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The British Council Strategic Literature Review: Climate Change Impacts on Cultural Heritage

Final Report

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Prepared by	Dr June Taboroff, Pierre Couté, Dr Scott Allan Orr, Saira Ali with Dr Samira al Shawesh and Roda Technology Ltd
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List of abbreviations

AFD	Agence française de développement
ADB	Asian Development Bank
AICS	Italian Solidarity and Cooperation Agency
ALIPH	International alliance for the protection of heritage in conflict areas
ArcHerNet	Archaeological Heritage Network
BNF	Bibliothèque nationale de France
BC	The British Council
CNRS	Centre national de recherche scientifique
COP27	Conference of the Parties of the UNFCCC
CPF	Cultural Protection Fund
DCMS	Department of Culture, Media and Sport
EBRD	European Bank for Reconstruction and Development
EF	Expertise France
EU	European Union
FAO	United Nations Food and Agriculture Organisation
FCDO	Foreign and Commonwealth Development Office
GEF	Global Environment Facility
GIZ	Deutsche Gesellschaft für internationale Zusammenarbeit
ICCROM	International Center for the Preservation and Study of Cultural Property
ICH	Intangible Cultural Heritage
ICMS	International Co-Sponsored Meeting on Culture, Heritage and Climate Change
ICOMOS	International Council on Monuments and Sites
ICNR	Italian Consiglio Nazionale delle Ricerche
IPCC	Intergovernmental Panel on Climate Change
JICA	Japanese International Cooperation Agency
LDC	Least developed countries
MENA	Middle East and North Africa
NAPA	National Adaptation Programmes of Action
NASA	US National Air and Space Agency
OECD	Organisation of Economic Cooperation and Development
RPF	Request for Proposal
SIDA	Swedish International Development Association

SLR	Strategic Literature Review
TL	Triple Line Consulting
UCL	University College London
UNDP	United Nations Development Programme
UNEP	United Nations Environmental Programme
UNESCO	United Nations Education, Science and Culture Organisation
UNFCCC	United Nations Framework Convention on Climate Change
WB	The World Bank Group.

1 Introduction

1.1 Purpose and objectives

The British Council (BC), through its Cultural Protection Fund (CPF), aims to *strategically support* countries and organisations in the conservation, safeguarding, and management of their cultural heritage. It commissioned Triple Line Consulting, in response to a Request for Proposal (RFP), to prepare a systematic literature review on climate change impacts on cultural heritage and their technical, societal, cultural, and economic effects. The review encompasses peer reviewed publications and, to the extent possible, the grey literature.¹

The intention behind this report is to inform the British Council and its stakeholders on the current state of knowledge on the climate change and cultural heritage nexus and more specifically on trends in academic research (peer reviewed publications) and the main concerns and practical responses at the international donor and institutional levels (grey literature publications and reports).

Climate change impacts on cultural heritage are considered at international, regional, national, and local levels by means of a comprehensive systematic review of the international literature, evidence, research, and, when practicable, policies.

This review and its accompanying graphics will be a tool to assist the British Council and CPF to optimise positive impacts and/or minimise potential negative impacts of their cultural heritage conservation and safeguarding activities and support beneficiaries through advanced information and improved methodologies. The Triple Line team is mindful of the potential use foreseen for the research to inform practice and shape policy by the British Council and CPF, as noted in the RFP.

The review responds to significant knowledge, research gaps and the urgency of climate change threats to heritage. The International Council on Monuments and Sites (ICOMOS) International Co-Sponsored Meeting on Culture, Heritage, and Climate Change (ICSM) White Paper of 2022 concludes:

‘Although heritage is present in IPCC [Intergovernmental Panel on Climate Change] literature (Assessment Reports and Special Reports), this inclusion is unsystematic, superficial, and not inclusive of the vast diversity of types of heritage and risks posed by climate change.’

The White Paper also asserts that ‘climate change impacts are exacerbating environmental, social, and cultural risks to heritage.

Several publications, beside earlier strategic literature reviews covering climate change and cultural heritage, have initiated a stocktaking of the existing but **still fragmentary knowledge** on this challenge. An important milestone is the Geosciences, 2019 special issue on the preservation of cultural heritage and resources threatened by climate change². It concludes that *‘heritage, material and environmental science are currently vibrant research and practice domains.’*

As the present review will demonstrate, the peer reviewed literature dealing with climate change and cultural heritage has grown rapidly in the last five years. Much of the literature is produced by academics and represents predominantly European and North American research in Europe and North America, with a preponderance of publications about physical impacts on individual buildings, sites, or social groups. Introducing climate change effects and threats within intersectional approaches and theories of domination (or decolonialisation) is also a recent trend, as demonstrated for instance by the influx of papers on indigenous and traditional knowledge³, and cross-referenced with gender and scientific studies of decay processes.

¹ We use the definition of grey literature as including a range of documents not controlled by “peer reviewed” publishing organisations see systematicreviewsjournal.biomedcentral.com

² “Preservation of Cultural Heritage and Resources Threatened by Climate Change” special issue of Geosciences magazine (June 2019)

³ Traditional knowledge as possible practical and relevant response to the effects of climate change at community level or to identify and foresee indirect effects of climate change on indigenous traditional cultural practices bypassed by policy makers.

The grey literature, which two decades ago focused on policy papers and the need to encourage multi-disciplinary approaches, has expanded with more technical papers and reports issued by the growing number of programmes and projects financed by donors at international and national levels. Current programmes and projects focus on the identification, monitoring or counteracting of the damaging effects of climate change on cultural heritage. Technical studies prior to works, trainings, pilot and demonstration projects, technical reports are plentiful but not commissioned with an aim of immediate use and internal reporting circulation rather than knowledge sharing. Furthermore, because of their applied research or pre-implementation content, the reports do not necessarily claim any “climate change orientation” in their title and abstracts, thus making the bulk of grey literature difficult to locate⁴. Reports from international and bilateral development agencies have a wider geographic scope but can be difficult to access as the parent websites are not always easily searchable.

In both peer reviewed and grey literature, consideration of the impact of climate change on intangible cultural heritage (ICH), rarely the sole focus of past research, is now taking its place. Vague timescales and unspecific references to changes in the natural environment have been acknowledged by researchers as limitations of the literature. The share of non-English literature is relatively modest.

1.2 Scope and definitions

The scope of work for the present study is to ‘undertake a systematic review which synthesizes the international literature, evidence and research from both the “Global South and Global North”, including research which is not in English, on climate change impacts on tangible cultural heritage and ICH and also the impact of cultural heritage on the environment, including developing hazard-impact diagrams focusing on the impacts of gradual changes in climate on: (1) cultural heritage and (2) intangible heritage.’

The review uses the following definitions which conform to those of IPCC and the British Council:

Impact. For this review we use the definition of impacts as set forth by the IPCC⁵. Impacts (consequences, outcomes): The consequences of realised risks on natural and human systems, where risks result from the interactions of climate-related hazards (including extreme weather/climate events), exposure, and vulnerability. The hazard-exposure-vulnerability framework is an established climate risk perspective that has been used in several IPCC Assessment Reports. The understanding and use of these terms is nascent which has resulted in a wide diversity of terminology and non-standardised approaches to discussing, quantifying, and evaluating risks of climate change for heritage.⁶ Impacts generally refer to effects on lives, livelihoods, health and wellbeing, ecosystems and species, economic, social, and cultural assets, services (including ecosystem services) and infrastructure. Impacts may be referred to as consequences or outcomes and can be adverse or beneficial.’ This includes both gradual, long-term change but also rapid-onset extreme events. The most recent risk frameworks supported by the IPCC (e.g., the 6th Assessment Report) include risks and impacts due to climate change response.⁷ We should note here that there is often a blurring in the literature between impacts and outcomes.

Cultural Heritage. In its guidance for the CPF, the British Council states that ‘cultural heritage includes many different things from the past that communities value and want to pass on to future generation.’ This definition is in line with UNESCO cultural conventions, seeing cultural heritage as separate from natural heritage and including:

⁴ The first EU global project on technical matters, “Noah’s Ark” and “Climate for Culture” on such issues as, preventive conservation monitoring, and climate or numerical modelling on material components for assessing environmental impact and climate change.

⁵ IPCC, 2019b

⁶ See especially Vokes, C., Brennan, J., Kehoe, B., Legard, J., & Moore, E. (2023). Approaches to heritage climate change risk assessment: an integrative literature review. Historic England Research Report Series 13 / 2023. In press. Thomas, H., Marincioni, V., Orr, S. A. (in preparation). Climate change risk assessments for cultural heritage: a review.

⁷ <https://www.sciencedirect.com/science/article/pii/S2590332221001792>

Tangible cultural heritage, encompassing all the following: Movable cultural heritage (paintings, sculptures, coins, manuscripts), immovable cultural heritage (monuments and historic buildings and urban centres, archaeological sites, and so on), underwater cultural heritage (shipwrecks, marine archaeology), also known as marine heritage.

Intangible cultural heritage including the terms: Knowledge and skills to produce traditional crafts, oral traditions, performing arts, social practices, rituals, festive events and knowledge and practices concerning nature and the universe.⁸

Intangible Cultural Heritage (ICH). Analysis of how climate change has and could have an impact on the safeguarding of ICH is new; to date the literature has been scant. Based on our extensive international field work, it is our view that ICH constitutes a major social, economic, and environmental resource. Yet it is a domain of knowledge that is less understood and regarded by academics and policy makers when considering climate change impacts. For example, the ICH-NGO Forum presentation, ‘Intangible Cultural Heritage in Urban Contexts’ (2020) does not mention climate change impacts. We are fortunate to have the recent experience of Ethiopia, Algeria, Yemen, and the Western Indian Ocean as well as the EBRD Performance Standard 8 Cultural Heritage Guidance Note fresh in our minds’ eye which shed light on climate change impacts on historic urban settlements in coastal areas, sacred sites, cultural practices related to planting and harvests, movement of people and other manifestations of cultural heritage. See 3.2 for further discussion.

Geography. Our systematic literature review pays particular attention to the sixteen CPF countries of operation while also examining the literature from other regions:

- **Middle East and North Africa (MENA):** Algeria, Egypt, Iraq, Jordan, Lebanon, Libya, Occupied Palestinian Territories, Syria, Tunisia, Yemen
- **East Africa:** Ethiopia, Kenya, Sudan, Tanzania, Uganda
- **South Asia:** Afghanistan

Rather than use the terminology ‘Global South and Global North,’ this report evaluates literature on climate change and heritage based on the economies in which people, research, and policy are focused. This analysis is then aggregated by World Bank classifications of region, income, and other socioeconomic factors high, middle, low middle and low income countries.

Languages. In accordance with the RFP, our review includes literature in languages other than English. This encompasses the literature in French, Italian, Spanish, and German (by our core team) which represent the bulk of accessible publications. Arabic, which is not widely used for technical publications was explored by a specialist (subcontracted). Literature in Chinese is often translated into English, and we surveyed the literature in Japanese and Russian through our professional networks. See 2.3.1.

Time Frame: The review covers the **post January 2015 period, that is post Paris Agreement, until September 2022.** As stated above, the first international programmes of significance, such as the EU Noah’s Ark (2004/2007) or the Case Studies on Climate Change and World Heritage (UNESCO, 2007) were developed before this SLR time frame; they produced a first layer of specific publication on the “global impact of climate change on cultural heritage”. At the same time a growing number of technical publications were produced that called for the adaptation of professional practices and technical solutions (building construction, building restoration, museum management and display etc.) or evidenced the elevation of temperature, the elevation of humidity level, the sea level rise or the appearance of new type of fungus on manuscripts or wooden artefacts in museums as threats to heritage. These publications do refer as such to climate change as an overall force and common global threat but rather respond to technical and management issues at the local level.

⁸ ICH, or living heritage, refers to the practices, representations, expressions, knowledge, and skills, that communities pass on from generation to generation in response to their environment, their interaction with nature, and their history (UNESCO, 2003, Article 2). UNESCO, 2003: *Convention for the safeguarding of the ICH*. UNESCO, Paris, 15 pp. Available at: <https://ich.unesco.org/doc/src/15164-EN.pdf>.

As discussed by Fatorić and Seekamp in 2017⁹ when doing a stocktake of the literature on cultural heritage and climate change, the topic entered research agendas in 2003 and early publications were relatively small in number compared to what is found now. They identified that many of these landmark projects, such as Noah's Ark¹⁰ and Climate for Culture¹¹, established a physical science basis for understanding impacts of climate change and heritage. They urged for greater inclusion of transdisciplinary efforts and the "need for future studies that not only focuses on efficient, sustainable adaptation planning options but also documents if, and how, the implementation of cultural heritage and resources adaptation or preservation is taking place."

1.3 The Project

The Systematic Literature Review is a ten-month project which began in mid-November 2022 (rather than mid-October 2022). Prior to the project Inception Meeting, the Triple Line team held an in-person all-day meeting in London on 16 November 2022 to review the proposal, update understanding, agree on how to carry out the search and plan for the overall project. During the Inception Meeting of 17 November, for which the team prepared an agenda, we presented several suggestions and clarifications for the study, which were agreed by the British Council:

- Classification of countries and regions: use of the World Bank classification of lending groups (low income, low middle income, middle income etc) rather than the terms Global North and Global South which involve some ambiguities.
- Languages other than English and location: begin the literature review with English, French, Italian, Spanish, and German. Then literature in Arabic, Chinese, Japanese, and Russian as relevant. Our analysis determines, as far as possible, where the work is based (location of the authors) and the location of the research. We give particular attention to the sixteen CPF countries.
- Types of heritage: use of the classification of types of heritage used by ICOMOS in *Future of our Pasts*¹².
- Climate drivers: use of the US National Air and Space Agency (NASA) classification of climate hazards as climate drivers (rather than climate stressors).¹³
- Negative impacts: Our understanding of the aim of the RFP question on negative impacts is to *examine unsustainable practice in view of climate change*.

During the Inception Meeting, we requested further information on the What Works Approach and its relation to this review, and the use and users of the SLR and hazard impact diagrams, including as evidence for the next UK Government Spending Review. We also asked for any written sources that we might not have known about, and confirmed the required outputs and their timing, including the Inception Report (prior to Christmas), Interim Report (March 2023), the draft Final Report (end May-June and Final Report, and the workshops (Spring-Summer, Autumn 2023).

We met informally on 3 March 2023 with the Head of the British Council's Research and Insight, Cultural Engagement, who confirmed the interest of the Cultural Protection Fund in ICH and expanded on the use foreseen for the literature review to: a) inform future funding rounds to assist British

⁹ Fatorić, S. and Seekamp, E., 2017. Are cultural heritage and resources threatened by climate change? A systematic literature review. *Climatic change*, 142(1-2), pp.227-254.

¹⁰ <https://www.ucl.ac.uk/bartlett/heritage/research/projects/project-archive/noahs-ark-project>

¹¹ <https://www.climateforculture.eu/>

¹² <https://openarchive.icomos.org/id/eprint/2459/>

¹³ This list was adapted from Simpson et al. 2022 since the focus here is particularly on how the heritage field might more closely align with the IPCC. There is no standardised list of climate change hazards (direct and indirect) for cultural heritage. Simpson, Nicholas P., Orr, Scott Allan, Sabour, Salma, Clarke, Joanne, Ishizawa, Maya, Feener, R. Michael, Ballard, Christopher, Mascarenhas, Poonam Verma, Pinho, Patricia, Bosson, Jean-Baptiste, Morrison, Tiffany and Zvobogo, Luckson (2022) *ICSM CHC White Paper II: Impacts, vulnerability, and understanding risks of climate change for culture and heritage: Contribution of Impacts Group II to the International Co-Sponsored Meeting on Culture, Heritage and Climate Change*. Discussion Paper. ICOMOS & ICSM CHC, Charenton-le-Pont, France & Paris, France, 109p. ISBN 978-2-918086-72-7. [Book]

Council and CPF staff as well as applicants so that they have the resources needed to integrate climate change considerations into programme and project design; and b) support the British Council's thought leadership to open international conversations on climate change and heritage and point up new areas where research is needed. Our Interim Report was submitted on 20 March 2023 and approved. Throughout the project, the project team has met on a weekly basis to review the status of the various activities, to share ideas and to ensure that it has approached the review according to the same criteria.

1.4 Approach

In this section we explain how we are delivering A What Works and a comprehensive and international approach, and how we integrated experience of environmental impact assessment and international development aid into our research.

1.5 Delivering a What Works approach

The UK Government What Works Network¹⁴ aims to 'improve the way government and other public sector organisations create, share, and use high-quality evidence in decision making. A What Works approach for cultural heritage intends to support better outcomes for cultural heritage protection and communities by bringing the best available evidence to heritage sector practitioners and decision makers. By sharing informed research, best practices, and lessons learnt, it will promote collaboration and learning, contributing to better coordination across all development sectors. The What Works Approach to international cultural heritage has four overarching evidence themes, all of which are relevant to this review:

- its contribution to sustainable development;
- its relation to climate change;
- its utility for a cultural relations approach; and
- its use in evaluation and research.

In accordance with the What Works Approach, our review aims to *provide improved access to high-quality usable evidence on cultural heritage protection and safeguarding, facilitate use of this evidence and create increased opportunities for evidence-based decision making.*

The team will present the findings of the strategic literature review at a What Works regional meeting in Kenya in mid-July which will be an opportunity to explain recent trends in the literature, hear from the British Council staff and heritage practitioners, and explore ways in which the review can be of operational use.

1.5.1 Adopting an Inclusive International Approach

Our review addressed, to the extent possible, the limitations identified in the ICOMOS White Paper¹⁵ and other analyses of the literature, whether peer reviewed or grey literature, through an investigation of non-European and non-North American studies; through an examination of the literature in the languages cited above; and through a search beyond the academic literature to include international and bilateral development agencies and specialized heritage and environmental organisations (the grey literature). By including a broad range of heritage stakeholders and local and indigenous knowledge, we have worked towards improving equity in climate change/heritage research.

¹⁴ <https://www.gov.uk/guidance/what-works-network>

¹⁵ Simpson, Nicholas P., Orr, Scott Allan, Sabour, Salma, Clarke, Joanne, Ishizawa, Maya, Feener, R. Michael, Ballard, Christopher, Mascarenhas, Poonam Verma, Pinho, Patricia, Bosson, Jean-Baptiste, Morrison, Tiffany and Zvobogo, Luckson (2022) ICSM CHC White Paper II: Impacts, vulnerability, and understanding risks of climate change for culture and heritage: Contribution of Impacts Group II to the International Co-Sponsored Meeting on Culture, Heritage and Climate Change. Discussion Paper. ICOMOS & ICSM CHC, Charenton-le-Pont, France & Paris, France, 109p. ISBN 978-2-918086-72-7. [Book]

The Triple Line team combines high interdisciplinary research and scientific capability with practical observations and experience. Well versed in environmental assessment and climate science, as well as heritage science and conservation, the team members are able to draw on their previous work developing climate change risk assessment indices and frameworks and reviewing and critically analysing the state of knowledge on cultural heritage and climate change.¹⁶

1.5.2 Environmental Assessment and International Development

Environmental assessment is a critical tool to understand the impacts of change on the historic environment and is required by international development agencies for large-scale projects such as roads and urban transport, pipelines, mining and other earth-moving projects.¹⁷ Many national governments have environmental assessment legislation which mandates an assessment prior to construction works. A feature of the environmental impact assessment is the determination of the baseline case, which includes assessment of the condition of cultural heritage and its sensitivity and vulnerability to change. Therefore, environmental assessment is a complementary tool when determining impacts of climate change on cultural heritage, although time frames differ as environmental assessment considers possible negative changes from a particular project and mitigation strategies rather than longer term changes. The TL team's experience of international development projects, in the MENA region and in other developing regions, provides first-hand insight into how cultural heritage is valued and contributes to societies. Working extensively in post-conflict countries, the team has also witnessed the disruptions to traditional cultural practices resulting from conflict, including conflicts fuelled by immediate climate change effects, especially flooding and draught and consequential population displacement.

1.6 Methodology and Research Matrix

In this section we define the nature of systematic literature reviews, set out the research question, describe the three phases of the work – Research, Analysis and Synthesis– and give technical explanations of our choices of identification of publications and eligibility criteria. We provide a table with our research matrix.

1.6.1 Defining the SLR and Its Limitations

According to the RFP,

'A systematic literature review's main aim is not simply to be 'comprehensive' but to address a specific question, reduce bias in the selection and inclusion of studies, to appraise the quality of the included publications, and to objectively summarise them'.¹⁸

SLRs are appreciated because of the transparency in the selection of search terms and search engines, exclusion criteria and analytical methods. This allows for bibliometric analysis (statistical assessment of distributions in the literature) and replicability of the same process in the future.

Systematic literature reviews were initially developed within medical science as a way to synthesize research findings in a systematic, transparent and reproducible way and have been referred to as the gold standard among reviews. The use of this research method has spread to other disciplines.¹⁹ The aim of a systematic literature review is to identify all empirical evidence that fits the pre-specified inclusion criteria to answer a particular research question or hypothesis. Using explicit and systematic methods when reviewing articles and available evidence is a way to minimize bias, thus providing reliable findings from which conclusions can be drawn. Among the advantages of a systematic review are the ability to determine whether an effect is constant across studies, identify knowledge gaps and guide future studies.

¹⁶ See also Scott Allan Orr's co-authored publication, <https://www.heritageresearch-hub.eu/white-paper-cultural-heritage-and-climate-change-new-challenges-and-perspectives-for-research/>

¹⁷ See EBRD PR8 Cultural Heritage Guidance Note, C. Le Quesne and J Taboroff, 2023.

