Realising the potential of cultural heritage to achieve climate change actions in the Netherlands

Fatorić, Sandra; Egberts, Linde

DOI
10.1016/j.jenvman.2020.111107

Publication date
2020

Document Version
Final published version

Published in
Journal of Environmental Management

Citation (APA)
Fatorić, S., & Egberts, L. (2020). Realising the potential of cultural heritage to achieve climate change actions in the Netherlands. *Journal of Environmental Management*, *274*, Article 111107. https://doi.org/10.1016/j.jenvman.2020.111107

Journal of Environmental Management 274 (2020) 111107

Contents lists available at ScienceDirect

Journal of Environmental Management

journal homepage: http://www.elsevier.com/locate/jenvman

Research article

Realising the potential of cultural heritage to achieve climate change actions in the Netherlands

Sandra Fatorić [a,*], Linde Egberts [b]

[a] Delft University of Technology, Faculty of Architecture and the Built Environment, Julianalaan 134, 2628, BL, Delft, the Netherlands
[b] Vrije Universiteit Amsterdam, Faculty of Humanities, De Boelelaan 1105, 1081, HV, Amsterdam, the Netherlands

ARTICLE INFO

Keywords:
Climate change adaptation
Climate change mitigation
Cultural heritage management
Heritage benefits
Interrelationships

ABSTRACT

Climate change impacts on diverse cultural heritage is gaining scholarly and policy attention, yet little research has been conducted on how can diverse cultural heritage informs decisionmakers and policymakers in achieving climate change actions (i.e., climate change adaptation and mitigation). For this study, we conducted semi-structured interviews with Dutch cultural heritage and environmental or climate change experts (n = 52) and participant observations across the Netherlands to explore the importance of cultural heritage benefits and their relation to climate change actions. We also explored the perceptions of cultural heritage management over time, including the influence of climate policy on heritage practice in the Netherlands. Our findings show that experts perceived a multiplicity of heritage benefits as important in supporting and informing present and future climate change actions. The most salient benefits were informational benefits where diverse cultural heritage is perceived as an important source of knowledge about past societal, economic and environmental developments and changes. Further, heritage management was perceived as constantly changing over time, reflecting the transformative nature of diverse heritage types. Experts agreed that climate policy has already influenced cultural heritage practice in the Netherlands. Lastly, the interrelationships between heritage benefits and management were identified and characterised. This study informs both cultural heritage and climate change research agendas and helps leverage diverse cultural heritage into climate change adaptation and mitigation policies.

1. Introduction

In recent years, research has been increasing our understanding of past, current and future climate change impacts on tangible (e.g., historic buildings, archaeological sites, landscapes, objects) and intangible cultural heritage (e.g., traditional practices, oral history), including solutions to reduce the impacts through climate change adaptation and safeguard irreplaceable and finite resources and associated benefits for current and future generations (Fatorić and Seekamp, 2017a; Guzman et al., 2020; Harkin et al., 2020; Mazurczyk et al., 2018; Sesana et al., 2018). Scholarly and policy work demonstrated the importance of economic, social, cultural and environmental benefits of diverse cultural heritage globally. Cultural heritage assets are important drivers of local, regional and national economies, for example, contributing to tourism and recreation developments together with urban growth and revitalisation (Avrami et al., 2019; Licciardi and Amirtahmasebi, 2012; OCW, 2019; Tuan and Navrud, 2008). Heritage is also a valuable source of knowledge and scientific information, which can be used to inspire and inform environmental and climate change management and policies (Jackson et al., 2018; Hambrecht and Rockman, 2017; RCE, 2018; Tisma and Meijer, 2018). Heritage assets can support decarbonisation and climate change mitigation through adaptive reuse of historic buildings (Foster, 2020; ICOMOS, 2019). Furthermore, diverse heritage can enhance community identity, cohesion and sense of place; particularly important during environmental or societal disturbances and disasters (Ghahramani et al., 2020; Parsizadeh et al., 2015; Pomeroy and Tapuke, 2016).

In heritage management, determining *heritage values* serves as an approach to identify the significance of heritage and enable management and conservation decisions to be made (De la Torre, 2002). Decisions about what to conserve and what to let go are based on cultural contexts and complex societal, political and economic forces or trends (Mason, 2008; Smith, 2006). Previous studies on cultural heritage values were largely concerned with conceptual characterisation or typology of

* Corresponding author.
E-mail addresses: s.fatoric@tudelft.nl (S. Fatorić), l.r.egberts@vu.nl (L. Egberts).

https://doi.org/10.1016/j.jenvman.2020.111107
Received 10 March 2020; Received in revised form 17 June 2020; Accepted 15 July 2020
Available online 10 August 2020

values (De la Torre, 2002; Fredheim and Khalaf, 2016; Smith, 2006), or with measuring and mapping those values or benefits, particularly in the context of urban planning and spatial development (Ginzarly et al., 2019; Licciardi and Amirtahmasebi, 2012; Nocca, 2017; Tuan and Navrud, 2008). Relatedly, much of the work of heritage experts have been based on an institutionalised categorisation of heritage values such as rarity, age, intactness, together with other values that are expressed in terms of benefits for society, such as the economic, social, informational, aesthetic and environmental values (for detailed typologies see Fredheim and Khalaf, 2016).

The term "values" and "*benefits*" of cultural heritage are often used interchangeably as an overarching proxy for the real and potential benefits attached to a heritage site/asset (De la Torre, 2002; Maeer, 2014; Mason, 2008). In this study, we use the term "benefits" to characterise the final outputs (in the form of services or products) from heritage assets that directly contribute to a wide range of stakeholders and communities (UNESCO, 2013). Despite the increasing research on heritage values or benefits limited knowledge exists on how heritage values may be affected by climate change adaptation and mitigation policy responses (e.g., Xiao et al., 2018), as well as how different social groups (e.g., experts, communities, visitors) value heritage assets in the context of climate change or environmental management. Scholars have recently started to explore the community and stakeholder groups' perceptions of heritage values or benefits being at risk from a changing climate (Carmichael et al., 2018; Dawson et al., 2020; Henderson and Seekamp, 2018; Sesana et al., 2018; Xiao et al., 2019). Yet, understanding social groups' perceptions and views of multiple heritage benefits to support current and future climate change adaptation and/or mitigation actions has not yet been explored.

Traditionally, *heritage management* and conservation focused on maintaining and conserving the physical condition and fabric of heritage assets. Over the past few decades, there has been a shift from material-focused preservation towards integration of heritage in spatial planning and design in Europe and many other Western-country contexts (Licciardi and Amirtahmasebi, 2012). Up to the 1980s, cultural heritage functioned as a separate sector, in which heritage management was strictly separated from spatial development, including environmental planning (Janssen et al., 2017; Ashworth, 2011). Since then, a more dynamic heritage management has been introduced, in which historic buildings, structures and landscapes have become an integrated factor in spatial development, for example through adaptive reuse projects. Regional heritage rehabilitation projects, such as Internationale Bauaustellung Emscher Park in Germany (Braae, 2015) and New Dutch Waterline (Van Alphen, 2020) can be considered as models of integrated adaptive reuse in regional redevelopment. The Historic Urban Landscape approach recommended by UNESCO in 2011 advances principles of integrating diverse cultural heritage types in urban planning and design (Ginzarly et al., 2019). A need for inclusive and sustainable heritage management, encompassing various social groups' including marginalised and minority people's values in evaluating and monitoring heritage management has recently become apparent (Avrami et al., 2019; Janssen et al., 2017; Jones, 2017). These approaches to heritage management currently function simultaneously in spatial planning and policy (Ashworth, 2011; Janssen et al., 2014). The Netherlands adopted a more dynamic planning and decision-making processes with the Belvedere Memorandum (Janssen et al., 2014) and the National Environmental Planning Strategy (one of the core instruments of the 2021 Environment and Planning Act) is expected to further enhance the integrated cultural heritage and environmental management (BZK, 2018).

