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Curating transformation can strengthen adaptation and minimize losses and damages

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Heritage conservation recognizes that losses and damages cannot be entirely prevented, that decisions about what to keep and what to let go are fundamental to maintaining values for future generations; even when what is valued is gone. The heritage principle of curating transformation can advance climate action through pragmatic and participatory management of losses and damages, offering lessons for climate change adaptation and giving people agency over what is lost.

Climate change is creating adverse economic and non-economic losses and damages to people and nature which are projected to increase with every fraction of a degree of global warming[1,2]. Losses and damages extend beyond tangible climate impacts on people and planet, to ways of life, livelihoods, traditions, and sense of belonging, disconnecting people from their surroundings and further exacerbating feelings of loss[3,4]. Rapid and widespread action on climate change is urgent to minimize these escalating impacts, but we also need tools to help manage them. The search for solutions requires contributions from disciplines not traditionally part of climate change research if we are to gain the necessary knowledge and insights to address the problem[5]. The heritage sector—comprising the humanities and sciences concerned with historical legacies, including archeology, architecture, art history, folk and Indigenous practices, museums and cultural landscapes, and spanning academia, the public realm, private companies, enthusiasts, and land managers—offers significant interventions to improve outcomes for climate change adaptation. For example, Indigenous Knowledge and local knowledge (IK and LK), inalienable from heritage praxis[6–8] are now widely recognized as crucial to successful adaptation[2]. In other ways, concepts emerging from the heritage sector are being used to communicate climate science to non-scientific audiences, often with the aim of stimulating climate action[9,10]. The heritage sector is also ideally placed to inform on losses and damages because the principles of heritage management embody the curation of change and decline with the aim of achieving the best possible outcomes for people and nature[11,12].

Heritage is what we inherit, claim, and value. Heritage is the full range of a society's traditions, monuments, objects, places, and culture, as well as the contemporary activities, knowledge, meanings, and behaviors that are drawn from them[13]. Heritage management is the act of collectively taking care of what we judge as significant for current and future generations. Individually, we make intergenerationally relevant decisions about what we want to preserve, what we are prepared to invest in preservation, and what we are prepared to let go. Key to heritage management is identifying what is valued across different groups and regions and agreeing on management plans for its preservation or decline. Climate change is already impacting heritage in ways that make it necessary to allow processes of transformation to take place, including losses and damages. This is a particular challenge for each of the currently 196 States Parties of the UNESCO 1972 "World Heritage" Convention which commits them "to ensure that effective and active measures are taken for the protection, conservation and presentation of the cultural and natural heritage situated on its territory" (Article 5)[14]. UNESCO records a range of climate hazards observed to impact over 100 inscribed World Heritage properties (Fig. 1), highlighting the impacts of climate change on almost 10% of the entire World Heritage list[15].

In response, heritage specialists are being forced to advocate for new ways to accommodate these impacts through iterative management practices. Some involve new and innovative approaches that challenge existing practices, and which require relinquishing commitments to existing conservation principles when preservation is no longer feasible[16]. Within the field of heritage many terms exist to describe this shift in process away from preservation to managed decline, such as 'adaptive heritage'[16] 'adaptive release'[11], 'palliative curation'[17], 'transformative continuity'[18], and 'heritage dynamics'[19]. What all these terms convey are ways in which losses and damages to significant places and things can be curated to ameliorate negative impacts that cannot be avoided in order to arrive at the best possible outcomes for current and future generations.

Table 1 provides definitions of the different terms for principles that underpin heritage praxis. What they all share in common is a shift toward conceptualizing heritage value as a continuous process of change rather than a static moment in time. Where this concept is useful in climate change adaptation is that if we are to achieve the best outcomes for climate change losses and damages, we, too, need to embrace valuation as a continuous process. As with heritage praxis, we need to learn to curate change in ways that ensure the continuity of value.

Here we draw together heritage conservation principles that underpin these terms, and bring them under the umbrella term of 'curating transformation'. Curating transformation is not a new label for participatory heritage management but offers a novel approach to climate change adaptation and to managing losses and damages. Curating transformation harnesses the fundamentals of these new heritage approaches and then