¹⁸ Refer to https://www.betterevaluation.org/en/evaluation-options/systematic_review

¹⁹ See <https://www.sciencedirect.com/science/article/pii/S0148296319304564>

Systematic literature reviews play an important role as a foundation for research and can serve as a basis for knowledge development and a spur for new ideas and directions for a particular field. Ultimately the systematic review strengthens the capacity to make evidence-informed decisions by providing rigorous and timely assessments of the evidence base. In our case this will be translated into recommendation to the British Council and CPF for the design and management of the project grant cycle.

While the method of systematic review has many benefits related to the ‘democratisation’ of identifying potential publications, it is important to acknowledge potential limitations of this method. Typically, the **limitations are linked to key word use, the framing of the research question and identification of relevant publications**, in this case primarily searching the grey literature. Although the team made efforts to capture key concepts with the key word selection and care was taken in translating them into other languages, reliance on the term ‘climate change’ has certain implications. Climate change is a concept that is new and is not in widespread currency in the cultural heritage sector. Archaeologists, conservation architects, museum curators and other heritage experts are familiar with negative impacts from flooding, storms, wind action, heat variant, insects, fluctuations in relative humidity, and other factors but may not conceptualise these under the heading of climate change. Therefore, there is likely to be an under-reporting or insufficient awareness of climate change impacts by heritage agencies and managers, which are considered instead under weather events or other negative scenarios. This language issue is not dissimilar to the gender debate. While in the past there may have been attention to exclusion of women in education or the workplace, it has only been identified as a gender issue in the last few decades²⁰. Climate change, like gender, is a relatively new concept with an associated time lag until it is fully incorporated into the literature. As a result, we attempted to identify those studies addressing climate change effects (and the respective technical answers and solutions) on the cultural heritage which may not have been undertaken or defined as climate change-related publications. Issues of conservation and alteration are inherent to the heritage corpus and as climate change exacerbates all natural decaying effects including those of natural hazards, the distinction is not easy and is not necessarily agreed by the authors themselves.

Systematic literature reviews on occasion have examined issues related to cultural heritage and climate change, for example the review of indigenous knowledge and climate change in East Asia, written by Pakistani academics.²¹ Since 2011 at least 12 systematic literature reviews addressing some aspect of cultural heritage and climate change have been published, 9 of which date from either 2020 or 2021. See 2.1.

In some cases, scoping reviews are preferred as they have the advantage of allowing space for clarifying key concepts and definitions, exploring the scale and scope of evidence, and identifying useful research methods and knowledge gaps. In some cases, they provide a platform for future systematic review. This approach is being used by UNESCO for ICH where search parameters are still being defined.

1.6.2 Research Question & Project Phases

The research question that we address is: **What are the impacts of climate change on tangible and intangible cultural heritage, and what are the negative impacts of cultural heritage on the environment?**²²

The Systematic Literature Review incorporates publications from the Scopus database (see section 2.2) and other sources. The process of literature identification, selection, and analysis follows PRISMA²³ best practice and documentation methods. The review covers literature published between January 2015, when the terms of the Paris Agreement were agreed after COP20 in Lima, Peru to

²⁰ See for example the UN Women <https://www.unwomen.org/en/csw>. Most international development agencies have programmes to address gender issues, including the World Bank, EU, and the regional development institutions.

²¹ See <https://www.sciencedirect.com/science/article/abs/pii/S0959652620306429>

²² See also Dr Scott Allan Orr discussion’s distinction based on what is valued as heritage and which is seen as the ‘thing that causes change to heritage’. <https://www.emerald.com/insight/content/doi/10.1108/JCHMSD-08-2019-0099/full/html>

²³ <https://prisma-statement.org/PRISMAStatement/PRISMAStatement>

September 2022, inclusive. On occasion in our analysis, we refer to later publications where highly relevant.

Research Phase

Our Systematic Review follows a robust and repeatable procedure, thus ensuring that it is transparent but also repeatable, allowing for periodic monitoring through the future proofing of subsequent analysis. The review is documented through a PRISMA flow diagram²⁴ that incorporates searches of databases, registers, and other sources.

Initial Selection of Publications

The review incorporates five bodies of literature, identified through their respective databases for the period January 2015 to September 2022:

Peer-reviewed publications and indexed conference proceedings and reports in English: sourced through Scopus. Scopus is a source-neutral abstract and citation database curated by independent subject matter experts delivering the most comprehensive overview of the English language world's research output in the fields of science, technology, medicine, social science, and arts and humanities.²⁵

Peer-reviewed publications and indexed conference proceedings and reports in non-English languages: sourced through language- and/or regional-specific databases. For example, the catalogue of the Bibliothèque nationale de France (BNF), Centre national de la recherche scientifique (CNRS) and publication database Persée, German Archaeological Institut, Italian Consiglio Nazionale delle Ricerche, national learned and scholarly societies and academies (such as the British Academy) and other relevant institutional databases, such as "fichier des thèses" in French.

Heritage-focused grey literature: sourced through national and international repositories including the V&A Culture in Crisis Portal, the ICCROM library, the Getty Conservation Institute Art and Research Collections, UNESCO World Heritage Center including State of Conservation Reports and Periodic Reports for CPF counties, the UNESCO ICH Secretariat, ICOMOS, Climate Heritage Network, the Archaeological Heritage Networks (ArcHerNet), Humboldt Forum, Council of Overseas Research Institutes (CAORC), Historic England, Historic Environment Scotland, the UK National Trust, National Lottery Heritage Fund, US Ambassadors' Fund, World Monuments Fund, Europa Nostra and implementation reports from identified significant organisations such as ALIPH.

Climate change grey literature: building on pre-existing review and analysis. Primarily, the review work already undertaken by Hall and Ram 2016²⁶ and Simpson et al., 2022²⁷ that has extensively reviewed the IPCC literature for the inclusion of heritage.

Wider grey literature: related to international development, urban regeneration, traditional knowledge, indigenous peoples, bio-cultural resources etc. Sources include the British Library database, UN system, World Bank, the GEF (Global Environmental Facility), FAO, EU, ADB, EBRD, OECD, IPCC, IUCN, and bilateral organisations such as the Agence française de développement (AFD) Expertise France (EF), Deutsche Gesellschaft für internationale Zusammenarbeit (GIZ), Japanese International Cooperation Agency (Jica), Swedish International Development Association (Sida), DFID and USAID. Although the number of climate change heritage related publications is also growing in these institutions - primarily project reporting outputs - very few projects directly finance and address the nexus.

²⁴ <https://prisma-statement.org/prismastatement/flowdiagram.aspx>

²⁵ https://www.elsevier.com/___data/assets/pdf_file/0007/69451/Scopus_ContentCoverage_Guide_WEB.pdf

²⁶ Hall, C.M., 2016. Heritage, heritage tourism and climate change. *Journal of Heritage Tourism*, 11(1), pp.1-9.

²⁷ ICSM CHC White Paper II: Impacts, vulnerability, and understanding risks of climate change for culture and heritage: Contribution of Impacts Group II to the International Co-Sponsored Meeting on Culture, Heritage, and Climate Change - ICOMOS Open Arc <http://openarchive.icomos.org/id/eprint/2718/>

Databases, Criteria, Terms and Searches

Scopus is the main database used. Scopus was selected for its wide range of publications, and because it has a greater coverage of non-English documents than Web of Science²⁸.

Within the title, abstract, and keywords, the following criteria must all be met. Due to the diversity of heritage and terminology, several terms have been included to catch a wide range of cultural resources.

Search One: predominantly tangible heritage: [2,819 records indicated by preliminary scoping]:

- cultur* OR archae*
- histori* OR heritage* OR site* OR enviro*
- climat*
- resilience OR change
- impact*

Scopus input:

```
TITLE-ABS-KEY ( [cultur* OR archae*] AND [histori* OR heritage* OR site* OR enviro*]  
AND [climat*] AND [resilience OR chang*] AND [impact*] ) AND PUBYEAR > 2015 AND  
PUBYEAR < 2023
```

Search Two: predominantly intangible heritage [1,894 records indicated by preliminary scoping]:

- local OR indigen* OR traditito*
- knowledge
- climat*
- chang* OR resilience
- impact

Scopus input:

```
TITLE-ABS-KEY ( [local OR indigen* OR traditito*] AND [knowledge] AND [climat*] AND  
[chang* OR resilience] AND [impact] ) AND PUBYEAR > 2015 AND PUBYEAR < 2023
```

This search, with its use of wildcards²⁹, identified a range of sources. ‘Wild card’ asterisks means that variation in terms (e.g., cultural and culture) are identified. This query is powerful, as it allows for cross-cutting resources to be identified, for example those with keywords relating to Indigenous sites and climate resilience or archaeological environments and the impact of climate on its resilience.

For b) [Peer-reviewed publications and indexed conference proceedings and reports in non-English languages], we drew on existing thesauruses to ensure that translation linguistically correct and semantically appropriate based on variation in terminology use. Language-specific databases for French, Italian, Spanish and German were identified, and these search terms were translated³⁰ by subject experts and applied. The literature in Arabic, Chinese, Japanese and Russian was considered for inclusion following an initial survey.

Identification of grey literature

This query was undertaken in a single search in Scopus but was manually implemented for other databases. The team examined the websites and knowledge portals of the major international

²⁸ See <https://link.springer.com/article/10.1007/s11192-019-03264-z>

²⁹ Wildcards are special characters or symbols that characters in a text value represent one or more characters and can be used for locating multiple terms with similar, but not identical data. A wildcard character can be seen as a placeholder represented by a single character such as an asterisk (*) which can be interpreted as a number of literal characters and is often used in file searches, so the full name need not be typed.

³⁰ We also refer to ICOMOS’s translation of terms.

development agencies, the UN system, and specialist heritage and environment organisations. Thus, the following searches were required.

- climate impact cultural heritage resilience
- climate impact cultural heritage change
- climate impact archaeological site resilience
- climate impact archaeological site change
- climate impact cultural environment resilience
- climate impact cultural environment change

Eligibility criteria and Inclusion/exclusion process

Three criteria were applied for selection of the subset of literature:

1. **Sufficient focus** and emphasis placed on both cultural heritage and climate change (binary question, yes or no).

Quality/relevance, for which each resource must keep both of the following indicators (adapted from³¹):

Credibility: findings are plausible and trustworthy

Confirmability: a clear link or relationship between the data and the findings

Exclusion of literature focusing on impacts on long-term past climate change, e.g., paleoenvironments³², etc.

This selection was undertaken by multiple individuals on the team. An initial harmonisation was done with a sample of 50 publications to ensure consistency of application, and clarification, if necessary, of the criteria. For 37 of these (74%), all individuals agreed in their classification. A further 10 (thus a total of 94%) had only one team member vary in exclusion recommendation to the others. A group discussion to normalise the source of these discrepancies was held to ensure that the main exclusions were evaluated consistently.

1.6.3 Synthesis Phase & Coding System

The selected publications were analysed against a predetermined system of coding, which included the below. An initial sample of 15 publications was used to harmonise application of the criteria and determine whether any modification was required to address the aims of this review. This initial sample did not result in any changes.

Climate drivers³³

- Sea-level rise (including associated salinisation, flooding and erosion)
- Increased rainfall (including wind driven, fluvial, and pluvial flooding)
- Tropical storms and hurricanes
- Increased global average warming

³¹ <https://onlinelibrary.wiley.com/doi/full/10.1111/tct.13242>

³² This broadly maps to the last 100 years.

³³ Based on impacts / risks to heritage, this represents a synthesis across all three IPCC special reports (page 19): Simpson, N. P., Orr, S. A., Sabour, S., Clarke, J., Ishizawa, M., Feener, R. M., Ballard, C., Mascarenhas, P. V., Pinho, P., Bosson, J.-B., Morrison, T., & Zvobogo, L. (2022). *ICSM CHC White Paper II: Impacts, vulnerability, and understanding risks of climate change for culture and heritage: Contribution of Impacts Group II to the International Co-Sponsored Meeting on Culture, Heritage and Climate Change*. ICOMOS & ISCM CHC. <https://openarchive.icomos.org/id/eprint/2718/>

- Flood outbursts (glacial)
- Landslides
- Heat stress
- Drought (agricultural and hydrological)
- Wildfire (from increased aridity and lightning strikes)

Types of heritage, as modified by the ICOMOS Climate Change Working Group (the final two combined into one type, since they are so closely linked):

- Movable
- Buildings and structures
- Sites, inc. archaeological
- Cultural landscapes
- Intangible heritage and associated (local) communities.

Where the work is based, as determined by the economies in which author affiliations are based, for peer-reviewed literature. The Excel sheet used to make the table was accurate at the time of analysis (mid-2023).

The primary regional groupings include:

- East Asia & Pacific
- Europe & Central Asia
- Latin America & Caribbean
- Middle East & North Africa
- North America
- South Asia
- Sub-Saharan Africa

Where the work is focused (i.e., location of research), again based on economies in which the work is focused. Note that several economies can be mentioned in an individual publication/resource, and this was accounted for in our analysis.

Negative impacts on the environment, also considered as ‘unsustainable heritage practice’ (binary question), including open descriptions.

Country classifications by income level (if applicable), based on World Bank classifications of GNI per capita in US\$³⁴.

- Low-income economies (\$1,085 or less per year)
- Lower-middle income economies (\$1,086 to \$4,255 per year)
- Upper-middle income economies (\$4,256 to \$13,205 per year)
- High-income economies (\$13,205 or more per year)

These results are compared to other recent reviews in heritage and climate change, which have had various foci, including intangible and urban heritage, among others³⁵.

³⁴ <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>

³⁵ <https://www.science.org/doi/10.1126/sciadv.aaz1455>,
<https://www.tandfonline.com/doi/full/10.1080/17567505.2021.1957264>,
<https://link.springer.com/article/10.1007/s10584-017-1929-9>, ICSM CHC White Papers 2021, forthcoming UNESCO-

1.6.4 Analysis phase & Integrating AI Technology

In conformity with the tasks defined in the RFP, we analysed the content through abstracts and executive summaries to further screen the publications and then read and analysed the content of the selected publications for impacts of climate change on cultural heritage to produce a systematic presentation of the findings.

Current state of the impacts of climate change on tangible and intangible heritage

As detailed in the proceeding sections, we have drawn on a range of sources – peer-reviewed and the relevant grey literature – so that we are inclusive in the selection. Regarding ICH, our effort is to decouple it from Indigenous and local knowledge (a weakness in previous reviews).

The SLR utilises a state-of-the-art machine learning technology known as ResearchLens³⁶, which designed and coded a set of specific pre-defined instructions created by the team. These instructions included keywords and terms the technology could use to determine how relevant a piece of literature was for our review. Each pre-defined category was given a score from 0-1, in which 0 represented no mention of the variable in that piece of literature to 1, the variable was highly present in the literature. To ensure our process did not overlook different combinations of our search terms, categories were created to group all similar terms/ expressions. For example, climate variable *rainfall was categorised with all the terms that were similar or related and included but were not limited to rain, showers, and precipitation. Similarly, this was done for terms relating to our chosen heritage variables, e.g., Intangible heritage, which covered but was not limited to the mention of oral traditions, social practices, or rituals as per UNESCO's definition of Intangible cultural heritage³⁷.

The AI was able to accurately determine the prevalence of these terms by processing content from PDF versions of literature, filtering to separate key information and terms, and removing any lexical noise, including stop-words and less relevant terms. This process allowed us to maintain a stringent criterion, resulting in a set of literature that was refined and specific to our exacting needs, helping us to identify key patterns in each paper's core topics from a small context window and ensuring that the literature we included within the study was the most relevant to our paper.

Although some of our literature was publicly available, a significant chunk was sourced from other paid/academic platforms; therefore, adhering to the relevant confidentiality and data protection regulations was imperative, and this was fully integrated by our provider.

These methods have enabled us to:

- Identify the range of impacts of climate change on heritage commensurate with the diversity, quantity, and severity of the impacts; and
- Produce a comprehensive synthesis of results and an evidence-based analysis.

1.6.5 Negative Impacts of Tangible & Intangible Heritage

It is timely to reassess traditional practices, identified as 'cultural traditions', in the light of climate change pressure. This includes water management practices, agricultural techniques, building methods, religious pilgrimages, food and diet, animal husbandry and hunting, pharmacopeia, and traditional medicine (ethnomedicine), etc. We have identified, when possible, local literature on the issues but the evidence remains anecdotal. We use 'unsustainable cultural heritage practice' at the selection criterion, including open descriptions. Admittedly, this area is very understudied, especially when it considers negative impacts caused by cultural and especially religious traditions in non-European or non-North American environments. Traditional slash-and-burn agriculture, modern religious pilgrimages using air transport, traditional diet promoting high level of meat consumption,

commissioned work on impacts of climate change on intangible heritage [personal communication, <https://link.springer.com/article/10.1186/s42779-022-00147-2>, <https://www.sciencedirect.com/science/article/pii/S2212420921005124>, <http://eprints.sparaochbevara.se/879/>, <https://journals.sagepub.com/doi/full/10.1177/20530196211005482>

³⁶ Find more information here <https://rodotech.co.uk/researchlens/>

³⁷ Definitions used for heritage variables can be found here

https://whc.unesco.org/en/glossary/?action=list&pattern=intangible+&id_keywords=

and replacing of qat for food crops in areas of water scarcity are among cultural practices which can be discussed in technical circles computing the carbon impacts of activities and life cycle approaches but are not studied at the academic level.

In some cases, overuse of materials can cause negative environmental impacts and may be unsustainable practice, including quarrying for stone, harvesting rainforest wood for timber or using large loads of materials for construction. Another negative impact can result from reliance on wood for stoves which lead to deforestation and erosion or hazardous heating systems that produce unhealthy effluent. In some cases, traditional dyes for fabrics can be toxic as can the production of traditional mortars. The last examples are typical of activities that are absent from the academic literature but may be addressed through development projects.

1.7 Synthesis Phase

In this phase we concentrated on the final RFP questions related to the limitations and strengths of previous research in this area and learning and recommendations for further studies in this area.

The Strengths & Weaknesses of Previous Research

Appraising the quality of the included publications is a serious challenge. Here we use the categories established in the ICOMOS White Paper as the basis for assessment and incorporate the suggestions agreed at the Inception Meeting. Throughout our investigation we pay particular attention to use of terminology related to risk and examine inherent inequalities and bias in the previous research, related to the quantitative dominance of English language and western researchers, and other potential sources of bias such as geographic location or urban versus rural setting.

Learning and Recommendations for the British Council and CPF

Having summarized and synthesized the various research threads, utilizing our understanding of the What Works Approach³⁸ and referring to our own field experience, we prepared a set of recommendations for the British Council and CPF. These recommendations, both short and longer term, are directed to how the systematic literature review can support future best practice. Our recommendations are also at regional level where indicated. See section 4.

Research Matrix

Below in summary form is a matrix setting out the research questions and sources of information.

Question/topic	Sources	Comments
Current state of climate change impacts on tangible heritage and ICH	Review of information related to impacts on archaeology, urban heritage, rural heritage, cultural landscapes, ³⁹ and ICH in the international literature, focusing on CPF countries. Inclusion of the national literature, National Adaptation Programmes of Action (NAPA)s, and documents submitted to the IPCC.	Reports from international and bi-lateral development agencies, World Heritage State of Conservation reports and site management plans, UNESCO's ICH at Risk are major sources. Project evaluations are especially important here.
Negative impacts of tangible and ICH on the environment	Review of any information available on negative impacts in the literature, including project reports.	In the CPF countries, there seem to be few published reports. Team's field experience for insights.

³⁸ <https://www.gov.uk/guidance/what-works-network> and <https://www.nordicity.com/news/british-council-what-works-centre>

³⁹ ICOMOS, The Future of our Past, See <http://openarchive.icomos.org/id/eprint/2459/>

Question/topic	Sources	Comments
Hazard-impact diagrams	Design of published reports including the 2021 Systematic Literature Review	Screening to establish how to illustrate interactions among impacts.
Limitations and strengths of previous research	Investigation of publications in languages other than English (French, Italian, Spanish, German, Portuguese, Japanese, Russian, Arabic and Chinese) and in the grey literature	Many “database” publications are in English and from the UK, US, and Europe. For French Persée, fichier central des thèses et catalogue Bibliothèque Nationale are important. No equivalent databases were found for Italian, German, Spanish or other languages.
Recommendations	Consultation with British Council and CPF regarding their needs for: the British Council Heritage Peer and Collaborative Learning Network; DCMS, FCDO, British Council Arts teams globally, external Arts Advisory Group and other stakeholders; the UK government Spending Review and next Tailored Review of the British Council.	What Works is a key criterion and guide for our recommendations. Design of practical recommendations best suited to CPF countries of operation.

Table 1: Matrix of Research Questions

The findings are summarised in the following chapter through charts and graphics enabling decision makers to grasp trends and needs and opportunities.

1.8 Challenges & Risks

Several challenges and risks were identified and successfully mitigated in the course of this review. Table 2 summarises these challenges, their impact, mitigation measures and risk level. Our research design and methodology aimed to mitigate, to the extent possible, the risks which were identified. As we proceeded with our research and analysis, we reassessed the risks and adjusted our work accordingly.

