impacts on human health and well-being during emergency evacuation and recovery</td>
</tr>
<tr>
<td>Historic Urban</td>
<td>Environmental change and its impacts on natural environments</td>
<td>Environmental change and its impacts on natural environments</td>
<td>Environmental change and its impacts on natural environments</td>
</tr>
<tr>
<td>Historic Towns</td>
<td>Historic landscapes and communities</td>
<td>Environmental change and its impacts on natural environments</td>
<td>Environmental change and its impacts on natural environments</td>
</tr>
<tr>
<td>Historic Cities</td>
<td>scenic landscapes and communities</td>
<td>Environmental change and its impacts on natural environments</td>
<td>Environmental change and its impacts on natural environments</td>
</tr>
<tr>
<td>Historic Villages</td>
<td>Environmental change and its impacts on natural environments</td>
<td>Environmental change and its impacts on natural environments</td>
<td>Environmental change and its impacts on natural environments</td>
</tr>
</tbody>
</table>

**Key Challenges**
- Increased coastal flooding and erosion
- Increased salinity
- Loss of species and habitats
- Loss of cultural heritage

**Potential Impacts**
- Increased coastal flooding and erosion
- Increased salinity
- Loss of species and habitats
- Loss of cultural heritage

**Adaptive Strategies**
- Increased coastal flooding and erosion
- Increased salinity
- Loss of species and habitats
- Loss of cultural heritage

**The Future of Our Pasts**
- Increased coastal flooding and erosion
- Increased salinity
- Loss of species and habitats
- Loss of cultural heritage
Heritage and Climate Change Outline Report

Cultural Landscapes

Archaeological Resources (including underwater archeology)

Buildings & Structures

Cultural Landscapes (including submerged cultural landscapes, historic urban landscapes, parks and gardens)

Associated & Traditional Communities

Intangible Cultural Heritage

- Loss of local knowledge associated with natural and cultural resources
- Changed relationships with plants, fish, and traditional designs and practices

Decision Making Matrix

<table>
<thead>
<tr>
<th>Climate Change Impact</th>
<th>Movable Heritage (including Museums &amp; Collections)</th>
<th>Archaeological Resources (including underwater archeology)</th>
<th>Buildings &amp; Structures</th>
<th>Cultural Landscapes (including submerged cultural landscapes, historic urban landscapes, parks and gardens)</th>
<th>Associated &amp; Traditional Communities</th>
<th>Intangible Cultural Heritage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facilities</td>
<td>• Increased risk associated with increased ground heave</td>
<td>• Increased vulnerability associated with rising sea levels</td>
<td>• Increased risk associated with potential flooding of structures</td>
<td>• Increased risk associated with potential flooding of structures</td>
<td>• Increased risk associated with potential flooding of structures</td>
<td>• Increased risk associated with potential flooding of structures</td>
</tr>
<tr>
<td>Collectors</td>
<td>• Decrease in rainfall</td>
<td>• Increase in rainfall</td>
<td>• Decrease in rainfall</td>
<td>• Increase in rainfall</td>
<td>• Increase in rainfall</td>
<td>• Increase in rainfall</td>
</tr>
<tr>
<td>During Flood</td>
<td>• Total submergence of facilities (e.g. sites, structures, parks)</td>
<td>• Increased risk associated with potential flooding of structures</td>
<td>• Increased risk associated with potential flooding of structures</td>
<td>• Increased risk associated with potential flooding of structures</td>
<td>• Increased risk associated with potential flooding of structures</td>
<td>• Increased risk associated with potential flooding of structures</td>
</tr>
<tr>
<td>Post-Flood</td>
<td>• Low-lying coastal areas (e.g. sites, structures, parks)</td>
<td>• Increased risk associated with potential flooding of structures</td>
<td>• Increased risk associated with potential flooding of structures</td>
<td>• Increased risk associated with potential flooding of structures</td>
<td>• Increased risk associated with potential flooding of structures</td>
<td>• Increased risk associated with potential flooding of structures</td>
</tr>
<tr>
<td>Intensified Storms, (including Hurricanes &amp; Cyclones) and Storm Surge</td>
<td>• Increased risk associated with potential flooding of structures</td>
<td>• Increased risk associated with potential flooding of structures</td>
<td>• Increased risk associated with potential flooding of structures</td>
<td>• Increased risk associated with potential flooding of structures</td>
<td>• Increased risk associated with potential flooding of structures</td>
<td>• Increased risk associated with potential flooding of structures</td>
</tr>
</tbody>
</table>

The Future of Our Pasts - 1 July 2019
<table>
<thead>
<tr>
<th>Category</th>
<th>Impact</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Movable Heritage</td>
<td>Damage due to increased acidity resulting from fossil fuel combustion</td>
<td>Erosion of stone due to increased acidity, drift of stone, etc.</td>
</tr>
<tr>
<td></td>
<td>Erosion of building stone by wave action and storm force</td>
<td>Damage to historic stained glass windows, buildings, etc.</td>
</tr>
<tr>
<td></td>
<td>Effects of pollution and changing levels of pollution in urban areas (e.g., urbanisation)</td>
<td>Damage to historic stained glass windows</td>
</tr>
<tr>
<td>Archaeological Resources</td>
<td>Increase in the rate of decay due to increased acidity, drift of stone, etc.</td>
<td>Damage to historic stained glass windows, buildings, etc.</td>
</tr>
<tr>
<td></td>
<td>Effects of pollution and changing levels of pollution in urban areas (e.g., urbanisation)</td>
<td>Damage to historic stained glass windows</td>
</tr>
<tr>
<td>Cultural Landscapes</td>
<td>Increase in the rate of decay due to increased acidity, drift of stone, etc.</td>
<td>Damage to historic stained glass windows, buildings, etc.</td>
</tr>
<tr>
<td></td>
<td>Effects of pollution and changing levels of pollution in urban areas (e.g., urbanisation)</td>
<td>Damage to historic stained glass windows</td>
</tr>
<tr>
<td>Associated &amp; Traditional Communities</td>
<td>Increase in the rate of decay due to increased acidity, drift of stone, etc.</td>
<td>Damage to historic stained glass windows, buildings, etc.</td>
</tr>
<tr>
<td>Intangible Cultural Heritage</td>
<td>Increase in the rate of decay due to increased acidity, drift of stone, etc.</td>
<td>Damage to historic stained glass windows, buildings, etc.</td>
</tr>
</tbody>
</table>