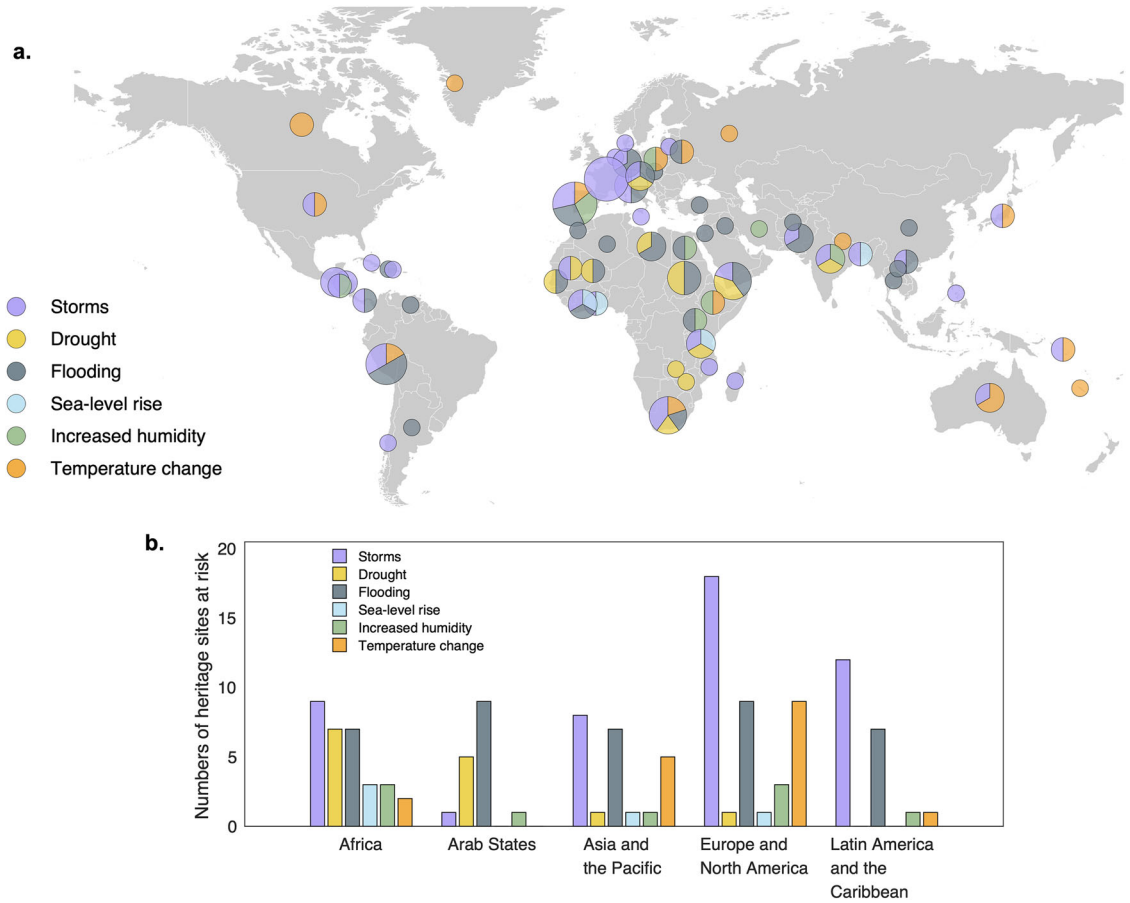

Fig. 1 | UNESCO World Heritage properties affected by climate change. a Global distribution of climatic hazards documented by UNESCO to have climate change impacts on World Heritage properties by country. The size of the circle represents the observed number of sites affected per country while the pie slices represent the number and type of hazards per country. **b** Number and type of climate change impacts on World Heritage Sites by region (data from UNESCO and grouped according to commonly used regional categories by UNESCO[15]).

Table 1 | Terms used in heritage praxis relevant to curating transformation

Term	Definition
Adaptive heritage[16]	A processed-based approach to heritage sites in which change is an inherent part of the site's value.
Adaptive release[11]	An emphasis on iterative and reflective management, monitoring and learning from change with relinquishment of control and willingness to accept uncertain outcomes.
Articulating heritage loss[12]	How to communicate heritage losses and damages to better articulate change so that challenges and opportunities may be fully appreciated.
Curated decay[30]	The disintegration of the structural integrity of heritage does not necessarily lead to the evacuation of meaning or value.
Creative Transformation[31]	Transformation to help maintain a connection to the past rather than sever it.
Heritage dynamics[19]	Heritage is a dynamic and complex socio-cultural practice.
Palliative curation[17]	When heritage loss is inevitable but allows an opening into many possible futures.
Transformative continuity[18]	Heritage transformation enables a reorganization of values focused on the discovery of future values.

situates people firmly at the center of change. As such, curating transformation is not about managing change to significant places and things for their best possible future but rather ensuring the best possible future for people through our relationship with places and things that are significant to us. Curating transformation is a means by which people can anticipate change and act upon it. It gives people agency over change making loss more palatable because we have choices.