Challenge	Impact	Mitigation	Risk
Weak information and evidence base	Uneven coverage of areas outside Europe and North America leading to uncertainty and bias in findings	To supplement the written record, we have an important international sector network of colleagues in all regions. Extensive field experience in the majority of CPF countries	High A serious risk. Our proposed methodology produced new evidence.
Accessibility of data base through internet	Lack of access could compromise the coverage of the review	Triple Line and UCL facilitated access to information sources	Medium
Lack of agreement on terminology and definitions	Confusion and reduction in validity in findings	We use the UNESCO, ICOMOS Glossary and UN agreed terminology	Low

Contradictory recommendations from literature review and informants	We use our quality screening to determine which is most rigorous	International literature on the matter is often very generic, without reference to local specificity. We have balanced the “academic” approach with field realities	Medium
Internal discussions on how to assess the quality or relevance of a publication	Importance of regular sharing of team experience and views to establish quality criteria.	Extensive inputs on word search and setting up of criteria with powerful tools developed at UCL research lab. Weekly team meetings, email exchanges and ongoing coordination with British Council and CPF	Probable
High time demands to accomplish the coding of the publications	Inadequate time and resource to synthesize findings and draw recommendations	Use of AI-assisted coding techniques to expedite the process	Risk mitigated through adoption of a new technology
Lack of interest in the British Council workshops	Possible decrease in sharing and learning	Our understanding of the local conditions, strategies, and policies. Discussions with British Council, CPF and stakeholders to tailor content.	Risk mitigated
Delivery of documents and workshops in appropriate languages	Reduced sharing and learning	Presentation abstracts can be translated in several languages if needed	Risk mitigated
Difficulty to access non-Latin alphabet database	Uneven coverage of many of the non-Latin alphabet publications leading to uncertainty and bias in findings	Budget to recruit ad hoc experts in Arabic and several languages. Large database of scholars through UCL network	Risk mitigated

Table 2: Challenge, Impact, Mitigation and Risk

1.9 Research Ethics & Application

Triple Line’s Ethical Considerations

Triple Line’s ethical considerations, as included in the supplier response, were adhered to throughout the duration of the Systematic Literature Review. Triple Line’s ethical policies are based on compliance with national and global laws and standards including the OECD standards for Development Evaluation, DFID’s Ethics Principles for Research and Evaluation (2011), and DFID’s zero tolerance stance on corruption and fraud. Our corporate values and ethics are safeguarded through a set of policies and codes of conduct including anti-fraud and anti-corruption, conflict of interest, equity, diversity, and quality. Because the research for this project have been limited to a desk-based review, the project has been identified as low-risk.

Ethical standards based on the values of transparency, integrity and accountability were followed throughout the Strategic Literature Review;

The independence and objectivity of research are without conflicts of interest or partiality;

Our secondary research was conducted in a way that recognises and is sensitive to cultural, socio-economic, environmental, and political context.

Triple Line also adheres to the ethics outlined by the British Council and Evaluation Ethics Policy by:

Maintaining the highest standards of rigour and integrity in all aspects of research;

Supporting a research environment that is underpinned by a culture of integrity and based on good governance, best practice, and support of researchers;

Using transparent, robust, and fair processes to deal with allegations of research misconduct should they arise;

Working together to strengthen the integrity of research and to reviewing progress regularly and openly. Two of our team (J. Taboroff and P. Couté) have taken the required British Council training in the course of the British Council Yemen Country Study.

2 The Systematic Literature Review

In this section we present an overview of previous SLRs, a discussion of materials and methods and an analysis of results.

2.1 Overview and Previous SLRs

A wide range of systematic literature reviews have been undertaken in climate change and heritage, as well as reviews studying relevant but broader areas. These have generally considered relatively few publications: one aim of the present review was to be inclusive of a wide range of types of heritage and geographic regions. Specifically, to address a gap of knowledge about the state-of-the-art in intangible heritage—not considered separately, but as part of a wider assessment of both tangible and intangible heritage. The following is a list of earlier SLRs.⁴⁰

1. Aktürk, G., & Dastgerdi, A. S. (2021). Cultural landscapes under the threat of climate change: A systematic study of barriers to resilience. *Sustainability (Switzerland)*, 13(17). <https://doi.org/10.3390/su13179974> [n=112]⁴¹
2. Fatorić, S., & Seekamp, E. (2017a). Are cultural heritage and resources threatened by climate change? A systematic literature review. *Climatic Change*, 142(1–2), 227–254. <https://doi.org/10.1007/s10584-017-1929-9> [n=124]
3. Ford, J. D., Berrang-Ford, L., & Paterson, J. (2011). A systematic review of observed climate change adaptation in developed nations. *Climatic Change*, 106(2), 327–336. <https://doi.org/10.1007/s10584-011-0045-5> [n=39]
4. Guto, R. (2020). A Meta-Analytical Review of the Role of Indigenous Knowledge on Environmental Conservation and Climate Change in Kenya. *Regional Journal of Information and Knowledge Management*, 5(January), 65–84. [n=220]
5. Horowitz, A. D., Lopez, M. F., Ross, S. M., & Sparenberg, J. A. (2016). Climate Change and Cultural Heritage Conservation a Literature Review. APT Technical Committee on Sustainable Preservation's Education and Research Focus Group, July, 10–26. [n=68]
6. Lam, D. P., Hinz, E., Lang, D., Tengö, M., Wehrden, H., & Martín-López, B. (2020). Indigenous and local knowledge in sustainability transformations research: a literature review. *Ecology and Society*, 25(1): 3. <https://doi.org/10.5751/ES-11305-250103> [n=81]
7. Maldonado-Erazo, C. P., Álvarez-García, J., del Río-Rama, M. de la C., & Durán-Sánchez, A. (2021). Scientific mapping on the impact of climate change on cultural and natural heritage: A systematic scientometric analysis. *Land*, 10(1), 1–19. <https://doi.org/10.3390/land10010076> [n=47]
8. Orr, S. A., Richards, J., & Fatorić, S. (2021). Climate Change and Cultural Heritage: A Systematic Literature Review (2016–2020). *Historic Environment: Policy and Practice*, 1–43. <https://doi.org/10.1080/17567505.2021.1957264> [n=165]
9. Petzold, J., Andrews, N., Ford, J. D., Hedemann, C., & Postigo, J. C. (2020). Indigenous knowledge on climate change adaptation: A global evidence map of academic literature. *Environmental Research Letters*, 15(11). <https://doi.org/10.1088/1748-9326/abb330> [n=236]
10. Quesada-Ganuza, L., Garmendia, L., Roji, E., & Gandini, A. (2021). Do we know how urban heritage is being endangered by climate change? A systematic and critical review. *International Journal of Disaster Risk Reduction*, 65, 102551–102551. <https://doi.org/10.1016/j.ijdrr.2021.102551> [n=29]
11. Sesana, E., Gagnon, A. S., Ciantelli, C., Cassar, J. A., & Hughes, J. J. (2021). Climate change impacts on cultural heritage: A literature review. *Wiley Interdisciplinary Reviews: Climate Change*, 12(4). <https://doi.org/10.1002/WCC.710> [n=191]

⁴⁰40 The list was assembled by Professor Christopher Ballard.

⁴¹41 n = number of references retained for final analysis in each study

12. Shaffril, H. A. M., Ahmad, N., Samsuddin, S. F., Samah, A. A., & Hamdan, M. E. (2020). Systematic literature review on adaptation towards climate change impacts among indigenous people in the Asia Pacific regions. *Journal of Cleaner Production*, 258, 120595–120595.
13. Simpson, Nicholas P., Orr, Scott Allan, Sabour, Salma, Clarke, Joanne, Ishizawa, Maya, Feener, R. Michael, Ballard, Christopher, Mascarenhas, Poonam Verma, Pinho, Patricia, Bosson, Jean-Baptiste, Morrison, Tiffany and Zvobogo, Luckson (2022) *ICSM CHC White Paper II: Impacts, vulnerability, and understanding risks of climate change for culture and heritage: Contribution of Impacts Group II to the International Co-Sponsored Meeting on Culture, Heritage and Climate Change*. Discussion Paper. ICOMOS & ISCM CHC, Charenton-le-Pont, France & Paris, France, 109p. ISBN 978-2-918086-72-7. [Book] [n = 165 for cultural heritage and 1136 natural heritage and sites] <https://doi.org/10.1016/j.jclepro.2020.120595> [n=25]

2.2 Materials & Methods

In this section we set out the materials and methods we used in our SLR research.

2.2.1 Examination of Peer Reviewed Literature

For peer-reviewed and other indexed literature, we implemented two keyword searches for literature published between 2015 and 2022 inclusive as detailed in the Inception Report. The first focused broadly on tangible heritage (n = 2898) and the second on local, traditional, and Indigenous knowledge (n = 1946). **In total we extracted 4,844 articles from the Scopus listing.**

We then implemented a process of exclusions for the literature which we consistently used throughout the project:

1. Exclude resources focusing on impacts on long-term past climate change, e.g., paleoenvironments, pre-Anthropocene, etc. (n = 214 excluded).
2. Demonstrate sufficient focus and emphasis are placed on both cultural heritage and climate change (n = 4009 excluded).
3. Conform to quality/relevance criteria, particularly credibility and confirmability (n = 1 excluded, as the article was retracted).
4. Eliminate duplicates (n = 39 excluded).
5. Assure quality/relevance for literature which could be relevant but for which insufficient metadata or the text was unavailable (n = 54 excluded).

Applying the exclusion criteria left 527 in our subset of included literature. Of particular interest is that the subset contains a good number of results from both search terms (broadly tangible, n = 323; broadly intangible, n = 204). For intangible cultural heritage and traditional knowledge, the agriculture-sector, landscape, and indigenous peoples' literature is an important source. The urban sector and museum-focused literature yielded numerous references for tangible heritage.

For “indigenous” we noticed that in the last two + years, a growing production of articles has advocated for the role of indigenous populations in the assessment of climate change effects on their habitat or socio-economic conditions or calling for a better appraisal of their capacities and specific needs in the debate. Many of these publications touch on cultural heritage issues but without considering heritage conceptually or even naming it explicitly. The status of indigenous people and their claim to specific rights, resources and knowledge are the central focus with only a small group of publications providing sufficient attention to the climate change impact and cultural heritage nexus to qualify for inclusion in our strategic literature review. Technical texts on tangible heritage are very important as well. Coding of the papers gives an overview of the overall corpus. For technical papers or reports we sometimes have limited the number of articles from each topic or areas of interests when compiling grey literature thematic publications in a given journal or symposium publication. For instance, the well-studied “effect of climate change on humidity level and consequences for the maintenance of stone façade for historical buildings in Italy”, or “the elevation of temperature, propagation of fungus and threats to manuscript conservation” offer reference for dozens of articles at the occasion of a single publication. National research bodies, professionals' organisations and

institutes may address the same topics or challenges and contribute to similar corpus and consequently we screened to avoid duplication and to overweight some areas of research.⁴²

Because the most comprehensive database, Scopus, is an English language data base which screens English journals and therefore English text, most references come from English language sources. There are, however, some references from Chinese, Spanish, Italian, German, and French publications. Our search did not identify and publications in Arabic or Japanese. For peer-reviewed literature in French sources we explored two main French data bases to identify relevant publications. We also agreed on the translation of key words into French (changement climatique, climat, patrimoine, culturel, culture, consequence/influence) and Italian (cambiamento climatico, patrimonio culturale/bene culturale, impatto).

These peer reviewed articles were downloaded in full PDF for the team to evaluate in greater detail. We then coded each against the list of aspects of interests as set out in the Inception Report:

- Which climate drivers are discussed;
- Which types of heritage are considered;
- Where the work is based;
- Where the work is focused (which countries);
- Negative impacts on the environment;
- Country income classification

The coding process is deliberate and very time consuming. We were carefully review the texts, including only those which are relevant and compliant with our criteria. Thus, a passing reference to rainfall, sea level rise or traditional knowledge is not enough for inclusion in the list; it would need to be a topic that is considered in some level of detail. See section 1.5.5 on coding methods. For the peer-reviewed literature, the coding also built on work led by Helen Thomas (UCL Institute for Sustainable Heritage / Historic England) that formed the basis for a forthcoming publication on risk assessment approaches currently employed for climate change and heritage.

2.2.2 Examination of Grey Literature

The examination of the grey literature was a complex exercise in view of the number of possible source organisations, each with their own system of website construction and navigation. We also found that the search engines of the organisations are not always comprehensive, for example UNESCO, so it has been necessary to do manual searches looking at individual programmes. We can state that the search functionalities range from basic to advance regarding our topic.

We extracted literature from a range of institutions: heritage focused; international development agencies; and the wider grey literature (catalogues of key national libraries such as the British Library, Bibliothèque Nationale de France etc.). Among the heritage focused institutions, we examined the V&A Culture in Crisis Portal, ICCROM library, the Getty Conservation Institute and the AATA, UNESCO (World Heritage Centre, Intangible Cultural Heritage Secretariat, and other UNESCO programmes and regional offices), the Climate Change Network, the Archaeological Heritage Network (ArchHerNet), the Council of Overseas Research Institutes, and the US National Park Service. We have also added the UK National Trust, the US National Trust for Historic Preservation, the National Lottery Heritage Fund, the US Ambassadors Fund for Cultural Property, World Monuments Fund, and Europa Nostra. We also examined ALIPH, ICOMOS, Historic Scotland and English Heritage.

For development institutions, we extracted titles from the World Bank, the Global Environmental Facility (GEF), UN Food and Agriculture (FAO), EBRD, OECD, GiZ, Sida, AFD and Expertise France, FCDO and USAID. We also added IUCN and examined UNDP and UNEP.

⁴² For instance, corpuses on stone, plaster, foundations, museum hygrometry etc. This is of course more relevant to grey literature.

For the wider grey literature, we consulted the British Library database and checked the Italian Centro Nazionale di Ricerche and other national data base and professional journals especially Persée and CNRS for publication in French.

Of the nearly 400 grey literature references for our date range that we located, after assembling all available PDFs and performing the exclusions, 161 publications were included in the list.

Another challenge at this stage was to sort out larger donors' stocks of publications, reports etc. In exploring the EU data base(s) we applied the same approach as for other donors although the EU has been more inclined to finance cultural/climate change issues, particularly in its Members States. The EU through its numerous directorates and country delegations is the largest international aid institution while the EIB the largest financial institution in terms of amount (now larger in financial commitments than the World Bank). This level of activity implies an enormous quantity of reports, studies, base line etc. published daily. Of course, a very small number of the total directly addresses cultural issues, and crossed with climate change is even less. Although we expected the possibility of thousands of publications, the majority of what we identified were technical, and consisted of projects or programmes formulation rationale and outputs of projects implementation.

If for example we look at a subsector within one Directorate General's operations through the following link we reach several major projects, regional or multi-countries, each of them offering their own data base with publications of scientific interest for cultural heritage and related to climate change (or environmental changes). This is another area of concern as relevant articles may not refer in their titles to "climate change" but rather to a larger topic such as "environment" and its modification due to climate change. However, our exclusion criteria specifies that the publication must use the terms climate change.

Each of the following projects has a list of publications we examined and listed, an example for one project is: Climate change impact on the degradation of historically significant wooden furniture in a cultural heritage building in Vestfold, Norway E3S Web Conf. Volume 362, 2022 BuildSim Nordic 2022 (pdf) [this is not included in the Scopus database].

We screened four of the most relevant EU Directorate Generals (DGs publications for the EU system):

- <https://culture.ec.europa.eu/fr/cultural-heritage/cultural-heritage-in-eu-policies/sustainability-and-cultural-heritage>

The ongoing projects financed under this DG operations 43 of relevance to our research question are;

- <https://shelter-project.com/>
- <http://www.heracles-project.eu/ongoing-achievements/publications>
- <https://www.storm-project.eu/>
- <https://www.hyperion-project.eu/hyperions-vision/>

The examination of non-peer reviewed (grey) sources of information yielded 161 reports that were in PDF form or were able to be converted into PDFs. This selection, however, does not fully capture the activity around climate change and heritage. There were numerous short articles, meeting announcements, blogs and other forms of communication that refer to climate change impacts on heritage that give an indication of current interest in the topic. It is also important to note that not all organisations had adequate search engines so that it was not possible to ensure that all references were identified. UNESCO is a case in point where it was necessary to do manual searches of different conventions and programmes to discover material related to the SLR question. Similarly, the EU website is very complex, thus requiring manual searches of the principal Directorates that may deal with culture within their activities. Importantly, the EU has recently initiated a new concept of "cultural resilience" which is now envisaged to inform all aspects of EU policies and notably the EU Green deal and the New Bauhaus.

The grey literature consists of two types of documents at the international level:

⁴³ See Annexe 1 for in-depth presentation.

- *Research papers commissioned by donors and international organisations.* The bulk of publications originate from the EU and for research papers on technical matters, since 2003 and research papers on the identification of threats to cultural heritage due to climate change; and policy papers on what to do to foster policies and to ensure cultural heritage protection in EU, and how to integrate cultural heritage protection. The latter is a new focus on introducing cultural resilience into existing or planned EU overall policies and actions. At a secondary level, the World Bank group is also addressing similar topics but with a more diffused approach as the World Bank does not launch and implement research programmes at the scale of the EU and does not benefit from the legal prerogatives that the EC enjoys in the EU. The World Bank works primarily at country level and if it were, for example to launch a programme to mitigate the effect on cultural heritage of rising sea level on the coast of East Africa with separate demonstrations actions or studies in several countries and locations, it is not in a position to produce directives to East African countries to incorporate cultural heritage into their national policies and programmes modifying their national laws. ICOMOS and UNESCO are fair producers of research papers with UNESCO's 2006 Secretariat now considering the effects of climate change on ICH. The FAO and GEF have also supported projects and research of relevance.
- *Bilateral agencies operating internationally* such as the British Council and CPF, AFD, GIZ, JICA, Sida etc. These bilaterals are large producers of grey literature in the form of projects documents and final reports especially. Few of them are available openly and they are in general circulated through projects' dedicated website with a limited life expectancy. They directly answer to questions raised by the project activity.

For international projects, the grey literature in general focuses on technical activities, engineering sciences and applied research.

2.3 Limitations & Adaptations

2.3.1 Non-English Sources

French sources. Searches within French data bases did not result in a large number of publications although the protection of cultural heritage is considered a national mission in France since the first edict on the matter in 1513. Furthermore, the French government is active in promoting and financing adaptation and mitigation activities in many economic sectors and local plans incorporating responses to climate change threats are prepared by all local authorities⁴⁴. We believe this small number does not accurately reflect the state of knowledge of climate change impacts on heritage number but is a result of how "climate change" as an overarching term is used. It is sometimes considered as suspect in France⁴⁵ where "sustainable development" remains better accepted. Interestingly, in our interaction with the ICOMOS French which is a very active chapter including its own publications, most of the references provided including by French authors were in English and published through the EU programmes and projects mentioned here above and therefore listed in the English database. These were case studies but also general papers on how to address climate change and cultural heritage in general. Papers written in French on the nexus were very largely found in technical and scientific journals but very rarely mention the two terms in the same paper. A telling example is a collection of texts on gardens and parks examining the elevation of temperature and modification of their immediate environment with no mention of cultural heritage, therefore escaping the database screening. For future research we note that the French Ministry of Culture very recently launched a call for proposal for studies and research grants on the climate change and culture nexus, thus filling a void. Our analysis also reveals that, a fair share of the identified texts in French through the Persée database were research papers from Québec. We can surmise that Quebec may be more accustomed to associate the two terms because of their proximity with the English medium and the wide currency of the topic, "indigenous knowledge" in Canada.

Italian and German sources. Many of the Italian and German language publications include an English summary and are captured in the Scopus data base. We also searched the Italian Centro

⁴⁴ 32,000 thousand of them (half of the total number in the EU) with a local development plan and at least one historic monument per LA.

⁴⁵ As a tool to foster social and economic regression, economic decline, taxes raising etc.

Nazionale di Ricerca index and that of the German science organisation, the Deutsche Forschungsgemeinschaft. Our search included the major heritage organisations in both countries.

Arabic language sources. The search of the Arabic language publications that bring together discussion of climate change impacts and cultural heritage yielded a small number of articles (see Annex 2). Some were academic publications, others were interviews, meeting notices or translations into Arabic of reports from international agencies such as UNESCO. The majority were general texts on the threats posed by climate change. Drivers of climate change most frequently mentioned were sea level rise; drought; increase in soil moisture and salinity; extreme precipitation; and sandstorms. The types of heritage that featured in the discussion were archaeology, historic buildings, and mud brick architecture. Several of the articles mentioned intangible cultural heritage and traditional knowledge as both at risk and as a source of resilience. Specific articles reported on the situation in Egypt, Sudan, Palestine, Iraq, and Yemen with mention of World Heritage sites that were under threat. A few publications referred to institutional responsibilities for mitigating climate change impacts.

The literature raises the alarm bell for the Middle East and North Africa region where global warming is occurring at nearly twice the global rate and shows how vulnerable the region is to the serious impacts and repercussions of climate change. Major climate change effects include:

- Sea level rise
- Water scarcity and shortage
- Increased frequency and intensity of extreme weather events such as heat waves, floods, heavy rains, sand, and dust storms
- Significant impacts on infrastructure, beaches, and fertile lands in the Nile Delta because they are vulnerable to erosion, salt-water intrusion, and flooding.

Cultural heritage and archaeological sites are at particular risk from sea level rise and increased temperature and humidity. Regarding UNESCO World Heritage natural sites, a third of the 252 natural sites are currently threatened by climate change. In 2014, climate change was identified as the greatest potential threat, in 2017, climate change became the fastest growing threat and in 2020 the most prevalent current threat.

2.4 Findings of the SLR

In this section we explore our findings in regard to author, geographic focus, drivers, types of heritage, and strength of relationships explored between heritage and climate, and changes over time. Finally, we compare where knowledge/work is generated with where it is focused to further explore the geographic distribution of research.

2.4.1 Author Analysis

Out of a total of 688 publications from our study period spanning 2016 to 2022, the significant majority - 527 (77%) were peer-reviewed, while the remaining 161 (23%) were classified as grey literature. The 688 publications contained authors and co-authors from at least 98 different countries.

Analysis of the distribution of authors and co-authors across the world points to a high concentration belonging to the Euro Area, European Union (EU), and other high-income countries. Specifically, we have found that the United States and the United Kingdom contribute significantly, comprising nearly 25% of total lead authors in our literature. Authors from France and Italy also contribute a share, comprising of 2.5% and 6% of lead authors, respectively. This aligns with our research that had specifically explored French and Italian language literature in addition to English language literature. These findings emphasise the significant impact of research from high-income countries on shaping the discussion around the relationship between climate change and heritage.