**Facilities**: Reduced storage capacity to protect sites and resources, increased risk of flooding, etc.

**Colleges**: Loss of some artefacts and artefacts, increased risk of flooding, etc.

**Collections**: Risk of loss of local species and artefacts, increased risk of flooding, etc.

**Buildings & Structures**: Increased risk of loss of local species and artefacts, increased risk of flooding, etc.

**Archaeological Resources**: Increased risk of loss of local species and artefacts, increased risk of flooding, etc.

**Cultural Landscapes**: Increased risk of loss of local species and artefacts, increased risk of flooding, etc.

**Associated & Traditional Communities**: Increased risk of loss of local species and artefacts, increased risk of flooding, etc.

**Intangible Cultural Heritage**: Increased risk of loss of local species and artefacts, increased risk of flooding, etc.
### Climate Change Overview (Secondary Stressor)

<table>
<thead>
<tr>
<th><strong>Moveable Heritage</strong> (including Museums &amp; Collections)</th>
<th><strong>Archaeological Resources</strong> (including underwater archaeology)</th>
<th><strong>Buildings &amp; Structures</strong></th>
<th><strong>Cultural Landscapes</strong> (including submerged cultural landscapes, historic urban landscapes, parks and gardens)</th>
<th><strong>Associated &amp; Traditional Communities</strong></th>
<th><strong>Intangible Cultural Heritage</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Coastal flooding exposes other nearby, but different, information-rich sites. Facilities may be better located in order to accommodate coastal engineering structures such as seawalls, breakwaters and drainage channels. Treatment in all respects is directed at site and supply chain responsiveness. Costs associated with them have been allowed for separately and will be included in the design process. Adaptation to protect coastal areas and seashore means that resilience and mobility are key.</td>
<td>- Risks to low-lying archeological sites from sea-level change due to hydroelectric projects. Damage to archaeological sites from construction of renewable energy facilities. Damage to archaeological sites from construction of coastal or riverine defense works.</td>
<td>- Flooding and loss of land are local and site-specific changes due to urbanization and landscaping. - Change to archeological sites from construction of renewable energy facilities. - Damage to archeological sites from construction of coastal or riverine defense works.</td>
<td>- Spread of invasive species is a long-term challenge. - Degradation of integrity of historic landscapes. - Loss of submerged cultural resources. - Loss of landscapes associated with traditional land uses such as fisheries. - Loss of culturally significant plants and environments, including within ecosystems such as freshwater wetlands.</td>
<td>- Reduction in risk of bluff erosion due to development or encroachment.</td>
<td>- Increased development in distinct subareas due to climate conditions. - Loss of biodiversity due to habitat loss, fragmentation, over-exploitation. - Loss of access to traditional cultural places including landscapes. - Loss of knowledge and cultural practices needed for local communities.</td>
</tr>
</tbody>
</table>

### Risks from climate mitigation actions Mitigation & Adaptation Strategies (Secondary Stressor)

<table>
<thead>
<tr>
<th><strong>Moveable Heritage</strong> (including Museums &amp; Collections)</th>
<th><strong>Archaeological Resources</strong> (including underwater archaeology)</th>
<th><strong>Buildings &amp; Structures</strong></th>
<th><strong>Cultural Landscapes</strong> (including submerged cultural landscapes, historic urban landscapes, parks and gardens)</th>
<th><strong>Associated &amp; Traditional Communities</strong></th>
<th><strong>Intangible Cultural Heritage</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Increased access to sites and supply chain responsiveness. - Costs associated with them have been allowed for separately and will be included in the design process. - Adaptation to protect coastal areas and seashore means that resilience and mobility are key.</td>
<td>- Risks to low-lying archeological sites from sea-level change due to hydroelectric projects. Damage to archaeological sites from construction of renewable energy facilities. Damage to archaeological sites from construction of coastal or riverine defense works.</td>
<td>- Flooding and loss of land are local and site-specific changes due to urbanization and landscaping. - Change to archeological sites from construction of renewable energy facilities. - Damage to archeological sites from construction of coastal or riverine defense works.</td>
<td>- Spread of invasive species is a long-term challenge. - Degradation of integrity of historic landscapes. - Loss of submerged cultural resources. - Loss of landscapes associated with traditional land uses such as fisheries. - Loss of culturally significant plants and environments, including within ecosystems such as freshwater wetlands.</td>
<td>- Reduction in risk of bluff erosion due to development or encroachment.</td>
<td>- Increased development in distinct subareas due to climate conditions. - Loss of biodiversity due to habitat loss, fragmentation, over-exploitation. - Loss of access to traditional cultural places including landscapes. - Loss of knowledge and cultural practices needed for local communities.</td>
</tr>
</tbody>
</table>

### The Future of Our Pasts

- **Cultural Landscapes**
  - Archaeological Resources
    - Moveable Heritage
  - Buildings & Structures
  - Cultural Landscapes
  - Associated & Traditional Communities
  - Intangible Cultural Heritage

- **Heritage and Climate Change Outline Report**
  - 1 July 2019 - The Future of Our Pasts

- **Climate Change Overview**
  - Moveable Heritage (including Museums & Collections)
  - Archaeological Resources (including underwater archaeology)
  - Buildings & Structures
  - Cultural Landscapes (including submerged cultural landscapes, historic urban landscapes, parks and gardens)
  - Associated & Traditional Communities
  - Intangible Cultural Heritage