Looking beyond Dutch cultural heritage management, the country's Delta Programme, which aims to ensure that a wide range of socio-economic sectors is climate-proof and water-resilient by 2050, recognises that Dutch cultural heritage provides invaluable traditional knowledge on managing water- and flood-related hazards and spatial and climate adaptation (Delta Programme, 2019). Yet, the Delta Programme makes no reference to the need for considering diverse heritage values or benefits in the design, implementation, or monitoring climate adaptation of various socio-economic sectors. We argue that a lack of understanding and awareness about multiple heritage benefits and their relationships with heritage and environmental management can create unwanted trade-offs between heritage and other sectors, minimise opportunities for synergies and continuous provision of heritage benefits. In this context, we find that participatory and deliberative discussions on the potential of diverse heritage types to support climate change adaptation and mitigation are warranted.

This paper aims to identify and characterise perceived heritage benefits for leveraging climate change actions in the Netherlands by eliciting the opinions of cultural heritage and climate change or environmental experts. The term "climate change actions" is used here as broad policy objectives of climate change mitigation and adaptation (IPCC, 2014; UNSDG, 2020). We also explored experts' perceptions of whether the Dutch cultural heritage management has changed over time and the possible influence of climate policy on cultural heritage practice. We conclude with critical recommendations for decisionmakers and policymakers, as well as propose new areas for future research.

2. Methods

2.1. Data collection

In this study, we used semi-structured interviews to explore (a) multiple heritage benefits, (b) heritage management over time and (c) influence of climate policy on heritage practice. Semi-structured interviews are widely acknowledged as a suitable technique for achieving a depth of understanding of the particular phenomenon (Bryman, 2012; Polit and Beck, 2010).

An extensive web-based search was used to identify 150 experts (i.e., purposive sampling; Etikan and Bala, 2017) and then scoping expert meetings with 95 individuals were carried out across the Netherlands by the lead author of this paper to capture their specific, insider and diverse perspectives on topics within the interview guide (i.e., using an emic approach which is opposite from an etic approach that uses theoretical frameworks and classifications developed by the outsider research team; Anders and Lester, 2014). These identified experts were involved either in: (a) Dutch climate change or environmental management and/or policy with some extent of cultural heritage experience (hereafter, CCE experts); or (b) Dutch cultural heritage management and/or policy with some extent of climate change experience (hereafter, CH experts). From the list of experts, the lead author of this study conducted 52 semi-structured interviews between April 2019 and March 2020. Specifically, interviewees included representatives of Dutch national (12), provincial (4) and local (7) governments, water authorities (8), as well as representatives of non-governmental organisations (8), academic or research institutions (6) and the private sector (7). An attempt was made to ensure balanced gender representation in the data collection process; female experts represented nearly half (46%) of the whole expert sample. Experts averaged 6 years of experience in their current position (range between 1 and 24 years), while their average experience working in cultural heritage management or policy and climate change/-environmental management or policy was 20 years (range between 2 and 38 years).

Our purposive sample yielded a new in-depth understanding and insights (i.e., analytical generalisation) rather than statistical generalisation, which can extrapolate findings from a sample to a population (i.e., achieving a representative sample typically used in quantitative studies; Polit and Beck, 2010). Furthermore, the expert sample achieved theoretical saturation (i.e., sufficient and redundant information in qualitative research; Bryman, 2012) after 51 interviews. Most interviews were conducted face-to-face in experts' workplaces, some interviews were carried out in public space, while two interviews were conducted via Skype. All interviews were conducted in English, hence, a linguistic uncertainty might arise because translating responses from Dutch to

English could have inaccurate or different meanings and could contribute to misinterpretation of expert responses (Carey and Burgman, 2008). To reduce the linguistic uncertainty, a lead author of this paper sought constant clarification and revision of responses, including visual communication aids such as maps, pictures and drawings.

The interview data were triangulated (see Fig. 1; Fusch et al., 2018) with participant observation data from scoping expert meetings, walking in the landscape with experts, as well as with data from collected policy documents and written materials (e.g., local newspaper articles, official documents, tourism brochures, various reports) to gain background information about Dutch policies on climate change and heritage, contextualise original information brought up in the interviews and to ensure that expert bias is minimised.

The data presented in this paper are part of a larger research project led by the lead author of this paper and only represent a subset of interview questions. While the full interview guide contained three sections with 21 questions (an average interview length was 50 min); only the first section with three questions is used in this paper. An interview guide was developed using existing literature. Additionally, a test interview was conducted which resulted in small changes in the terminology and flow of questions to maximise experts' engagement and use of their time. Each interview began by asking experts about their opinions on heritage benefits that could be important both for heritage conservation and supporting climate change actions. Next, experts were asked about their perceptions of Dutch cultural heritage management over time and whether the climate policy has influenced heritage practice in the Netherlands.

The interview guide and protocols were approved by the Human Research Ethics Committee of the Delft University of Technology and informed consent was obtained before each interview.

2.2. Data analysis

The interviews were digitally recorded and fully transcribed. Both interview and participant observation data were coded by the lead author of this paper and analysed using the software ATLAS. ti 8.4.4 following the guide of content analysis (Bryman, 2012). As shown in Fig. 2, coding of the data comprised four stages (Saldaña, 2012). First, the main themes of codes were identified and categorised using a descriptive coding process developed from the interview guide. Open coding was then used to reveal emerging patterns and further elaborate data into subthemes. Axial coding was used to reorganise and compare all the relevant coded data and identify the most and least salient subthemes, including similarities and differences between CCE and CH expert group responses. Lastly, using causation coding we analysed and developed a conceptualisation of interrelationships among the subthemes (Saldaña, 2012). Once the coding process was finalised, an intercoder reliability process (Campbell et al., 2013) was carried out by an external researcher who has expertise in cultural heritage conservation and policy in the Netherlands. The external researcher reviewed and validated the codes (intercoder agreement was 96%). An agreement on coded data was sought and reached after the discussion between the lead author of this paper and external researcher. This enhanced the credibility and trustworthiness of our findings. After the intercoder reliability, we calculated frequencies of each subtheme to illustrate a range of experts' opinions. Due to the qualitative nature of purposive sampling and content analysis, we do not present the percentages of experts discussing the themes and subthemes since that would erroneously suggest that such percentages reflect the opinions of the overall Dutch experts.

