RECOMMENDATIONS FOR A CULTURAL HERITAGE & CLIMATE CHANGE POLICY IN JORDAN

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Funding bodies: UK Arts and Humanities Research Council (AHRC)
www.ukri.org/councils/ahrc/

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Citation: Finlayson, B., Rouhani, B., Abedalhaleem, H., Firas, D. and others (2025) Recommendations for a cultural heritage and climate change policy in Jordan. Oxford: University of Oxford and Petra National Trust. DOI: 10.5281/zenodo.17250493

ISBN: (2025/10/5907)

Acknowledgments

This document is the result of a collaborative effort between the Petra National Trust (PNT) and the Endangered Archaeology in the Middle East and North Africa (EAMENA) Project at the University of Oxford, with valuable contributions from various Jordanian national and local government entities, Non-Governmental Organisations, and regional partners from Palestine, Iraq, and Egypt.

We extend our sincere gratitude to the UK Arts and Humanities Research Council (AHRC) for funding this project and to the British Council's Cultural Protection Fund for supporting climate impact assessments of heritage sites that formed the foundation of this work. Acknowledgement is extended to the Palestinian Ministry of Tourism and Antiquities, the Department of Antiquities of Jordan, the Ministry of Environment, the As-Salt Greater Municipality, the Baptism Site Commission, the Petra Development and Tourism Region Authority, as well as the ICOMOS Working Group on Climate Action and ICOMOS Jordan.

Additionally, we appreciate the dedication of heritage professionals, climate experts, policymakers, and civil society members who engaged in discussions, workshops, and policy development, ensuring that this document reflects diverse perspectives and practical recommendations.

Finally, we recognise the efforts of researchers, conservationists, and governmental institutions who are working tirelessly to safeguard Jordan's cultural heritage amidst the challenges posed by climate change. Their commitment to resilience and preservation has been instrumental in shaping these recommendations.

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Excutive Summary

This document is the result of a collaborative project between the Petra National Trust (PNT) and the Endangered Archaeology in the Middle East and North Africa (EAMENA) project at the University of Oxford, assisted by several Jordanian national and local government bodies, NGOs, and partners from Palestine, Iraq and Egypt, with the aim of developing recommendations for a cultural heritage climate change policy. The project reviewed international and national climate change and related policies before coming up with these recommendations.

Funded by the UK Arts and Humanities Research Council (AHRC), this project builds on climate impact assessment work supported by the British Council's Cultural Protection Fund. These assessments focussed on the World Heritage Sites of As-Salt, the Baptism site, Tell es-Sultan (Jericho), the latter conducted in collaboration with the Palestinian Ministry of Tourism and Antiquities. This work has been combined with PNT's assessment of climate vulnerabilities at the World Heritage Site of Petra.

The following recommendations emphasise a holistic approach to addressing climate risks, building capacity, centred on people, and prioritising mitigation, adaptation, a collaborative climate change and heritage network, and sustainable financing. They require political will, policy action, and coordination among government agencies and stakeholders.

Key Recommendations:

▸ A Holistic Approach to Heritage

To effectively safeguard cultural heritage and mitigate the adverse impacts of climate change, all dimensions of cultural heritage—including its diverse forms, historical periods, and structural variations—must be comprehensively integrated. Tangible and intangible heritage must be approached as an interconnected whole. Climate impacts on cultural heritage will have wide-ranging effects on people, living heritage such as historic city centres, the tourist industry, archaeological remains and the landscape.

The interconnection of culture and nature should be acknowledged. Cultural heritage is deeply rooted in landscapes, bound to the natural world. Adaptation strategies should follow Article 7 of the Paris Agreement, being sensitive to specifics, including considerations of gender and local communications, place-based and traditional knowledge and community values and concerns. A holistic perspective is crucial, particularly given the significant role of traditional knowledge in bolstering resilience and alleviating the adverse effects of climate change.

▸ Understanding Climate Risks and Vulnerabilities

Projections of climate change and its potential impacts and cascading effects on cultural heritage are essential tools in developing effective risk assessments. For each region, landscape, and cultural site, multiple climate scenarios must be evalu-

ated, incorporating analyses of anticipated and projected changes, addressing the potential consequences of varying climate scenarios, greenhouse gas emission projections, and global warming trajectories.

Heritage, especially World Heritage Site managers must possess a comprehensive understanding of the specific climate risks related to the site they manage, the vulnerabilities of the sites in their care, the adaptive capacity of systems and the potential impacts on surrounding communities. Risk assessment should take into account future hazards, risks, vulnerabilities, and human responses.

Creating accessible, searchable, and shareable databases with baseline information on cultural heritage sites is a critical step toward assessing potential vulnerabilities and risks effectively. This may include the establishment of a climate risk register for heritage places.

Climate risk actions should prioritise implementation at the local level on matters the cultural heritage sector has full control of and not global issues outside of control. Engagement with local communities in the risk assessment process is essential, and they should be kept informed of assessment outcomes to ensure transparency. They need to be actively engaged in building resilience and achieving effective climate adaptation measures.

▸ The Need for Capacity Building and Education in Climate Action

Climate change represents a current and emerging challenge to cultural heritage, and the cultural heritage field is not well placed to respond to the scale of current and future impacts. Training and capacity building on policy and implementation is needed for heritage professionals, decision makers, NGOs, municipalities, universities, and local communities to ensure that climate actions are informed and appropriate. A national awareness campaign, starting with elementary schools, is recommended. PNT is working with the National Centre for Curriculum Development to integrate cultural heritage and climate change related materials. Cultural heritage and World Heritage sites can serve as educational platforms to raise awareness about climate change risks among younger generations and local communities.

▸ People-centred Approach to Cultural Heritage and Climate Change

Adopting a fundamentally community-based and people-centred approach is essential for long-term effectiveness and sustainability. The diverse values of cultural heritage can only be effectively identified and recognised through a participatory model involving all stakeholders, including local communities. Addressing existing barriers relating to issues of justice and equity necessitates engaging typically underrepresented groups—such as youth, women, and marginalised communities— and is essential in discussions around the identification and appreciation of the full spectrum of cultural heritage and its associated values.
This people-centred approach is also crucial for assessing climate change-related risks, analysing vulnerabilities, and understanding how climate change may impact cultural heritage and the communities reliant upon it. It is also essential to allow sustainable climate action to become embedded in cultural heritage management.

▸ Mitigation

Cultural heritage can act as both a contributor and mitigator of greenhouse gases. The UNESCO Policy Document on Climate Actions (2023) identifies carbon mitigation as the key strategy for limiting global temperature increases in line with the 2015 Paris Agreement, and for reducing the resulting impacts on cultural heritage. The heritage sector has two main contributions:

1. Producing greenhouse gas emissions (direct and indirect emissions, including the role of tourism).
2. Reducing/ sinking greenhouse gas emissions through i.e. culture-nature links, retrofitting historic buildings for carbon efficiency, and circular economy/ recycling at sites.

UNESCO encourages World Heritage Sites (WHS) to be exemplars of carbon mitigation and climate action. These sites can act as models for similar actions at other heritage sites.

▸ Adaptation

Adaptation is necessary where mitigation cannot reduce risk. Every WHS should develop a climate change adaptation plan based on the specific climate change scenarios and risks established in the assessments conducted. Risk assessments should precede all adaptation actions and should evaluate the potential for maladaptation. Monitoring is key to understanding both the impacts of climate change and the effectiveness of adaptation activities, as well as for identifying maladaptive actions.

Climate change adaptation must address all hazards directly and indirectly linked to climate change, including the associated vulnerability factors—whether physical, social, economic, or institutional. Climate change acts as a risk multiplier, amplifying existing hazards, exposures, and vulnerabilities affecting cultural heritage, and these may be further compromised by poorly designed adaptation or mitigation strategies, known as maladaptation.

Cultural heritage, along with its inherent values, holds the potential to enhance social resilience and aid in recovery from climate-induced losses by offering a common framework to identify potential risks and by fostering a sense of place, continuity, and identity. Locally led and nature-based solutions should be explored where appropriate to ensure sustainable and synergistic climate action, which also aligns with broader social and economic benefits.

▸ Climate Change and Heritage Network: Towards Multi-Sectoral Coordination

Jordan's cultural heritage encompasses a vast range of forms and historical periods, spanning from prehistoric times to the contemporary era. It includes both tangible and intangible heritage, such as diverse traditions and ways of life, offering a rich spectrum of cultural values. Jordan's cultural heritage landscape involves numerous stakeholders, with responsibilities for management and protection distributed across a range of governmental entities and civil society organisations, depending

on the type of heritage. Consequently, planning for heritage preservation in the context of climate change risks extends beyond the capacity of any single institution, requiring a multi-sectoral, collaborative, and participatory approach. A coordination mechanism is essential to foster synergy, such as a specialised network focussed on climate change and cultural heritage, with mandates to raise awareness, enhance coordination, disseminate information among policymakers, and liaise with civil society and heritage organisations.

- **Finance**

There are several sources of funds available, both national and international, such as the Green Climate Fund (GCF). It is necessary to build awareness of the funding available, ensure consideration of heritage within the agendas of agencies administering funds, as well as updating and upskilling the community on what they can apply for relevant to heritage and climate change. The role of the Ministry of the Environment is as a gateway for funding.

The Jordanian Government is recommended to continue to engage with emerging international climate funding opportunities including adaptation and loss and damage funding.

It is crucial to plan for follow-up activities to monitor and evaluate the effectiveness of the policy recommendations and the capacity of the organisations undertaking climate actions.

Part 1: Recommendations

1.1 Introduction

This document provides recommendations to better integrate cultural heritage into Jordan's national climate change policy and aligns with the definitions of concepts outlined in the Policy Document on Climate Action for World Heritage (UNESCO World Heritage Centre 2023). There are places where heritage can intersect with policy, both nationally and under UN obligations. Examples include Jordan's national adaptation plan (2021), Updated Climate Change Policy 2022–2050, and Jordan's NDC (2021).

The recommendations of this document are intended to offer regional good practice guidelines for resilience and sustainability that can be adopted by neighbouring countries facing similar climate challenges. Despite the region's current and future vulnerability to climate change—marked by rising temperatures, increasing temperature extremes and differentials, unpredictable rainfall, drought, flash flooding, windstorms, wildfire, and sea level rise—there has yet to be an effort to fully integrate cultural heritage and climate resilience in the Middle East and North Africa (MENA) region. This is of particular concern given the region's globally significant heritage sites and the potential significance of traditional land management to sustainable resilience in a time of rapid development.

Climate change is having an increasing global impact on cultural heritage, but the Intergovernmental Panel on Climate Change (IPCC) notes that the Middle East is one of the regions of the world most vulnerable to climate change (IPCC 2022; World Bank Group 2022) (Fig 1).

The Middle East will experience a rise in average air temperature, bringing about more frequent, longer, and more intense heatwaves. This will have a significant impact on the liveability of the region, particularly on human health, as well as the feasibility of outdoor activities and tourism. By the end of the century, many areas in the Middle East, including deserts and semi-arid zones in Asia, will experience considerably more intense heat stress. This projection holds true under all climate scenarios (Lee et al. 2021; Seneviratne et al. 2021).