- **Risks from climate mitigation actions Mitigation & Adaptation Strategies (Secondary Stressor)**
  - Moveable Heritage (including Museums & Collections)
  - Archaeological Resources (including underwater archaeology)
  - Buildings & Structures
  - Cultural Landscapes (including submerged cultural landscapes, historic urban landscapes, parks and gardens)
  - Associated & Traditional Communities
  - Intangible Cultural Heritage
This report uses two sets of terms: one from the climate change field and one from the heritage field. The climate change terms in the Outline are drawn from IPCC, 2018: Annex I: Glossary. Heritage terms used in the Outline are drawn from the Burra Charter and the ICOMOS Madrid-New Delhi Document and. Note that the sub-terms in this glossary are listed immediately below the main terms.

The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, 2013. (Burra Charter)
ISC20C ICOMOS Approaches to the Conservation of Twentieth Century Cultural Heritage, 2017. (Madrid New Delhi Document)
Heritage and Climate Change Outline Report

The sources of other terms are noted with each occurrence – climate change, climate action, institutional, ecological or biocultural. See also adaptation, adaptation capacity and maladaptive actions (maladaptation).

Adaptation pathways - See pathways.

Adaptation pathway - See pathways.

Adaptation pathway - The process of adjustment to actual or expected climate and its effects in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adaptation may occur through evolutionary or other natural history processes, including human intervention. Adaptation may facilitate adjustment to expected climate and its effects. In heritage practice, the word ‘adaptation’ typically means changing a place to suit the existing use or a proposed use. Use means the functions of a place, including the activities and traditional and customary practices that may occur at the place or are dependent on a place. (Burra Charter.

Adaptability - See adaptive capacity.

Adaptability - The ‘Anthropocene’ is a proposed new geological epoch resulting from significant human-driven changes to the structure and functioning of the Earth’s system, including the climate system. Originally proposed in the Earth system science community in 2006, the new epoch is undergoing a formalization process within the geological community based on the recognition that human activities have changed the Earth’s system to the extent of forming geological deposits, which will remain in the geological record. Both the stratigraphic and Earth system approaches to defining the Anthropocene are striving to achieve a most appropriate starting date, although both have been proposed and continue to be debated. The Anthropocene is the most promising by a diversity of disciplines and the public to denote the substantive and shared changes base on the human dimensions and future of the Earth system. See also Holocene.

Anthropogenic - Resulting from or produced by human activities. See also anthropogenic emissions.

Anthropogenic emissions - Emissions of greenhouse gases (GHGs). Precursors of GHGs and aerosols caused by human activities. This definition builds from IBI (2018). For a discussion of the term forest and land-use and land-use changes (LULUC), livestock production, fertilisation, waste management and industrial processes. See also anthropogenic and anthropogenic removals.

Atmospheric aerosols - whether natural or anthropogenic, originate from different pathways: emissions of primary particulate matter (PM), and formation of secondary PM from gaseous precursors. The bulk of aerosols are of natural origin. Some scientists use group labels that refer to the chemical composition, namely: sea salt, organic carbon, black carbon (BC), mineral species (mainly desert dust), sulphate, nitrate, and ammonium. These aerosols are, however, interconnected as aerosols combine to particles to create complex mixtures. See also black carbon (BC).

Aforestation - Planting of new forests on lands that historically have not contained forests. For a discussion of the term forest and related terms such as afforestation, reforestation and deforestation, see the IPCC Special Report on Land Use, Land-Use Change, and Forestry (IPCC, 2019), which was prepared by the United Nations Framework Convention on Climate Change (UNFCCC, 2019) under mandate decision 9/CP.17/Rev.1 of the Conference of the Parties. Methodological Options to Inventory Emissions from Direct Human Induced Degradation of Forests and Degradation of Other Vegetation Types (IPCC, 2003). See also reforestation, deforestation, and Reversing Emissions from Deforestation and Forest Degradation (REDD+).

Agreement - In the context of this glossary, the degree of agreement within a discipline and the public to denote the substantive and shared changes base on the human dimensions and future of the Earth system. See also Holocene.

Air pollution - Air pollutants are substances which have negative effects on human health or the natural or built environment due to the introduction, by natural processes or human activity, into the atmosphere of substances that change the composition of the atmosphere (primary pollutants) or indirectly (secondary pollutants) harm health. Air pollution differs from climate change in that the former is a pollution problem, whereas the latter is a climate problem.

Albedo - The fraction of solar radiation reflected by a surface or object, often expressed as a percentage. Sea-surfaced leaves have a high albedo, whereas desert dust and vegetation-covered surfaces have a low albedo. The Earth’s planetary albedo changes mainly through varying cloudliness and changes in snow, ice, leaf area and land cover.

Anthropocene - The ‘Anthropocene’ is a proposed new geological epoch resulting from significant human-driven changes to the structure and functioning of the Earth’s system, including the climate system. Originally proposed in the Earth system science community in 2006, the new epoch is undergoing a formalization process within the geological community based on the recognition that human activities have changed the Earth’s system to the extent of forming geological deposits, which will remain in the geological record. Both the stratigraphic and Earth system approaches to defining the Anthropocene are striving to achieve a most appropriate starting date, although both have been proposed and continue to be debated. The Anthropocene is the most promising by a diversity of disciplines and the public to denote the substantive and shared changes base on the human dimensions and future of the Earth system. See also Holocene.
cumulative amount of global carbon dioxide emissions that is estimated to limit global surface temperature to a given level above a reference period, taking into account global surface temperature contributions of other GHGs and climate forcers.

(2) the distribution of the carbon budget defined under (2) to the regional, national, or sub-national level based on considerations of equity, costs or efficiency.