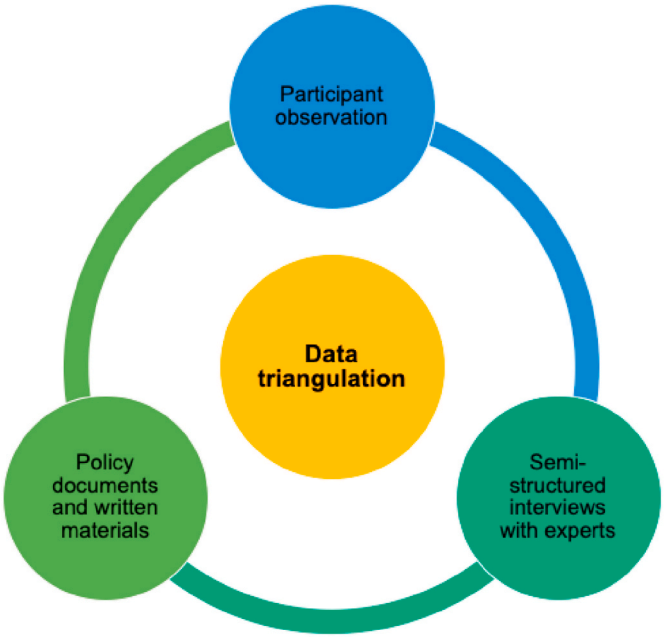

Fig. 1. Process of triangulation of the data.

3. Results and discussion

The findings are presented by first identifying and characterising multiple cultural heritage benefits and connecting their importance to climate change actions. Then the findings of the notion of Dutch cultural heritage management as evolving and/or static through time are presented to identify opportunities for leveraging climate change actions. Further, the perspectives about the influence of climate policy on heritage practice in the Netherlands are discussed. Lastly, interrelationships between heritage benefits and heritage management over time, as well as interrelationships between heritage benefits and climate policy influence on heritage practice are presented. A sample of quotations to bring out the richness and the prevalence of our findings are provided in Supplementary Material 1.

3.1. A multiplicity of cultural heritage benefits relevant to climate change actions

A multiplicity of cultural heritage benefits was found as important in the context of both climate change mitigation and adaptation and heritage management among the Dutch experts (Fig. 3). Building on the typology of heritage values (Fredheim and Khalaf, 2016), we found that the most salient benefits were informational benefits, followed by social, economic, aesthetic and environmental benefits.[1]

3.1.1. Informational benefits

Diverse cultural heritage was perceived by the majority of the experts to hold a valuable and unique technical and traditional knowledge to support and inform present and future climate change actions, including environmental management. Historic landscapes and archaeological sites, historic buildings and structures are identified as tangible records of the changing climate and flood risk management in the Netherlands. In this context, water and flood management techniques are part of Dutch heritage and were historically part of the community and spatial development. The knowledge behind the patterns of land use and spatial development or arrangements shown across historic landscapes, including a survival or continuity of resilient historic structures (e.g., dykes, embankments, canals, ditches), as well as techniques and materials used in the design and construction of

[1] Note that different articulations of heritage values or benefits can be different expressions of the same aspects seen through different multidisciplinary expertise (Avrami et al., 2019) therefore, we recognise the possible overlap between the identified benefits.

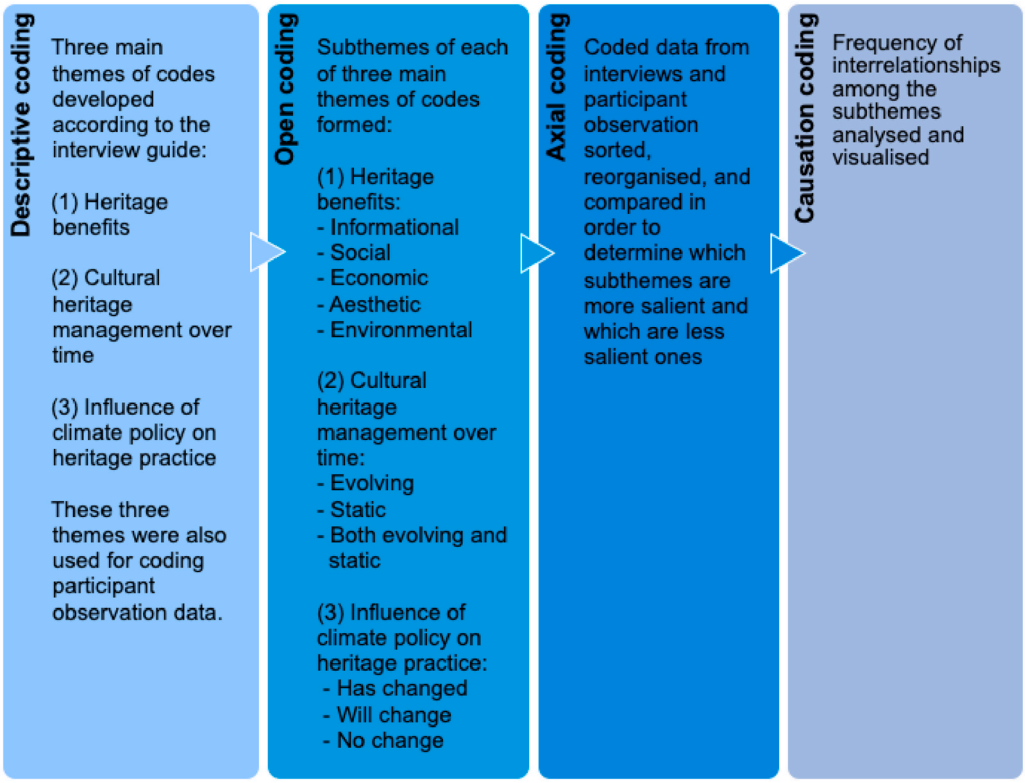

Fig. 2. Process used for interviews and participant observation data coding and analysis (Saldaña, 2012).

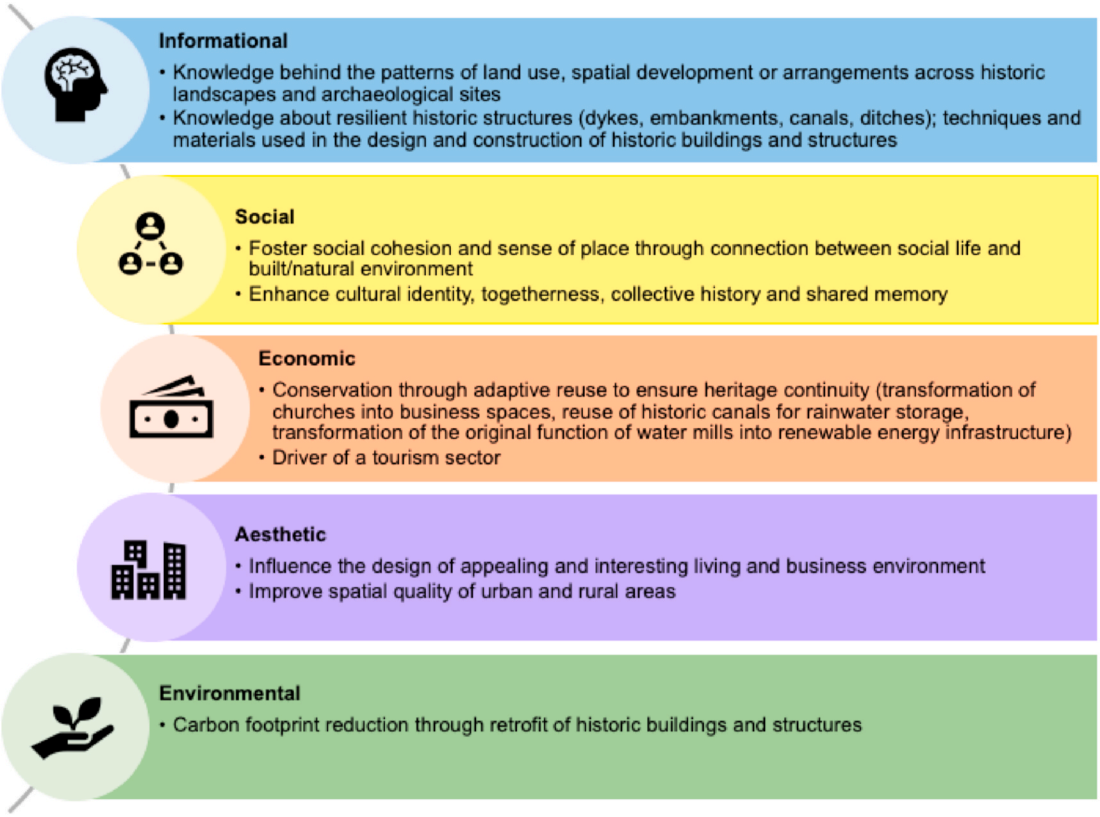

Fig. 3. Overview of the identified and characterised benefits of cultural heritage for supporting climate change actions in the Netherlands.