While climate change's effect on drought varies regionally, subtropical areas like the Mediterranean are anticipated to experience a decrease in precipitation as global temperatures rise, escalating the likelihood of year-round drought. This drying trend is likely to extend beyond the range of values observed and reconstructed over the past millennium. Rising temperatures, leading to greater evaporative losses, play a key role in the projected drying of these semi-arid regions.

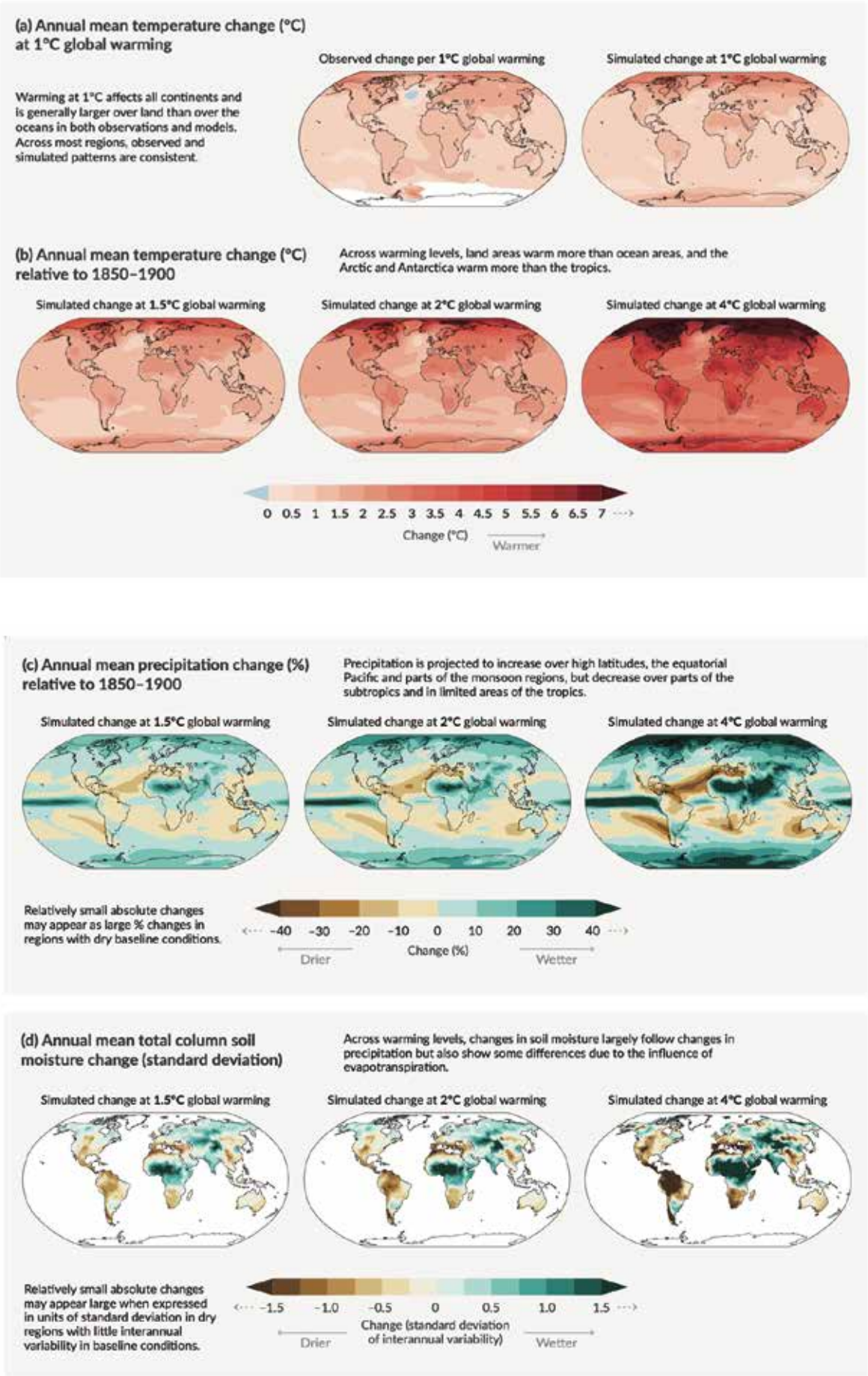


Figure 1 With every increment of global warming, changes get larger in regional mean temperature, precipitation and soil moisture, IPCC Sixth Assessment report

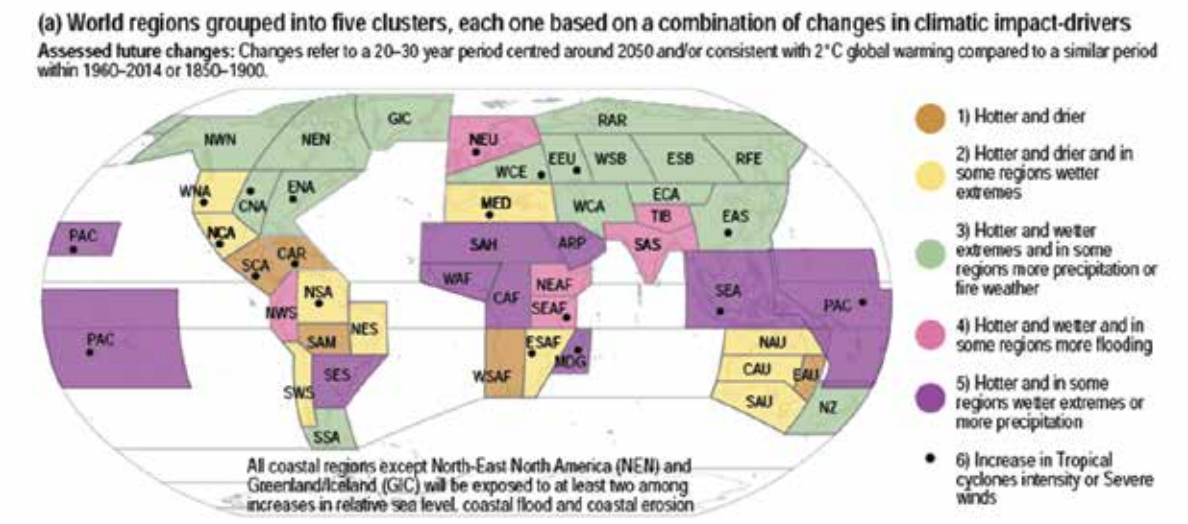


Figure 2 World regions grouped into five clusters, each one based on a combination of changes in climatic impact-drivers. (Source: IPCC sixth assessment report- page 130)

Although there is limited evidence of consistent changes in the frequency or intensity of dust storms in most regions, the Middle East's vulnerability to this hazard remains. The future of dust storms under climate change is uncertain, and the projection of future changes is complicated by several factors, including uncertainties in future regional wind and precipitation patterns as the climate warms and in the influence of human activities on the land surface.

The regional context is amplified by multiple ongoing conflicts. These act as multipliers of vulnerabilities, particularly in the movement of displaced people, difficulties in forward planning, and lowering the prioritisation for cultural heritage protection. Large regional projects, such as pumping water from trans-national aquifers, creates additional risks to water security.

These recommendations were discussed during a workshop jointly held by EAMENA-PNT in Amman in December 2024, attended by representatives from various governmental and non-governmental organisations, as well as partners from Jordan, Palestine, Iraq, and Egypt.The draft was then presented at an event with HRH Dana Firas, President of Petra National Trust; HE Eng Mohammad Al-Hyari, Mayor of Greater As-Salt Municipality; HE Dr Fares A. Braizat, Chief Commissioner of the Petra Development and Tourism Region Authority; Rustom Mkhjian, Director General of the Baptism Site Commission; and HE Jehad Yasin, Director General of the Archaeological Excavations Department at the Palestinian Ministry of Tourism and Antiquities. A detailed list of workshop participants and contributors can be found in the Appendix.

1.2 Climate Change in Jordan: An Overview

Jordan, located in the Middle East region, experiences a diverse climate influenced by its topography and geographical location. The country's climate ranges from Mediterranean in the highlands, characterised by hot, dry summers and cool, wet winters, to desert conditions in the Badiya region in the east and south of Jordan, where temperatures can be extreme and rainfall is scarce. The Jordan Rift Valley,

where temperatures can be extreme and rainfall is scarce. The Jordan Rift Valley, including the Jordan River and the Dead Sea, has a semi-tropical climate, with high temperatures and plays a crucial role in agriculture due to its water resources.

Jordan's unique topography supports four major biogeographical regions: the Mediterranean, Irano-Turanian, Saharo-Arabian, and Sudanian penetration. The Mediterranean region, found in the highlands, features forests and fertile soil, while the Irano-Turanian zone consists of steppe vegetation and small shrubs. The Saharo-Arabian region, covering nearly 80% of Jordan, is predominantly arid with sparse vegetation. The Sudanian penetration extends along the Dead Sea and Wadi Araba, supporting alluvial and saline soils.

Despite its small size, Jordan's diverse ecoregions contribute to its rich biodiversity, with over 2,400 plant species, including endemic and endangered flora. The country also hosts various mammals, reptiles, and migratory bird species, highlighting the need for conservation measures amid growing environmental pressures.

Figure 3 A Map of Jordan showing the 12 governorates (Hashemite Kingdom of Jordan, 2025)

Jordan faces severe climate change challenges, including rising temperatures, fluctuations in annual precipitation, and increased frequency of extreme weather events like droughts and heavy rainfall leading to flash floods, as recognised in Jordan Climate Change By-Laws No.79 of Year 2019. These climatic changes already impact vital sectors such as water, agriculture, health, cultural heritage, and tourism, all of which are crucial to the country's economy and social welfare.