Carbon cycle - The term used to describe the flow of carbon in various forms (CO2, CO, carbon in biomass, and carbon dissolved in the ocean as carbonate or bicarbonate) through the atmosphere and marine biosphere and lithosphere. In this report, the reference unit for the global carbon cycle is 1 GtCO2/yr or GC (gigatonnes of carbon = 1 Gt = 10^15 g).

Carbon dioxide (CO2) - A naturally occurring gas, CO2 is also a by-product of burning fossil fuels (such as oil, gas and coal), of burning biomass, of land-use changes (LUC) and of industrial processes (e.g., cement production). It is the principal anthropogenic greenhouse gas (GHG) that affects the Earth's radiative balance, and against which other GHGs are measured and therefore has a global warming potential of 1, as the reference gas.

Carbon dioxide removal (CDR) - Anthropogenic activities removing CO2 from the atmosphere and stably storing it in geological, terrestrial, or ocean reservoirs, or in products. It includes existing and potential anthropogenic enhancement of biological or geochemical sinks and direct air capture and storage, but excludes natural CO2 uptake not directly caused by human activities. See also mitigation (of climate change) and sink.

Carbon sequestration - The removal of carbon from the atmosphere by storing carbon in a carbon pool. See also blue carbon, carbon dioxide capture and storage (CC(S)), sequestration, and sink.

Carbon sink - A system of storing carbon in a carbon pool.

Carbon capture and storage (CC(S)) - Capture and storage of carbon dioxide (CO2) emission that would cause the same integrated radiative forcing over 100 years as a given amount of CO2 released into the atmosphere. It includes identifying the cultural significance of the heritage site, cataloguing how the heritage site may be affected by climate change, and identifying policies to conserve that significance into the future. In some countries, the heritage conservation plan is also used. (ICOMOS Madrid New Delhi Document 2017)

Coping capacity - The ability of people, institutions, organizations, and systems, using available skills, values, beliefs, resources, and opportunities, to address, manage, and overcome adverse conditions in the short to medium term. This glossary entry builds from the definition used in UNDRR 2009 and IPCC 2012. See also resilience, risk.

Capacity development is the process by which people, organizations, and society systematically stimulate and develop their capacities over time to achieve social and economic goals. It is a concept that extends the term capacity building to encompass all aspects of creating and sustaining capacity growth over time. It involves learning and various types of training, but also continuous efforts to develop institutions, political awareness, financial resources, technology systems and the wider enabling environment.

Climate change - A change of climate which is attributed directly or indirectly to human activities that alters the climate system, or to variations and/or removing greenhouse gas emissions, where possible (IPCC, 2014).

Climate system - The climate system is the highly complex system consisting of five major components: the atmosphere, the hydrosphere, the cryosphere, the lithosphere and the biosphere and the interactions between them. The climate system evolves in time under the influence of its own internal dynamics and feedbacks, external forcing such as variations or anthropogenic forcings such as the changing composition of the atmosphere and land-use change.

Climate variability - Climate variability relates to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all spatial and temporal scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural forcing (external forcing, internal variability). See also climate change.

Climate Vulnerability Index (CVI) - A rapid assessment methodology for quantifying climate risks to the Outstanding Universal Value (OUV) of World Heritage sites, and is being developed with the support of ICOMOS. The CVI is a transparent, reproducible methodology that uses best available information and can be undertaken in a two-day workshop and is applicable across all biomes.

CO2 equivalent (CO2-eq) emission - The amount of carbon dioxide (CO2) emission that would cause the same integrated radiative forcing over 100 years as a given amount of CO2 released into the atmosphere.

Cop-benefits - Co-benefits are involved. There is an evolution towards more complex feedback systems and internal. There are three categories of cultural landscapes, defined (such as a historic garden), evolving (such as an agrarian landscape or townscape) and associative (where the cultural value is linked to the function to serve a specific and well determined purpose) (ICOMOS Madrid New Delhi Document 2017)

Cost-effectiveness - A measure of the cost at which a policy goal or outcome is achieved. The lower the cost the greater the cost-effectiveness.

Climate - Climate in a narrower sense is usually defined as the average weather statistics of a region or location over a period of time, usually a season. Climate is related to human culture, although the term can be used to describe the climate of the past, present, or future generations. Climate significance is embodied
Demand- and supply-side measures -

- **Demand-side measures**: policies and programmes for improving the demand for goods and/or services. In the energy sector, demand-side management aims at reducing the demand for electricity and other forms of energy required to deliver services.

- **Supply-side measures**: Policies and programmes for influencing how a certain demand for goods and/or services is met. In the energy sector, supply-side management involves the production of energy, for example, by supply-side measures.

- **Mitigation Measures**: are intended to reduce the amount of greenhouse gas emissions per unit of energy produced. See also Mitigation Measures.

- **Demand-side measures - See Demand- and Supply-side Measures.**

Drought - A period of abnormally dry weather long enough to cause a serious hydrological imbalance. Drought is a relative term, therefore any discussion in terms of precipitation deficit must refer to the precipitation trend that is under discussion. For example, shortage of precipitation during the growing season impinges on crop production. In an ecosystem function in general (due to soil moisture drought), also termed agricultural drought, and during the growing season primarily affects water supplies (hydrological drought). Storage changes in soil moisture and groundwater are also affected by increases in evapotranspiration in addition to reductions in precipitation. A period with an abnormal precipitation deficit is defined as a meteorological drought. See also soil moisture.

Drought-megadrought - A megadrought is a very lengthy and pervasive drought, lasting much longer than normal, usually a decade or more.