Within climate change adaptation curating transformation bridges the concepts of transformational adaptation that changes the fundamental attributes of a system and may extend to the abandonment of places that are

overwhelmed by climate change impacts[2,20], and transformative adaptation that addresses the root causes of vulnerability through the genuine inclusion of those experiencing impacts and engagement with governance and institutional factors[21]. Curating transformation seeks genuinely inclusive ways of responding to climate change risks to social-ecological systems. We present examples from heritage management where curating transformation has led to positive outcomes, and we provide three key principles of curating transformation that can sit alongside and inform existing climate change adaptation best practices.

Significant places, the city of Nimrud

Cities are vulnerable to climate change. They are particularly at risk from sea level rise, flooding, drought and heat waves[2]. As early as 2040 Africa and Asia will have an additional 2.29 million and 16.36 million people exposed to coastal flooding respectively[1]. This will impact coastal heritage with many cities at the coast losing part or all of their significant 'places'[22].

In 2016, ISIS destroyed almost 90% of the archeological remains of the ancient Mesopotamian city of Nimrud[23]. Although a casualty of conflict, not climate change, it presents a lesson in curating significant places, past and present, by recording their history and archeology, preserving their cultural attributes, and educating their communities and the wider public on their significance. This not only enables the re-presentation and valuation of what remains but also gives people agency over what is lost.

Nimrud, like other great ancient cities—Angkhor Wat, Teotihuacán, Machu Picchu—stood as a testament to remarkable human endeavor and creativity. To the Iraqi people, it evidenced the achievements of their nation's past, while its 'ancientness' and authenticity added to its cultural value[23]. The destruction of Nimrud is on one level a catastrophe, but the city has been recorded, analyzed and interpreted, in academic journals, books, art, movies and fiction, while its material remains are housed in museums around the world. As such, even in its destruction its intrinsic cultural value and significance have not been lost. Moreover, its destruction offers an opportunity to undertake modern excavations[24], which will provide new insights into how people living in agglomerated settlements negotiated urban planning, and such fundamentals as mobility, walkability, local self-sufficiency, gastronomy and healthy living[9]. New excavations would not have been possible had the extant remains not been destroyed. Far from being lost, its continued curation ensures its previous iterations are remembered and valued even while new excavations reveal more ancient aspects of the city and give it new value.

Traditional lifeways, hunting in the Arctic Circle

The planet is on track to warm by more than 2 °C above pre-industrial temperatures within 30 years and possibly by 3 °C towards the end of the century if we continue current greenhouse gas emissions[1]. In this scenario, transformational adaptation pathways will become both increasingly difficult and necessary, with low-income countries, marginalized communities, and some minority groups being at greater risk of reaching limits to adaptation and the potential for maladaptation[21,25]. The traditional lifeways of First Nations hunters and Arctic Indigenous communities are at the forefront of this challenge, being at risk of poor outcomes for both transformational and transformative adaptation.

Key elements for positive transformative adaptation include: (1) making rights and justice the target of adaptation, (2) acknowledging power relations, (3) embracing knowledge pluralism, (4) fostering bottom-up coalitions to strengthen local sources of adaptation, and (5) recognizing risks, trade-offs and unexpected outcomes[21]. Knowledge exchange between First Nations hunters and Arctic Indigenous communities is a heritage example of where these five key elements have been successfully put into practice with legislative commitment from the Canadian Government[25].

In the Arctic Circle the loss of sea ice, which is classified as World Heritage by UNESCO, is impacting Indigenous (Inuit) traditional lifeways by limiting their ability to hunt seals and whales[25]. In response, knowledge exchange between First Nations hunters and Arctic Indigenous communities is transforming the ways in which Inuit hunt, which helps to preserve traditional ways of life and ways of remembering what has been lost. First Nations hunters from the Northwest Territories are building capacity and providing skills to Labrador Inuit related to moose harvesting. In exchange, Labrador Inuit are sharing their expertise in harvesting, processing, and use of ringed seals. As traditional sources of food become scarcer and as the ecological niche of moose moves north, new ways of hunting for Labrador Inuit will bring about positive transformative adaptation, engendering resilience and keeping alive ways of life, even as traditional modes of hunting are impeded by changing environments[25,26].