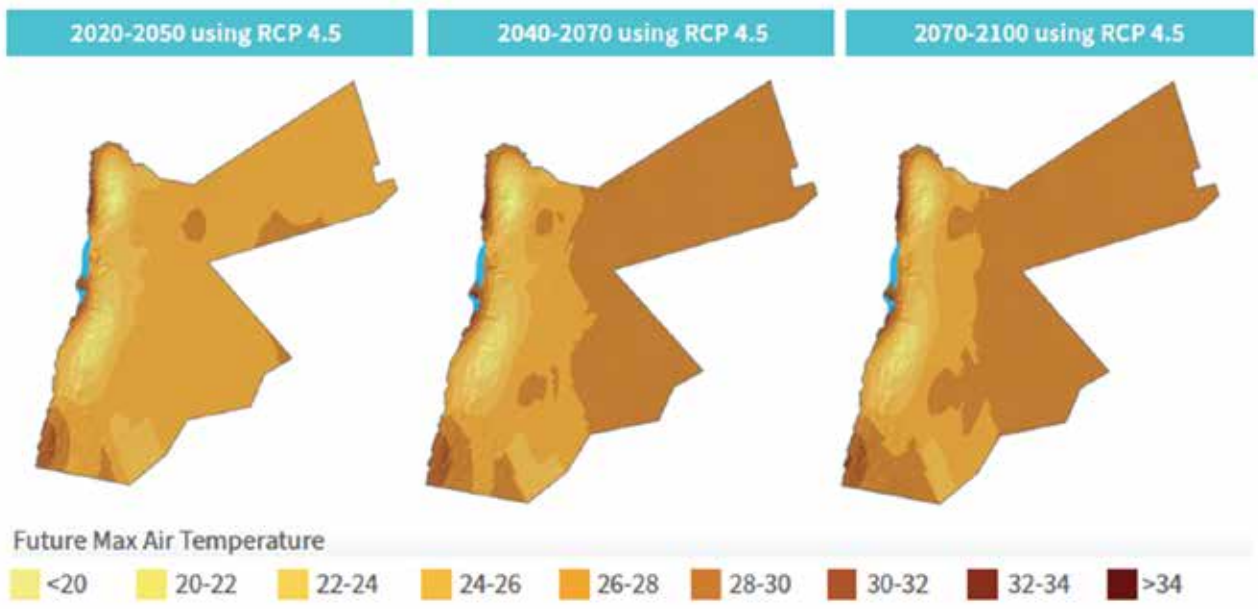


Figure 4 Projected average air temperature for the three-time horizons using RCP 4.5 (Ministry of Environment & UNPD, 2024)

Figure 5 Projected Differences in Annual Precipitation for the three time horizons using RCP 4.5 (Ministry of Environment & UNPD, 2024)

Figure 6 Projected Differences in droughts probability, for the three time horizons using RCP 4.5 (Ministry of Environment & UNPD, 2024)

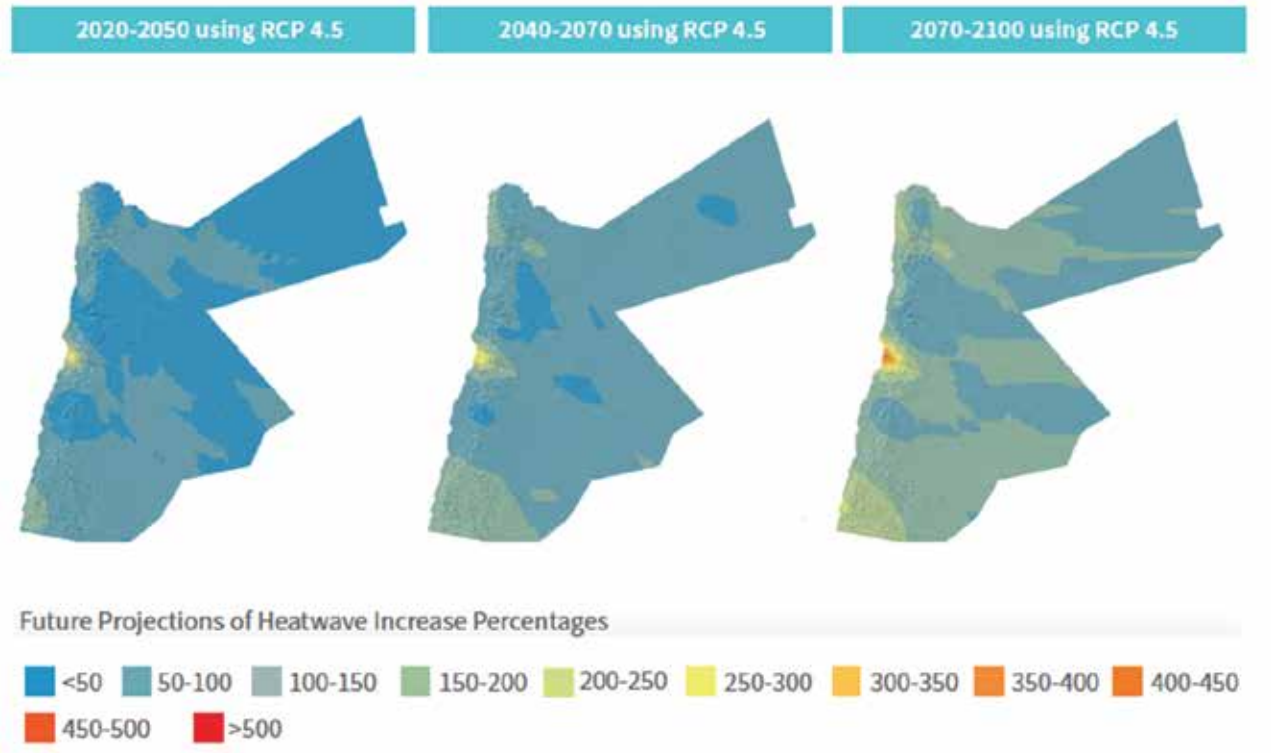


Figure 7 Spatial distribution of the potential future heatwaves projection using RCP 4.5 (Ministry of Environment & UNPD, 2024)

The IPCC initiated its sixth assessment reporting cycle (AR6) in 2021, introducing scenarios known as SSP-RCP ('SSPX-Y'), which combine elements of the Shared Socio-economic Pathways (SSPs) and the Representative Concentration Pathways (RCPs) from AR5. These five scenarios represent different narratives and emissions trajectories based on varying assumptions. The SSP scenarios outline possible future developments, grounded in consistent assumptions about key drivers, such as technological progress and socio-economic trends. Meanwhile, the RCP components indicate specific levels of radiative forcing expected by 2100. These SSP-RCP scenarios underpin climate model projections, which simulate changes in the climate system while accounting for factors like solar activity and volcanic influences[1].

According to the Country Climate and Development Report by the World Bank Group (2022), the key sectors in Jordan affected by climate change include are:

- **Water:** Jordan is among the most water-scarce countries in the world, with just 61 m^3 of water per capita per year in 2021 (National Water Strategy 2023-2040), far below the 500 m^3 threshold for absolute water scarcity. Climate change is expected to further decrease water availability by 30% per capita by 2040, while increasing water demand due to higher temperatures and evapotranspiration levels, droughts, and more intense heatwaves will also further stress Jordan's limited water resources, with significant effects on agriculture and domestic water use.
- **Agriculture :** The agriculture sector is particularly vulnerable, with climate change expected to decrease productivity in critical crops. For instance, Jordan could see a 15.6% reduction in wheat yields by 2050 due to rising temperatures and reduced rainfall. These challenges will increase Jordan's dependency on food imports, further impacting food security. Changing the crops grown, if possible, may have an impact of traditional agricultural and food practices, which underlie much local cultural heritage. Additionally, increased water demand for irrigation, expected to rise by 5-20% by the 2070s, will put further pressure on already scarce water resources.
- **Tourism:** Jordan's tourism sector, vital to the national economy, is heavily reliant on natural and cultural heritage sites like Petra, and is at direct risk from climate change. Rising temperatures, flash floods, and water shortages can damage tourism infrastructure and reduce visitor numbers. Flash floods, in particular, pose a significant risk to iconic sites such as the Siq at Petra, which could face frequent closures and physical damage due to extreme weather events.

1.3 Jordan's Cultural Heritage

Jordan's cultural heritage is a rich tapestry that spans thousands of years, reflecting its central location at the crossroads of the ancient world. The region has been inhabited since prehistoric times, with evidence of human activity dating back to the Palaeolithic period. Over millennia, Jordan has been home to numerous civilisations, including the Nabataean, Roman, Byzantine, and Islamic, as well as modern Bedouin and other local traditional practices, leaving an extraordinary legacy of both tangible and intangible heritage.

1 The IPCC's Sixth Assessment Report is available at https://www.ipcc.ch/assessment-report/ar6/ (Accessed 31 Jan 2025)
The set of SSPs is described in Chapter 1 at https://www.ipcc.ch/report/ar6/wg1/chapter/chapter-1/ (Accessed 31 January 2025).

Tangible cultural heritage in Jordan is vast, encompassing archaeological sites, monuments, ancient cities, historic buildings, vernacular heritage and urban landscapes. There are also considerable movable heritage and museum collections. Petra, the most famous archaeological site, has been a UNESCO World Heritage Site since 1985.

Figure 8 Al Khaznah, Petra. - Photo by H. Abedalhaleem

Much of Jordan's tangible and intangible heritage is directly related to natural heritage, while many tangible cultural heritage sites preserve important natural heritage, as well as the explicitly mixed cultural and natural heritage site of Wadi Rum. There is a deep history of human-environmental interactions in the country as is evident in its heritage sites. Even areas once promoted as virgin wilderness, such as the Dana biosphere reserve, are now understood to reflect this interaction, where many of the ancient trees survive in the enhanced moisture provided by equally ancient terraces. The vegetation cover is the product of thousands of years of goats being grazed.

Jordan is home to six other World Heritage Sites: As-Salt, Al-Maghtas (the Baptism Site), Qusier Amra, Umm al Jimal, Um er-Rasas, and Wadi Rum[2], a mixed cultural and natural heritage site, in addition to Petra. The Cultural Space of the Bedu in Petra and Wadi Rum; Al-Mansaf feasting in Jordan; Date palm knowledge, skills, traditions and practices; Arabic calligraphy; and as-Samer (dancing) in Jordan, have all been inscribed on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity. Each shows different aspects of the country's historical and cultural significance, reflecting the artistic, architectural, and social achievements of past civilisations (for example Madaba is part of UNESCO Creative Cities Network since 2017) and contributing to a broader understanding of Jordan's role in global heritage.

2 https://ich.unesco.org/en/RL/cultural-space-of-the-bedu-in-petra-and-wadi-rum-00122#:~:text=The%20Bedu%20communities%20inhabiting%20this,and%20tracking%20and%20climbing%20skills.

13other sites are on Jordan's World Heritage tentative list, including well-preserved Roman cities, the Umayyad Desert Castles, crusader castles, desert inscriptions, as well as natural heritage sites.

There are c 15,500 other archaeological sites registered in the Jordanian Department of Antiquities database (Mega-Jordan), within a much larger estimated 100,000 archaeological places, many of which are located within natural heritage places and landscapes.

These are often living landscapes where people live in and alongside their heritage places.

Addressing current impacts and future risk from climate change to both current and tentative WH sites is a key requirement of the 2023 Updated UNESCO policy document for Climate Action and World Heritage. While this policy is written for WH sites, its utility extends to the wider heritage sector as World Heritage Sites are illustrative of impacts to other heritage sites in the country, many of which are very vulnerable to climate change.

Figure 9 Baptism Site "Bethany Beyond the Jordan" (Al-Maghtas) - Photo by H. Abedalhaleem

The preservation of this cultural heritage is crucial for Jordan's national identity, helping to foster a sense of pride and continuity among its people.

The cultural heritage of Jordan is also of outstanding universal value as evident from the number of World Heritage and other UNESCO designations. These all play a pivotal role in the country's economy, particularly through tourism, which draws millions of visitors each year to explore its archaeological and cultural treasures – but which produce greenhouse gas emissions and is a high consumer of energy and water, putting pressure on Jordan's natural assets.