Early warning systems (EWS): The set of technical, financial and institutional capacities needed to create, maintain and operate, and a hazard to prepare to act promptly and appropriately to reduce the possibility of harm or loss. ODMs or EWS may draw upon scientific and Indigenous knowledge. EWSs are also considered for ecological applications e.g., conservation, where the organization to conduct ECAP include conservation systems or ecosystem under conservation is an example of coral bleaching alarm, in agriculture (like citrus and coconut), and in fisheries (storm and tsunami warnings). This glossary entry builds from the definitions used in UNISDR (2009) and IPCC (2012a).

Ecosystem - An ecosystem is a functional unit consisting of living organisms, their non-living environment and the interactions between and within them. The components included in a given ecosystem and its spatial boundaries depend on the purpose for which the ecosystem is defined: in some cases they are relatively sharp, while in others they are diffuse. Ecosystem boundaries can change over time. Ecosystems are nested within other ecosystems and their scale can range from very small to the entire biosphere. In the current era, most ecosystems either contain people as key organisms, or are influenced by the effects of human activities in their immediate environment. See also ecosystem services.

Ecosystem services - Ecological processes or functions having monetary or non-monetary value to individuals or society at large. These services include (1) supporting services such as productivity or biodiversity maintenance, (2) provisioning services such as climate regulation or carbon sequestration, and (6) cultural services such as an aesthetic appreciation. The most obvious ecosystem services include the food we eat, the water we drink and the plant materials we use for building materials and textiles. There are also many less visible ecosystem services such as the climate regulation and natural flood defences provided by forests, the billions of tonnes of carbon stored by peatlands, or the pollination of crops by insects. Even less visible are cultural ecosystem services such as the inspiration we take from wildlife and the natural environment.

Emergency management is also used, sometimes interchangeably, with the term disaster management, particularly in the context of biological and technological hazards. While there is a large degree of overlap, an emergency can also relate to hazardous events that do not result in the serious disruption of the functioning of a community or society (UNISDR 2017).

Endogenous capacities - the initiative of local people using local knowledge and resources to participate. See also equality, ethics and fairness.

Embodied carbon (kg CO2 equivalents/kg) is the amount of carbon consumed to extract, refine, process, transport and fabricate a material or product.

Energy efficiency - The goal of a given country, or the global community as a whole, to maintain an adequate, stable and predictable energy supply. Measures encompass safeguarding the sufficiency of energy supplies, including national energy demand at competitive and stable prices and the resilience of the energy supply system, in order to ensure that essential energy demands are met during extreme weather.

Endogenous Knowledge - the information on which the lead authors are basing their findings. In this report, the degree of evidence reflects the amount, quality and consistency of scientific/technical information or other relevant evidence informing their findings. See also agreement, likelihood and uncertainty.

Equity - Equity is the principle of fairness in burden sharing and is a basis for understanding how the impacts and responses to climate change, including costs and benefits, are distributed in and by society in more or less equal ways. It is often aligned with human rights, and is reflected in established principles of fairness, or other entities aim to achieve zero fossil carbon existence.

Inequality - Uneven opportunities and social positions, and processes of discrimination within a group or society, based on gender, class, ethnicity, age, disability, or other identities. Uneven distribution of resources and vulnerabilities, and demand for unequal demand.


Environmental degradation - Contraction of forest to non-forest. For a discussion of the term forest related terms such as afforestation, reforestation and deforestation, see the IPCC Special Report on Land Use, Land-Use Change, and Forestry (IPCC, 2000). See also information provided by the United Nations Framework Convention on Climate Change (UNFCCC, 2013) and the report on Definitions and Methodological Options to Inventory Emissions from Direct Human-induced Degradation of Forests and Degeneration of Other Vegetation Types (IPCC, 2003). See also afforestation, reforestation, and deforestation.

Devegetation of Other Vegetation Types (IPCC, 2003). See report on Definitions and Methodological Options to Inventory Land Use, Land-Use Change, and Forestry (IPCC, 2000). See also afforestation, reforestation, and deforestation.

Depletion - the process by which a resource is rapidly used up. It may refer to a natural resource, or other entities aim to achieve zero fossil carbon existence.

Disaster - a change or event with a formal assessment of confidence. Evaluating the relative contributions of multiple causal factors to detected in observations if its likelihood of occurrence by chance providing a reason for that change. An identified change is detected in a situation of generalized violence, violations of human rights or other entities aim to achieve zero fossil carbon existence.

Ecosystems; environmental functions, services, and resources; and impacts and policies across society, generations, and gender, and in the sense of who participates and controls the processes of decision-making.

Inter-generational equity - Equity between generations that acknowledges the effects of past and present emissions, vulnerabilities and policies impose costs and benefits for people in the future and of different age groups.

Procedural equity - In the process of decision-making, including recognition and inclusiveness in participation, equal representation, bargaining power, voice and equal access to knowledge and resources to participate. See also equality, ethics and fairness.

Ethics - Ethics involves questions of justice and value. Justice is concerned with right and wrong, equity and fairness, and, in general, with the rights of which people and living beings are entitled to be protected, nourished, healed, or good. See also equality, ethics and fairness.

Evidence - Data and information used in the scientific process to establish fact. Independent, objective, unbiased, and rigorous, it affects the amount, quality and consistency of scientific/technical information or other relevant evidence informing their findings.

Equity - Equity is the principle of fairness in burden sharing and is a basis for understanding how the impacts and responses to climate change, including costs and benefits, are distributed in and by society in more or less equal ways. It is often aligned with human rights, and is reflected in established principles of fairness.

Extreme weather, extreme weather event - An extreme weather event is one that is outside the normal range of occurrence for a given location. Definitions of rare vary, but an extreme weather event would usually be as rare or as rare as the top 1% or 5% of the probability distribution of the data. Definitions of extreme are used to distinguish between observations. By definition, the characteristics of what is called extreme weather may vary from place to place in an absolute sense. When a pattern of extreme weather persists for some time such as a season, it may be classified as an extreme climate event, especially if it yields an average or total that is itself extreme (e.g., drought or heavy rainfall over a season). See also heatwave and climate extremes.