Authors from The British Council Cultural Protection Fund (CPF) regions, including the Middle East and North Africa, East Africa, and South Asia, are not widely represented in the literature. Only a small number of lead authors (10) and co-authors (17) come from MENA countries, with slightly higher numbers from Sub-Saharan Africa (26) and South Asia (17). Among publications focused on MENA

economies, only 29% had a first author from the region. Similarly, 39% of literature from Sub-Saharan Africa had a lead author from the region, and 43% of literature focusing on South Asian economies had a lead author from South Asia.

Despite the relatively low level of research conducted in CPF regions surrounding climate and heritage, a modest percentage of the publications related to these areas are authored by researchers from within their respective regions and the number of these publications shows a gradual increase. There was only one instance of a MENA-based author before 2019, increasing in 2019 to 7 and rising to 29 in 2022. In total, **only 62 instances of a MENA-based author were identified**, representing 2.4% of the total authors on the peer-reviewed publications surveyed. The increase in number of MENA authors is a positive and significant trend as it indicates there is a growing representation of local expertise, perspectives, and insights on climate and heritage within these regions.

For literature based in North America, 64% of lead authors were based within the region. There were slightly less lead authors based in East Asia and Pacific (46%).

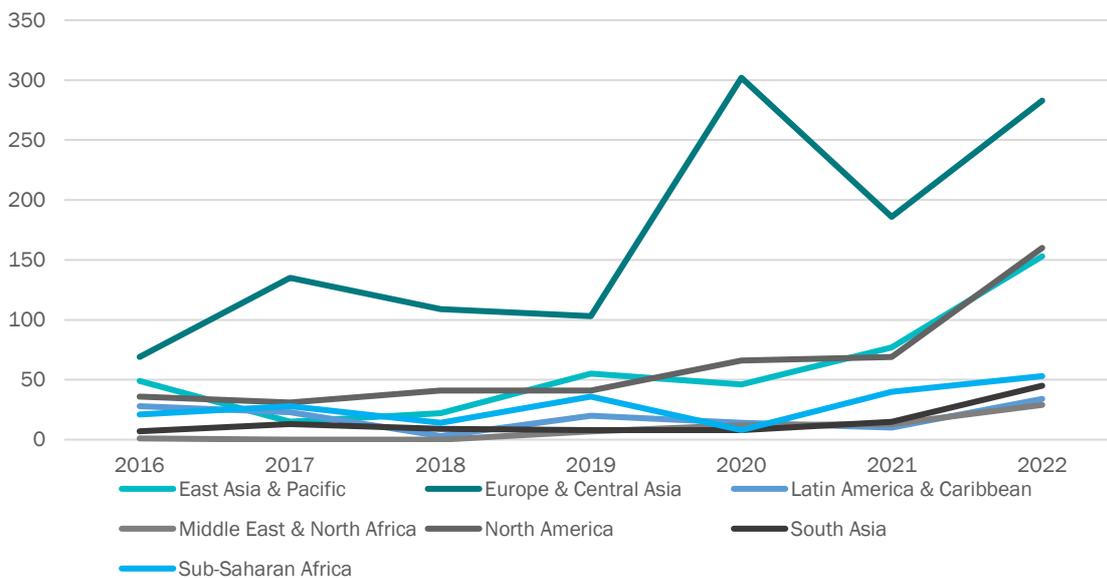


Figure 1: Number of authors by region and year (2016-2022) from the analysed peer-reviewed literature.

All areas are seeing a growth in the number of authors working within them. However, this growth is not equal: for instance, Europe and Central Asia have seen the greatest growth. East Asia and the Pacific, and North America, have increased in the number of publications per year, particularly since 2021. Growth in other regions, namely Southeast Asia, Sub Saharan Africa, and MENA, is considerably slower.

2.4.2 Highly Cited Publications

Limiting ourselves to peer-reviewed publications that have a formal system of citation, the most highly cited publications are reviews, e.g.,

- Thomas, K., Hardy, R.D., Lazrus, H., Mendez, M., Orlove, B., Rivera-Collazo, I., Roberts, J.T., Rockman, M., Warner, B.P. and Winthrop, R., 2019. Explaining differential vulnerability to climate change: A social science review. *Wiley Interdisciplinary Reviews: Climate Change*, 10(2), p.e565. [n > 47 average citations per year]
- Sesana, E., Gagnon, A.S., Ciantelli, C., Cassar, J. and Hughes, J.J., 2021. Climate change impacts on cultural heritage: A literature review. *Wiley Interdisciplinary Reviews: Climate Change*, 12(4), p.e710. [n > 25 average citations per year]
- Fatorić, S. and Seekamp, E., 2017. Are cultural heritage and resources threatened by climate change? A systematic literature review. *Climatic change*, 142(1-2), pp.227-254. [n > 22 average citations per year].

However, there are a few key publications that demonstrate the wide interest in non-technical aspects of this area of research: specifically, the role of cultural heritage in sustainable development⁴⁶ [n > 23 average citations per year] and indigenous community engagement in climate research⁴⁷ [n > 19 average citations per year].

2.4.3 Geographic Focus

The key pattern displayed in the geographies covered in the literature show a **strong correlation between areas of interest studied within peer reviewed literature and wider grey literature**. Using World Bank regions, literature based in Europe and Central Asia is the most common accounting for 47% of our total peer reviewed sample, and 43% of grey literature. Sub-Saharan Africa was the third most common region studied accounting for 11% of peer reviewed literature and equally 11% of grey literature. The relatively higher proportion of grey literature on Sub Saharan Africa may indicate it is a greater area of interest for large international development agencies, local insights, and non-academic sources in capturing the effects of climate change on heritage. The popularity of this region in the grey literature may also indicate a growing interest in acknowledging and incorporating indigenous knowledge systems and practices in research on cultural heritage in the face of worsening climate change.

The increasing interest of Sub-Saharan Africa in the literature is a positive change, however, these changes are not being identified for MENA countries. Literature from this region comprised only 12% of our sample, and over half (64%) of this literature has been authored by individuals from other regions.

When looking at income groups, based on the World Bank Income Groups system, high income countries greatly surpass research in any other income group (63%) across both types of literature. Research from lower middle-income countries, is the second most researched income group, although this comprises a significantly lower percentage (20%). Upper middle-income literature formed 13% and low income 3% of the literature. For the MENA region, which overall represents a small body of research, the grey literature accounts for 19% and the peer reviewed 7%,

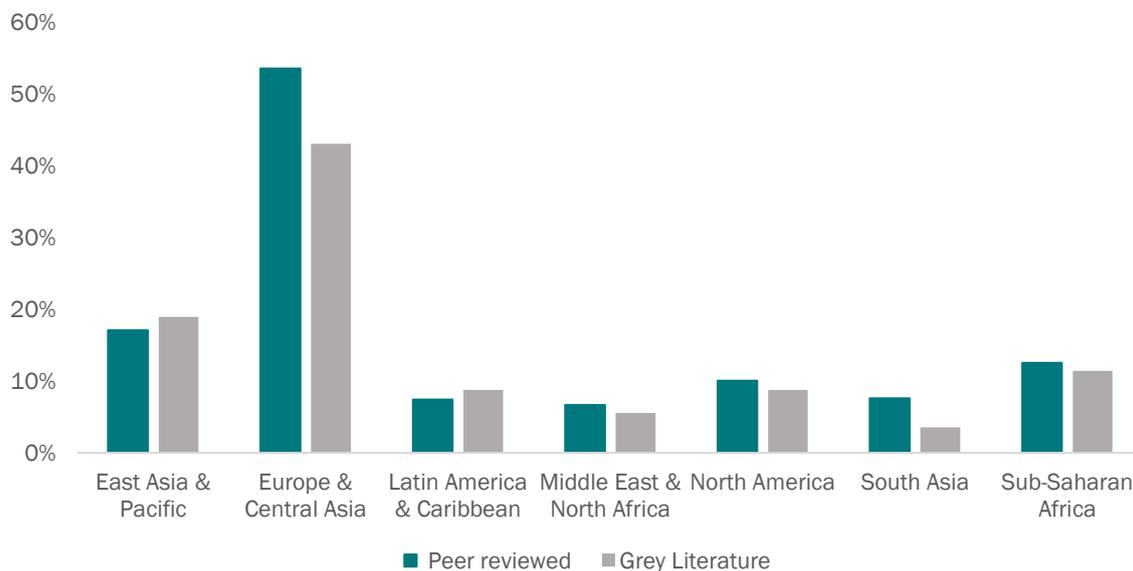


Figure 2: Geographic focus (%) in the grey and peer-reviewed literature, showing the prevalence of focus on Europe & Central Asia across both groups of literature.

⁴⁶ Nocca, F., 2017. The role of cultural heritage in sustainable development: Multidimensional indicators as decision-making tool. *Sustainability*, 9(10), p.1882.

⁴⁷ David-Chavez, D.M. and Gavin, M.C., 2018. A global assessment of Indigenous community engagement in climate research. *Environmental Research Letters*, 13(12), p.123005.

2.4.4 Drivers

The most noticeable feature of the peer reviewed literature when looking at the distribution of climate drivers is the **prevalence of global warming or increases in temperature**, which was mentioned in 80% of the literature. Rainfall was the second most explored driver, discussed in over half (52%) of the peer reviewed papers, similarly storms were mentioned in a quarter (25%), drought in 19% and sea level rise in 15%.

From this we can infer that climate impacts with immediate to short-term consequences are studied in a greater proportion of peer reviewed literature than more extreme drivers with longer onset periods such as glacial melting (6%), wildfires (4%) and landslides (4%). The exception to this is the **popularity of measuring temperature increases as an indicator of climate change**. Although, temperature increases can be measured more frequently and it is internationally recognised as a key component of climate change.

The **distribution of the climate driver focus on the grey literature is much less concentrated than found in the peer-reviewed literature**. Other than the significant prevalence of global warming/temperature increases in just over half of the literature (51%), sea level rise (17%), rainfall (12%) and storms (14%) are slightly more frequent in grey literature. Similarly, glacial melting (3%), wildfires (2%) and landslides (2%) are much less frequently cited.

A further explanation into why temperature and rainfall (in particular for the peer-reviewed literature) are the most studied across the entire body of literature may relate to their significance in cultural landscapes which include farming and agricultural research and issues of food security in the climate change discussion. Temperature increases and more frequent disruptions in rainfall patterns are highly damaging and the effects are usually noticed in a short period of time, this not only makes the effects of climate change more noticeable but easier to study. This may also be relevant for intangible cultural heritage where

Our analysis also identified an increased focus on intangible cultural heritage, which can go some way in explaining why there is a lack of physical drivers being studied as it is harder to identify the specific climate hazards that are threatening intangible heritage. Therefore, climate is discussed as a broader concept.

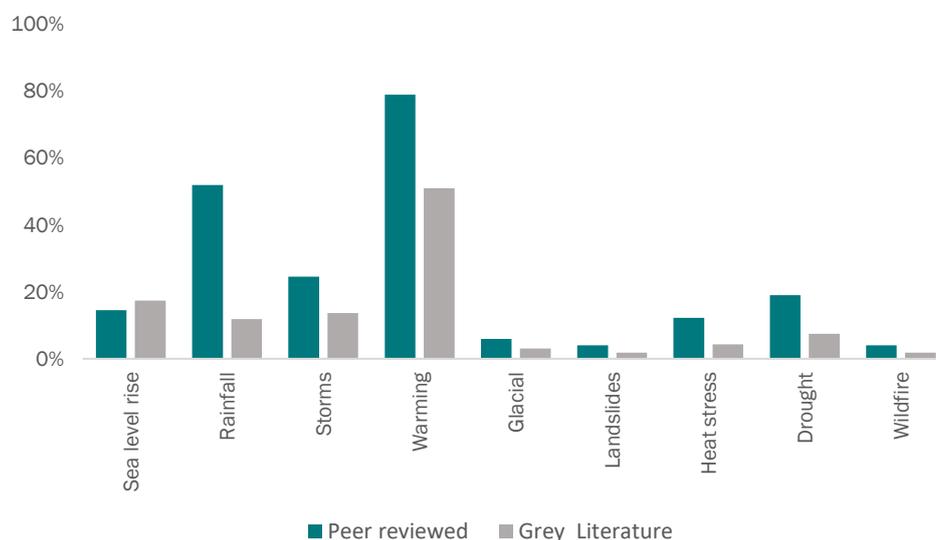


Figure 3: Percentage of literature that pertained to climate drivers, presented for both peer reviewed literature and grey literature (2016-2022).

2.4.5 Types of Heritage

The most frequently studied types of heritage within the climate literature is 'sites' (45%) explored in just under half of the peer-reviewed literature, closely followed by 'built heritage' (40%). Landscapes

and intangible heritage are mentioned in only 16% and 12%, with even less emphasis on moveable heritage (10%).

Similar to the peer reviewed literature, over half (57%) of the grey literature is also clustered around exploring how heritage sites respond to climate drivers. However, there is much less emphasis on built heritage, dropping down to only 17% of literature and moveable heritage amounts to as little as 2% of the grey literature. In contrast, landscapes and intangible heritage have inverted and are now much more prevalent in the grey literature, occurring in a similar percentage of papers.

As mentioned above, landscapes (41%) and intangible cultural heritage (33%) are often explored in tandem as intangible practices are deeply rooted between communities and their natural surroundings, which reflects a shared understanding and nurturing with the environment. Landscapes can also shape and inspire intangible cultural expressions, as they provide the context for various cultural practices. This symbiotic relationship creates a connection that is often studied together to gain a more comprehensive understanding of the cultural and natural aspects the changing environment.

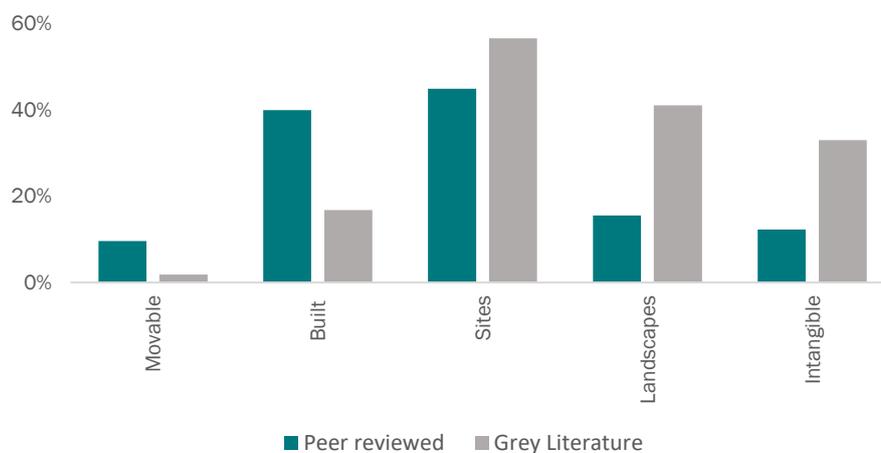


Figure 4: Percentage of literature that studied each type of heritage, presented for both peer reviewed literature and grey literature (2016-2022).

2.4.6 Relationships Between Heritage & Climate

The key patterns when looking at the interrelatedness within and between the types of heritage and climate drivers addressed in our review will be discussed in this section. First, landscapes have a strong positive relationship with intangible heritage, which suggests they are often discussed in the literature together which reinforces our findings discussed above. Buildings and sites are also positively associated, which is consistent with their high frequency in the peer literature.

In a similar vein, rainfall and temperature have a strong positive relationship which could increase our understanding of their high frequencies in peer reviewed literature. Climate drivers that are similar in nature such as rainfall and storms, heat and drought also have a strong positive correlations, but this does not stand for the less commonly explored drivers such as landslides and wildfires. A relationship of note is the correlation of studying opposing climate drivers - rainfall and drought which is also positive. Studying this relationship may provide useful insights into the changing patterns of water availability particularly in areas vulnerable to less frequent rainfall, to help inform adaptation practices.

As mentioned in the peer reviewed literature, the grey literature is also consistent with exploring similar groups of climate drivers such as, precipitation, sea level rise and storms that have a relatively strong association. The majority of the relationships indicated in the peer reviewed analysis also stand for the grey literature, and are primarily within climate drivers or types of heritage being discussed together. There is evidence of a moderate positive relationship across glacial melting and moveable heritage, however, since there was so little literature on glacial melting and moveable heritage this cannot be taken as face value. This also applies to the moderate positive relationship between moveable heritage and drought.

A key feature to note is the noticeable lack of literature branching between specific climate drivers and their effect on types of heritage. This may be because of its more recent rise in popularity and importance, a lot of gaps are yet to be addressed.

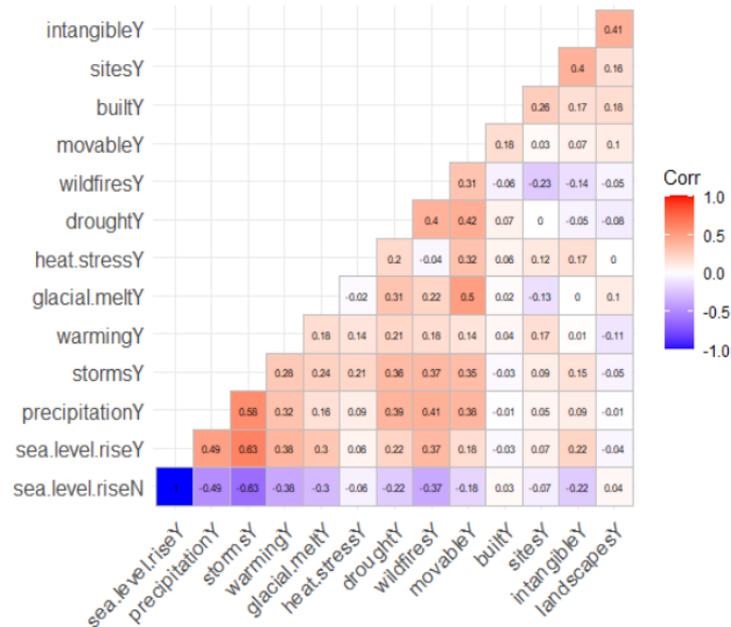


Figure 5: Heat Map indicating the relationship between heritage and climate variables.

2.4.7 Time Analysis

Almost every climate driver has experienced a steady increase as a research topic both individually and collectively since 2016. Following a temporary drop in the number of papers published in 2018 by -31%, this recuperated by the same amount in 2019 (+31%).

Papers published including the relevant drivers increased the most significantly by 44% between 2019 and 2020, during the time of the COVID-19 pandemic.

Global warming and sea level rise have grown quicker as a topic within peer reviewed literature than any other driver, representing just under half (40%) of all literature in our sample in 2022. This indicates the two climate drivers are some of the most well researched drivers in the field, this may be due to them being recognised as universal indicators for a changing climate around the world.

Year	2016	2017	2018	2019	2020	2021	2022
Sea Level Rise	24	31	23	24	47	55	67
Rainfall	4	14	4	7	13	9	25
Storms	5	15	7	17	26	25	33
Global Warming	37	39	38	41	75	80	102
Glacial Melting	3	1	2	5	6	9	5
Landslides	1	2	1	2	4	5	6
Heat Stroke	4	4	5	7	13	16	15
Drought	11	8	7	12	15	23	23

Wildfires	1	1	1	0	6	5	7
Total	90	115	88	115	205	227	283

Table 3: The number of publications studying each climate driver by year (2016-2022).

The overall outlook for heritage literature in the climate change field is positive, showing steady year-on-year increases since 2016, with the exception of 2018 and 2021. Interestingly, sites and built heritage have consistently been the most studied by a significant margin throughout our sample. In 2022, however, landscapes and intangible heritage experienced a surge in publications in a positive way.

Year	2016	2017	2018	2019	2020	2021	2022
Moveable	2	5	4	6	12	8	13
Built	10	20	21	20	48	32	57
Sites	11	33	19	24	53	33	61
Landscapes	4	13	5	5	12	13	29
Intangible	2	5	3	3	11	12	28
Total	29	76	52	58	136	98	188

Table 4: The number of publications studying each type of heritage over time (2016-2022).

The relationship of literature studied by region does not follow as simple a pattern as do the drivers and types of heritage. Europe and Central Asia contribute most of the literature from 2022 in our sample, with minimal focus on CPF regions. Papers on MENA, in particular, have struggled to surpass 2016 output, however if the growth pattern continues in the same way as 2021 to 2022 it could see a return to 2016 numbers. This decline may be due to the rise in conflicts and political instability in the region. South Asia saw a peak in publications in 2021, although these most likely do not include research on conflict areas. Sub Saharan Africa is the third largest focus region, indicating its increasing popularity as an area of focus. This may be due to the unproportional effects of climate change plaguing the region, drawing in more research.

World Bank Regions	2016	2017	2018	2019	2020	2021	2022
East Asia & Pacific	9	6	4	8	18	16	28
Europe & Central Asia	12	38	26	22	70	46	68
Latin America & Caribbean	5	7	3	4	5	6	8
Middle East & North Africa	11	2	0	5	7	3	7
North America	6	4	6	3	11	11	12
South Asia	4	5	1	4	4	13	8
Sub-Saharan Africa	14	6	7	5	2	15	16
Total	61	68	47	51	117	110	147

Table 5: The number of publications over time studying each region, with the British Council CPF regions highlighted in dark blue.

2.4.8 Knowledge Generation vs Focus

It is important to evaluate whether 'centres of knowledge generation', i.e., where authors are institutionally affiliated, overlap with economies in which heritage is being studied. This acts as an

indication of how globalised literature about particular regions and income areas are. Two key indicators of the global flow of knowledge are instances in which the first author (typically the individual who has undertaken the majority of the work) is based in the economy in which they are writing about, and instances in which no author has an affiliation in which the economy of focus.

North American authors are most likely to be writing about the economy in which they are based (64%). In contrast, only 29% of peer-reviewed publications about economies in the Middle East and North Africa were led by an author based in the economy being studied. These figures are not significantly different for Latin America and the Caribbean (31%) and Sub-Saharan Africa (39%).