Living heritage, Fa'a Samoa

Pacific island communities will experience considerable economic and non-economic losses and damages from climate change in the future. Recent research has shown that non-economic losses and damages amongst Pacific Island communities are understood, perceived, and experienced through the lens of intangible values, identity, and cultural landscapes[4]. A considerable challenge for climate change adaptation to losses and damages will be preserving the living heritage of Pacific Island communities. For Pacific Islanders, the land of their ancestral home is a sacred space. A plot of land is inhabited by the same family for generations and cannot be assessed in purely economic terms. Ancestors are buried within its boundaries, and these are believed to live on as the spiritual guardians who watch over the family and protect the land. Western perspectives of home ownership do not fully grasp the extent to which the loss of family land can directly contribute to the loss of Pacific Islander identity[27]. By drawing on the concept and praxis of curating transformation, Pacific Island communities can ensure that the loss of their homeland does not also entail the loss of their identity.

Increasingly, museums are playing a key role in the continuity of identity and social practice of Pacific Island peoples. The very real cultural damage associated with forced migration, an inevitable outcome of rising seas, is inspiring innovative exhibitions curated by Pacific Islanders. Interventions into museum programming, acquisitions, research and publication have reset the aims of these exhibitions away from 'showing culture' to 'producing culture'[27]. In 2019, Te Papa Tongarewa Museum in Aotearoa New Zealand created a new exhibition space *Te Taigo* ('nature'), where different aspects of climate change impacts on the lives of Pacific Islanders are presented. This people-centered exhibition space asks its audiences to take on the role of guardians, and by so doing, the exhibition situates itself and its audiences within the context of climate action (https://www.tepapa.govt.nz/te-taiao-nature-exhibition-new-benchmark-for-new-generation) giving agency to people and enabling participatory curation of change.

Heritage principles for curating transformation

Best practice in climate change adaptation includes meaningful participation of diverse groups in decision-making processes, the recognition that equitable power relations are key to successful outcomes, that the co-production of diverse knowledge offers greater legitimacy for adaptation solutions, that grassroots coalitions empower from the ground up, and that there will always be risks and unexpected outcomes[21].

Curating transformation offers three further guiding principles from heritage conservation, the most important being the recognition that different kinds of value are intrinsic to successful adaptation outcomes. Identifying and understanding what is valued will determine what are considered intolerable, tolerable, and acceptable losses and damages[3].

Second is anticipatory recording of what is valued and making this equitably accessible via different media. Finally, learning encourages informed and active participation across different stakeholders. Experts should use their knowledge and skills to encourage and enable others to continuously and iteratively learn how best to respond to climate change[28]. There is also a need for language that informs dialog about loss that enables communities to describe and debate the process of loss and provide some structure to help people address what is an intractable state of change[12].

Conclusion

Heritage practice provides a template for climate change adaptation that balances action to minimize losses and damages where such action is possible, and the management of unavoidable losses and damages where it is not. Curating transformation, as practiced in the heritage sector, provides three new guiding principles for advancing both transformational and transformative adaptation: (1) identifying what is valued, (2) ensuring it is recorded before it is lost, and (3) engaging with people about its significance to enable acceptance and 'letting go' in relation to what cannot be saved, while salvaging value for current and future generations[3,27]. Curating transformation provides a context in which new value can be created, communicated, and adopted through anticipation of and adaptation to future loss. Through recognition of both economic and non-economic values, curating transformation holds the potential to deliver adaptation outcomes that are both more positive and more pragmatic than those driven by conventional decision-making based on tangible assets and economic values. Further, it helps overcome the false dichotomy of 'economic' and 'non-economic' dimensions in research and policy through its ability to capture tangible and intangible heritage value[29]. Inclusive decision-making processes that recognize the diversity of perceptions and values relating to what is at risk address the needs and priorities of those who are most vulnerable and whose voices are often ignored. Curating transformation can reduce the risk of maladaptation that is inherent in preservation-based approaches that are unrealistic in the face of large climate change impacts.

Data availability

No datasets were generated or analyzed during the current study.

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Author contributions

J.C. was responsible for the concept of curating transformation. J.C., A.Ho., J.F., H.M. N.B., and N.P.S. were responsible for further conceptualization and administration of the project; J.C, H.M., A.Ho., J.F., H.M., and N.P.S. were responsible for resources and wrote the original draft; N.P.S., J.C., B.O., C.H., A.Ho., H.M., J.F., V.A., C.B., S.W., N-A. W., K. A.A. N.B., and A.Hu. reviewed and edited the manuscript; and J.C, A.Ho., J.F., H.M., and N.P.S. were responsible for funding acquisition. The authors are grateful to Robert Nicholls for constructive review and input on early drafts of this manuscript.

Competing interests

The authors declare no competing interests.

Additional information

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