Firgue 10: Jordanian properties inscribed on the World Heritage List by the end of 2024 (Source: https://whc.unesco.org/en/statesparties/jo/)

1.4 Recommended Policy for Cultural Heritage and Climate Change in Jordan

These recommendations are an output from a regional meeting held in Amman, funded by the UK Arts and Humanities Research Council (AHRC) with contributions from PNT. The recommendations result from a partnership between the Endangered Archaeology in the Middle East and North Africa (EAMENA) project of the School of Archaeology at the University of Oxford and the Petra National Trust (PNT), building on previous research into the impacts of climate change on the World Heritage Sites of Petra, As-Salt, the Baptism Site, and Jericho (in cooperation with Palestinian authorities).

PNT and EAMENA have been assisted by several Jordanian national and local government bodies, and NGOs, with Palestinian, Iraqi and Egyptian partners to develop recommendations for a cultural heritage climate change policy.

The project reviewed international and national climate change and related policies and frameworks, before coming up with these recommendations. The project has been funded by the AHRC to follow on from British Council Cultural Protection Funded climate impact assessment work at the World Heritage Sites of As-Salt, the Baptism site, Tell es-Sultan, the last of these in collaboration with the Palestinian Ministry of Tourism and Antiquities. This work was combined with that of the PNT at Petra. We have, at this time, concentrated on World Heritage Sites. The recommendations are initially tuned to fit the Jordanian policy context but should be suitable for adaption to Palestine, and we hope they can be used to encourage other countries in the region.

Management Structure

It is crucial to understand the roles and responsibilities of the various stakeholders, decision-makers, and legal authorities involved in heritage protection and management in Jordan to effectively integrate and mainstream cultural heritage considerations into national climate change policies and in any future development.

Obstacles include:

- The economic and political situation.
- The diverse threats posed by climate change to cultural heritage sites, making it challenging to develop effective protection mechanisms.
- The ongoing rise in global atmospheric temperatures and sea levels, which will exacerbate the impacts of climate change on heritage over time.

- The involvement of local communities in preservation efforts.
- The lack of understanding of the importance of heritage in social and economic development and consequent failure to include it as a national priority.
- The regional context, including the situations in Iraq, Palestine, Syria, and Lebanon, as well as the large-scale tourism developments in Saudi Arabia, which place additional pressure on Jordan in responding to climate change impacts.

Paragraph 7a of Article 2 of the Jordanian Law of Antiquities No. 21 of 1988 (amended by Law No. 23 in 2004) defines 'antiquities' as "any movable or immovable object which was made, written, inscribed, built, discovered, or modified by a human being before the year AD 1750" (General Department of Antiquities 2004). The law further stipulates that objects dating after AD 1750 may be considered antiquities if designated by the Minister of Tourism and Antiquities, through a decision published in the Official Gazette. The Department of Antiquities (DOA) holds the primary responsibility for the protection, maintenance, repair, and preservation of these antiquities.

However, the DoA is not the sole authority overseeing Jordan's archaeological and cultural heritage sites. Also, under the overall control of DOA, the Petra Development and Tourism Regional Authority (PDTRA), established in 2009, manages the Petra region, including the Petra Archaeological Park (PAP). Additionally, the Petra National Trust (PNT), Jordan's national NGO dedicated to protecting and preserving national cultural heritage, focuses particularly on the World Heritage Site of Petra.

Several other World Heritage Sites in Jordan are managed by distinct entities. For instance, the Baptism Site is governed by the Baptism Site Commission, an independent board of trustees appointed by His Majesty King Abdullah II. In the case of the World Heritage city of As-Salt, its management system is spearheaded by the As-Salt Greater Municipality. The Aqaba Special Economic Zone Authority (ASEZA), established in 2001, manages all of the Aqaba region, including the Wadi Rum Protected Area. This complex framework of authorities highlights the need for a coordinated approach to ensure cultural heritage is safeguarded within broader climate change policies and the management of these places can now be informed by the policy document.

Intangible and post-1750 heritage

While Jordan's Antiquities Law effectively protects sites, monuments, and artefacts predating 1750, a draft law aims to extend protections to cultural and historical properties post-1750. However, more recent cultural heritage continues to receive comparatively less attention. Notably, the WHS of as-Salt is inscribed on the basis of its post-1750 values. These later heritage assets, however, reflect essential facets of Jordan's societal evolution and are deeply connected to its people and traditions.

Consequently, a comprehensive cultural heritage policy to address climate change impacts must encompass all historical periods, including the contemporary era, ensuring that protective and mitigation measures apply uniformly across all heritage assets. New legislation that harmonises the treatment of antiquities and heritage is still in development.

Jordan's intangible cultural heritage, encompassing traditional knowledge and social practices, is central to the country's overall cultural heritage framework and it is under the responsibility of Ministry of Culture. A holistic approach should inte-

grate both tangible and intangible heritage within national preservation policies, as intangible heritage represents the core that sustains tangible heritage and vice versa. Climate change poses substantial risks to traditional lifestyles by altering landscapes, water resources, vegetation, and agricultural patterns, thereby endangering the intangible heritage passed down through generations. Conversely, traditional knowledge, particularly in water resource management, agriculture, and land use, provides invaluable insights for mitigating the impacts of climate change and strengthening resilience within contemporary communities against unpredictable environmental changes.

Figure 10 General view of As Salt World Heritage Site. Photo by H. Abedalhaleem

Participatory process

To effectively integrate cultural heritage into national climate change policies, it is crucial to first conduct a thorough identification of cultural heritage and its broader context, ensuring that its diverse values are acknowledged by all relevant government bodies, local communities and other non-governmental stakeholders. The historical, cultural, social, ritual, scientific, aesthetic, and economic dimensions of cultural heritage underscore the necessity of involving diverse groups and communities in this identification process. The participatory process followed in the development of the Integrated Management Plan for Petra provides a useful Jordanian starting point for such an approach (Cesaro et al 2023).

National documents addressing cultural heritage and climate change should explicitly recognise this value diversity and actively facilitate the inclusion of local communities and multiple perspectives. While identifying these values may initially appear straightforward, it often reveals varying perspectives and approaches. Thus, this process must be participatory, utilising a community-centred, people-focussed approach to protect the full spectrum of values and perspectives in the identification and preservation of cultural heritage.

Women, youth, marginalised, and local communities, as well as economically disadvantaged populations, are frequently the most disproportionately impacted by climate change. Yet, their cultural heritage and essential roles in heritage preservation remain largely unacknowledged. While these communities contribute minimally to the drivers of climate change, they endure its most severe consequences. This reality underscores the urgent need to recognise and actively engage these groups in climate resilience initiatives, appreciating both their distinctive cultural heritage and their pivotal contributions to its protection.

Climate literacy and training is key to ensuring this happens. Repeated surveys of the heritage sector by UNESCO, ICOMOS and ICCROM have identified foundational knowledge (along with finance) as the primary barrier to undertaking climate action[3].

Climate change risk assessment

In assessing climate change risks to cultural heritage, four critical questions must be addressed:

1- What is at risk (values). Risk assessments should be values-led in line with heritage best-practices incorporating a wide range of stakeholders, identifying how climate change might impact cultural heritage and what attributes might be affected?

2- What are the current (impacts) and potential future impacts (risks) based on scenario modelling. How can we address uncertainties in evaluating future risks? Is it possible to lose the Outstanding Universal Values (OUV) of a World Heritage Site because of climate change?

3- How vulnerable are the values (sensitivity, wider socio-economic issues, adaptive capacity of systems). Are there any risk multipliers which increase risk?

4- Are there any responses at all levels; national, regional and global, which reduce or increase risk: for example, irrigation restoration (reduces risk) or road building, which can increase risk. What could be done at site (local), national, regional and global levels in order to mainstream climate change impact in cultural heritage preservation?

What are the specific hazards? Who or what is at risk? And what factors contribute to the vulnerability of these at-risk elements?

It is essential to develop structured methodologies and mechanisms for systematically assessing these risks. Such approaches should enhance the ability to measure impacts and potential losses in heritage values, as well as deepen the understanding of the economic, social, health, educational, and environmental costs associated with these losses, including effects on ecosystem and cultural services (UNESCO World Heritage Centre 2023).

Key Recommendations

It is important to fully implement the policy, and this requires developing the process and obtaining funding as needed. Training and building the network are key to this process.

3 https://www.iccrom.org/sites/default/files/publications/2023-11/anticipating_futures_web_pdf.pdf; https://whc.unesco.org/en/news/2624

A Holistic Approach to Heritage

To effectively safeguard cultural heritage and mitigate the adverse impacts of climate change, all dimensions of cultural heritage—including its diverse forms, historical periods, and structural variations—must be comprehensively integrated. (The current distinction between pre-1750 antiquities and post-1750 heritage is, we understand, due to be removed in a new cultural heritage act, still in development.) Tangible and intangible heritage must be approached as an interconnected whole, while recognising the often specific issues arising from climate change, where the risks facing intangible cultural heritage are different to those facing tangible sites. An understanding of the further interconnectedness between culture and nature should be acknowledged. Adaptation strategies should follow Article 7 of the Paris Agreement, being sensitive to specifics, including considerations of gender and local communications, place-based and traditional knowledge and community values and concerns. A holistic perspective is crucial, particularly given the significant role of traditional knowledge in bolstering resilience and alleviating the adverse effects of climate change.

Moreover, it is essential that climate policies underscore the profound interdependence between culture and nature. Cultural heritage, in all its manifestations, is deeply rooted in landscapes or marine environments, intrinsically bound to the natural world and its values. Climate change not only poses a substantial threat to natural ecosystems but, through these environmental transformations, profoundly affects cultural heritage. Achieving sustainable cultural heritage preservation requires bridging the divides that often exist between the nature and culture sectors, as well as among their respective practitioners, to foster integrated and coordinated approaches in assessing climate change impacts across the nature-culture continuum.

The holistic approach needs to go further and consider Jordan's cultural heritage in its wider context in planning, the environment, rural affairs, and the economy. Climate impacts on cultural heritage will have wide-ranging effects on people, the tourist industry, and the landscape. In particular, living heritage such as historic city centres, agricultural landscapes, and seascapes, face complex issues. Mitigation measures may equally have benefits that extend beyond cultural heritage protection.

In this context, it is also crucial to highlight an important issue at the national level, particularly in academia. While Jordanian universities are introducing new specialisations, climate change and other interdisciplinary challenges cannot be effectively addressed by experts in individual specialisations. This needs to be discussed with decision-makers to foster holistic thinking and action. Graduates must be equipped with broader, cross-disciplinary knowledge to meet the demands of these complex issues.

Understanding Climate Risks and Vulnerabilities

The IPCC describes climate risk as 'The potential for adverse consequences for human or ecological systems, recognising the diversity of values and objectives associated with such systems' and vulnerability as 'The propensity or predisposition to be adversely affected' (IPCC 2018).

Projections of climate change and its potential impacts on cultural heritage are essential tools in developing effective risk assessments. For each region, landscape, environment and cultural site, multiple climate scenarios must be evaluated. Climate risk assessments for cultural heritage should incorporate analyses of anticipated and projected changes, addressing the potential consequences of varying climate scenari-

os, greenhouse gas emission projections, and global warming trajectories. These assessments often require consideration of both long-term impacts and extreme events (e.g., severe or recurrent floods), typically with return intervals of 50 to 100 years, alongside slower-onset processes (Romão and Rouhani 2023). Research, documentation and monitoring are all required.