World Bank Regions	First author affiliation with an institution in that economy (%)	No author affiliation with an institution in that economy (%)
East Asia & Pacific	46	42
Europe & Central Asia	42	40
Latin America & Caribbean	31	64
Middle East & North Africa	29	63
North America	64	23
South Asia	43	50
Sub-Saharan Africa	39	50

Table 6: The number of publications with regards to authorship by region. *The British Council CPF regions are highlighted in teal.*

Further to this, looking at instances in which no author was affiliated with an institution in the economy studied, it can be seen that outside of high-income economies, more than half of the publications for each economy did not include any authors from that economy. While it is important to recognise that there are many ways that local practitioners, communities, and academics may have contributed to the research in other ways (such as focus groups, interviews, and surveys), the work was likely not co-produced with these individuals in a way that acknowledges their contributions as equally as those who have authored these publications.

World Bank Income Lending Groups	First author affiliation with an institution in that economy (%)	No author affiliation with an institution in that economy (%)
High Income	45	37
Upper Middle Income	41	54
Lower Middle Income	40	56
Low Income	14	57

Table 7: The number of publications with regards to authorship by World Bank lending groups.

3 Commentary

In this section we offer additional commentary on our findings, considering three major topics: the intersection of climate change and culture; climate change impacts on intangible cultural heritage and gaps in current coverage and knowledge.

3.1 Understanding the Climate Change & Culture Intersection

Culture is deeply embedded in our relationships to the natural world. All major religions celebrate the seasons and the life cycle, through rituals of light, planting, and harvesting. Religious calendars mark these moments, whether Christmas, the spring festivals of Cherry Blossoms⁴⁸, Persian Nourouz⁴⁹ and the Jewish Sedar or harvest festivals. Seasonal ceremonies are critical social practices. In polytheistic religions, there are gods of agriculture (Demeter, Ceres) and weather (Mayan gods). Climate change brings disruptions and dislocations. Rhythms are upended with implications for crops and thus in food production. Tradition bearers often responsible for ensuring survival of their community which means looking after well-being, knowledge of flora and fauna.

Different types of threats – rain, drought, heat, cold - can also bring forms of adaptation as expressed in architecture, artistic productions, changes in fashion, and habit. Historic global freezes also had strong impacts (ref. Vermeer’s Hat for 17th century freeze with implications for diet, disease, trade etc.).

Distinction between traditional knowledge and culture⁵⁰ Traditional knowledge is at the core of indigenous identity, culture, languages, and heritage. It is transmitted between generations through stories, songs, dances, carvings, paintings, and performances. Increasingly traditional knowledge is recognized as a part of the range of actions needed to mitigate climate change. Transferring knowledge generations is vital. Preserving languages matter: they represent knowledge accumulated over thousands of years on medicine, meteorology, agriculture etc. and are a link to heritage and the sacred as they are repositories of knowledge and main conveyors to transmit practices that can benefit the world today. Indigenous people’s knowledge of their lands includes an array of successful practices, from fire control to water management.

Resilience. A new trend, as evidenced in the EC Report, ‘Strengthening Cultural Heritage Resilience for Cultural Change: Where the European Green Deal Meets Cultural Heritage’ (2022), is to look at strengthening cultural heritage resilience to protect it from the effects of climate change. The report points out that cultural heritage can be a valuable source of knowledge and inspiration for policy makers, heritage managers and society. The report collects 83 good practice examples from 26 countries which illustrate the impact of climate change on cultural heritage and the potential of cultural heritage solutions. Regarding built heritage, it acts as a repository of traditional knowledge and craft techniques that were often born out of resource and energy scarcities. A high percentage of built heritage uses climate friendly building materials, which were locally sourced and manufactured, thus avoiding high transport costs and additional CO2 emissions.

The report points out that:

- Many countries do not have a legal framework for heritage and climate change. Typically, different ministries oversee the two topics.
- Making cultural heritage fit for climate change while avoiding maladaptation is a huge challenge, involving small changes such as continuous monitoring and retrofitting of buildings to avoid heat loss and use of unsustainable building materials (concrete as an example).
- The role of research and innovation in protecting cultural heritage from climate change is paramount.

⁴⁸ Brimblecombe, P., Hayashi, M. and Futagami, Y., 2020. Mapping climate change, natural hazards, and Tokyo’s built heritage. *Atmosphere*, 11(7), p.680.

⁴⁹ Nourouz is listed as an element of intangible cultural heritage by UNESCO. <https://ich.unesco.org/en/RL/nawrouz-nowruz-nowrouz-nowrouz-nauryz-nooruz-nowruz-navruz-nevruz-nowruz-navruz-01161>

⁵⁰ See <https://press.un.org/en/2019/hr5431.doc.htm>

- Education is of primary importance in understanding the role cultural heritage plays in society.
- Awareness of the vulnerability of cultural heritage and the threats due to climate change are low, whether within the scientific community, heritage agencies and managers and often among local communities as well.
- Fragmentation of the sector and lack of coordination are obstacles that impede protection.
- Major downfalls include, the integration of cultural heritage into mainstream climate change policies; knowledge of the scale and dimension of climate change damage and loss of cultural heritage; a coherent methodology for obtaining reliable information and quantitative data; incentives for cultural heritage to mitigate climate change effects; resources to research and implement actions; quantitative data on costs and benefits of adaptation measures; an inventory or central information point on loss and damage to cultural heritage; cross-sectoral cooperation; long-term monitoring of cultural heritage to document changes; and climate change and scientific expertise.

The EU notes that ‘there are no coherent methodologies for obtaining reliable information quantitative data or deep knowledge about the decay and loss of cultural heritage.’⁵¹

3.2 Intangible Cultural Heritage

To date no comprehensive review of the literature on the relationship between ICH and climate change has been undertaken. The UNESCO Safeguarding of ICH Secretariat has commissioned a scoping review of the literature which is currently underway.⁵² In previous years ICH has had low visibility in the literature on climate change with few publications that focus directly on climate change and ICH.

As we have pointed out in Section 2, there is a new trend to greater attention to the ICH and climate change nexus, particularly since 2020. These studies help to understand how ICH engages with climate change.

One of the challenges for the SLR is that the literature is very diffused, and terminology is not consistent, for example the distinction between traditions and ICH.

3.2.1 Underrepresented Types of Heritage

As we have noted, the principal focus of literature dealing with climate change impacts on heritage is built heritage, museums, and moveable heritage. Maritime and arctic heritage are relatively new areas of interest by the heritage sector and have yet to figure in the climate change discourse. It can be anticipated, however, that in the coming years there will be increasing attention to this topic. According to IUCN, ‘climate change has become the biggest threat to the conservation of the 50 marine sites on UNESCO’s World Heritage List and some 70% of these sites are currently under threat from climate change.’⁵³ Not all these sites have a cultural heritage component.

In the case of arctic heritage, rising in temperature can reveal previously hidden sites of exploration and human habitation. New publications (in 2023) are beginning to look at climate change impacts on immovable cultural heritage in polar regions and other related topics⁵⁴

⁵¹ See https://ec.europa.eu/commission/presscorner/detail/en/IP_22_5353

⁵² Personal communication from Professor Christopher Ballard and the ICH Secretariat.

⁵³ See <https://whc.unesco.org/en/climate-change-marine/#:~:text=Marine%20World%20Heritage%20in%20a%20Changing%20Climate&text=Climate%20change%20has%20become%20the,2020%20IUCN%20World%20Heritage%20Outlook.>

⁵⁴ See <https://wires.onlinelibrary.wiley.com/doi/full/10.1002/wcc.822>

Cultural heritage and climate change is a vibrant practice and research domain which is evolving and expanding its scope to examine lesser investigated types of heritage.

3.2.2 Urban Heritage

It is a given fact that urban population is increasing rapidly at global level, especially in Sub Saharan African, East, and South Asian and MENA regions. In MENA by 2021 the percentage of urban population (% of total population) stands at 66 % in contrast to a rate of 35% in 1960. Of the CPF countries the rate of urbanisation is high: Algeria 74%, Iraq 71%, Jordan 92%, Lebanon 89%, Libya 81%, West Bank Gaza 77%, and Yemen 39%. Cities represent the first area of energy consumption and carbon emission, and built heritage, present in most cities in the form of buildings for housing or administrative activities, represents the first obvious and more visible element of the urban cultural heritage. Ironically, the urban built heritage has also to be protected from aggressive policies and regulations aiming at reducing carbon emission for the sake of climate change. For instance, setting up standards and objectives for energy consumption for housing (such 50 Kwh/m²/year in France in 2050) may lead to massive external thermal insulation works on existing facades with immediate effects on architectural perception, or alternatively to encourage destruction and reconstruction of buildings with new and more efficient materials.

The SLR reveals that research papers and advocacy writings promote the “grey energy” approach and the life cycle analysis to mitigate the out-of-context immediate results of energy performance assessment of older urban buildings. Other research is also advocating the need to incorporate the construction and demolition phases in the carbon impact analysis to allow a fair comparison over the longer term between demolition / reconstructions strategies based on energy performance assessment.

Other studies promote the traditional approach to climatic stresses, advocating historic urban forms which offer with narrow lanes, shades and plantations or trees serving as cooler and humidity provider. In that sense the urban cultural heritage is quite often considered to be under threat because of simplistic climate-change oriented policies as well as by economic development although the latter remains the main threat in the global south urban set ups.

3.2.3 Social Dimensions of Climate Change & Conflict

While progress has been made on the science and types of policies that support climate change adaptation and resilience, there is increasing acknowledgement of a need to address cultural and social inclusion aspects.

‘Climate change is more than an environmental crisis – it is a social crisis and compels us to address issues of inequality on many levels: between wealthy and poor countries; between rich and poor within countries; between men and women; and between generations’⁵⁵.

Climate change is deeply intertwined with global patterns of inequality. As the impacts of climate change mount, millions of vulnerable people face disproportionate challenges related to extreme events, food, water and livelihood security, health effects, migration and forced displacement, loss of cultural identity and other related risks. Certain social groups are particularly vulnerable due to a combination of their geographical locations, their cultural and socio-economic status and access to resources, services, and decision-making power.

Increasingly, the perspectives, skills, and wealth of knowledge of communities, whether indigenous peoples or urban dwellers – are being valued in the quest for ways to strengthen resilience and address climate change. Cultural practices have a large role to play in this movement. The growth of literature on these topics is revealed in the SLR.

⁵⁵ See <https://www.worldbank.org/en/topic/social-dimensions-of-climate-change>

A good deal has been written about climate change exacerbating conflict and there are a series of case studies, from the Philippines to Ethiopia, that identify the mechanisms which shape these processes yet, the cultural heritage and climate change literature is largely silent. For example, the ICOMOS White Paper 'Impacts, Vulnerability and Understanding Risks from Climate Change to Culture and Heritage' is silent on conflict in its discussion of risks and vulnerabilities.

Moreover, although there have been questions and concerns about the uneven coverage of literature on the climate change/culture nexus, surprisingly, what has not been examined is the relationship between this topic and conflict.⁵⁶ A recognised weakness of previous literature is that it is uneven in its geographic spread. Our research and field work point to a strong correlation between low rates of coverage and conflict.

Characteristic of countries in conflict are: the weak capacities of government to manage and conserve cultural heritage and of higher education institutions to carry out science-based research; the lack of adequate funding for cultural heritage conservation and safeguarding; low numbers of peer-reviewed publication in the fields of cultural heritage and climate science; limited access for international researchers; and lack of awareness of climate change and cultural heritage nexus on the part of government heritage and environment agencies and managers and site owners. The 2019 Geosciences study found that the common background among co-authors is engineering, earth and planetary science and environmental science. In the MENA and East Africa regions the university faculties of engineering, earth and planetary science and environmental science are at an early stage of development and typically have little funding for research. This is also true of arts and humanities, chemistry, and material science. Therefore, it is rare that they have the resources to carry out research and publish peer-reviewed papers. Moreover, in situations of conflict, it is highly unlikely that field work, other than humanitarian emergency support, is possible. Furthermore, travel advisories issued by the World Bank, EU, the UK Foreign and Commonwealth Office, the US government and other official sources strongly discourage or actively prevent travel in conflict countries. Any travel in the conflict countries is typically non-insurable and visas may not be granted. It can also be difficult to arrange except as part of a humanitarian action, and hazardous.

Examining the list of the 16 countries that are eligible under the Cultural Protection Fund, 8 are currently considered to be conflict countries⁵⁷: Iraq, Libya, Occupied Palestinian Territories, Syria, Yemen, Ethiopia, Sudan, and Afghanistan. Six other countries have areas, usual borderlands, where travel is considered to be hazardous: Algeria, Egypt, Lebanon, Tunisia, Tanzania, Uganda. Therefore, it is only Jordan and Kenya among CPF countries where there are no special travel advisories. For the CPF these are significant considerations which will influence their way of working.

3.2.4 Compounding Effects

It is important to recognise that the physical drivers of climate change do not operate in isolation, but as a complex system. In this way, many impacts of climate change are not the direct result of a single driver, but the result of a complex set of physical changes. It is thus promising to see that many publications discuss several physical drivers simultaneously. For example, in the peer-reviewed literature, more than 61% of the publications discuss three to five physical climate drivers.

It is also important to consider the wider context in which climate change hazards arise for example climate migration, geopolitical relations, and social inequalities. These contextual (sometimes described as indirect) hazards will compound the direct physical hazards that are most typically considered in risk and resilience of heritage in the face of climate change. **Greater research is needed in this area.**

3.3 CPF & Climate Change

The Cultural Protection Fund provides 'grants that will help protect endangered global heritage, preserve local communities and protect sites at risk from conflict or climate change.' In the last two

⁵⁶ For example, the White Paper xxx does not refer to conflict.

⁵⁷ These conflict countries are generally characterised as areas where armed conflict is ongoing.

rounds of grants in 2022 and 2023, many of the projects make mention of climate change in their proposals. Of the 17 large grants, 7 refer directly to climate change⁵⁸.

Project title	Type of heritage	Country/countries	Comment
On the Tracks of Music – Folk Music in the Levant and Mesopotamia	ICH	Lebanon, Jordan, Iraq, Syria	Conflict and climate change
Safeguarding Sudan’s Living Heritage	Museum ICH	Sudan	Flooding is cited as a threat
Athar Lina Heritage Climate Change: Conservation and Capacity Building	Historic buildings	Egypt	Urban heritage
Withstanding change: heritage amongst climate uncertainty	Historic buildings	MENA and East Africa – Egypt, Ethiopia, Zanzibar, Jordan	Impacts to built heritage
EAMENA: Mitigating Conflict and Climate Change Risks through Digital Heritage, Capacity Building and Consolidation ⁵⁹	Archaeology	MENA Algeria, Iraq, Jordan, Libya, Occupied Palestinian Territories, Syria	Conflict and climate change
In situ Preservation of 1.6-million-year-old footprints	Palaeontology Museum	Kenya	An opportunity to understand long term climate impacts
Partnership for Heritage Safeguarding Traditional Architecture and ICH	ICH Historic buildings	Tunisia Libya	Understanding how traditional buildings can withstand climate change and associated ICH practices

Figure 8: Examples of CPF Climate Change Grants in 2022

⁵⁸ It is outside the scope of the SLR to examine the CPF applications and how they identified climate change and the relevance and potential effectiveness of the proposed intervention. This would be an important follow-on study that would draw on the evidence produced in the SLR.

⁵⁹ <https://www.durham.ac.uk/research/institutes-and-centres/durham-centre-for-cultural-heritage/about-us/news/mitigating-conflict-and-climate-change-risks-through-digital-heritage/>

Project title	Type of heritage	Country/countries	Comment
Revitalising the intangible cultural heritage of the Endorois people	Intangible cultural heritage	Kenya	Rising water levels
Documentation and Conservation of Lebanon's Coastal Castles	Archaeology	Lebanon	Coastal zones are at risk from rising sea level
Khan Musallah	Built heritage	Iraq	The site was affected by conflict
Cultural Heritage Preservation Northern Karamoja	Intangible cultural heritage (cultural identity)	Uganda	Conflict as well as climate change

Table 9: Examples of CPF Climate Change Grants in May 2023

Countries in the MENA region which are involved are: **Algeria, Egypt, Iraq, Lebanon, Libya, Syria, Tunisia, and the Occupied Palestinian Territories**. In East Africa they are **Ethiopia, Kenya, Sudan, Uganda, and Zanzibar**.

Types of heritage are **archaeology, built heritage and intangible cultural heritage**. The organisations that are leading the projects are **non-governmental groups (INTO), civil society groups, academic institutions**. These new grants follow on the first pilot phase of grants (2020) in East Africa for projects that address climate change. The five projects including projects in Uganda, Tanzania, Kenya, and Sudan were a first demonstration of the linkages between climate change and cultural heritage and the utility of mitigation actions to protect and safeguard important heritage sites, collections, and intangible practices.

4 Conclusions & Recommendations

4.1 Conclusions

The SLR, covering the period 2015 to 2022 reports on the results of medium and longer-term projects (that is grey literature) for activities which occurred from 2012 to 2020 (based on three years as the average duration of a project) and the academic production (peer reviewed).

The grey literature produced reports which confirm, based on on-site projects, certain negative effects of climate change on cultural heritage. The reports also explored solutions to counteract and mitigate the most serious negative impacts. They can be considered as applied research literature and are the offshoot of previous research projects initiated in the early 2000s exploring, on a more theoretical basis, the possible effects of climate change. This is an important seam of knowledge, in view of the tendency of 'the interrupted flow of information between the theoretical knowledge available at the international level and the passing of that knowledge down to the local management scale.'⁶⁰ We can also emphasise a two-way flow of knowledge from tradition bearers and local experts to researchers.

The grey literature also makes the case for the need for new approaches and policies encompassing cultural resilience with on-going policies, especially economic. This is a very important output as it will open the door for public finance at a larger scale and will foster academic work as well on new topics and areas, especially on the economic dimension of cultural resilience. The academic literature is

⁶⁰ See Geosciences 2019 articles. <https://www.nature.com/ngo/articles?type=article>

composed of articles deriving from research projects and offering sound and solid information and results on specific areas of interest but also, and this seem to be quite recent, on the question of cultural heritage in relation with other areas of interest of the academic, especially in European and North American universities in a logic of intersectional studies. Here it is possible to identify new trends or areas which will be likely to be financed by donors in more substantial levels in the future.

The understanding of what is ICH. Until two decades ago and at donors' level ICH was the poor cousin of cultural heritage activities and programmes. The bulk, of grants and financing was directed to tangible heritage and mostly to buildings of local importance and significance, cultural places, museums, palaces etc. Following the recognition of urban issues in development studies throughout the second half of the 20th century, donors incorporated built heritage as a potential source of stability, or income generation allowing well financed urban services development programmes to secure some small component on heritage protection including physical works. Tangible heritage being served, the ICH sector, then limited to UNESCO, was grew in recognition in donors' policies as an element of stability, economic development (arts and crafts, support to tourism etc.). Other impacts to ICH due to deforestation, migration, and affecting rites and cultural practices came later and through academic and activist publications. This was most famous in South America for the recognition of local cultures as opposed to Spain or Portugal, in countries such as Bolivia for instance. Indigenous knowledge and recognition derive from these cultural 'battles' and represent a large part of the recent publication especially when cross nourished with post-colonial approaches.

4.2 Prospective

4.2.1 Trends of Research

Based on the SLR key words statistical analysis the likely areas of interest to emerge in the coming years includes:

- Cultural resilience and impact on gender, post-colonial studies
- Cultural resilience, oral traditions, and ICH
- Development of specific appraisal tools for cultural heritage assessment regarding energy management, life cycle approach
- Economic appraisal of the social and resilience value of cultural heritage

Other trends or areas to be supported include:

- The roles and responsibilities of stakeholders to assess and document climate change impacts including those of loss and damage.
- Research on economic and social impacts of climate change on cultural heritage
- Identification of resilience measures
- Areas of research for IPCC and COP related to climate change impacts on cultural heritage.
- The management of scientific and climate-relevant information

4.2.2 The SLR as an Operational or Predictive Tool?

The SLR through its large data base and diagrams assist BC or CPF managers to determine the innovativeness of a proposal and the likelihood of its relevance in a given geographical context. Information from environmental studies, for example coastal zones in Lebanon or ecosystems in north Uganda are other important sources of information to help verify claims of climate change impacts on heritage.

The SLR points the main origins of studies and the geographical coverage. of reviewed publications, indicating blank areas and allowing to set up geographic priorities.

As well as provides indications on cultural bias/imperialism/colonialism in cultural studies, as seen through language. Attention to language issues is needed. For instance, activities in the MENA region needs to be circulated in Arabic and French or English depending on the countries to expect an

impact at national and beneficiary levels and to gain some international visibility. This is also the case for Swahili for British Council operations in East Africa for instance.

4.3 Recommendations to the British Council

The results of the SLR to be circulated and explained to British Council staff and partners with a view for the:

- SLR to identify relevant and /or priority projects when analysing future calls for proposal⁶¹.
- SLR to balance British Council /CPF investments per geographic regions or thematic areas.
- SLR abstract to facilitate British Council /CPF staff to the climate change/culture existing climate change/culture corpus of knowledge.
- SLR to promote the assessment of impacts on culture for any adaptation investment project.
- SLR to engage with other cultural heritage funders, namely the Grantmakers for Cultural Heritage Protection funders network (GCHeP).
- To promote interdisciplinary approaches and avoid fragmentation of knowledge and uncoordinated approaches.
- To upscale research to feed into implementation activities.