buildings or structures so they can cope with environmental and climate hazards, were recognised as invaluable informational benefits of cultural heritage. Several CCE experts opined that diverse heritage types have the capacity to convey a story of the past through its physical and visual presence in the landscape (area) and chronological aspects of changes. Some CH experts commented that the knowledge and skills attached to diverse cultural heritage types need to be documented and widely communicated with diverse stakeholders and policymakers so that can inspire urban or environmental planning, design for renewal and making heritage more recognisable for the communities and visitors rather than being an obstacle in various decision-making processes.

Some examples of traditional flood mitigation techniques that were commonly mentioned in the interviews include, dwelling mounds ("terpen" or "wierden") made from local materials with buildings, and villages built on top of these mounds as protection from coastal flooding across the coastal northern provinces (Nieuwhof et al., 2019; Van Alphen, 2020). Today, these dwelling mounds have inspired numerous modern elevated dwellings across the Netherlands (Room for the River, 2019). Reviving some of the traditional techniques can also contribute to the conservation of local knowledge for future generations (Nanavati, 2018; Khakzad and Griffith, 2016). Another example often mentioned by the CH experts is the use of historical maps and archival documents to analyse past water management practices. For instance, in the city of Kampen, archival material informed and accelerated new spatial development and climate adaptation at the local level (Het Oversticht, 2019). Furthermore, next to functioning dykes there are often former dyke remains or artefacts which lost their flood defence function but are an important source of historic and local knowledge (e.g., design, construction, materials) and can increase learning about environmental management and climate adaptation (RCE, 2018). This is also confirmed in previous research (Henderson, 2019; Jackson et al., 2018; Khakzad and Griffith, 2016) which highlighted the importance of both tangible and intangible heritage benefits for a range of sectors and stakeholders. We emphasise the importance of combining these sources of information with natural and social science approaches to enhance multidisciplinary research and inform present and future evidence-based policy-making.

In fact, the Dutch Cultural Heritage Agency (RCE, 2015), which is mandated to conserve Dutch built heritage underlines that "cultural heritage provides anchor points for understanding the present and thinking about the future." Our findings show that the coexistence of culture, history, engineering, ecology and economics is at the heart of both Dutch heritage management and climate change adaptation and mitigation. Much as diverse heritage can provide evidence of how communities responded to climate and environmental hazards and built their resilience (Nieuwhof et al., 2019; Van Alphen, 2020; RCE, 2018), today, these valuable historic assets can inspire environmental and climate change decisionmakers and stakeholders to learn from and embrace change and transformation through successful adaptation. The capacity to learn from heritage has been traditionally recognised in cultural heritage policies, for instance, in developed countries such as the United States (NPS, 1998) and United Kingdom (Historic England, 2008) and developing countries such as Costa Rica (ICOMOS Costa Rica, 2019) and South Africa (SAHRA, 1999). Yet, Fatorić and Biesbroek (2020) found that in practice, there is a profound lack of awareness of diverse heritage benefits among environmental and/or climate change stakeholders and policymakers. Similarly, Bosher et al. (2019) suggested that research and practice on climate adaptation and disaster risk reduction need to better understand not only what they can do for cultural heritage to conserve it for the future generations, but also what the heritage sector can do for climate adaptation and disaster risk reduction. In our study, we found that some experts were not aware (or able to suggest) of practical examples of how diverse heritage can support climate change mitigation and adaptation. Thus, identifying and quantifying heritage benefits for supporting climate adaptation of various sectors and systems and reducing greenhouse gas emissions is a timely task as multiple sectors already compete for limited financial resources in enhancing climate change resilience (Fatorić and Seekamp, 2018; Xiao et al., 2019).

3.1.2. Social benefits

Social benefits were recognised by the experts as important aspects for current and future cultural heritage management and for leveraging climate change actions. As noted by experts, heritage is shaped by social contexts and processes over decades and centuries and is a place- and time-specific. Experts commonly stressed that cultural heritage is valuable because it can contribute to processes of cultural identity and togetherness, as well as to collective and shared history and memory. Many experts stressed that heritage is a stimulus for social cohesion and integrity and a sense of place through a connection between social life and the built and natural environment, particularly relevant in the time of climate crisis. This perspective is also reflected in national cultural heritage policy by pointing out that "Through our cultural heritage, we feel connected with one another and with the past, in that way deriving a significant part of our identity" (RCE, 2015).

Our interview data suggest that resilient cultural heritage can positively influence some of the social benefits such as cultural identity, social cohesion and place attachment. Similar findings were found in previous research on social benefits of cultural heritage, in Iran, in terms of earthquake recovery (Parsizadeh et al., 2015), in New Zealand, related to indigenous people practices (Pomeroy and Tapuke, 2016), in the UK, related to coastal and marine ecosystem management (Ainsworth et al., 2019) and also in terms of fishing practices in the U.S. (Khakzad and Griffith, 2016).

3.1.3. Economic benefits

Economic benefits are found to strongly relate to the utility of cultural heritage for communities and some sectors, such as renewable energy, water management, urban revitalisation and tourism. Economic benefits are a guiding factor of current national cultural heritage policy (RCE, 2015). The majority of the experts stressed that as societies, economies and environment change, so do cultural heritage values, management and conservation standards and regulations. Experts underlined the need for heritage conservation through adaptive reuse or transformation, which can meet contemporary societal, economic and environmental needs and ensure heritage continuity. Familiar examples include the transformation of churches into business spaces, reuse of historic canals or water millponds for rainwater storage, restoration of old fortifications for current dyke reinforcements and transformation of the original function of water mills into renewable energy infrastructure and homes. Several CH experts stated that various heritage types can benefit from adaptive reuse and transformation, as these processes can ensure dynamic conservation and continuity of diverse heritage. Indeed, Janssen et al. (2017) studying the development of the Dutch heritage sector, demonstrated that heritage's continuity was achieved not in the conservation of physical or material aspects, but in terms of reuse and transformation of heritage. Cultural heritage has become a component of spatial quality embedded in a new transformation plan and has provided new economic value to society (rather than solely focusing on the conservation of individual historic buildings or structures). This in turn can help enhance community resilience against the changing climate (ICOMOS, 2019).