World Heritage Site managers must possess a comprehensive understanding of the specific climate risks related to the site they manage, the vulnerabilities of the sites in their care, and the potential impacts on surrounding communities. Climate risk is interconnected with wider risks to heritage places. Climate risk assessments should be values-led, working with mixed stakeholders to assess risk to the Outstanding Universal Value and other values of properties. Risk assessment should take into account future hazards, vulnerabilities, the exposure of attributes and human responses. Creating accessible, searchable, and shareable databases with baseline information on cultural heritage sites is a critical step toward assessing potential vulnerabilities and risks effectively. This may include the establishment of a climate risk register for heritage places.

Various resources at both international and national levels are available to help understand climate change scenarios and associated risks. These include the IPCC Working Group's Climate Atlas (https://interactive-atlas.ipcc.ch/), the Jordan National Agricultural Research Centre's interactive platform with flood maps (https://apps.narc.gov.jo/maps/), and the drought monitoring and disaster map provided by Jordan's National Centre for Security and Crisis Management. Also, the assessment and mapping of flash flood hazard severity in Jordan provides consistent information at a national-scale on flood hazard reclassification to support the development of the implementation of flood management policy of flood mitigation activities (Al Mahasneh et al 2023).

Climate risk actions should be at the local level on matters the sector has full control of and not global issues outside of control.

Engagement with local communities in the risk assessment process is also essential, and they should be kept informed of assessment outcomes. Estimating the extent of loss and damage under each scenario, encompassing both economic and non-economic losses, is a crucial element of risk comprehension. Such impacts may be especially acute for marginalised communities and their tangible and intangible cultural heritage. Climate change effects can intensify various factors that drive human mobility, including migration and displacement. Communities connected to certain cultural heritage sites are already encountering climate-related challenges that may eventually lead to migration or displacement, thereby affecting the heritage values of these sites. This is especially significant for heritage sites whose values rely on sustained cultural continuity.

Effective climate action involves identifying and overcoming barriers and obstacles. These barriers can exist at multiple levels and scales but may include challenges with technical language, ineffective communication, a lack of access to existing data or knowledge of available datasets, access to resources and funding and the availability

People-centred Approach to Cultural Heritage and Climate Change

Protecting cultural heritage in the face of climate change necessitates both top-down

Effective climate action involves identifying and overcoming barriers and obstacles. These barriers can exist at multiple levels and scales but may include challenges with technical language, ineffective communication, a lack of access to existing data or knowledge of available datasets, access to resources and funding and the availability and suitability of training to the heritage sector. Identifying strategies to overcome these barriers are essential to impactful, inclusive and sustainable climate action.

Climate actions should be integrated into existing strategies, including the Strategic Environmental Assessment (SEA) procedure and the Green Growth Plan and others.

The Need for Capacity Building and Education in Climate Action

Climate change represents a current and emerging challenge to cultural heritage and the field is not well placed to respond to the scale of current and future impacts and necessary training and capacity building is needed to ensure that climate actions are informed and appropriate. Foundational climate literacy for the heritage sector can be developed for all levels of staff. Training is needed in policy and implementation, both for decision makers but also for communities, NGOs, municipalities, and universities. A national awareness campaign, starting with elementary schools, is recommended through the Ministry of Education. It is essential to continue to develop awareness of the intersection between climate change and heritage. While noting that PNT has developed lesson plans and curricula and is working with the National Centre for Curriculum Development to integrate cultural heritage and climate change related materials for this purpose.

Cultural heritage and World Heritage Sites can serve as educational platforms to raise awareness about climate change risks among younger generations and local communities. Cultural heritage is gaining recognition for its role in advancing climate action, with heritage education playing a vital part in building climate adaptation skills. This can encourage constructive discussions about climate change, influence perspectives, and inspire meaningful action (Curulli, Kaya, and Khaefi 2023).

The **Climate Heritage Youth Leaders** PNT extracurricular programme is dedicated to empowering youth ages 16-18 to become advocates for the protection of cultural heritage in the face of climate change. By fostering awareness and engagement, the me equips young leaders with the knowledge and skills necessary to address the growing challenges posed by environmental change.

Participants engage in hands-on workshops, such as crafting dioramas of cultural heritage sites using sustainable materials, to deepen their understanding of preservation and climate challenges.

The programme also emphasises intergenerational and peer learning, providing local insights into global climate and heritage challenges. Through these activities, young leaders are prepared to advocate for sustainable solutions that protect both cultural heritage and the environment.

and bottom-up actions. Embracing a fundamentally community-based and people-centred approach is essential for long term application and sustainability. The diverse values of cultural heritage can only be effectively identified and recognised through a participatory model involving all key stakeholders and right-holders, including local communities. Top-down approaches, limited to the input of "experts" within each sector as well as non-expert civil servants and political decision-makers, often fall short in acknowledging the multifaceted and evolving values of cultural heritage and its varied forms. It is vital to understand the various roles of different community members (men, women, youth, any underrepresented or marginalised groups) and important to engage them in discussions around the identification and appreciation of the full spectrum of cultural heritage and its associated values.

This people-centred approach could be supported by the establishment of a network of local champions to lead the process of change in a locally appropriate way. These champions should be equipped with the necessary training and support (including financial support) to drive climate action in their communities. They could be local experts working on-site under the supervision of the site management system, or members of the local community. This initiative should be integrated with other, global, movements, such as the Climate Heritage Network, to foster a grassroots driven approach for conservation and sustainability.

This people-centred approach is crucial not only for identifying cultural heritage values but also for assessing climate change-related risks, analysing vulnerabilities, and understanding how climate change may impact cultural heritage and the communities reliant upon it. They are also key to ensuring equitable and sustainable climate action.

Case Study: Climate Risk Assessment of Petra World Heritage Site

Petra, a UNESCO World Heritage Site celebrated for its historical, cultural, and natural significance, faces escalating threats from climate change. In 2023, the Petra National Trust (PNT), Petra Development and Tourism Regional Authority (PDTRA), and ICOMOS International collaborated on a comprehensive climate risk assessment under the Preserving Legacies Project. This initiative sought to evaluate vulnerabilities, risks, and adaptive strategies to safeguard Petra's heritage for future generations.

The study aims to identify climate change risks to Petra's cultural, economic, and natural values and propose actionable adaptation measures for long-term preservation.

Petra's sandy, rock-carved landscape is particularly susceptible to climate-induced phenomena. Shifts in seasonal precipitation, from snow to rain, and higher temperatures have led to frequent flash floods that threaten key archaeological structures like the Siq and the Treasury. Additionally, urbanisation, overgrazing, poor agricultural practices, and deforestation have degraded the surrounding environment, stripping it of its ability to buffer harmful climatic impacts, such as flooding.

The site's heritage value is further compromised by the loss of traditional knowledge about sustainable resource management, water harvesting, and ecosystem conservation. Compounding these issues is the massive influx of visitors, resulting in envi-

The site's heritage value is further compromised by the loss of traditional knowledge about sustainable resource management, water harvesting, and ecosystem conservation. Compounding these issues is the massive influx of visitors, resulting in environmental stress and waste management challenges, particularly the accumulation of plastic bottles and organic waste.

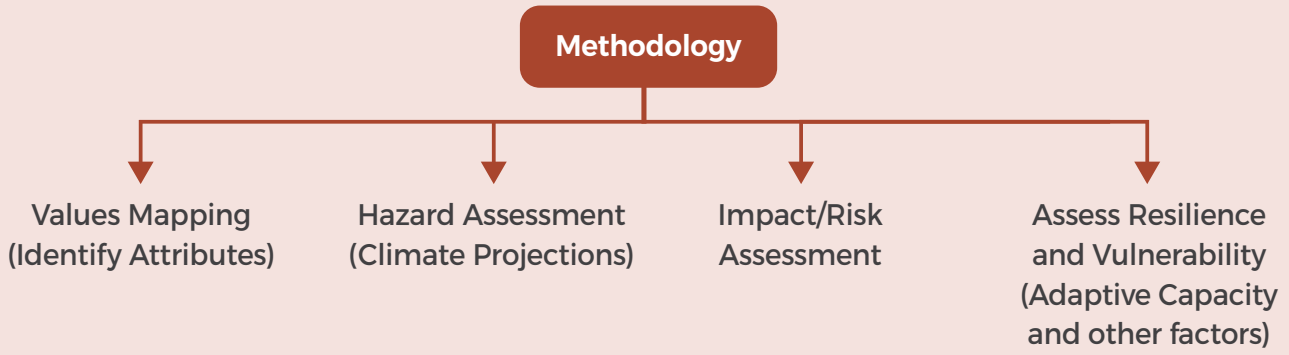
The study adopted an integrated approach that combines community-driven assessment and scientific approaches.

Key Findings - Climate related Hazards:

1- Flash Floods: Rising precipitation intensity threatens the Siq (Petra's iconic gorge) and other archaeological structures, risking erosion and visitor access.

2- Drought: Prolonged dry periods endanger ancient, terraced farming systems—critical to local livelihoods—while creating hydrophobic soils that exacerbate flood risks.

3- Intensified Storms: Increased storm frequency and severity endanger both built heritage (e.g., tombs, temples) and natural ecosystems.



Impacts on Values:

- **Cultural Heritage:** Low risk due to proactive measures like restoring Nabataean water systems, which mitigate flood and erosion damage.
- **Tourism Economy:** Moderate risk from vulnerable infrastructure (e.g., access roads, visitor centres), potentially disrupting tourism revenue.
- **Agriculture and Biodiversity:** Moderate risk driven by water scarcity, soil degradation, and shifting ecosystems affecting flora and fauna.

Adaptation Strategies: To build resilience, the PDTRA prioritised:

- **Heritage-Specific Measures**: Restoring ancient water diversion systems and constructing modern flood barriers at high-risk zones.
- **Community Empowerment**: Training programmes on sustainable agriculture and disaster preparedness, coupled with awareness campaigns.
- **Ecosystem Protection:** Reviving traditional terracing to combat soil erosion and enhance water retention in agricultural areas.

Measures and Solutions

Efforts to combat these issues have focussed on leveraging community involvement, technological advancements, and traditional knowledge systems.
Key initiatives include:

- **Community-Based Risk Management:** The Petra Development and Tourism Regional Authority (PDTRA) has implemented capacity-building programmes, training local residents in emergency response, risk assessment, and conservation techniques. Additionally, community-led early warning systems, including rainfall sensors and flood alerts, have been installed to protect the site.
- **Sustainable Waste Management:** Through the "Mitigating Climate Change through Waste Management in Southern Jordan" project, PDTRA has initiated recycling programmes for plastic, paper, and organic waste. Local youth and cooperative associations have been actively engaged, ensuring economic benefits while reducing pollution and greenhouse gas emissions.
- **Nature-Based Solutions (NbS):** Reviving traditional knowledge, such as Nabataean water harvesting techniques and alternate grazing systems, is helping restore the ecological balance. These approaches, combined with modern scientific methods, provide cost-effective and sustainable solutions to manage precipitation and reduce environmental degradation.
- **Sustainable Tourism Practices:** Eco-friendly pathways, controlled visitor numbers, and awareness campaigns have minimised the environmental impact of tourism while promoting economic resilience.