Extreme climate event - See climate extreme event.
Heritage and Climate Change Outline Report

The Future of Our Past - 1 July 2019
Heritage and Climate Change Outline Report

1 1 July 2019 - The Future of Our Past

weather or climate event.

Famine - Impartial and just treatment without favouritism or discrimination in which each person is considered of equal worth with others, regardless of race, gender, and social status.

Feasibility - The degree to which climate goals and response options are considered possible and/or desirable. Feasibility depends on geographical, economic, technological, human, economic, social and institutional conditions for change. Conditions underpinning feasibility are often weak or differentiated between groups. See also enabling condition, enabling conditions.

Flood - The overflowing of the normal confines of a stream or other body of water, or the accumulation of water over areas that are normally submerged. Floods include flash floods, urban floods, flash floods, sewer floods, coastal floods, and glacial lake outburst floods.

Flood risk - A situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 2001).
Industrial Revolution - A period of rapid industrial growth with far reaching social and economic consequences, beginning in Britain during the second half of the 18th century and spreading to Europe and North America, including the countries across the United States. The invention of the steam engine was an important trigger of this development. The Industrial Revolution marks the beginning of a strong increase in the use of fossil fuels, initially coal, and hence emission of carbon dioxide (CO2). See also pre-industrial.

Industrialized/developed/developing countries - There are a diversity of approaches for categorizing countries on the basis of their level of development, and for defining terms such as industrialized, developed, or developing. Several categorizations are used in this report. (1) In national systems, there is no established convention for designation of developed and developing countries or areas. (2) The United Nations system specifies developed and developing regions based on common practice. In addition, specific countries are designated as Least Developed Countries (LDC), landlocked developing countries, Small Island Developing States, and transition economies. Many countries can be assigned to one of these categories. (1) The World Bank uses income as the main criterion for classifying countries into upper middle, upper middle-high, and high income. (2) The UNDP indicators for life expectancy, educational attainment, and income into a single composite Human Development Index (HDI) to classify countries as low, medium, high or very high human development.

Inequality - See equality.

Inherently sustainable societies (ISS) - the traits of traditional buildings that maintained occupant comfort before industrialised heating, ventilation (HVAC) and other mechanical hardware became commonplace.

Institution - Institutions are rules and norms held in common by a social group, in order to guide, constrain or enable the actions and decisions of its members. Institutions can guide, constrain and shape human interaction through direct control, through incentives, and through habitualization. See also institutional capacity.

Institutional capacity - Institutional capacity comprises building and strengthening individual organizations and providing technical and management support to integrate planning and decision making processes between organizations and people, as well as empowerment, social capital, and an enabling environment, including the culture, values and power relations (Willems and Baumert, 2001).

Integrated Assessment - A method of analysis that combines knowledge from two or more domains into a consistent framework to evaluate the status and the far-reaching social and economic consequences, beginning in 1988 at the Third Session of the Conference of the Parties (COP3). This definition builds on ISO (2018). Inter-generational justice - Justice in the distribution of economic and non-economic costs and benefits across an international boundary. Kyoto Protocol - The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC), adopted in December 1997 in Kyoto, Japan, at the Third Session of the Conference of the Parties (COP3) to the UNFCCC. It contains legally binding commitments, in Annex B of the Protocol (mostly OECD countries and pre-industrial). Land use, land–use change and forestry (LULUCF) - See land-use change.

Land-use change (LUC) - Land-use change involves a change from one Land Use Category to another. Land use, land-use change and forestry (LULUCF) in the context of the UNFCCC refers to the changes in land use and land-use change over time, particularly those occurring on non-agricultural lands and associated with changes in the interactions and practices that have been applied to produce, ecological or social functions. LULUCF can be used to influence CO2 removals and emissions, not only from agricultural lands, but also from landscapes where ongoing active management is a primary objective.

Maintenance - the continuous protective care of a place, and its setting. Maintenance is to be distinguished from repair or reconstruction. Maintenance is fundamental to conservation. Maintenance should be undertaken where fabric is of cultural significance to ensure that fundamental conditions necessary to retain that cultural significance. (Burra Charter)
The Future of Our Pasts

1.5°C pathway - A pathway of emissions of greenhouse gases and socio-economic development. It is intended to have a 50% chance of limiting global warming to below 2°C relative to pre-industrial levels. It is representative of pathways that are tied to or influenced by climate factors including climate risks and opportunities but are not explicitly focused on climate change mitigation and adaptation.

Ocean Acidiﬁcation (OA) - Ocean acidiﬁcation refers to a reduction in the pH of the ocean over an extended period, typically decades or longer, which is caused primarily by uptake of carbon dioxide (CO2) from the atmosphere, but can also be caused by other chemical additions or subtractions from the ocean. Anthropogenic ocean acidiﬁcation refers to the component of pH reduction that is caused by human activity.

pH - pH is a dimensionless measure of the acidity of a solution measured on a logarithmic scale where pH = -log10[H+]. Thus, a pH decrease of 1 unit corresponds to a 10-fold increase in the concentration of H+ or acidity.

Pathways - The temporal evolution of natural and/or human systems towards a future state. Pathway concepts range from sets of future projections of greenhouse gas (GHG) emissions, atmospheric concentrations, or global mean surface temperatures implied from mitigation and adaptation actions associated with a set of broad and immediate economic, technological, societal and behavioral changes. Pathways also consider the impacts of climate change on the food, water, energy, and raw materials systems, systems that support the delivery of human services, and other systems that are involved with the provision of goods and services to society. Pathways are key components of the Paris Agreement, and are intended to be used as a basis for developing and communicating climate change mitigation and adaptation policies.

Pathways also consider the impacts of climate change on the food, water, energy, and raw materials systems, systems that support the delivery of human services, and other systems that are involved with the provision of goods and services to society. Pathways are key components of the Paris Agreement, and are intended to be used as a basis for developing and communicating climate change mitigation and adaptation policies.