There is a growing consensus in the climate adaptation literature highlighting the value of economic diversification in reducing the impacts of climate change on climate-sensitive sectors such as tourism (IPCC, 2014). In this study, economic diversification was found among the CH experts to have important implications for the heritage tourism sector facing climate change challenges. Several heritage experts emphasised the importance of cultural heritage as a driver of the distinctive Dutch tourism sector, which is a less climate-sensitive tourism type than coastal or mountain tourism. For instance, the dyke Afsluitdijk located between the provinces of North Holland and Friesland, which is an active flood defence and a nationally significant

heritage asset, attracted around 700,000 visitors in 2018.[2] Opportunities from Dutch heritage tourism may increase especially with projected drier summers and warmer seasons (IenM, 2016).

3.1.4. Aesthetic and environmental benefits

Aesthetic benefits that are related to the physical or visual appearance of the cultural heritage were identified as less salient benefits. Experts mentioned that "beautiful" heritage can influence the design of appealing and interesting living and business environment and assist in improving the spatial and environmental quality of urban and rural areas. Interestingly, only two experts mentioned the importance of environmental benefits in the context of climate change actions. For these experts, reducing carbon footprint by retrofitting historic buildings and contributing to climate change mitigation and sustainable development goals by balancing the need for energy transition and conservation practices were important aspects. Relatedly, Nocca's (2017) study, which critically analysed economic, cultural, social and environmental benefits of heritage for achieving sustainable development, found that the environmental benefits of cultural heritage are poorly considered in decision-making processes. Similarly, Foster (2020) found that environmental benefits from adaptive reuse of cultural heritage are not widely addressed in heritage practice. Thus, further research is warranted to improve recognition and representation of environmental benefits and potential loss and damage of different cultural heritage types in environmental and climate change policies.

3.2. Evolving vs. static cultural heritage management

The majority of experts opined that Dutch cultural heritage management has been changing and continuously evolving through the decades. That said, management is perceived as a continuous "exhibition" of change over time, reflecting the transformative nature of diverse heritage types through their adaptive reuse, reinterpretation, changing social and cultural groups' values and perceptions. Only three experts stated that heritage management has been static or "frozen", focusing mainly on conserving original heritage materials, fabric and overall integrity and/or authenticity. For some experts, heritage management was perceived as both evolving and static. As such, few CH expert opined that such management has been prone to "starts and stops", where new initiatives for heritage management or conservation would start from scratch due to new environmental policies and ignore what was already done within the sector.

The notion of the evolving and transformative heritage management was brought up by many CH experts as a critical requirement for more sustainable heritage management, especially in time of anthropogenic climate change. Climate change resilient heritage reflects decision-makers' capabilities to adapt heritage practice through transformation, continuous heritage assets reuse and development through time. Previous research has shown that reusing historic buildings or structures has a high potential to both conserve the heritage significance and associated benefits, as well as to help reduce greenhouse emissions by minimising the use of new building materials, increasing the energy efficiency of heritage sites (Bertolin and Loli, 2018; Foster, 2020; Hambrecht and Rockman, 2017; Harkin et al., 2020; Sesana et al., 2019), or conserving historic landscapes and archaeological sites because of their carbon sequestration capacity (Gearey et al., 2014). Equally important is to document and monitor intangible heritage such as traditional or local knowledge, practices and skills (Ghahramani et al., 2020; Kim, 2011) which are shown in this study as invaluable informational benefits for diverse stakeholders and policymakers in climate change mitigation and adaptation fields.

[2] Data gathered at the scoping meeting with Rijkswaterstaat, a national government agency that is responsible for dyke's safety and water management.

Our findings also suggest that experts perceived the evolving nature of heritage management and loss of specific characteristics of heritage as an inevitable outcome of "living heritage" where heritage management has been and will be subjected to loss due to changing climate. Experts noted that diverse heritage types that were already lost provide invaluable lessons, including the inspiration for present heritage transformation or building resilience and designing adaptation actions. Indeed, as proposed by Holtorf (2018), decisionmakers and stakeholders should avoid loss aversion and recognise that a transformation of heritage can ultimately be a way of absorbing climate change disturbance. Similarly, Renes (2018) suggested that letting existing historic buildings fall into ruins rather than demolishing them, conserving parts of former dykes and visualising and interpreting lost archaeological sites could be potential climate adaptation strategies which focus on the transformation of diverse heritage rather than on their inevitable loss. Richards et al. (2019) went on to urge that while disasters are perceived as serious threats to heritage sites, their potential contribution to the formation of new types of heritage should be acknowledged and co-creation of the environment within heritage should be emphasised. Nevertheless, careful attention need to be paid to address social and climate justice (Wallimann-Helmer, 2015) in such decision-making processes as various community and stakeholder groups who have ties to cultural heritage can be affected by those decisions (ICOMOS, 2019).

3.3. A changing cultural heritage practice due to climate policy

When asked about whether the current cultural heritage practice is being influenced by climate policy in the Netherlands, about half of the experts described that their heritage practices have been already changing, while some experts opined that the change to heritage practice and policy will likely come in the near future. For only a few experts, no change in heritage management or policy was perceived. Climate mitigation and the use of renewable energy were brought up by most experts as an important driver of changing heritage practice. The responses most often included new regulations in the heritage sector due to installation of solar thermal or photovoltaic panels on historic buildings, construction of wind turbines or parks across historic landscapes and transformation of mills to generate green energy. Experts often recognised the synergistic relationship between heritage conservation and environmental management and climate change actions. Specifically, CCE experts recognised that integration of renewable energy and energy efficiency in historic buildings present more sustainable solutions for conservation (e.g., reusing existing materials will help to achieve decarbonisation).

Our findings also show a positive framing of changing heritage management where heritage sector has a capacity for "adapting", "transforming" and "reorganising" in the face of new challenges such as climate change. Several CH experts emphasised that resilient heritage management requires con sideration of past efforts and experiences both internally and within the wider environmental management. Indeed, Holtorf (2018) argued that cultural heritage that is not adaptable and receptive to transformation is not sufficiently resilient and sustainable over time. However, the role of the heritage sector in achieving climate change actions has not been well recognised, nor have heritage sector been well integrated into climate change policies so in the Netherlands as globally (Fatorić and Biesbroek, 2020; Delta Programme, 2019; ICOMOS, 2019). The failure to design and implement climate adaptation policy not only can lead to conflicts between the heritage sector and environmental or climate policies in the Netherlands during the implementation of climate- and water-proof initiatives for the most important economic and social sectors (Delta Programme, 2019; IenM, 2016) but also is required if diverse heritage assets are to continue to maintain their benefits over time. Previous research has argued that heritage decision-making should apply an approach that allows for integrating cultural heritage significance or values assessment into climate change vulnerability or risk assessment (Carmichael et al., 2018; Daly, 2014;

Sesana et al., 2018; Xiao et al., 2019), assessing possible climate adaptation failures and designing actions to minimise failures, preparing for actions that might be triggered later, monitoring and adjusting actions, promoting adaptive learning over time and revisiting policy decisions (Haasnoot et al., 2013; Klijn et al., 2015). Nevertheless, several CH experts cautioned that such transformation of heritage assets must be just and inclusive and pay attention to the stakeholders and communities who could be affected by new standards, regulations and policies. Reflecting this challenge, greater research attention should be placed on the relationship of potential trade-offs between economic, environmental and social objectives in heritage transformation. For instance, there is a need to determine how much transformation of cultural heritage is allowed before it loses its heritage benefits, or how to frame the loss as an opportunity for the evolving heritage management or potential new benefits in cultural heritage policy subjected to climate change.