Conclusion

This case study demonstrates how integrating local/ traditional knowledge with modern science can increase heritage sites' resilience against climate change. Such collaborative frameworks are vital for protecting culturally significant landscapes worldwide, ensuring they remain resilient and accessible in a warming climate.

Mitigation

The Intergovernmental Panel on Climate Change (IPCC) defines mitigation as 'A human intervention to reduce emissions or enhance the sinks of greenhouse gases' (IPCC 2018). Cultural heritage can act as both a contributor and mitigator of greenhouse gases. The UNESCO Policy Document on Climate Actions identified carbon mitigation as the key strategy to limit global temperature increases in line with the Paris Agreement and its subsequent impacts on heritage. Two main points:

- The role of the heritage sector in producing greenhouse gas emissions (direct and indirect emissions including the role of tourism).
- The role of the heritage sector in reducing/ sinking greenhouse gas emissions (culture-nature links, retrofitting historic buildings for carbon efficiency, circular economy/ recycling at sites).

UNESCO encourages WHS to be exemplars of carbon mitigation and climate action.

Adaptation

Every WHS should develop a climate change plan based on the specific climate change scenarios and risks established in the assessments conducted. These should include appropriate mitigation and adaptation measures.

The Intergovernmental Panel on Climate Change (IPCC) defines adaptation in human systems as the process of adjusting to actual or anticipated climate and its effects to reduce harm or capitalise on potential benefits (IPCC 2012: 556).

Climate change adaptation must address all hazards directly and indirectly linked to climate change, including the exposure of various components of cultural heritage to these hazards and the associated vulnerability factors—whether physical, social, economic, or institutional. This perspective underscores the necessity of addressing the full spectrum of climate risks, including hazards, exposure, and vulnerability, while also clarifying that climate adaptation cannot be considered in isolation from other risk factors. Climate change acts as a risk multiplier, amplifying existing hazards, exposures, and vulnerabilities affecting cultural heritage, and these may be further compromised by poorly designed adaptation or mitigation strategies, known as maladaptation (UNESCO World Heritage Centre 2023: 12).

Cultural heritage, along with its inherent values, holds the potential to enhance social resilience and aid in recovery from climate-induced losses by offering a common framework to identify potential risks and by fostering a sense of place, continuity, and identity. World Heritage Sites can serve educational and communicative roles by illustrating the interconnectedness of nature and culture and the sustainability embedded in many historical, traditional, and local practices. Heritage values play a vital role in supporting social cohesion, a key component of adaptive capacity, which can be strengthened through participatory approaches to heritage management (Ibid: 13).

There are opportunities within the sector to establish a national fund by offsetting, and local funds through tourism charges and waste recycling business revenues.

Climate Change and Heritage Network: Towards Multi-Sectoral Coordination

As discussed, Jordan's cultural heritage encompasses a vast range of forms and historical periods, spanning from prehistoric times to the contemporary era. It includes both tangible and intangible heritage, such as diverse traditions and ways of life, offering a rich spectrum of cultural values. The risks associated with climate change and global warming—such as alterations in precipitation patterns, water resources, and vegetation—compound the impacts of evolving water consumption in modern development and agriculture, potentially leading to adverse effects on various forms of cultural heritage and the communities associated with them. These impacts pose not only physical threats to cultural heritage but also profound social and economic repercussions.

Jordan's cultural heritage landscape involves numerous stakeholders, with responsibilities for protection distributed across a range of governmental entities and social groups, depending on the type of heritage. Consequently, planning for heritage preservation in the context of climate change risks extends beyond the capacity of any single institution, requiring a multi-sectoral, collaborative, and participatory approach. While establishing a new, dedicated body to comprehensively address the

mandates to raise awareness, enhance coordination, disseminate information among policymakers, and liaise with civil society and heritage organisations.

Currently, no such mechanism exists within the MENA region, positioning Jordan as a potential leader in this area. The proposed network could facilitate collaboration among the Ministry of Tourism and Antiquities, the Department of Antiquities, the Ministry of Environment, the Ministry of Planning and International Cooperation, the Ministry of Water and Irrigation, the Ministry of Education, the Ministry of Agriculture, the Ministry of Culture, the Ministry of Energy and Mineral Resources, and the Ministry of Youth, PDTRA, ASEZA along with municipal councils, civil society groups, and heritage NGOs such as the Petra National Trust, the National Committee of ICOMOS Jordan, and other heritage organisations. Relevant university departments and climate scientists should also be included. Connecting this network to existing international frameworks would further enable the exchange of experience and knowledge, thereby enhancing awareness and capacity for addressing climate change impacts on cultural heritage. The network could establish a central website/database to provide an information hub supporting the network, potentially with access to local community participants.

Case Study: conservation of the irrigation system and dry-stone structures in Al-Makhrour cultural landscape World Heritage Site- Palestine

Heritage sites in Palestine, including archaeological sites, historic urban centres, and unique agricultural landscapes, face a dual crisis of degradation from conflict and the increasing impacts of climate change. Palestine's agricultural landscapes, particularly within the UNESCO World Heritage Site Palestine: land of olives and vines/ cultural landscape of southern Jerusalem-Battir, are a very good example showing the impact of climate change on ancient terraces, watchtowers, dry-stone walls, and the traditional irrigation systems.

Round shaped watchtower overlooking agricultural terraces of the World Heritage Site site (Photo by Ziad Abuowda)

Battir is a living example of sustainable agricultural practices that align with principles of environmental stewardship. Its designation as a UNESCO World Heritage Sites in 2014 underscores its Outstanding Universal Value, particularly as a landscape that illustrates how human ingenuity can harmonize with natural resources to create a sustainable ecosystem. The dry-stone terraces and watchtowers serve as a testament to the adaptability and persistence of communities that have managed limited resources efficiently over time. These practices resonate with other agricultural landscapes around the Mediterranean and beyond, offering valuable insights into climate-resilient land management and water conservation.

The conservation project in the Al-Makhrour is an important example to mitigate the impacts of climate change by conserving the cultural landscape and the bigger

socio-cultural and environmental aspects through the rehabilitation of watchtowers, irrigation systems, dry-stone walls and agriculture terraces. These components encouraged farmers and landowners to revitalize their lands and increase the green planted agricultural terraces.

Also, the planting of olive trees and vines was encouraged to retrieve the authentic and domestic trees that have marked the property for a very long time instead of other types

Historical structures and agricultural terraces of Battir UNESCO World Heritage Sites
(Photo by Ziad Abuowda)

of trees that invaded the area recently, such as the Cypress, which negatively affect the domestic trees and change the overall landscape and environment.
(Ziad Abuowda et al. 2023)

Conservation of Agricultural Terraces. (Photo by Ziad Abuowda)

Using traditional materials and techniques during the conservation of watchtowers at Al- Makhrour area (Photos by Ziad Abuowda)

Ziad AbuOwda, Zaki Aslan & Ahmed Rjoub (2023) Conservation of dry stone structures: a practical study on the Al-Makhrour's watchtowers, Landscape History, 44:1, 121-142, DOI: 10.1080/01433768.2023.2196127

Finance

There are several climate related funding opportunities available, both national and international. It is necessary to build awareness of the funding available, update and upskill the community on what they can apply for relevant to heritage and climate change. The Ministry of Environment has an important role as a gateway to funding and it is crucial to involve them in any future plans for funding requests. It may be possible to develop innovative financial mechanisms at policy level and find a national way to propose some new financial models or mechanism such as climate change levies, biodiversity levy's etc.

It is crucial to plan for follow-up activities to monitor and evaluate the effectiveness of the policy recommendations and the capacity of the organisations undertaking climate actions.

Part 2: Policy Review

International frameworks play a critical role in addressing climate change and integrating cultural heritage into adaptation and mitigation strategies. The United Nations Framework Convention on Climate Change (UNFCCC), adopted in 1992[4] (UNFCCC), established the foundation for global climate action. Complementing this, the Intergovernmental Panel on Climate Change (IPCC), formed in 1988[5], provides scientific assessments and policy guidance on climate change impacts, adaptation, and mitigation.

The Paris Agreement, adopted in 2015 under the UNFCCC (Paris Agreement), aims to limit global temperature rise and strengthen adaptive capacities. A significant component of this is the Global Goal on Adaptation, introduced in the same year to enhance climate resilience and reduce vulnerabilities, including those of cultural heritage (Global Goal on Adaptation).

Additionally, the Nagoya Protocol, adopted in 2010 under the Convention on Biological Diversity (Nagoya Protocol), emphasises the importance of traditional knowledge systems by promoting equitable access to and benefit-sharing of genetic resources. These international efforts recognise that cultural heritage and traditional knowledge provide invaluable insights and tools for climate adaptation, fostering sustainable practices and community-driven solutions.

2.1 UNESCO's Policy on Climate Action for World Heritage

UNESCO has been addressing the intersection of climate change and World Heritage since adopting its first policy on the subject in 2007 (UNESCO World Heritage Centre 2007). This initial policy acknowledged the substantial threat climate change poses to heritage sites, impacting both their physical integrity and the social, economic, and cultural well-being of surrounding communities. Over time, UNESCO has expanded its climate efforts to include more evidence-based frameworks, developed through interdisciplinary research and partnerships, with an emphasis on both mitigation and adaptation strategies to protect cultural and natural heritage.

The updated document (UNESCO World Heritage Centre 2023), prepared by UNESCO's Climate Action Working Group, reflects the latest scientific findings on climate risks to heritage and outlines specific, actionable goals up to 2030, aligned with key UNFCCC 'Pillars'. These goals focus on **risk assessment, adaptation, mitigation, knowledge-sharing, and fostering transformative change,** and the importance of taking a precautionary approach. UNESCO encourages States Parties to prioritise climate-resilient management of heritage properties, incorporate traditional knowledge, reduce greenhouse gas emissions, and support community adaptation efforts.

By integrating these goals with global frameworks, such as the Paris Agreement and Sustainable Development Goals, the new policy aims to safeguard heritage sites as resilient, low-carbon exemplars in climate action.

4 https://unfccc.int/resource/docs/convkp/conveng.pdf

5 https://www.ipcc.ch/

2.2. ICOMOS International: The Future of our Past - Engaging cultural heritage in climate change

The report The Future of Our Pasts: Engaging Cultural Heritage in Climate Action was developed by the Climate Change and Heritage Working Group under the International Council on Monuments and Sites- ICOMOS (2019). It outlines the intersection between cultural heritage and climate change, emphasising the importance of integrating heritage into climate action efforts. The document stresses that cultural heritage is both under threat from climate change and a valuable asset for climate adaptation and mitigation.