The SLR results can then become the basis for:

- A knowledge portal for British Council /CPF staff for screening of existing studies related to applications and identify the areas where British Council can make a difference and gain extensive visibility of operations.
- Detailed analysis of the trends in research to identify new areas to be financed in a pursuit for innovativeness.
- Training on climate change impacts on cultural heritage for British Council /CPF staff – and assessors- including training materials.
- Guidance for potential new calls to respond to known flash points, gaps etc.
- Engaging citizens who may not understand climate change and
- Capturing diverse forms of knowledge such as indigenous and local knowledge in building climate resilience.
- To set up a monitoring and evaluation mechanism for the climate change component of British Council and CPF funded projects.

⁶¹ The SLR findings could also help guide priority setting, for example heritage that is likely to be affected by sea level rise or subject to flooding in river basins or intangible cultural heritage that is particularly affected by drought.

5 Annex

5.1 Annex 1. Literature of Note

Global research and action agenda on culture, heritage and climate change <https://openarchive.icomos.org/id/eprint/2716/>

Decolonising climate change-heritage research to recognise and protect invaluable sites & traditions <https://www.ucl.ac.uk/bartlett/heritage/news/2022/feb/decolonising-climate-change-heritage-research-recognise-and-protect-invaluable-sites>

Strengthening cultural heritage resilience for climate change <https://op.europa.eu/en/publication-detail/-/publication/4bfcf605-2741-11ed-8fa0-01aa75ed71a1/language-en/format-PDF/source-search>

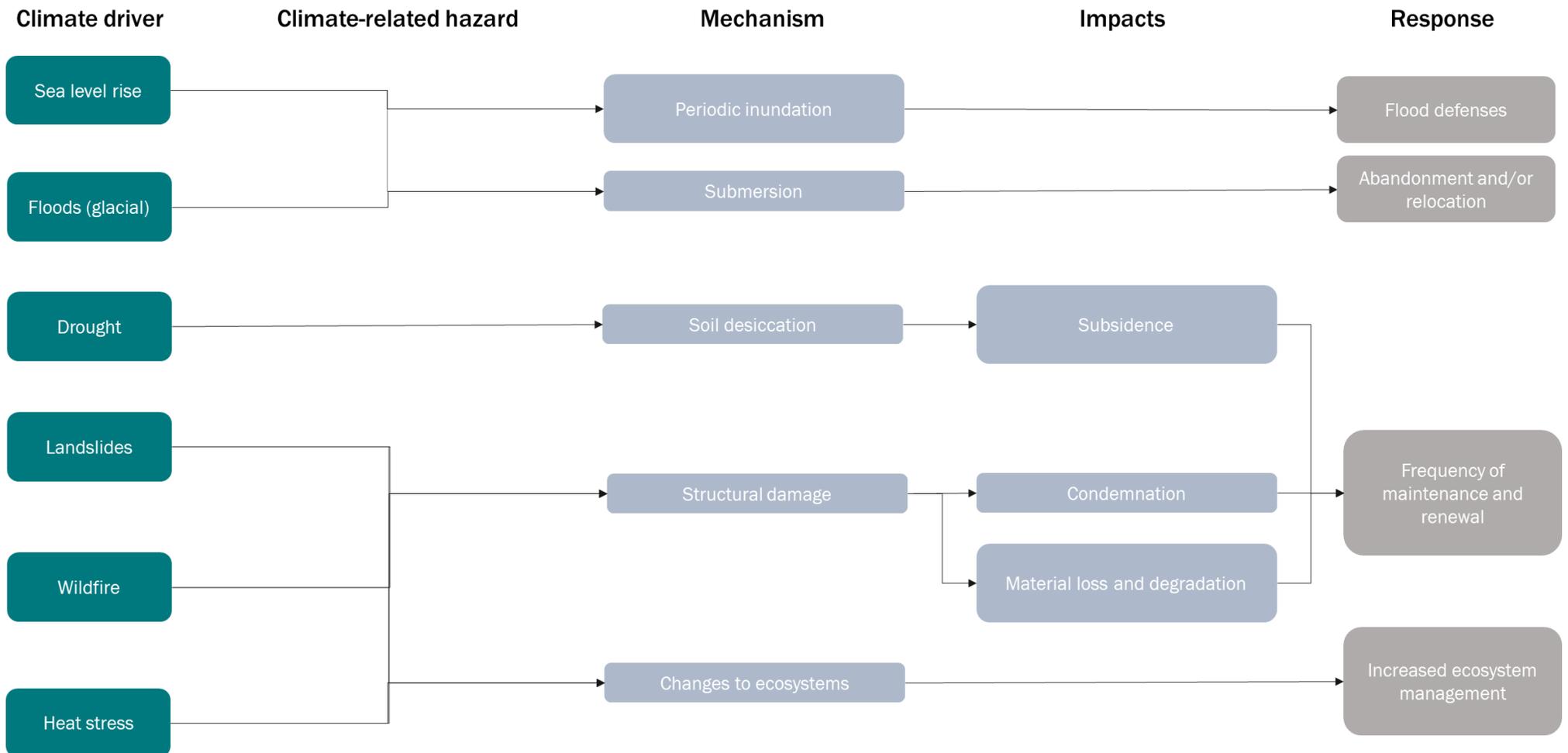
Cultural Heritage and Climate Change: New Challenges and Perspectives for Research White Paper by JPI Cultural Heritage & JPI Climate <https://www.heritageresearch-hub.eu/white-paper-cultural-heritage-and-climate-change-new-challenges-and-perspectives-for-research/>

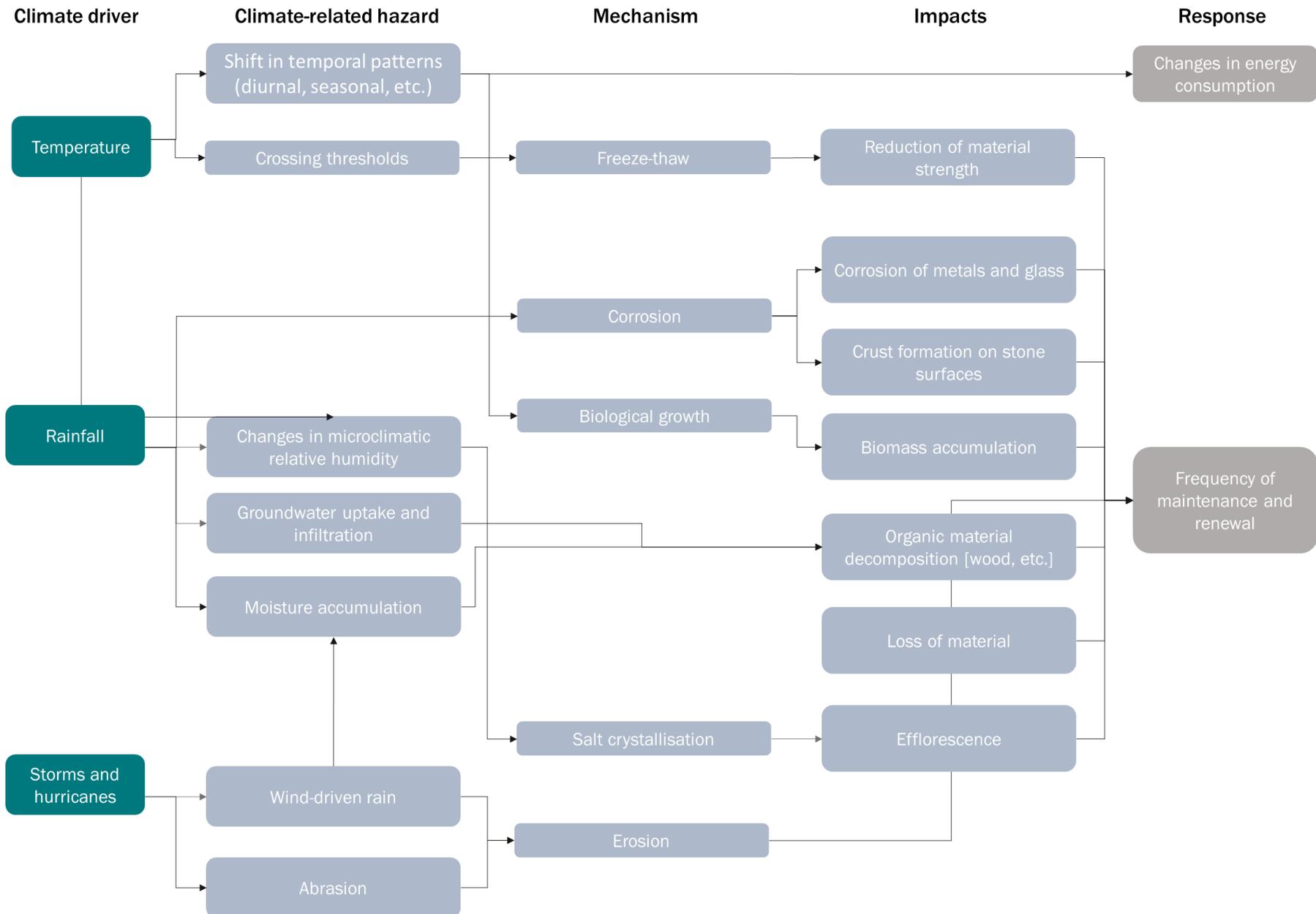
FCDO Discussion paper Nov 2021: UK action to support countries to avert, minimise and address the risk of loss and damage from climate change (including cultural heritage)

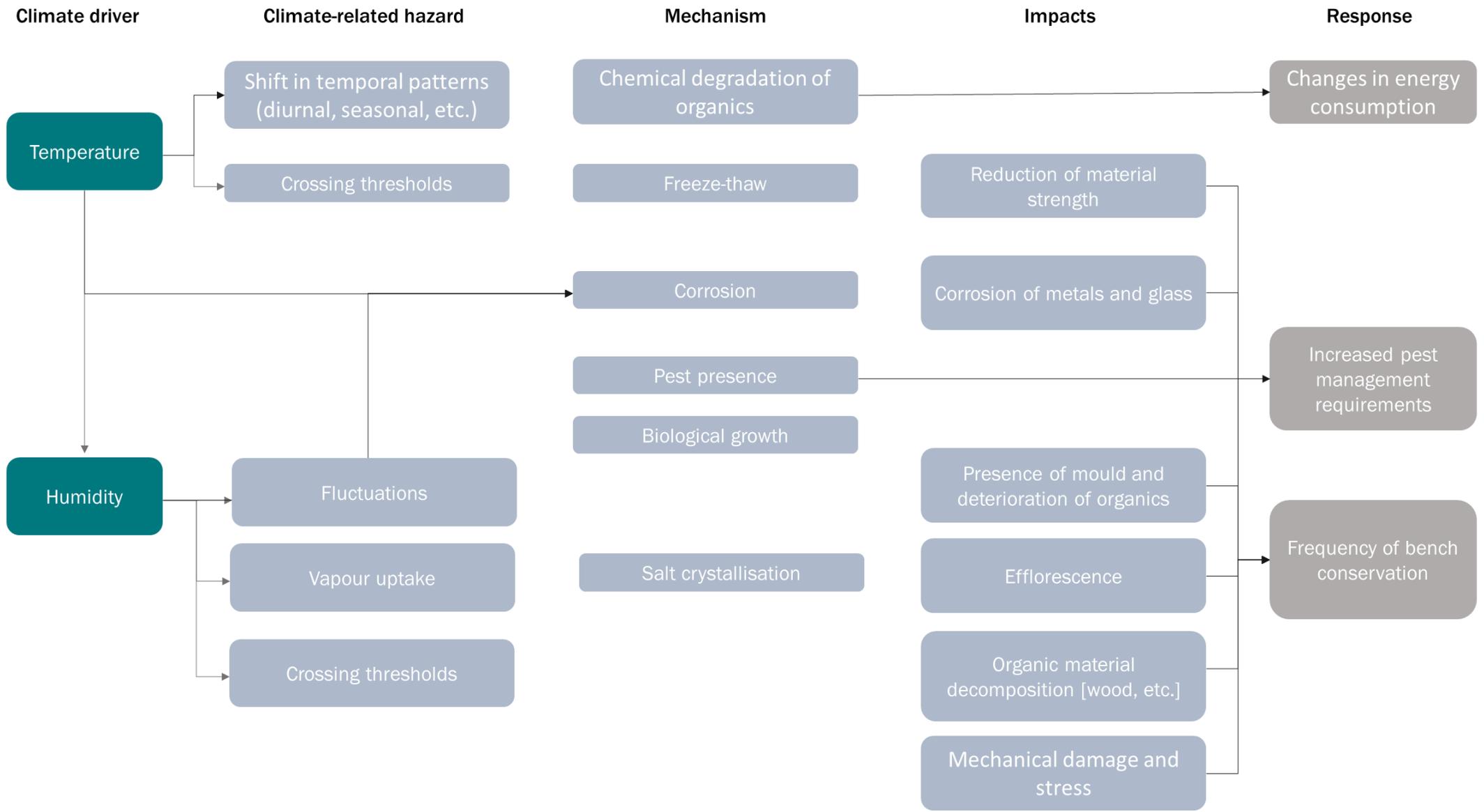
2nd Report: Bridging the Gaps: Cultural Heritage for Climate Action - the Brief Report

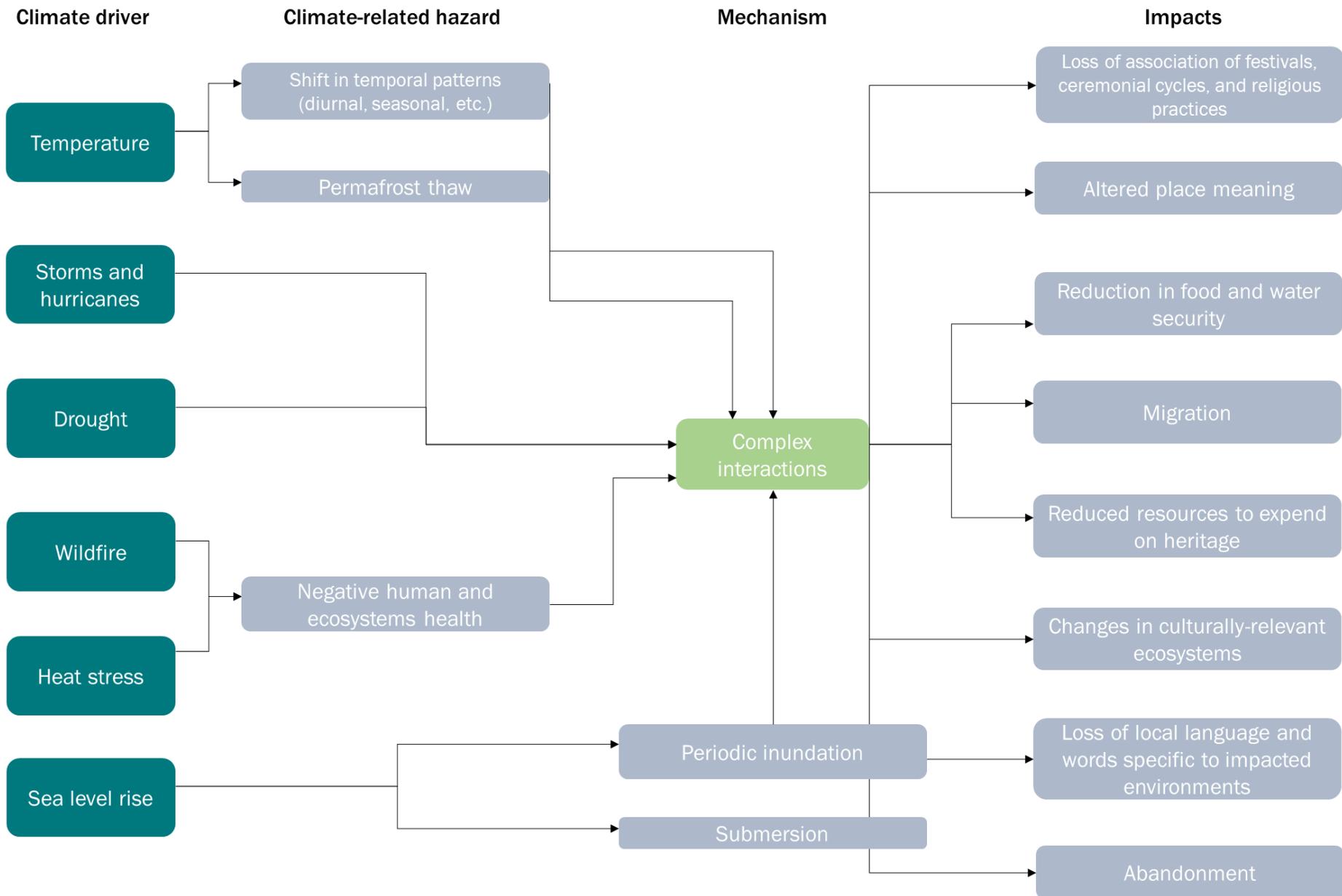
<https://www.sciencedirect.com/science/article/abs/pii/S095965262030642>

5.2 Annex 2. Hazard Impact Diagrams









5.3 Annex 3. Arabic Language Sources

The following is an annotated list of Arabic language publications that matched the key word search and the SLR criteria. In the absence of a comprehensive Arabic language database, similar to Scopus or World of Science, the list must be considered as indicative.

No	Description	Location	The effects of climate change	Reference
1	<p>Despite the low contribution of the Middle East region to the rate of global heat emissions, compared to developed countries it is considered one of the regions most affected by the repercussions of climate change. Droughts and desertification caused a decline in agricultural crop production and a decline in the water level in rivers.</p> <p>With the rise in climate threats as a result of high levels of carbon dioxide, the risks of the global warming problem in developing countries in general and in the Middle East region in particular are increasing twice as fast as the global average. This constitutes a threat to the effects of the Middle East for example Possible influences on the pyramids of Giza, Egypt.</p> <p>The ancient city of Babylon, located in southern Iraq, was founded about 4,300 years ago. Babylon was one of the largest cities in the world, home to the Hanging Gardens, which is one of the Seven Wonders of the World, in addition to the legendary Tower of Babel. Today, the plaster facades that were rebuilt in the city have begun to fall off, while entering some buildings has become dangerous for tourists. The ancient city of Babylon has become a mixture of modernity and antiquity.</p> <p>Eleanor Robson, professor of ancient Middle Eastern history at University College London, said in an interview with DW that groundwater seepage and sweltering summers has led to buildings collapsing.</p>	<p>Middle East</p> <p>Egypt</p> <p>Iraq</p> <p>Libya</p> <p>Jordan</p> <p>Yemen</p>	<ul style="list-style-type: none"> ▸ High levels of carbon dioxide ▸ Global warming problem ▸ Frequent forest fires ▸ Sandstorms ▸ Dangerous levels of air pollution ▸ High soil salinity ▸ Rising landslides. ▸ Heavy rains ▸ Drying up of the main water sources, which led to the disappearance of vegetation and forced the population to leave. ▸ The coastal zone is at risk due to the rise in sea levels and the occurrence of floods. 	<p>تقرير: تحذيرات من تأثير التغير المناخي على آثار الشرق الأوسط</p> <p>Report: Warnings of the impact of climate change on the effects of the Middle East <u>October 1, 2022.</u></p> <p>https://thelevantnews.com/article/</p>

The pyramids of Giza in Egypt are part of the endangered list, as the colour of the stones in the historical structures began to change with cracks due to high temperatures and humidity. Other historical sites in the Middle East are also at risk from frequent forest fires and sandstorms, as well as dangerous levels of air pollution, high soil salinity and sea level rise. In Jordan, there are growing fears that parts of the 2,300-year-old city of Petra, which is rich in cliff-side buildings, are at risk due to landslides. In Yemen, specifically in the east of the country, heavy rains continue to damage the famous brick buildings in Wadi Hadramout, and the torrential rains, which are becoming more common in the country, have washed away brick buildings. In Libya, the ancient oasis of Ghadames is threatened with disappearance due to the drying up of the main water sources, which led to the disappearance of vegetation and forced the population to leave. The archaeological sites overlooking the coast in the region are at risk due to the rise in sea levels and the occurrence of floods.

In September 2022, a team of researchers from the Max Planck Institute for Biochemistry in Germany and the Cypriot Institute published a research paper in which the researchers predicted that the worst is to come. The paper stated that warming in the Middle East and eastern Mediterranean region "is increasing twice as fast as the global average in other populated regions of the world." The results of the research sound alarm bells, as castles, forts, pyramids, and other ancient sites in the Middle East are at greater risk than ever due to climate change. Heavy rains and torrential rains threaten the Yemeni city of Shibam, which is the oldest skyscraper city in the world.

Nicholas Pakertzis, a professor specializing in archaeology and cultural heritage at the Cyprus Institute, expressed his fears that "the cultural heritage in the Middle East is at greater risk than the cultural heritage in other parts of the world, such as Europe." He attributed this to two things: the first is related to the exacerbation of the phenomenon of climate change and the rise in warming at a faster rate compared to the rest of the world. The second reason is that many countries in the Middle East are concerned about issues other than preserving heritage and historical sites, especially since many of them are still groaning under the weight of economic or political crises, as well as conflicts, violence and fighting. He added, "Everyone understands that (preserving heritage) is a challenge, but not everyone can bear the idea of this being a priority."

In the Middle East, there are countries that are making progress in managing archaeological sites to confront the threat of climate change, such as Egypt, Jordan, and the Gulf states, but on the other hand, there are other countries that cannot do the same. In this, Eleanor Robson, a professor of ancient Middle Eastern history at University College London, said that government organizations have been established to manage heritage sites such as the Iraqi State Council for Antiquities and Heritage.

However, she stressed that these organizations suffer from "a severe shortage of resources, equipment and training, due to the sanctions and what happened during the past twenty years in Iraq. Now the need for material resources is more urgent, which makes their maintenance more expensive."