3.4. *Interrelationships between heritage benefits and heritage management*

We developed a concept diagram (Fig. 4) to show the interrelationships between heritage benefits and cultural heritage management over time, as well as interrelationships between heritage benefits and climate policy influence on heritage practice. These interrelationships were identified from experts' responses (see Fig. 2 for causation coding technique) and present the first attempt to identify such interrelationships between heritage benefits and management. Two types of interrelationships were found: (1) bidirectional where the heritage benefit can affect the heritage management and heritage management can affect heritage benefit, and (2) unidirectional where heritage benefit can affect heritage practice. The informational, economic, social and environmental benefits can positively affect heritage management by shaping heritage management over time (i.e., leading to changing or evolving management as perceived by many experts). In parallel, the evolving/changing heritage management can positively affect heritage benefits by increasing or enhancing the provision of heritage benefits. Similarly, heritage management that is perceived as both evolving and static can positively affect all identified benefits and these heritage benefits can positively affect management over time. Static heritage management is found to be positively affected only by aesthetic benefits and aesthetic benefits can affect static management over time. Both aesthetic benefits as static management are the least transformative dimensions. We also found that environmental benefits (e.g., reduction in carbon footprint and greenhouse gas emissions) can drive positive change (i.e., unidirectional relationship) in heritage practice which is or will be influenced by climate policy.

Note that in this study, we identified only positive interrelationships, but we recognise that interrelationships can be both positive and negative.

4. Concluding remarks

Assessments of climate change risks and vulnerabilities for diverse cultural heritage together with strategies on how to cope with those risks have been emerging to fill significant knowledge gaps and help inform current and future cultural heritage decision- and policy-making processes (Bertolin and Loli, 2018; Bosher et al., 2019; Fatorić and Seekamp, 2017a; Guzman et al., 2020; Mazurczyk et al., 2018). Yet, the understanding of linkages between benefits of cultural heritage and climate change actions are poorly explored. Despite the fact that this study is based on a purposive expert sample, the novelty of our study lies in using an emic approach to identify and characterise a multiplicity of cultural heritage benefits for supporting climate change adaptation and mitigation actions in the Netherlands. In this respect, diverse cultural heritage assets do not only play an important role in being a source of information and knowledge about past societal, economic and environmental development, disturbances and disasters, but diverse heritage assets also play a role in sustaining a shared identity and history and contributing to more sustainable and resilient economic sectors.

Further multidisciplinary research is required to advance our findings on the potential of Dutch heritage for achieving climate change actions by expanding the sample size and diversity of experts. Equally important is the need to reassess experts' perceptions, knowledge and attitudes over time in order to mitigate possible conflicts so in heritage and environmental management as in supporting climate change actions. Considering the lack of research on how can diverse cultural heritage types better support climate change adaptation and mitigation at the global scale, future research could focus on a wide range of international, regional and local case studies (longitudinal comparative

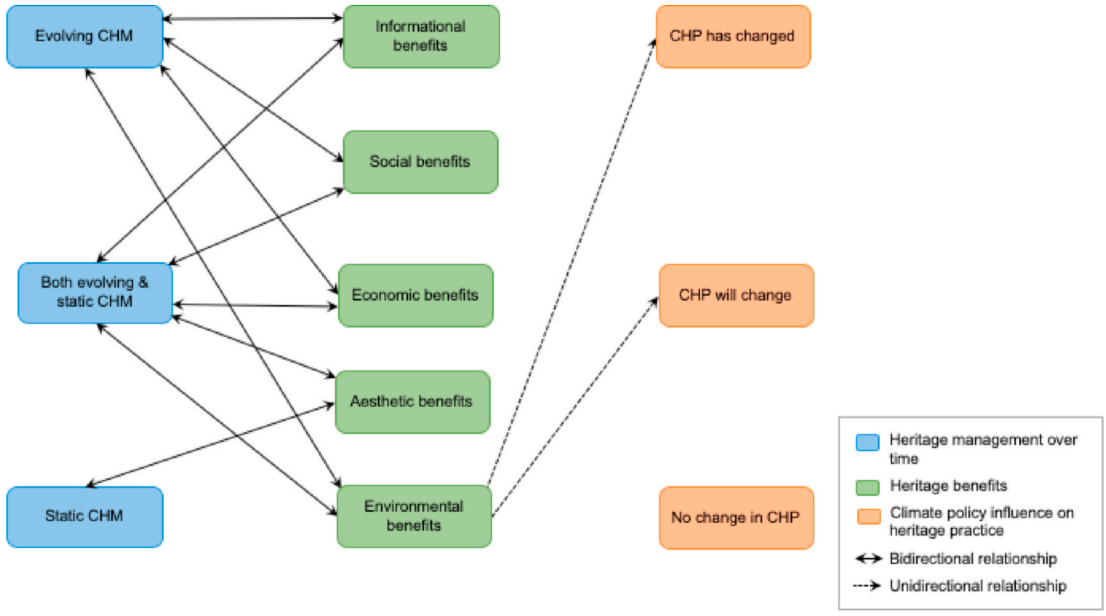

Fig. 4. Concept diagram showing bidirectional relationships (solid arrows) between heritage benefits in green boxes and cultural heritage management (CHM) over time in blue boxes. Diagram also shows unidirectional interrelationships (dashed arrows) between heritage benefits and climate policy influence on cultural heritage practice (CHP) in orange boxes. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

cases) using deliberative approaches to identify heritage benefits among multilevel actors, stakeholders and community and indigenous groups. This would also facilitate discussion and understanding of the different valuing processes at play in both heritage management and climate change adaptation and mitigation. Most adaptation and mitigation policies are approached in isolation from each other, which limits the potential for synergies or minimises trade-offs across adaptation and mitigation actions (IPCC, 2014). As shown in the present study, diverse cultural heritage types can provide examples of possible integrated climate change management. Thus, it is essential to improve understanding of how to effectively mobilise cultural heritage in climate change mitigation and adaptation policies across various governance, socio-cultural, and economic settings globally. Bolstering the need for additional research are the efforts made by the Irish government with its recent development of climate adaptation policy for cultural heritage (CHG, 2019).

This study also advances the current understanding of the evolving or transformative nature of heritage management in the Netherlands, as well as the understanding of the influence of climate policy on heritage practice. These findings are not widely addressed in the heritage management and climate change or environmental literature or policy documents. Thus, research is needed to analyse the effects of climate change mitigation and adaptation policies on cultural heritage benefits, values and practice by using more culturally appropriate approaches such as values-based and decision-analytic approaches (e.g., Fatorić and Seekamp, 2017b; Gregory and Trousdale, 2009) and evaluate the multilevel actors' transformational skills and capacities, identify limits and opportunities within existing governance systems and explore dimensions of social and climate justice in enabling transformative change of heritage management and policy in different social and geographic contexts. We also identified positive interrelationships between heritage benefits and heritage management, yet further investigation is needed into understanding the interrelationships between heritage benefits and management and the mechanisms behind those interrelationships.

From a policy perspective, we suggest that climate change practice and policy in the Netherlands and in other geographic contexts may benefit greatly from closer interaction and communication with cultural heritage stakeholders and multilevel actors so that mutual challenges and competing priorities (Fatorić and Biesbroek, 2020) in transformative climate change policies could be minimised and more holistic co-production of knowledge could be explored. Ultimately, we hope that this study will encourage heritage scholars and practitioners globally to consider climate change actions in their work which could increase collective action toward low-carbon and climate-resilient development.