The report presents a framework that addresses cultural heritage as an essential element in climate action. Some of the key aspects of this framework include:

1. **Heritage as a Climate Asset**: Cultural heritage can help raise awareness about the urgency of climate change. Iconic heritage sites can serve as powerful tools for communication, drawing attention to the impacts of climate change and showcasing effective adaptation and mitigation strategies.
2. **Adaptation and Mitigation:** The report highlights the wealth of knowledge embedded in cultural heritage, including traditional agricultural practices and architectural adaptations that can inform contemporary responses to climate change. Communities have developed resilient ways of living that can inspire current climate-smart strategies.
3. **Social Resilience**: Cultural heritage fosters social cohesion and resilience, helping communities face climate challenges. By involving local communities in the management and preservation of heritage sites, heritage practice supports community-based climate adaptation and strengthens societal resilience.
4. **Integrating Heritage into Climate Science:** The report emphasises the need for heritage practitioners to engage with climate science and policy. It advocates for the inclusion of cultural heritage in climate assessments, such as those of the Intergovernmental Panel on Climate Change (IPCC), to ensure heritage is fully represented in global climate frameworks.

The report calls for collaborative efforts between heritage professionals and climate scientists to ensure that cultural heritage is preserved while contributing to climate resilience and adaptation strategies.

There is also a very useful table of potential climate impacts on different heritage typologies[6].

2.3 Global Research and Action Agenda on Culture, Heritage and Climate Change

More recently, a substantive report was produced on the Global Research and Action Agenda on Culture, Heritage, and Climate Change (Morel et al. 2022). This report presented the findings from an International Co-Sponsored Meeting between ICOMOS, UNESCO and the IPCC held in 2021 with over 100 participants from around the world representing different sectors. These included climate scientists, cultural and natural heritage professionals and members of indigenous communities.

6 Table 6: Correlating Climate Change to Cultural Heritage, Climate Change and Cultural Heritage Working Group. 2019. The Future of Our Pasts: Engaging Cultural Heritage in Climate Action, July 1, 2019. Paris: ICOMOS.

This is the only official document produced by the IPCC with heritage organisations with a focus on these three themes:

Theme 1: Systemic Connections of Culture, Heritage and Climate Change (Knowledge Systems).

Theme 2: Loss, Damage, and Adaptation for Culture and Heritage,

Theme 3: Roles of Culture and Heritage in Transformative Change and (Impacts) and Alternative Sustainable Futures (Solutions).

The report had a strong focus on issues of justice, equity and inclusion encouraging the incorporation, validation and valorisation of plural knowledge systems in climate decisions making.

2.4 General National Policies, Action Plans, and Recommendations

Jordan faces significant climate change challenges, including increased temperatures, reduced rainfall, and more frequent droughts (with associated desertification), which exacerbate its already critical water scarcity. The country is projected to experience a 2.1˚C temperature rise by 2100 and a 21% decrease in annual rainfall mainly to the east-north parts of Jordan, leading to severe impacts on agriculture, water resources, and ecosystems. The IPCC Atlas offers analytical tools for flexible spatial and temporal analyses of observed and projected climate change data. It includes various variables, such as mean temperature and precipitation, based on warming scenarios ranging from 1.5˚C to 4˚C[7] . These changes threaten food security, public health, and biodiversity. Additionally, Jordan's reliance on imported energy and the pressures from a growing population and refugee influx intensify the strain on its infrastructure and natural resources, further complicating efforts to achieve sustainable development and climate resilience.

2.4.1 National Climate Change Policy of the Hashemite Kingdom of Jordan 2022-2050

Policy Vision, Objective, and Principles

Jordan's Bylaw 79/2019 on Climate Change establishes the institutional and regulatory framework for climate action, particularly within the government. It defines the structure and role of the National Climate Change Committee[8].

The National Climate Change Policy 2022-2050 (Ministry of Environment and United Nations Development Programme 2022) envisions Jordan as a resilient, low-carbon nation by 2050, contributing to global carbon neutrality. The policy emphasises inclusiveness, fairness, and adherence to the principle of common-but-differentiated responsibilities. The objectives are to integrate climate resilience into all sectors and ensure sustainable development. Key principles include intergenerational equity, partnerships, and the precautionary approach.

Jordan is signatory to the Sharm El Sheikh Declaration on Culture Based Climate Action, a document that was endorsed by the Jordanian Council of Ministers in 2022 (Climate Heritage Network 2022). It is also a member of the Group of Friends on Culture-Based Climate Action, a coalition of state parties to advocate for placing culture and heritage at the heart of climate action established at COP28 in Dubai and co chaired by Brazil and the UAE (Climate Heritage Network 2023).

7 https://interactive-atlas.ipcc.ch/ (Accessed 03 February 2025)

8 https://climate-laws.org/document/bylaw-79-2019-on-climate-change-pursuant-to-environmental-protection-law-6-2017_ 6d3b (Accessed 31 January 2025).

References to Culture, Tourism, or Cultural Heritage

The policy recognises the need to protect cultural and heritage assets from climate change. Specific actions include improving preparedness for climate impacts on tangible and intangible cultural heritage, integrating traditional knowledge into adaptation plans, enhancing governance systems for cultural heritage management, and improving monitoring and mapping systems of the cultural heritage sites to identify and integrate the climate change variable risks, and to inform the international conventions and systems (Ministry of Environment and United Nations Development Programme 2022: 30).

The Monitoring and Evaluation (M&E) Framework for Climate Change Policy 2022-2050 includes a section specifically addressing Cultural Heritage. Key aspects of this framework related to cultural heritage include:

1. **Problem Identification:** There is a poor understanding of the underlying causes of vulnerability in cultural and heritage values to climate change. This lack of knowledge risks significant economic, social, and symbolic losses of Jordan's cultural heritage, especially due to climate-related threats such as flash floods at important cultural and archaeological sites.
2. **Policy Formulation:** The framework proposes investments in protecting and rehabilitating significant cultural and heritage values. Additionally, there is a focus on creating institutions, financing, and programmes aimed at safeguarding these important assets.
3. **Policy Evaluation**: Progress will be measured by the level of investment in the protection and rehabilitation of cultural heritage sites and the number of institutions and programmes established to support these efforts (56).

Adaptation and Mitigation

- **Adaptation:** The focus is on reducing vulnerability and increasing resilience to climate impacts, particularly for more vulnerable groups such as women, children, youth, and other groups. Key sectors include water, agriculture, ecosystems, health, and urban development, with actions such as improving water conservation, promoting drought-resistant crops, and enhancing health infrastructure.
- **Mitigation**[9]**:** Jordan aims to reduce greenhouse gas emissions across sectors, with a focus on energy efficiency, renewable energy development, and promoting sustainable transport. Mitigation actions are designed to support Jordan's path to carbon neutrality, ensuring sustainable economic growth.

Enabling Factors

Jordan's climate strategy relies on legal and institutional frameworks, technology transfer, financing, and education. The role of media and public engagement is also crucial for raising awareness and ensuring policy success.

Emerging Issues

Emerging concerns include urban migration, refugees, and disaster risk management. These stressors may offer opportunities for enhancing climate resilience but also pose challenges that require inclusive solutions.

9 Climate Change Mitigation: Efforts to reduce emissions and enhance sinks (UNFCCC)

Monitoring and Evaluation

The policy incorporates a robust Monitoring and Evaluation (M&E) framework, ensuring transparency and periodic reviews aligned with the five-year Nationally Determined Contribution review process. Indicators will track progress in both adaptation and mitigation efforts.

2.4.2 National Climate Change Adaptation Plan of Jordan – 2022

The National Climate Change Adaptation Plan of Jordan 2022 outlines the country's approach to addressing the impacts of climate change. It is a comprehensive framework developed by the Ministry of Environment to integrate climate resilience into national planning and development processes. This plan aims to reduce vulnerabilities and enhance Jordan's adaptive capacities across various sectors by fostering cross-sectoral collaboration, institutional strengthening, and promoting sustainable development (Ministry of Environment 2020a).

There is no sectoral section for heritage or even tourism, nor education.The document focuses on various sectors such as water resources, agriculture, biodiversity, health, urban resilience, and socioeconomic resilience, but it does not address cultural heritage or archaeological concerns directly.

The document does focus on several key sectors highly vulnerable to climate change, many of which intersect with culture and tourism, or aggregate and compound risk to the sectors:

1. **Water Resources:** Given Jordan's severe water scarcity, the Adaptation Plan emphasises sustainable water management through climate-resilient infrastructure, improved efficiency, and water reuse.
2. **Agriculture:** It addresses the impacts of rising temperatures, changing precipitation patterns, and droughts on food production and rural livelihoods. Measures include promoting climate-resilient crops and irrigation techniques.
3. **Urban Development:** Urban systems are exposed to extreme weather events, flash floods, and landslides, which threaten infrastructure and urban livelihoods.
4. **Biodiversity and Ecosystems:** The plan targets ecosystems vulnerable to climate change, particularly forests and water bodies, by promoting conservation and restoration efforts.
5. **Health and Socioeconomic Systems:** The plan also tackles health challenges arising from climate impacts, such as vector-borne diseases and food security, while aiming to protect vulnerable communities.
6. **Tourism:** Recognized as a crucial economic sector, tourism is addressed to enhance its resilience to climate change impacts, especially regarding Jordan's cultural heritage.

2.4.3 Tourism Sector Green Growth National Action Plan 2021-2025

The document titled Jordan Tourism Sector Green Growth National Action Plan 2021-2025 was developed by the Ministry of Environment with the support of the Global Green Growth Institute and was published in 2020. It was created to align the tourism sector with Jordan's broader green growth strategy, outlined in the National Green Growth Plan and the Jordan Vision 2025, and to support climate resilience, sustainable development, and economic recovery from shocks such as COVID-19.

The plan is part of Jordan's commitment to achieving its Nationally Determined Contributions under the Paris Climate Agreement.

The report is structured into several sections:

1. **Green Growth Framework:** It explains the principles of green growth and outlines the connection to tourism.
2. **Tourism Sector Situation Analysis:** This includes a current state assessment of Jordan's tourism sector, focusing on its natural resources and economic role.
3. **Sub-Objectives and Action Plans:** It provides specific green growth objectives for the tourism sector and the corresponding actions needed to achieve them.
4. **Implementation Arrangements:** Guidelines on how the proposed actions will be implemented and monitored.
5. **Investment and Policy Priorities:** Identifies key investment projects and enabling policy actions.

Main Issues Covered

The plan covers a wide range of issues, including resource efficiency, sustainable economic growth, social development, poverty reduction, and climate change adaptation and mitigation. It highlights the tourism sector's reliance on natural capital, such as eco-tourism (considered to have a net positive effect on natural capital by increasing awareness of locals and tourists about the importance of the natural environment), and the environmental risks posed by unsustainable tourism activities. The report considers the tourism sector a contributor to global climate change through aviation fuel used in transport and energy consumption in hotels. Without options for tourists to travel to Jordan by rail, flights are likely to remain the primary source of emissions in Jordan's tourism sector, exceeding those from in-country transport and accommodation combined. Additionally, it emphasises the need for public-private collaboration and investment to enhance the sector's resilience and sustainability.