<p>2 Egypt is a country that is highly vulnerable to climate change. According to the Intergovernmental Panel on Climate Change (IPCC), the Nile Delta in Egypt is one of the three most affected places in the world, and future projections indicate that Egypt will suffer from the following climate change impacts: sea level rise; water scarcity and shortage; increasing frequency and intensity of extreme weather events such as heat waves, floods, heavy rains, and sand and dust storms. This will have significant impacts on the infrastructure, beaches, and fertile lands of the Nile Delta because they are vulnerable to erosion, saltwater intrusion, and flooding. Thus, food security, human health, economy, and ecosystems in Egypt are at risk. Moreover, <i>cultural heritage and archaeological sites will be at risk from sea level rise and increased temperature and humidity.</i></p> <p>Egypt is making a great effort to adapt and mitigate the effects of climate change in many vulnerable sectors such as agriculture, water resources, ecosystems, etc. Also, the National Climate Change Council was established to develop strategies, policies and action plans for adaptation and mitigation of the effects of climate change. <i>This research seeks to bridge the gap and investigate adaptation and mitigation strategies and action plans related to cultural heritage sites and what are the necessary procedures for that, and capacity building in this context.</i> The research is based on the analysis of national reports, reports of the United Nations Framework Convention on Climate Change, national action plans, and presidential and governmental decisions related to climate change. An analysis of this data will be presented in the research to provide more</p>	<p>Egypt</p>	<ul style="list-style-type: none"> • Sea level rise • Water scarcity and shortage • Increased frequency and intensity of extreme weather events such as heat waves, floods, heavy rains, sand, and dust storms • Significant impacts on infrastructure, beaches and fertile lands in the Nile Delta because they are vulnerable to erosion, saltwater intrusion and flooding. • Cultural heritage and archaeological sites will be at risk from sea level rise and 	<p>إستراتيجيات وسياسات التكيف والتخفيف مع تغير المناخ المتعلقة بالتراث الثقافي في مصر مجلة كلية السياحة والفنادق - جامعة مدينة السادات</p> <p>Climate change adaptation and mitigation strategies and policies related to cultural heritage in Egypt.</p> <p>Journal of the Faculty of Tourism and Hotels - Sadat City University</p> <p>Article 2, Volume 5, Issue 1 - Serial Number 11, June 2021, Page 21-38</p> <p>DOI: 10.21608/mfth.2021.190352</p> <p>https://journals.ekb.eg/article_190352.html</p>
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	understanding and develop policies to mitigate the effects of climate change on Egypt's cultural heritage.		increased temperature and humidity.	
3	<p>Biosystems, communities and their livelihoods in Algeria, Egypt, Lebanon, Morocco, Tunisia, and the United Arab Emirates are all suffering from the negative impacts of accelerating climate change, according to a new report from Greenpeace Research Laboratories at the University of Exeter in the UK entitled: On the Brink: Implications of Climate Change for Six Nations. countries in the Middle East and North Africa region.”</p> <p>The report shows that the Middle East and North Africa region is warming at nearly twice the global rate and shows how vulnerable the region is to the serious impacts and repercussions of climate change, including severe water scarcity.</p> <p>And based on the scientific findings and facts stated in the report, Greenpeace Middle East and North Africa calls on the global leaders who will meet in Sharm El-Sheikh to participate in the COP27 climate conference within days, to work on achieving climate justice, by establishing a fund to compensate countries and societies that face the most dangerous effects of climate change. As a result of the losses and damages incurred, in addition to fulfilling previously announced pledges in the field of adaptation and risk reduction, and the need to finance alternative development paths for these countries through grants instead of loans.</p> <p>“It is clear that many countries in the region naturally experience very dry and warm conditions compared to other parts of the world, which makes life difficult at first glance,” said Catherine Miller, Scientific Advisor at Greenpeace Research Laboratories. Weather and Climate Patterns Year after year, it now seems clear that the region as a whole has been warming at an accelerated rate of 0.4 °C per decade since the 1980s, which is twice the global rate.”</p> <p>“Lives are being lost, homes are being destroyed, crops are being destroyed, livelihoods are being diminished, and cultural heritage is being erased, yet the historical polluters who contributed to these losses and damages refuse to abide by the ‘polluter pays’ principle and compensation for the losses and damages that the societies of the Global South have incurred and are still suffering from.”</p>	East and North Africa	Warming at about twice the global rate.	<p>منطقة الشرق الأوسط وشمال إفريقيا تشهد احترار يقارب ضعف المعدل العالمي</p> <p>غرينبيس الشرق الأوسط وشمال افريقيا</p> <p>نوفمبر 2, 2022</p> <p>The Middle East and North Africa region is warming at about twice the global rate.</p> <p>Greenpeace Middle East and North Africa</p> <p>November 2, 2022</p> <p>https://www.greenpeace.org/mena/ar/</p>

“Until climate finance is secured, it will remain a significant obstacle for the countries of the Middle East and North Africa region and other countries of the South in their efforts to adapt to and recover from the effects of climate change and move towards a green and sustainable future. It is also the responsibility of the governments of the region to ensure that financing is distributed appropriately. It is appropriate to include the groups most affected and most vulnerable, in addition to investing in alternative development paths that respect local heritage and traditions.”

“It is imperative that we move from fossil fuels to a stage of energy self-sufficiency. There is no reason for us to choose the path taken by the countries of the Global North over the past three centuries, which led to the climate catastrophe we are witnessing today.”

4	<p>Climate change is a major challenge to our societies. <i>Cultural heritage, whether tangible or intangible, natural, or digital, is not immune to climate change</i>, which leads to profound environmental and societal changes, greater frequency and greater intensity of extreme weather events (high winds, heavy rains, heat waves, cold waves, fire, flash flood, etc.), which increases the risk of deterioration and damage.</p> <p><i>But cultural heritage can also be a resource in the context of sustainable development policies, for example through the rehabilitation of old buildings or the revitalization of traditional know-how.</i></p>	General	<p>Strong winds Heavy rain Heat waves Cold waves Fires Flash floods</p>	<p>التراث والبيئة (without date) Heritage and environment https://www.culture.gouv.fr/ar/19/40/7/4</p>
5	<p>Because climate change is related to all human life patterns, its association with culture is directly related. This is because it is related to the ability of the creator to express the environment in its relationship to society and its developments on the one hand, and it is also linked to the architectural and artistic capabilities that establish the cultural structure. Therefore, the effects of climate change on culture and the tangible cultural heritage in particular will cause many societal problems and challenges that can be exacerbated. If it is not worked on, study, implementation, and protection.</p> <p>The report (Knowledge base of culture / cultural heritage and climate change. A collection of data and documents on culture / cultural heritage and climate change in the urban context), issued by the Italian Ministry of Culture, in cooperation with the Foundation for Cultural Heritage and Activities in Italy, with the support of the University of Notre Dame, and a</p>	Oman	<ul style="list-style-type: none"> • Negative effects of changing environmental conditions. • Carbon neutrality 	<p>الثقافة والتغير المناخي 03 سبتمبر 2022 Culture and climate change https://www.omandaily.om/na/الثقافة-اأفكار-وآراء/الثقافة-والتغير-المناخي</p>

working group Climate Change affiliate of ICOMOS, that understanding the relationship between climate change and culture is not only about protecting cultural heritage from "the devastating negative effects of changing environmental conditions, but also because of the prominent role that culture and cultural heritage can play in adaptation and mitigation processes". Therefore, the report focuses on the idea of (the city) as a (unique man-made artifact). It is the result of their creativity, so it is a 'cultural expression', which must be protected from climate changes.

The truth is that the Sultanate of Oman has taken and is still taking many measures and actions related to climate change and achieving (carbon neutrality by 2050). Whether through the work of climate-related institutions, or the enactment of appropriate regulations and legislation that contribute to limiting or mitigating the effects of climate change, or working on statistics and databases, and even preparing (the national strategy for mitigation and adaptation to climate changes), and other national procedures and projects.

The partnership between culture and climate change is a sustainable partnership based on providing best practices to preserve lifestyles on the one hand, and the cultural heritage that represents the identity of societies on the other hand. It is a partnership that presents itself as an "enabler and driver of sustainable development". This is because the culture of society includes all urban lifestyles (cultural diversity, biological diversity, geographical diversity, and intellectual diversity), and because it is also one of the most important lifestyles affected by climate change, and therefore the sustainability of its development and growth will depend on its resilience and its effectiveness in participating in mitigating the severity of the disease. negative effects

The threat of climate change threatens social, cultural, and economic patterns of life, and for this reason the world calls for that effective partnership between institutions concerned with the environment, climate, culture and media, given that this change not only threatens current societal life, but also directly affects development practices for future plans, the more we share in limiting and mitigating its effects. This was in support of the process of societal development, and therefore the *role of culture (institutions and individuals) here is a fundamental one, starting with educating society about the various intellectual writing patterns, and actively contributing to the development of cultural diversity*

	patterns, and creating modern means to preserve cultural heritage, it does not end with active participation in the sustainable investment of cultural resources.			
6	<p><i>Traditional resilience practices in the past can enhance resilience today. Much of this threatened and vulnerable intangible heritage provides opportunities to learn from climate adaptation in the past and increase resilience in the future.</i></p> <p>For example, the pastoral systems used by the nomads of Africa, who follow or herd their livestock to suitable open grazing lands, evolved as effective responses to the natural drought in much of the continent thousands of years ago. Ancient practices of water access and management have a lot to contribute today, too.</p> <p>Indigenous knowledge should be highly valued.</p> <p>Indigenous and local communities are often the first to notice changes in environmental phenomena, as their detailed traditional knowledge of the interactions of local species and weather has been built over many generations of observation and cultural interaction.</p> <p>The three basic types of knowledge—scientific, indigenous, and local—should not be combined into one hybrid system, but rather used together in a “braided” system of knowledge to get the full benefit of different systems and points of view.</p> <p>Indigenous knowledge is often absorbed and integrated into science-based climate impact and adaptation strategies, without the full involvement of the knowledge holders themselves.</p> <p>The same is true at decision-making and policy levels, where indigenous and local communities have not had a platform to speak for themselves, instead of mediating through the voices of others, more often than not, they have not been given access to decision-making and climate action planning, and adaptation plans– lacking basic knowledge, ideas and toolkits of practice.</p>	General	Adapting to climate in the past and increasing resilience in the future.	<p>تجاهل فقدان التراث الثقافي والضرر من تغير المناخ يحتاج COP27 تدخل عاجل من</p> <p>01/11/2022</p> <p>آثار التراث الثقافي التقليل من شأنها</p> <p>Ignoring the loss of cultural heritage and the damage from climate change needs urgent intervention from COP27.</p> <p>The effects of cultural heritage underestimated.</p> <p>https://greenfue.com/</p>
7	Climate change in a fragile country like Yemen has its own importance, as there is something that makes its risk high and its negative consequences and effects more severe.	Yemen	Heavy rain Floods	<p>اليمن في مواجهة مخاطر التغير المناخي</p> <p>5ديسمبر 2022</p>

1. The long-term conflict: The conflict in Yemen, since 2014, has destroyed the country's infrastructure and caused the suspension of many existing projects and plans to confront the consequences of climate change, including, for example, the program to raise the resilience of local communities, not to mention the damage it caused. or caused to the environment.

The ongoing fuel crises in light of the conflict - for example - increased the pace of logging, which led to the shrinking of green belts, and this in turn facilitated the desertification process and made the soil lose its immunity to rain and torrential rains. It remains that conflict areas and their populations are more vulnerable to climate and environmental crises.

2. Weak governance: Yemen is one of the most fragile states in the region. Government policies (and sometimes the lack of policies in the first place) are responsible, for example, for neglecting protected areas, failure or cancellation of related programs and interventions, mismanagement, and exploitation of resources (especially water), and consumption. Unbalanced natural resources, especially water.

3. Chronic economic crisis: There is no doubt that such an economy creates less favourable conditions and less ability to deal with the effects of climate change, as well as less adaptation.

4. The growth of social activities harmful to the environment: the adoption by an increasing segment of the population, within the framework of their economic and productive activities, of adaptation mechanisms that are not sustainable and harmful to the environment, such as the unbalanced consumption of natural resources, especially water; An important part of this consumption is due to the remarkable expansion of qat cultivation, as the vegetation cover is threatened by the dependence of a large part of the population on firewood as fuel in light of the lack of access to other alternatives. Uncontrolled and unsustainable marine fishing also threatens marine biodiversity and destroys the habitats of many marine organisms.

Exposure of archaeological sites in desert regions

Widespread logging phenomenon

Increasing warming leads to an increase in the ability of sea water to penetrate the land, and thus to an increase in the salinization of groundwater in coastal areas.

Rising of temperature

Sea level rise floods low-lying coastal areas, causing many of them to be flooded, as well as the disappearance of many islands and their non-aquatic organisms.

Yemen facing the dangers of climate change.

Yemeni Studies Unit

December 5, 2022

<https://epc.ae/ar/details/featured/alainkishaf-almadid-alyaman-fi-muajahat-makhatir-altghyur-almunakhi>

5. The demographic factor: Although the population of Yemen does not exceed 31 million, according to available estimates, it has one of the highest population growth rates in the world (close to 3%), which contributes to exacerbating the consequences of climate change, given that these Excessive increase is not consistent with the deteriorating economic situation of the country, nor with the current rates of growth and development, and imposes great pressure on natural resources, as is the case with economics and politics.

Threat to cultural heritage: Climate change has emerged as a growing threat to tangible cultural heritage in the Middle East and around the world. In Yemen, archaeological sites are at greater risk, as heavy rains are damaging historical brick buildings and threatening historic cities such as Old Sana'a and Shibam in Hadramout. The torrents wash away the sites of historical monuments, as happened in Marib, Al-Jawf and Hadramout months ago. Poverty and the exposure of archaeological sites are driving an increase in looting and illegal trade in antiquities. While recognizing the importance of cultural heritage and historical sites and the importance of preserving them, the divided Yemeni authorities are preoccupied with issues that they deem more important, especially with the country suffering from protracted military conflicts and raging economic, political and humanitarian crises for nearly a decade.

8	<p>Some of the oldest archaeological sites in Iraq are exposed to destruction due to climate change, as high salt concentrations in them lead to erosion of stones, frequent sandstorms cause erosion of ancient monuments, and the climate crisis exacerbates the problem as temperatures and droughts increase in Iraq. The United Nations estimates that average annual temperatures will rise by 2 degrees Celsius by 2050 with more days with maximum temperatures above 50 degrees Celsius, while precipitation will decrease by up to 17% during the rainy season, and the number of sand and dust storms will more than double. , from 120 per year to 300</p>	Iraq	<p>high salt concentrations Increased days of maximum temperatures salt build-up Sandstorms Lack of rain increasing desertification</p>	<p>تغيّر المناخ يهدد بدمار المواقع الأثرية العراقية أبريل 2022 Climate change threatens to destroy Iraqi archaeological sites. April 16, 2022 https://www.alaraby.com/news/</p>
<p>One of the places to have suffered significant salt damage is the UNESCO-recognized city of Babylon, where 2,600-year-old mud bricks are</p>				

	<p>covered with a salty luster. At the temple of Ishtar, the Sumerian goddess of love and war, the base of the walls collapses as salt accumulates until it crystallizes, cracking and disintegrating the bricks.</p> <p>Other damaged sites include Samra, the capital of the Islamic era, with its spiral minaret being eroded by sandstorms, and Umm al-Aqrabee, with its white temple, palace and cemetery that is swallowed up by the desert.</p> <p>According to the spokesman for the Iraqi Meteorology Department, Amer Al-Jabri, the main cause of sandstorms is the lack of rain and the increase in desertification, with the absence of a green belt around cities.</p>		Lack of green belts around cities	
9	<p>Many studies have warned of the exposure of cultural and natural heritage sites in Arab countries, especially in the north, from the effects of climate change and erosion processes associated with the acceleration of sea level rise, according to the results of the study prepared by a team of climate and heritage risk experts and published in the journal <u>Nature Climate Change</u>.</p> <p>The results indicate that sea level rise will more than triple the number of natural and cultural heritage sites at risk of serious coastal flooding in Africa. And by 2050, more than 190 of these sites could be in imminent danger.</p> <p>Many archaeological sites are affected by two important factors, namely human destruction, or climatic changes. It may be one of the reasons for the destruction or demise of some archaeological sites, especially since the majority of historical buildings belong to mud brick architecture, as they are in constant contact with the ground, which makes them more susceptible to absorbing and transporting water in their structure with its output through evaporation. The increase in soil moisture can lead to more salinization, which constitutes damage to the facades of buildings. Torrential rains lead to damage to the original building materials, which cannot bear large amounts of water and its strong runoff. For example, the floods that occurred in southern Morocco during the year 2015 resulted in the fall of parts historical buildings and facilities.</p> <p>Palestine suffers from impacts of climate change, for example, the level of Lake Tiberias began to decline, in addition to the scarcity of groundwater. A group of objects, as a result of climate change, were</p>	Arab countries, especially in the north Egypt Morocco Algeria Palestine	Erosion processes accompanying the acceleration of sea level rise. An increase in soil moisture can lead to more salinization. Floods The level of Lake Tiberias began to decline. Groundwater scarcity As a result of climate change, it drowned in the waters of the Mediterranean Sea	تداعيات التغيرات المناخية تهدد المواقع التراثية 28 نوفمبر 2022 The repercussions of climate change threaten heritage sites. November 28, 2022 https://www.maspero.eg/investigations-and-interviews/2022/11/28/295172/

	<p>exposed to drowning in the waters of the Mediterranean Sea; they were extracted and are now and displayed in museums inside the Gaza Strip.</p> <p>Algeria was subjected to vandalism during the colonial period. Most of the existing antiquities are Roman antiquities in the first place. We have Ottoman antiquities and a few Islamic antiquities. The state is trying hard to overcome the problems of climate change and work to limit its impact on archaeological sites.</p>			
10	<p>The daily climate change that Egypt is witnessing confirms - beyond any doubt - that the threat of climate change to Egyptian antiquities, whether in Pharaonic, Christian, or Islamic antiquities, will be severe if we do not hasten to take protection and prevention measures.</p> <p>The environment of heritage sites in Egypt is considered the most vulnerable to any climate change in climatic parameters such as sea level rise, temperature rise, storm frequency and intensity, precipitation patterns, drought, surface runoff, ocean circulation, ocean acidity, in addition to physiological effects. These cause long-term damage to many coral reefs, and any change in soil temperature or the amount of water it contains will affect the preservation and preservation of cultural and natural heritage sites, in addition to the resulting disturbances that undermine the process of preserving natural ecosystems, and the sustainability of social and economic systems.</p> <p><i>The study recommended the necessity of establishing and activating crisis departments in the Ministries of Antiquities and the Environment to draw up a specific cultural and environmental strategy to confront the risks of climate change on Egyptian antiquities, protect buried cultural property, seek help from scientific studies in this field, and invite UNESCO to play its role in protecting cultural and world heritage. endangered as a result of climate change.</i></p> <p>The risks of climate change on the buildings of the historic city of Cairo, Alexandria, the Delta cities, the heritage coastal cities, and the cities of Upper Egypt close to the Nile River, which are exposed to dangers more than ever before. Settling of the soil underground and in the formation of high places and depressions in the surface of the earth, which causes the occurrence of large landslides.</p> <p>Rising sea levels could also threaten coastal cities, with the consequent permanent inundation of low-lying areas, and an increase in the</p>	Egypt	<p>Rising sea levels, High temperature Storm frequency and intensity Precipitation patterns Drought Runoff Circumferential circulation Ocean acidity The long-term physiological effects of many coral reefs A change in soil temperature or in the amount of water it contains will affect the conservation and preservation of cultural and natural heritage sites. Sudden and rapid shifts in seasonal transition cycles between hot and cold weather can affect the instability of the</p>	<p>خبير دولي يحذر من مخاطر التغيرات المناخية على الآثار ويدعو لاعتماد بروتوكول دولي لحماية التراث 2 مايو 2022 An international expert warns of the dangers of climate change on antiquities and calls for the adoption of an international protocol to protect heritage. May 2, 2022 https://www.elaosboa.com/266407/</p>

proportion of sea salt chloride in the soil of coastal areas. Changes in the cycles of rainy periods and dry periods lead to crystallization and thawing, which will affect archaeological materials found in the ground and in paintings, murals, and other forms of surface decoration, including pieces of rock art.

The study also monitored an increase in the percentage of soil moisture in old buildings, which leads to an increase in the accumulation and crystallization of salts in a way that harms the facades of these beautiful buildings, which are decorated with arts of lines and geometric motifs. The rains caused serious problems in the rainwater drainage networks in the historical cities, which could not withstand the heavy rains.

subsurface soil and the formation of elevations and depressions in the Earth's surface, causing large landslides.

Increasing percentage of sea salt chloride in the soil of coastal areas

Changes in the cycles of rainy periods and dry periods lead to crystallization and solubility, which will affect archaeological materials in the ground, paintings, murals, and other forms of surface decoration, including rock art.