CRediT authorship contribution statement

Sandra Fatorić: Conceptualization, Methodology, Investigation, Visualization, Writing - original draft, Writing - review & editing, Funding acquisition. **Linde Egberts:** Resources, Validation, Writing - review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

The research presented in this paper was supported by the European Union's Horizon 2020 Research and Innovation Programme under the Marie Skłodowska-Curie grant agreement No. 707404. We would like to thank the experts who generously shared their perceptions and time for the research presented in this paper, as well as the anonymous reviewers whose thoughtful comments improved our paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvman.2020.111107.

References

Ainsworth, G.B., Kenter, J.O., O'Connor, S., Daunt, F., Young, J.C., 2019. A fulfilled human life: eliciting sense of place and cultural identity in two UK marine environments through the Community Voice Method. Ecosyst Serv 39, 100992. https://doi.org/10.1016/j.ecoser.2019.100992.

Anders, A.D., Lester, J.N., 2014. Lessons from interdisciplinary qualitative research: learning to work against a single story. Qual. Res. 5, 738–754. https://doi.org/10.1177/1468794114557994.

Ashworth, G.J., 2011. Preservation, conservation and heritage: approaches to the past in the present through the built environment. Asian Anthropol 10 (1), 1–18. https://doi.org/10.1080/1683478X.2011.10552601.

Avrami, E., Macdonald, S., Mason, R., Myers, D., 2019. Values in Heritage Management: Emerging Approaches and Research Directions. Getty Conservation Institute, Los Angeles.

Bertolin, C., Loli, A., 2018. Sustainable interventions in historic buildings: a developing decision making tool. J. Cult. Herit. 34, 291–302. https://doi.org/10.1016/j.culher.2018.08.010.

Bosher, L., Kim, D., Okubo, T., Chmutina, K., Jigyasu, R., 2019. Dealing with multiple hazards and threats on cultural heritage sites: an assessment of 80 case studies. Disaster Prev. Manag. 29 (1), 109–128. https://doi.org/10.1108/DPM-08-2018-0245.

Braae, E., 2015. Beauty Redeemed: Recycling Post-industrial Landscapes. IKAROS Press, Risskov.

Bryman, A., 2012. Social Research Methods, fourth ed. Oxford University Press, Oxford.

Campbell, J.L., Quincy, C., Osserman, J., Pedersen, O.K., 2013. Coding in-depth semistructured interviews: problems of unitization and intercoder reliability and agreement. Socio. Methods Res. 42 (3), 294–320. https://doi.org/10.1177/0049124113500475.

Carey, J., Burgman, M.A., 2008. Linguistic uncertainty in qualitative risk analysis and how to minimize it. Ann. N. Y. Acad. Sci. 1128, 13–17. https://doi.org/10.1196/annals.1399.003.

Carmichael, B., Wilson, G., Namarnyilk, I., Nadji, S., Brockwell, S., Webb, B., Hunter, F., Bird, D., 2018. Local and indigenous management of climate change risks to archaeological sites. Mitig. Adapt. Strategies Glob. Change 23 (2), 231–255. https://doi.org/10.1007/s11027-016-9734-8.

Daly, C., 2014. A framework for assessing the vulnerability of archaeological sites to climate change: theory, development, and application. Conserv Manage Archaeol Sites 16 (3), 268–282. https://doi.org/10.1179/1350503315Z.00000000086.

Dawson, T., Hambly, J., Kelley, A., Lees, W., Miller, S., 2020. Coastal heritage, global climate change, public engagement, and citizen science. Proc. Natl. Acad. Sci. Unit. States Am. 117 (15), 8280–8286. https://doi.org/10.1073/pnas.1912246117.

De la Torre, M., 2002. Assessing the Values of Cultural Heritage. Getty Conservation Institute, Los Angeles.

Delta Programme, 2019. Delta Programme 2020: Continuing the Work on the Delta: Down to Earth, Alert, and Prepared. Delta Programme Commissioner, The Hague.

Department of Culture, Heritage and the Gaeltacht, CHG, 2019. Built & archaeological heritage climate change sectoral adaptation plan, prepared under the national adaption framework. https://www.chg.gov.ie/heritage/climate-change/the-built-and-archaeological-heritage-climate-change-sectoral-adaptation-plan. (Accessed 16 December 2019).

Etikan, I., Bala, K., 2017. Sampling and sampling methods. Biom Biostat Int J 5 (6), 215–217. https://doi.org/10.15406/bbij.2017.05.00149.

Fatorić, S., Seekamp, E., 2017a. Are cultural heritage and resources threatened by climate change? A systematic literature review. Climatic Change 142 (1), 227–254. https://doi.org/10.1007/s10584-017-1929-9.

Fatorić, S., Seekamp, E., 2017b. Evaluating a decision analytic approach to climate change adaptation of cultural resources along the Atlantic Coast of the United States. Land Use Pol. 68, 254–263. https://doi.org/10.1016/j.landusepol.2017.07.052.

Fatorić, S., Seekamp, E., 2018. A measurement framework to increase transparency in historic preservation decision-making under changing climate conditions. J. Cult. Herit. 30, 168–179. https://doi.org/10.1016/j.culher.2017.08.006.

Fatorić, S., Biesbroek, R., 2020. Adapting cultural heritage to climate change impacts in The Netherlands: barriers, interdependencies, and strategies for overcoming them. Climatic Change. In press.

Foster, G., 2020. Circular economy strategies for adaptive reuse of cultural heritage buildings to reduce environmental impacts. Resour. Conserv. Recycl. 152, 104507. https://doi.org/10.1016/j.resconrec.2019.104507.

Fredheim, L., Khalaf, M., 2016. The significance of values: heritage value typologies re-examined. Int. J. Herit. Stud. 22 (6), 466–481. https://doi.org/10.1080/13527258.2016.1171247.

Fusch, P.I., Fusch, G.E., Ness, L.R., 2018. Denzin's paradigm shift: revisiting triangulation in qualitative research. J Social Change 10 (1), 19–28. https://doi.org/10.5590/JOSC.2018.10.1.02.

Gearey, B.R., Fletcher, W., Fyfe, R., 2014. Managing, valuing, and protecting heritage resources in the twenty-first century: peatland archaeology, the ecosystem services framework, and the kyoto protocol. Conserv. Manag. Archaeol. Sites 16 (3), 236–244. https://doi.org/10.1179/1350503315Z.00000000084.