Pathways also consider the impacts of climate change on the food, water, energy, and raw materials systems, systems that support the delivery of human services, and other systems that are involved with the provision of goods and services to society. Pathways are key components of the Paris Agreement, and are intended to be used as a basis for developing and communicating climate change mitigation and adaptation policies.

UHI - Urban heat island - A region in an urban area that is warmer than the surrounding rural areas.

V3.4.1 - The third partial report of the Intergovernmental Panel on Climate Change (IPCC). This report was produced in 2001.

World’s best - A term used to describe the most advanced or effective example of a particular technology, system, or practice.

World’s best - A term used to describe the most advanced or effective example of a particular technology, system, or practice.

World’s best - A term used to describe the most advanced or effective example of a particular technology, system, or practice.

World’s best - A term used to describe the most advanced or effective example of a particular technology, system, or practice.

World’s best - A term used to describe the most advanced or effective example of a particular technology, system, or practice.

World’s best - A term used to describe the most advanced or effective example of a particular technology, system, or practice.

World’s best - A term used to describe the most advanced or effective example of a particular technology, system, or practice.

World’s best - A term used to describe the most advanced or effective example of a particular technology, system, or practice.

World’s best - A term used to describe the most advanced or effective example of a particular technology, system, or practice.

World’s best - A term used to describe the most advanced or effective example of a particular technology, system, or practice.

World’s best - A term used to describe the most advanced or effective example of a particular technology, system, or practice.

World’s best - A term used to describe the most advanced or effective example of a particular technology, system, or practice.

World’s best - A term used to describe the most advanced or effective example of a particular technology, system, or practice.
Risk assessment - The qualitative and/or quantitative scientific estimation of risks. See also risk, risk management and risk perception.

Risk management - Plans, actions, strategies or policies to reduce the likelihood and/or consequences of risks or to respond to them. See also risk assessment.

Risk perception - The subjective judgment that people make about the characteristics and severity of a risk. See also risk, risk assessment and risk management.

Risk transfer - In the context of disaster risk reduction, risk transfer is the process of formally or informally shifting the consequences of particular risks from one party to another, thereby a household, community, enterprise or State authority will obtain resources from the other party in exchange for ongoing or compensatory social or financial benefits provided to that other party.

Runoff - The flow of water over the surface or through the subsurface, which typically originates from the part of liquid precipitation and/or snow/ice melt that does not evaporate or percolate, and is not stored. See also hydrological cycle.

Scenario - A plausible description of the future world based on a coherent and internally consistent set of assumptions about key driving forces (e.g. energy, economic, social, cultural and environmental). Scenarios can be distinguished by their capacity for adaptation, learning and transformation. This function builds from the definition used by Arctic Council (2013). See also hazard, risk and vulnerability.

Sea ice - Sea ice is ice that is floating on the surface of the ocean. Sea ice is formed when the temperature of the water drops below the freezing point and some of the water freezes into ice crystals. Sea ice may also be composed of brine or ice crystals that have formed in the ocean, and the ice may be thinner than 1 meter. See also sea ice conditions.

Sea level change (sea level rise/sea level fall) - Sea level changes are driven by changes in the volume of the ocean. Sea level is influenced by many factors, including climate change, such as warmer temperatures and increased precipitation, as well as human activities, such as seawater discharge from coastal areas.

Sea ice - Sea ice is the frozen seawater in the ocean that is floating on the surface. It is classified into three categories: first-year ice, multiyear ice, and perennial ice. First-year ice is ice that has existed for less than one year, multiyear ice is ice that has existed for more than one year but less than two years, and perennial ice is ice that has existed for more than two years.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level rise (SLR) - Sea level rise is the increase in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level rise can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.

Sea level change (sea level rise/sea level fall) - Sea level change refers to changes in the height of the ocean relative to the land. It is a measurement of the relative change in the elevation of sea level. Sea level change can be caused by a variety of factors, including changes in temperature, changes in climate, and changes in the amount of land ice.
development for all countries established by the United Nations through a participatory process and elaborated in the 2030 Agenda for sustainable development, including ending poverty and hunger; ensuring health and well-being; education, gender equality, clean water and energy, and decent work; building and ensuring resilient and sustainable infrastructure; cities and consumption; reducing inequalities; protecting land and water ecosystems; promoting peace; justice, and partnerships; and taking urgent action on climate change. See also sustainable development (SD).

Technology transfer - The exchange of knowledge, hardware and associated software, money and goods among stakeholders, which leads to the spread of technology for adaptation or mitigation. This may happen across different types of technologies and technological cooperation across and within countries.

Temperature overshoot - The temporary exceedance of a specified level of global warming, such as 1.5°C. Overtoposhot implies a peak followed by a decline in global warming, achieved through anthropogenic removal of CO2 exceeding remaining CO2 emissions globally.

Tipping point - A level of change in system properties beyond which a system undergoes a rapid change at scale. It may have many types of outcomes, from implosion of the data to ambiguously defined concepts or terminology, incomplete understanding of critical processes, or uncertain perceptions of human behaviour. Uncertainty can therefore be represented by quantitative measures (e.g., a probability density function) or by qualitative statements (e.g., reflecting the judgment of a team of experts) (see Moss and Schlesinger, 2000, IPCC, 2004; Mann et al., 2010). See also likelihood.

United Nations Framework Convention on Climate Change (UNFCCC) - The UNFCCC was adopted in May 1992 and opened for signature at the 1992 Earth Summit in Rio de Janeiro. It entered into force in March 1994 and as of May 2018 had 197 Parties (196 States and the European Union). The Convention’s ultimate objective is the stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The provisions of the Convention are pursued and implemented by two treaties: the Kyoto Protocol and the Paris Agreement. See also Kyoto Protocol and Paris Agreement.