Increasing the percentage of soil moisture in old buildings, which leads to an increase in the accumulation and crystallization of salts in a way that harms the facades of these beautiful buildings, which are decorated with arts of lines and geometric motifs. The emergence of serious problems in the rainwater drainage networks in the historical cities, which

			cannot withstand heavy rains	
11	<p>The regional workshop organized by the Regional Office for the Preservation of Cultural Heritage in the Arab World (ICCROM-Sharjah) kicked off today in the city of Sharjah entitled “Adaptation to Climate Change in Arab Historical Cities: Merging Cultures traditional buildings in adapting to climate change and directing the management of historic cities towards sustainable paths.</p> <p>This workshop focused on the unprecedented challenges facing cultural heritage due to the real risks posed by climate change, and how heritage itself can mitigate these risks. It is expected that severe weather events due to global warming will cause great damage to cultural heritage in various parts of the world, especially in the Arab region. These damages will not only affect the tangible cultural heritage, but also the intangible cultural heritage of traditional societies. While scientists are looking for scientific solutions to slow global warming and mitigate the impact of climate change, it has also become important for organizations concerned in this regard, such as the ICCROM Center, to focus on how to benefit from traditional practices in proposing treatments and solutions that can be updated or generalized in other regions of the world, with Bearing in mind that traditional practices were by nature keen on preserving the environment and preserving energy and natural resources.</p> <p>About this workshop, Dr Weber Nodoro, Director of the International Center for the Study of the Preservation and Restoration of Cultural Property (ICCROM), says, “The mission and mission of the ICCROM Center is to help its 137 Member States preserve their cultural heritage and make the world a better place to live. From this standpoint ICCROM finds itself directly involved in climate change issues and is committed to helping achieve environmental, social, and economic sustainability, considering the significant damage that climate change causes to tangible and intangible cultural heritage all over the world. ICCROM achieves a world in which cultural heritage is intimately linked with notions of progress, inclusiveness, well-being, and stability.”</p> <p>The workshop aims to present exemplary case studies on the impact of adopting traditional knowledge in contemporary architecture. raising awareness of the seriousness of the risks associated with climate change. The role of traditional knowledge in adapting to climate change</p>	Sharjah, United Arab Emirates,	General	<p>انطلاق أعمال ورشة العمل الإقليمية حول "التكيف مع التغير المناخي في المدن التاريخية العربية" (بيان صحفي)</p> <p>2023/01/31</p> <p>The launch of the regional workshop on "Adaptation to Climate Change in Arab Historical Cities" (press release)</p> <p>01/31/2023</p> <p>https://elfikr.net/?q=node/30466</p>

on the one hand and building the resilience of societies in dealing with disasters and related crises in the event of their occurrence on the other hand. Encouraging research into traditional heritage practices to devise sustainable solutions to prepare for existing and potential risks related to climate change, and for modern architecture compatible with the principles of sustainable development; and encourage those in charge of managing historic cities to coordinate efforts to adapt to global warming with those responsible for urban management and emergency preparedness; Finally, he developed a set of recommendations to serve as a reference documenting the current stage, and to be relied upon in designing the following activities for the authorities concerned with cultural heritage.

Regarding the importance of this workshop, Dr Zaki Aslan, Director of the Regional Office for the Preservation of Cultural Heritage in the Arab World (ICCROM - Sharjah), said: "At a time when many countries around the world have declared an urgent state to put in place practical measures to mitigate the effects of climate change, and have passed laws to deal with global warming. Scientific research on climate change issues, as well as studying its risks to historical cities, is still in its infancy in the Arab region, although studies indicate that the Middle East and North Africa region will be one of the region's most vulnerable to negative effects as a result of climate change. Dr Zaki Aslan adds, "From this standpoint, the importance of this workshop stands out in uniting efforts, promoting dialogue, exchanging experiences, and benefiting from all traditional cultures and practices in building with mud, for example in dry areas. There are great opportunities to learn from cultural traditions in the context of preserving cultural heritage to adapt to change." Climate and proactive preparation for potential risks associated with global warming, while trying to take advantage of the opportunities offered by foreseeing the future to protect our Arab cities.

12	Many ancient human civilizations arose in the Arab world, and those societies invented methods and tools that developed human life and contributed to their transfer from a life of primitive mobility to the life of great cities and civilizations that established social, economic, and political systems. The Arab world consists of 22 countries and owns a large area of land, and the climatic regions vary in it, so the effects of local climate change in the Arab world will not be similar.	Arab Countries Kuwait, Bahrain, the Arab Emirates, Palestine, and Lebanon,	Sea level rise water problem Earth heating Decrease in the amount of precipitation.	التغيرات المناخية في الوطن العربي الماضي والحاضر والمستقبل Climate changes in the Arab world past, present and future https://arabaffairsonline.com/
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	<p>The coasts of the Arab world extend about 1800 kilometres on the Atlantic Ocean, the Indian Ocean, the Mediterranean Sea, the Red Sea and the Arabian Gulf, and most of the population of the Arab world is concentrated in it, and more than 90% of the population of some Arab countries such as Kuwait, Bahrain, the Arab Emirates, Palestine, and Lebanon , Djibouti, and Morocco live on the coasts, and with a sea level rise of 1 meter, the Arab world will lose about 42 thousand square kilometres of coastal lands, and this affects about 40 million people, and it is believed that the most affected will be the coasts of North Africa and the Arabian Gulf; As it will drown about 15% of the Nile River Delta, which is fertile agricultural land on which about 6 million Egyptians depend.</p> <p>The water problem will be exacerbated during the current century with the theory of heating the earth and the resulting decrease in the amount of rain, high temperatures and evaporation, especially with the increasing need of the population for water and the increasing need for irrigation of crops. The emergence of unrest, and some writers expect an increase in international conflicts over water sources in the future, and that finding solutions to the water crisis is important to maintain stability and meet the population's need for water and the growing need for crops. The impact of climate change will be important on water resources in the Arab world, and it may be a cause in the emergence of disturbances</p>	Djibouti, and Morocco	High temperatures evaporation	2023/5/12
13	<p>Three World Heritage sites in the Arab region, namely the Qadisha Valley and the “Cedars of God” forest in Lebanon, Wadi Rum in Jordan, and the Wadan, Walata and Tichit palaces in Mauritania, describing their advantages and presenting the risks they face from the effects of climate change.</p> <p>Climate change and tourism activity are increasing pressure on traditional livelihoods and ecosystems in the Qadisha Valley. The world-famous Cedar Forest is confined to a small area of no more than two hectares.</p> <p>Wadi Rum is a unique desert site in southern Jordan, full of narrow gorges, high cliffs, caves, natural archways, and breathtaking scenery. It has been listed as a UNESCO World Heritage Site for its natural and cultural value, and climate change is expected to exacerbate these problems. Rising temperatures and increasing aridity will exacerbate water stress and will pose a particular threat to species confined to the</p>	Lebanon Jordan Mauritania	<p>High temperature and increased dehydration</p> <p>Desertification due to overgrazing, deforestation, and urbanization</p> <p>Severe long-term droughts and heavy precipitation when it rains</p>	<p>ثلاثة مواقع عربية للتراث العالمي مهددة مناخياً</p> <p>Three Arab world heritage sites are climatically threatened.</p> <p>By Environment News -Oct 9, 2016</p> <p>https://www.env-news.com/in-depth/reports/</p>

high mountainous areas of Wadi Rum. Detailed research on climate change scenarios in the valley is urgently needed.

Ksour, Ouadan, Chinguetti, Tichit and Walata are ancient cities in Mauritania that were important commercial and cultural centers on the caravan routes across the Sahara Desert in the Middle Ages. It is among the UNESCO World Heritage Sites, and desertification is exacerbated in the problematic “Sahel” region, and its causes include overgrazing, deforestation, and urbanization, in addition to long-term severe droughts and heavy precipitation when it rains, which increases the current pressures and conflicts over natural resources.

14	<p>On August 4, 2022, the Cairo Library organized an exhibition and forum “Heritage and Climate”, in cooperation with the Voluntary Team for Humanitarian Action, as part of the activities of the One Million Youth Volunteers Initiative for Climate Adaptation and the Qualitative Climate Union, under the auspices of Professor Yasser Mustafa Othman, within the framework of the <i>National Dialogue for Climate, with the Archaeologists Movement</i>. For Climate to come up with recommendations that help find solutions to preserve human civilization and heritage.</p> <p>For the first time, the first dialogue platform for those interested in the tourism and antiquities sector, “The First Forum of Archaeologists for Climate”, is launched, where Egyptian archaeologists and climate experts sound the alarm about the threat posed by climate change and pollution to the country’s unique ancient heritage, with the increasing number of forest fires and rising surface levels. sea, posing a threat to conservation efforts.</p> <p>Climate change, as evidenced by gradual changes in temperature, precipitation, atmospheric humidity, and wind intensity, as well as sea level rise and changes in the occurrence of extreme events, is already affecting cultural heritage sites in Egypt. Climate It reports on the effects of climatic stresses on cultural heritage and on evaluating the effects of climate change on cultural heritage assets. Scientists and experts have agreed on the effects of climate change on tangible cultural heritage through the development of hazardous impact schemes that focus on the effects of gradual changes in climate on:</p> <p>(1) Cultural heritage exposed to the external environment</p>	Egypt	<p>The increasing number of forest fires</p> <p>rising sea levels</p> <p>Gradual temperature changes</p> <p>Rainfall</p> <p>atmospheric humidity</p> <p>wind intensity</p> <p>sea level rise</p>	<p>منتدى ” التراث و المناخ ” يضع خارطة طريق التكيف للحد من الآثار السلبية للتغيرات المناخية على التراث الانساني</p> <p>August 4, 2022</p> <p>The “Heritage and Climate” forum lays down a road map for adaptation to reduce the negative effects of climate change on human heritage.</p> <p>https://alalameyoum.co/68199/</p>
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(2) The interiors of historical buildings and their collections

(3) Developing a road map for climate adaptation to avoid the negative effects of climate change on heritage.

The Archaeologists for Climate Forum discussed the following:

First: Climate Change and the Global Response

Record temperatures, accelerated melting of ice, inundation of populated areas from sea level rise, out-of-control fires, widespread coral bleaching and high-intensity storms are becoming increasingly frequent around the world, with growing impacts on the species that inhabit the planet, including population and infrastructure. Although the climate system is complex, and there remains uncertainty about the magnitude of impacts, there is a growing body of science, summarized by the IPCC in its assessment reports, that predicts significant warming in the 21st century and associated risks.

The international response to the climate crisis has evolved since the Earth Summit in Rio de Janeiro in 1992 with the first international agreement to address climate change – the Kyoto Protocol – in 1997 and, more recently, the more comprehensive Paris Agreement in 2015. Under the Paris Agreement, all nations are required to participate. Work to reduce or eliminate greenhouse gas emissions. Commitments are encapsulated in countries' Nationally Determined Contributions. At the time of writing, even if all countries implement their NDCs, we can expect a temperature rise of 3.2 °C this century.

15	<p>Previous civilizations left their mark across Africa, from the rock art at the southern tip of Africa to the pyramids along the Nile.</p> <p>A new study warns that climate extremes, sea level rise and other challenges linked to global warming threaten to destroy priceless cultural monuments considered world heritage.</p> <p>"If there is no major intervention, some of the most important features of Africa's heritage will be lost as a result of the direct and indirect impacts of climate change over the coming decades," researchers from Britain, Kenya and the United States say in the journal Azania.</p>	Sudan	sea level rise and other challenges linked to global warming	<p>فيضانات السودان: كيف يمكن أن يدمر تغير المناخ بعض مواقع التراث الثقافي المهمة في إفريقيا</p> <p>2020 /9/14</p> <p>Sudan Floods: How Climate Change May Destroy Some Important Cultural Heritage Sites In Africa</p> <p>https://www.bbc.com/arabic/world-54108420</p>
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	The warning comes at a time when archaeologists in Sudan are trying to prevent the waters of the Nile River from reaching the UN World Heritage site in Al-Bajrawiya.			
16	Climate change poses increasingly daunting challenges to all of humanity and is one of the most pressing global environmental problems. Today, the focus is on strategies to mitigate and adapt to the effects of the crisis, and this includes action at the national level and international cooperation as well. The challenge of decarbonization is the cornerstone of the response to the challenges posed by climate change. It is also a major factor that will change the extent of power and influence at the global level. The threat Qatar faces is sea level rise, but we are aware of these challenges and the benefits of decarbonisation. The Qatar National Vision 2030 has made environmental development one of its four main pillars, with the aim of managing the climate change crisis at the national level. At the United Nations Climate Action Summit 2019, His Highness the Emir of the State of Qatar stated, "There is no doubt that climate change is one of the most serious challenges of our time."	Qatar	Carbon emissions Sea level rise	حفظ الثقافة: حوار حول تغير المناخ أبريل 2023 Preserving Culture: A Dialogue on Climate Change https://qm.org.qa/ar/stories/all-stories/preserving-culture-climate-change/
17	The Jordanian monarch, King Abdullah II, called during his speech at the Climate Conference (COP 27), today, Monday, to save world heritage sites threatened by climate change, such as the Dead Sea and the Jordan River. He said, indicating that "the level of the Dead Sea water is declining at a rate of three feet annually, while only 7 percent of the water flows into the Jordan River compared to its historical rate," according to the Jordanian "Kingdom" channel. He continued, "Oases with their rich biodiversity also disappeared within a few decades in the region, at a time when climate change and unilateral policies related to water resources raise concerns about the future of the Nile River and the Tigris and Euphrates rivers."	Jordan	Level of Dead Sea and Jordan River	ملك الأردن يدعو إلى إنقاذ مواقع التراث العالمي المهددة بسبب التغير المناخي كالبحر الميت 2022/11/7 The King of Jordan calls for saving world heritage sites threatened by climate change, such as the Dead Sea https://sputnikarabic.ae/20221107/%D9%85%D9%84%D9%83-%D8%A7%D9%84%D8%A3%D8%B1%D8%AF%D9%86-%D9%8A%D8%AF%D8%B9%D9%88-%D8%A5%D9%84%D9%89-%D8%A5%D9%86%D9%82%D8%A7%D8%B0-%D9%85%D9%88%D8%A7%D9%82%D8%B9-%D8%A7%D9%84%D8%AA%D8%B1%D8%A7%D8%AB-

<https://arabic.euronews.com/2020/12/02/climate-change-critical-for-the-world-s-natural-heritage-sites>

18	<p>A third of the 252 natural sites classified by the United Nations Educational, Scientific and Cultural Organization (UNESCO) on the World Heritage List are currently threatened by climate change.</p> <p>The International Union for the Conservation of Nature and its Resources announced Wednesday that climate change is the main threat to World Natural Heritage sites, and in its new report, the union of 1,400 organizations and governments indicated that a third of the 252 natural sites classified by the United Nations Educational, Scientific and Cultural Organization (UNESCO) are on the World Heritage List. , are currently threatened by climate change, which poses a greater threat to these exceptional natural sites than that posed by invasive species.</p> <p>It rose to 94, the number of sites that are exposed to great danger or criticality due to several factors such as tourism, hunting, fires and water pollution, an increase of 32 sites from when the last report of this kind was published in 2017.</p> <p>About a third of the sites are at significant risk, while 7 percent are considered critical, meaning that "salvaging them urgently requires additional, large-scale conservation measures."</p>	General	<p>Tourism</p> <p>Hunting</p> <p>Fires</p> <p>Water pollution</p>	<p>التغير المناخي يشكل التهديد الرئيسي لمواقع التراث الطبيعي العالمي</p> <p>02/12/2020</p> <p>Climate change is the main threat to World Natural Heritage sites.</p> <p>https://arabic.euronews.com/2020/12/02/climate-change-critical-for-the-world-s-natural-heritage-sites</p>
19	<p>Climate change continues to affect more natural World Heritage sites. In 2014, climate change was identified as the greatest potential threat, and in 2017, climate change became the fastest growing. In the year 2020,</p>	General	<p>Tourist visits</p> <p>Hunting</p>	<p>النتائج الرئيسية للنظرة الاستشرافية للتراث العالمي الصادرة عن الاتحاد الدولي لصون الطبيعة النظرة الاستشرافية العالمية</p>

	<p>climate change has become the most prevalent current threat, and remains by far the greatest potential threat.</p> <p>Invasive species emerged as the most common threat in both 2014 and 2017, closely tracking climate change as the second most common current threat in 2020. This is followed by the effects of a group of threats derived from human activities such as tourist visits, hunting, fishing, water pollution, and fires and logging.</p> <p>Some assessments show positive aspects of the COVID-19 pandemic, most notably a decrease in tourist visitation pressures on ecosystems. However, the negative factors are multiple. The closure of sites to tourism has caused significant revenue losses, and downsizing of staff at some sites reduces control over illegal activities. These factors, in addition to the loss of livelihoods from tourism in some locations, increase the risks of wildlife poaching and illegal use of natural resources in many locations.</p>		<p>Fishing</p> <p>Water pollution</p> <p>Fires</p> <p>logging.</p>	<p>Key findings of the IUCN World Heritage Outlook</p> <p>Global outlook</p> <p>(Without date)</p> <p>https://worldheritageoutlook.iucn.org/ar/results</p>
20	<p>Practically all the continental and marine sub-regions of the Mediterranean basin are affected by recent human changes in the environmental field. Among the basic factors of change are climate (temperature, precipitation, general air circulation, extreme weather phenomena, sea level rise, temperature, salinity, and acidification of sea water), population growth and pollution. And practices of unsustainable use of land and sea and non-native species. In most regions, ecosystems and human livelihoods are affected together, and the effects will be exacerbated in the coming decades, given the global and regional trends of factors of change, especially the increase in global warming by 1.5-2 degrees Celsius above the pre-industrial level. Coping with the inevitable changes requires tremendous additional efforts, mitigating the factors of change and increasing the ability to adapt and resilience.</p>	Mediterranean basin	<p>Temperature</p> <p>Precipitation</p> <p>General air circulation</p> <p>Extreme weather phenomena</p> <p>Sea level</p> <p>Rise temperature</p> <p>Salinity</p> <p>Acidification of sea water</p> <p>Population</p>	<p>التغير المناخي والبيئي في حوض المتوسط - الوضع الراهن والمخاطر المستقبلية</p> <p>2020 Sep 22</p> <p>Climate and environmental change in the Mediterranean basin - the current situation and future risks</p> <p>Plan Blue</p> <p>https://planbleu.org</p>
21	<p>The United Nations Educational, Scientific and Cultural Organization (UNESCO) has announced a story competition it is organizing "on the topic of climate change and its impact on heritage sites in the world", inviting students between the ages of 12 and 18 to participate in it.</p>	General	<p>a story competition it is organizing "on the topic of climate change and</p>	<p>مسابقة قصصية من أجل التغير المناخي</p> <p>A story competition for climate change</p> <p>(Without date)</p>

	<p>The competition is supervised by an international jury, and the winning stories will be published in different countries of the world, after converting them into cartoon drawings. The conditions of the competition emphasized the importance of the participant's knowledge of the World Heritage site that was chosen in the story and its exceptional value, in addition to mentioning the problem of the site based on the effects of climate change, and developing proposed solutions or measures, so that the comics will be received on the sixteenth of next October.</p> <p>She pointed out that climate change is one of the biggest threats facing cultural heritage in natural sites.</p>		its impact on heritage sites in the world"	<p>https://omannews.gov.om/topics/ar/6/show/408092/</p>
22	<p>Young people will deal with the threats and opportunities of climate change, whether by choice or imposed on them, and whether they want to or not.</p> <p>Young people today, from all over the world, are standing up and demanding due attention be paid to climate change. They are outraged by these sometimes seemingly inevitable perceptions, and they are confident that their contributions will bear some fruit.</p> <p>Climate change is not a separate phenomenon. It will affect young people in all aspects of their lives. In many cases, the effects of climate change will be stronger on developing countries.</p> <p>Therefore, there is a critical importance to empowering and involving youth in responding to climate change.</p>	General	Youth and climate change	<p>في المواجهة: الشباب وتغير المناخ ملحق الشباب لتقرير حالة سكان العام 2009 Youth supplement to the State of World Population Report 2009</p> <p>https://mexico.unfpa.org/sites/default/files/pub-pdf/arabicyouthsupplement.pdf</p>

5.3 Annex 4. Research Projects

Projects related to climate change impacts on cultural heritage under the EU RESEARCH PROGRAMMES – Framework Programme 6, Framework Programme 7, Horizon 2020, and Horizon Europe.

Noah's Ark: global climate change impact on built heritage and cultural landscapes (2004–2007)

Sustaining heritage: sustaining Europe's cultural heritage: from research to policy (2004–2005)

Climate for culture: damage risk assessment, economic impact, and mitigation strategies for sustainable preservation of cultural heritage in the times of climate change (2009–2014)

Firesense: fire detection and management through a multi-sensor network for the protection of cultural heritage areas from the risk of fire and extreme weather conditions (2009–2013)

CHEF: cultural heritage protection against flood (2007– 2010)

Wreckprotect: strategies for the protection of shipwrecks in the Baltic Sea against forthcoming attack by wood degrading marine borers – a synthesis and information project based on the effects of climatic changes (2009– 2011)

Effesus: energy efficiency for EU historic districts sustainability (2012–2016)

Hercules: sustainable futures for Europe's heritage in cultural landscapes – tools for understanding, managing, and protecting landscape functions and values (2013– 2016)

Fragus: fragility and sustainability in restricted island environments – adaptation, cultural change, and collapse in prehistory (2013–2018)

Coordinating for life: success and failure of western European societies in coping with rural hazards and disasters, 1300–1800 (2014–2019)

Memola: Mediterranean mountainous landscapes – an historical approach to cultural heritage based on traditional agrosystems (2014–2017)

Iperion CH: integrated platform for the European research infrastructure on cultural heritage (2015–2019)

Heracles: heritage resilience against climate events on site (2016–2019)

STORM: safeguarding cultural heritage through technical and organisational resources management (2016–2019)

Warmest: warmest low altitude remote sensing for the monitoring of the state of cultural heritage sites – building an integrated model for maintenance (2017–2021)

Hyperion: development of a decision support system for improved resilience and sustainable reconstruction of historic areas to cope with climate change and extreme events based on novel sensors and modelling tools (2019– 2020)

Shelter: sustainable historic environments holistic reconstruction through technological enhancement and community-based resilience (2019–2023)

ARCH: advancing resilience of historic areas against climate-related and other hazards (2019–2022)

Heriland: cultural heritage and the planning of European landscapes (2019–2023)

PRO-Heritage: protect traditional built heritage skills (2019–2022)

CHICC: culture, heritage and identities – impacts of climate change in northwest Europe (2020–2022)

YADES: improved resilience and sustainable reconstruction of cultural heritage areas to cope with climate change and other hazards based on innovative algorithms and modelling tools (2020–2024)

EU-MACS: European market for climate services; EU-MACS in tourism: the use of climate services in tourism – strengthening climate resilience (2016-2018).