Cultural Heritage and Archaeology

The document specifically addresses the importance of cultural heritage to Jordan's tourism sector. It includes strategies to improve tourism products centred on cultural heritage and archaeological sites through participatory approaches. Enhancing and preserving Jordan's unique cultural heritage sites is considered essential for sustaining tourism growth, creating jobs, and maintaining local and international interest. Tourism enhances social interactions between diverse cultures, resulting in both beneficial and negative outcomes. Involving local communities in tourism activities and prioritising the careful preservation of cultural heritage—both tangible and intangible—helps reinforce the cultural and historical value of touristic sites while also building resilience to climate impacts. Ensuring that climate action is locally considered and community engaged is of central importance to ensure buy in and avoid maladaptation strategies.

Local Communities and Intangible Heritage

The plan emphasises the role of local communities in the sustainable development of tourism. It recognises that community participation is critical in preserving both tangible and intangible heritage. Cultural heritage tourism, which includes both physical sites and local traditions, is identified as a key area where local communi-

ties can play an active role in ensuring sustainability. The involvement of communities is seen as crucial to poverty reduction and the protection of cultural identity, particularly through eco-tourism initiatives and community-based tourism projects.

Notably, the Glasgow Declaration on Climate Action in Tourism commits the global tourism sector to aligning with the Paris Agreement's goal of limiting global warming to 1.5˚C above pre-industrial levels by the end of the century, which is the year 2100. It calls for urgent, coordinated action to halve emissions by 2030 and achieve net zero by 2050 through five key pathways: measurement, decarbonisation, regeneration, collaboration, and financing (One Planet Sustainable Tourism Programme 2021). Jordan signed onto the Tourism Declaration at COP29 in Baku.

2.4.4 Country Climate and Development Report

The Jordan Country Climate and Development Report (CCDR), developed by the World Bank Group (2022), aims to align Jordan's climate actions with its development goals. The report analyses Jordan's climate challenges and opportunities across multiple sectors and offers policy recommendations to help the country adapt to climate change while promoting sustainable economic growth.

Main Sectors Covered

The report focuses on five critical sectors:

1. **Water:** Jordan faces extreme water scarcity, exacerbated by climate change. The report emphasises the need for water efficiency, reducing fresh water use in agriculture, and increasing the use of treated wastewater. However, this would highly affect agricultural product exportation due to the importing countries' regulations.
2. **Energy:** The report advocates for greater renewable energy use, improved energy efficiency, and reduced greenhouse gas emissions in urban areas and the transport sector.
3. **Agriculture:** Agriculture is a major water consumer, and the report stresses improving water productivity through technological shifts and policy changes.
4. **Transport:** A significant emitter of greenhouse gases, Jordan's transport sector must adopt low-carbon alternatives like public transport reform and electric vehicles.
5. **Urban Development:** Climate-smart urban planning, including green infrastructure and efficient resource use, is critical to reduce emissions and improve urban resilience.

Approach to the Tourism Sector

The report identifies tourism as a key sector that could both benefit from and be harmed by climate change. Jordan's Vision 2025 sees tourism as a growth area, but the CCDR stresses the importance of integrating sustainability into tourism. The tourism sector is highly vulnerable to the effects of climate change, such as extreme heat and water shortages, which can affect natural and cultural heritage sites, especially during peak tourist seasons.

Climate Change Impact on Tourism (pages 5-6, 22)

Climate change is projected to reduce water availability, increase temperatures, and exacerbate extreme weather events, all of which can negatively affect tourism by making outdoor sites less accessible and appealing to visitors. Furthermore, the

increased frequency of droughts and heatwaves could damage both natural and cultural heritage sites, harming tourism's economic contribution. The sector also contributes to greenhouse gas emissions, particularly through transportation, and is impacted by rising operational costs associated with climate adaptation.

Recommendations for the Tourism Sector

The report suggests several recommendations for the tourism sector:

- **Sustainable Resource Management:** Focus on reducing water and energy consumption within hotels, restaurants, and tourist facilities.
- **Green Infrastructure:** Invest in climate-resilient infrastructure to protect cultural heritage sites from extreme weather and ensure sustainability.
- **Diversification:** Promote eco-tourism and diversify offerings beyond traditional cultural heritage sites to include less climate-vulnerable activities like desert tourism during cooler seasons.
- **Capacity Building:** Engage local communities and stakeholders in sustainable tourism initiatives to build climate resilience.

General Recommendations

The report emphasises the following general recommendations across sectors:

1. **Integrating Climate into Development Planning:** Make climate resilience a core component of all national and sectoral development plans.
2. **Water-Energy-Food Security Nexus:** Focus on water conservation and energy efficiency to address water scarcity while safeguarding agricultural livelihoods.
3. **Urban and Transport Reforms:** Encourage green urban planning and transport reforms to reduce emissions and improve resource efficiency in cities.
4. **Financial Mobilization:** Secure climate finance through public-private partnerships, concessional financing, and innovative financing mechanisms.
5. **Inclusive Climate Action:** Ensure vulnerable populations, including women and youth, are involved in climate-responsive job creation and adaptation efforts.

These recommendations are designed to help Jordan balance climate action with economic growth while fostering sustainable development across its key sectors.

2.4.5 National Disaster Risk Reduction Strategy (2023- 2030)

The National Disaster Risk Reduction strategy highlights the growing risks climate change poses to Jordanian sectors including tourism, particularly extreme weather events, water scarcity, and environmental degradation affecting both natural and cultural heritage sites. Flash floods, heatwaves, and erosion threaten key attractions like Petra, Wadi Rum, and the Dead Sea, while shrinking water resources impact hospitality services. The strategy calls for climate adaptation measures, efficiency, protecting biodiversity, and strengthening infrastructure resilience. It also emphasises heritage conservation, eco-tourism sustainability, and emergency preparedness to safeguard Jordan's industry against climate change impact.

2.4.6 Decentralised Wastewater Treatment Systems as a Climate Change Adaptation for Agriculture in Jordan

The Decentralized Wastewater Treatment Systems (DWATS) policy note, a Climate Change Adaptation Option for Agriculture in Jordan (2022), developed under the leadership of the United Nations Resident Coordinator's Office in Jordan, discusses the implementation of decentralised wastewater treatment as a solution to Jordan's acute water scarcity, especially in light of climate change. The brief, developed in collaboration with various UN agencies, aims to provide recommendations for policymakers and stakeholders involved in agriculture and water management.

The policy address DWATS' role in addressing Jordan's extreme water deficiency and supporting climate adaptation for agriculture. Temperature increase, drought, and Jordan's diminishing water resources render treated wastewater a vital alternative for irrigation. While Jordan has 34 wastewater treatment facilities, expanded small-scale, decentralised wastewater systems can enhance water efficiency, particularly in rural areas. The challenges are high expense, small size of the community, and social acceptability.

Key recommendations are the integration of DWATS into national water policies, improving institutional coordination, and studying financing mechanisms such as public-private partnerships and grants for implementation. It also recommends capacity building and awareness programmes for farmers to raise awareness of the advantages of DWATS and overcome technical and financial limitations. Promoting water-saving measures and revising wastewater standards are also crucial to long-term sustainability. Further, the strategy also demands an inclusive, multi-stakeholder framework, with the involvement of marginalised groups, including women and youth, in decision-making and implementation. Diversification of DWATS can enhance agricultural resilience, conserve water resources, and mitigate the impacts of the climate change on food security in Jordan.

2.4.7 Updated submission of Jordan's 1st Nationally Determined Contribution 2021 (Ministry of Environment)

Section 4.7 of this document specifically covers cultural heritage and tourism. The document highlights Jordan's rich cultural heritage and its significant contribution to its economy through tourism, services, handicrafts, and cultural industries. Climate change poses a threat to this cultural heritage, including food systems, traditional culinary skills, and food security. Increased temperatures, extreme weather, and changes in humidity potentially causing damage to fragile structures, artifacts, and ecosystems. The Ministry of Tourism has initiated a green growth plan for the tourism sector, focusing on resource efficiency and sustainability, which the Submission notes could be strengthened by integrating climate change adaptation measures. Key measures proposed include enhancing the adaptive capacity of cultural heritage sites and infrastructure, and integrating climate adaptation measures into the tourism supply chain and infrastructure.

2.4.8 Climate Risk and Resilience in Petra

The report Preserving Legacies: Climate Risk and Resilience in Petra (Abdalhaleem et al. 2024) explores the impacts of climate change on the World Heritage Site of Petra and proposes strategies to enhance its resilience. Developed as part of the Preserving Legacies initiative, a partnership with the National Geographic Society, ICOMOS, and the Climate Heritage Network, the report integrates scientific data, local knowledge, and community engagement to assess vulnerabilities and adaptation options for Petra, focusing on safeguarding its cultural, economic, and natural values

Methodology

The report follows a locally led, value-driven climate risk assessment methodology, emphasising community participation. It involved focus groups and a three-day workshop with diverse stakeholders, including local communities, tourism service providers, and heritage professionals. The methodology combined mapping key values, assessing climate hazards, evaluating potential risks, and gauging the adaptive capacity of the site and its community. Climate projections were based on the middle-of-the-road RCP 4.5 emissions scenario up to 2060.

Vulnerabilities

The primary vulnerabilities identified include increased precipitation, leading to flash floods, droughts, and stronger storms. These hazards threaten Petra's infrastructure, archaeological monuments, and the local tourism-dependent economy. Flash floods, in particular, pose a significant risk to the site's famous structures, including the Siq (the main entrance), which is vulnerable to sudden inundation. The variation in temperature increases the cracks in the rocks and thus their falling, causing a great impacts to tourists and visitors lives as well as site's structure. Additionally, over-tourism, poor conservation practices, and development pressures exacerbate the site's vulnerability to climate impacts.

Risks and Opportunities

The climate risk to Petra is considered moderate overall, though specific areas, such as the archaeological and historical values, face a lower risk due to existing adaptation measures like restored Nabataean water systems. However, economic values linked to tourism are highly susceptible to climate hazards, particularly flash floods and heatwaves. This creates opportunities for improving the resilience of Petra's tourism infrastructure through water management innovations, sustainable tourism practices, and better disaster preparedness. The local communities have highlighted agriculture as essential to their livelihood, especially post-COVID-19. They have also noticed that the increasing impact of climate change on agriculture is increasingly disrupting their traditional practices.

Key Messages

1. Community Involvement: Engaging local communities is crucial for implementing effective adaptation strategies. The report emphasises the value of local knowledge and community-led approaches in safeguarding heritage.
2. Resilient Infrastructure: Existing Nabataean water management systems offer a foundation for building adaptive capacity. Restoring and maintaining these ancient systems can reduce the impact of floods and water scarcity.
3. Moderate Overall Risk: While climate change poses significant risks to Petra, particularly through flash floods, the adaptive efforts already in place have moderated these threats.
4. Sustainable Tourism: The report calls for diversified tourism strategies, emphasising eco-tourism and better management of visitor flows to reduce the strain on the site and mitigate climate-related impacts.

In summary, the report advocates for a balanced approach that integrates scientific tools, local expertise, and cultural values to enhance Petra's resilience against the growing threat of climate change.

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RECOMMENDATIONS FOR A CULTURAL HERITAGE & CLIMATE CHANGE POLICY IN JORDAN