Uptake - The addition of a substance of concern to a reservoir. See also carbon sequestration and sink. Al alas - See cultural significance. Values-based approach or values-based management - The coordinated and structured operation of a heritage site with the primary purpose of protecting its cultural significance as defined by designation criteria, government authorities or owners, experts of various kinds, and other citizens with legitimate interests in that place. (Cultural Landscapes: Balancing Nature and Heritage in Preservation Practice, R. Mason, 2008, p.184)

Vulnerability - The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt. See also exposure, hazard and risk.

Vulnerability assessment - See Climate vulnerability index.
Invited Reviewers

Catherine Forbes
GML Heritage, Australia

International Committee on Archaeological Heritage Management (ICAHM)

Dr Felix Reid
Department of Archaeology and Heritage Studies

Ben Casson
Laboratory for Past Disaster Science | Centre for Environmental Humanities | Materials, Culture and Heritage Research Programme

Dr Matthew Saunders
Trinity College Dublin

Romeo Task Force, Embodied Carbon Network; Materials Knowledge Working Group, American Institute of Architects

Aparna Tandon
Director-General for Education, Youth, Sport and Culture, European Commission

Dr Serafina Trescot
Deputy Director, ICCROM

Dr Jennifer Rubis
World Heritage Leadership Programme, ICCROM

Eugene Jo
Fellow, UNESCO C2C

Sofie Linder,
National Trust for Historic Preservation (U.S.)

Caitlin Southwick
National Scientific Committee on Energy, Sustainability and Climate Change; Australia ICOMOS

Val Turner
Department of Parks, Recreation and Tourism Management, University of North Carolina-Chapel Hill (USA), 2019 ICCROM Research Fellow

Catherine Forbes
WWF-Columbia

Alice R. Kelley
Climate Change Institute, University of Maine, Orono, Maine, USA

Johanna Leissner
Fraunhofer-Gesellschaft, Braunschweig Office, German Research Alliance Cultural Heritage and Fraunhofer Sustainability Network

Jane Lomax
University of North Carolina-Chapel Hill (USA)

Australia ICOMOS, International Scientific Committee on Cultural Landscapes (ISCL)

Sofie Linder,
Swedish National Heritage Board

Valerie Masson-Delmotte
IPCC Working Group I|Climate Change

Sandu Fatori:
Department of Civil and Environmental Engineering, Faculty of Engineering, University of Auckland

Heritage and Climate Change Outline Report

Heritage and Climate Change Outline Report

The Future of Our Pasts - 1 July 2019

108

Heritage and Climate Change Outline Report

Heritage and Climate Change Outline Report

109

1 July 2019 - The Future of Our Pasts

Ryan Rabbit
School of Natural and Built Environment, Queen’s University Belfast

Dr Felix Reid
Department of Archaeology and Heritage Studies

Laboratory for Past Disaster Science | Centre for Environmental Humanities | Materials, Culture and Heritage Research Programme

Dr Jennifer Rubis
Local and Indigenous Knowledge Systems, UNESCO

Eugene Jo
Department of Parks, Recreation and Tourism Management, North Carolina State University (USA), 2019 ICCROM Research Fellow

Caitlin Southwick
Sustainability in Conservation

International Committee on Intangible Cultural Heritage (ICH): Marilyn Travisott

Sean Hedges
International Committee for the Interpretation and Presentation of Cultural Heritage Sites (ICIP)

ICOMOS International Committee on Risk Preparedness (ICORP)

Richard G. Brown, USA

ICOMOS Sustainable Development Goals Working Group

Sarah Quigley
International Polar Heritage Committee (IPHC)

Dr William Megarry
Historic England, UK

Dr Francisca Medda
ICOMOS Panama (former ICOMOS Executive Member)

Victor Bonilla
National Scientific Committee on Energy, Sustainability and Climate Change; Australia ICOMOS

International Committee on the Underwater Cultural Heritage (ICUCH)

Dario Crumley
Bamako, Mali

ICOMOS International Committee on Risk Preparedness (ICORP)

Renee Atwood
Malta Chamber of Planners

M. Moussa Diarra
Département Information Environnemental à l’Agence de l’Agricultural University (SLU) Uppsala, Sweden

Dr Erica Bower
National Research Council (CNR) - Institute of Atmospheric Building Conservation, Uppsala University

Dominic Drayton
Portuguese Directorate-General for Cultural Heritage

ICOMOS International Committee on Archaeological Heritage Management (ICAPH)
ICOMOS National Committees
(followed by the names of the NC members who coordinated their NC’s review)

Australia ICOMOS
Ian Travers

ICOMOS Belgium
Tim De Kock

ICOMOS Brazil
Silvio Mendes Zancheti
Charles Moraes de Lima
Aline Cavalcado
Luciana Silva
Romeu Duarte Junior
Yussef Dallert Selomons de Campos

ICOMOS Canada
Angus Affleck

ICOMOS Costa Rica
Okelia Samou Allaro
Bernadette Esquivel Morales

ICOMOS Ethiopia
Matias Belofo Fantaye

ICOMOS Ireland
Caroline Engil Purcell

ICOMOS Japan
Tomo Ishimura

ICOMOS Latvia
Ronalds Līsis

ICOMOS Mali
Louara Cissé

ICOMOS Malta
JoAnn Cassar

ICOMOS Morocco
Khalid El Harrouni

ICOMOS Mexico
Paloma Guzman
Carlos Alonso de Jesús Domínguez Vargas
Juan Antonio Siller Camacho
Pablo Antonio Chico Pierce de León

ICOMOS New Zealand
Rebecca Ramsay
Diane Menzies

ICOMOS Nigeria
Tolé Luton-Brown

ICOMOS Norway
Cecilie Smids Christiansen

ICOMOS Panama
Graciela Amunona