Ghahramani, L., McArdle, K., Fatorić, S., 2020. Minority community resilience and cultural heritage preservation: a case study of the gullah geechee community. Sustainability 12, 2266. https://doi.org/10.3390/su12062266.
Ginzarly, M., Pereira-Roders, A., Teller, J., 2019. Mapping historic urban landscape values through social media. J. Cult. Herit. 36, 1–11. https://doi.org/10.1016/j.culher.2018.10.002.
Gregory, R., Trousdale, W., 2009. Compensating aboriginal cultural losses: an alternative approach to assessing environmental damages. J. Environ. Manag. 90, 2469–2479. https://doi.org/10.1016/j.jenvman.2008.12.019.
Guzman, P., Fatorić, S., Ishizawa, M., 2020. Monitoring climate change in world heritage properties: evaluating landscape-based approach in the state of conservation system. Climate 8 (3), 39. https://doi.org/10.3390/cli8030039.
Haasnoot, M., Kwakkel, J.H., Walker, W.E., Ter Maat, J., 2013. Dynamic adaptive policy pathways: a method for crafting robust decisions for a deeply uncertain world. Global Environ. Change 23 (2), 485–498. https://doi.org/10.1016/j.gloenvcha.2012.12.006.
Hambrecht, G., Rockman, M., 2017. International approaches to climate change and cultural heritage. Am. Antiq. 82 (4), 62–641. https://doi.org/10.1017/aaq.2017.30.
Harkin, D., Davies, M., Hyslop, E., Fluck, H., Wiggins, M., Merritt, O., Barker, L., Deery, M., McNeary, R., Westley, K., 2020. Impacts of climate change on cultural heritage. MCCIP Science Review 2020, 616–641. https://doi.org/10.14465/2020.arc26.che.
Henderson, J., 2019. Oceans without history? Marine cultural heritage and the sustainable development agenda. Sustainability 11 (18), 5080. https://doi.org/10.3390/su11185080.
Henderson, M., Seekamp, E., 2018. Battling the tides of climate change: the power of intangible cultural resource values to bind place meanings in vulnerable historic districts. Heritage 1 (2), 220–238. https://doi.org/10.3390/heritage1020015.
Het Oversticht, 2019. Knowledge of the past contributes to the solution of Kampen's water problem. https://hetoversticht.nl/actueel/nieuws/125/knowledge-of-the-past-contributes-to-the-solution-of-kampens-water-problem. (Accessed 14 December 2019).
Historic England, 2008. Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment. Historic England, London.
Holtorf, C., 2018. Embracing change: how cultural resilience is increased through cultural heritage. World Archaeol. 50 (4), 639–650. https://doi.org/10.1080/00438243.2018.1510340.
International Council on Monuments and Sites, ICOMOS, 2019. Future of Our Pasts: Engaging Cultural Heritage in Climate Action. ICOMOS, Paris.
ICOMOS Costa Rica, 2019. Reglamento para la Ley Nº 7555 de Patrimonio Histórico Arquitectónico. http://www.icomoscr.org/content/index.php/ley-7555-reglamento. (Accessed 2 October 2019).
Intergovernmental Panel on Climate Change, IPCC, 2014. IPCC Fifth Assessment Report: Climate Change 2014, Working Group II: Impacts, Adaptation and Vulnerability. Cambridge University Press, Cambridge.
Jackson, R., Dugmore, A.J., Riede, F., 2018. Rediscovering lessons of adaptation from the past. Global Environ. Change 52, 58–65. https://doi.org/10.1016/j.gloenvcha.2018.05.006.
Janssen, J., Luiten, E., Renes, H., Stegmeijer, E., 2014. Heritage planning and spatial development in The Netherlands: changing policies and perspectives. Int. J. Herit. Stud. 20 (1), 1–21. https://doi.org/10.1080/13527258.2012.710852.
Janssen, J., Luiten, E., Renes, H., Stegmeijer, E., 2017. Heritage as sector, factor and vector: conceptualizing the shifting relationship between heritage management and spatial planning. Eur. Plann. Stud. 25, 1654–1672. https://doi.org/10.1080/09654313.2017.1329410.
Jones, S., 2016. Wrestling with the social value of heritage: problems, dilemmas and opportunities. J. Community Archaeol. Herit. 4 (1), 21–37. https://doi.org/10.1080/20518196.2016.1193996.
Khakzad, S., Griffith, D., 2016. The role of fishing material culture in communities' sense of place as an added-value in management of coastal areas. J Mar Island Cult 5 (2), 95–117. https://doi.org/10.1016/j.imic.2016.09.002.
Kim, H.-E., 2011. Changing climate, changing culture: adding the climate change dimension to the protection of intangible cultural heritage. Int. J. Cult. Property 18, 259–290. https://doi.org/10.1017/S094073911100021X.
Klijn, F., Kreibich, H., de Moel, H., Penning-Rowsell, E., 2015. Adaptive flood risk management planning based on a comprehensive flood risk conceptualization. Mitig. Adapt. Strategies Glob. Change 20, 845–864. https://doi.org/10.1007/s11027-015-9638-z.
Licciardi, G., Amirtahmasebi, R., 2012. The Economics of Uniqueness: Investing in Historic City Cores and Cultural Heritage Assets for Sustainable Development. World Bank, Washington, DC.
Maeer, G., 2014. The values and benefits of heritage: do economists think about more than money? APT Bull. 45 (2/3), 57–63.
Mason, R., 2008. Be interested and beware: joining economic valuation and heritage conservation. Int. J. Herit. Stud. 14 (4), 303–318. https://doi.org/10.1080/13527250802155810.
Mazurczyk, T., Piekielek, N., Tansey, E., Goldman, B., 2018. American archives and climate change: risks and adaptation. Clim Risk Manage 20, 111–125. https://doi.org/10.1016/j.crm.2018.03.005.
Ministry of Education, Culture and Science, OCW, 2019. Heritage Counts, the Meaning of Heritage for Society. OCW, The Hague.
Ministry of Infrastructure and the Environment, IenM, 2016. Adapting with Ambition: National Climate Adaptation Strategy 2016 (NAS). IenM, The Hague.
Ministry of the Interior and Kingdom Relations, BZK, 2018. Scope and Level of Detail SEA National Environmental Planning Strategy. BZK, The Hague.
Nanavati, M., 2018. Developing tradition: a case of heritage foundation of Pakistan. In: Amoruso, G. (Ed.), Putting Tradition into Practice: Heritage, Place and Design, Proceedings of 5th INTBAU International Annual Event. Springer, Cham, pp. 61–69.
National Park Service, NPS, 1998. National Register Bulletin: How to Apply the National Register Criteria for Evaluation. NPS, Washington.
Nieuwhof, A., Bakker, M., Knol, E., de Langen, G.J., Nicolay, J.A.W., Postma, D., Schepers, M., Varwijk, T.W., Vos, P.C., 2019. Adapting to the sea: human habitation in the coastal area of the northern Netherlands before medieval dike building. Ocean Coast Manag. 173, 77–89. https://doi.org/10.1016/j.ocecoaman.2019.02.014.
Nocca, F., 2017. The role of cultural heritage in sustainable development: multidimensional indicators as decision-making tool. Sustainability 9 (10), 1882. https://doi.org/10.3390/su9101882.
Parsizadeh, F., Ibrion, M., Mokhtari, M., Lein, H., Nadim, F., 2015. Bam 2003 earthquake disaster: on the earthquake risk perception, resilience and earthquake culture – cultural beliefs and cultural landscape of Qanats, gardens of Khorma trees and Arghe Bam. Int J Disast Risk Re 14, 457–469. https://doi.org/10.1016/j.ijdrr.2015.09.011.
Polit, D.F., Beck, C.T., 2010. Generalization in quantitative and qualitative research: myths and strategies. Int. J. Nurs. Stud. 47, 1451–1458. https://doi.org/10.1016/j.ijnurstu.2010.06.004.
Pomeroy, A., Tapuke, S., 2016. Understanding the place of intangible cultural heritage in building enduring community resilience: murupara case study. N. Z. Sociol. 31 (7), 183–204.
RCE, 2015. Heritage Act 2016. RCE, Amersfoort.
RCE, 2018. Manual Water, Heritage and Environment. RCE, Amersfoort.
Renes, H., 2018. New nature in old landscapes: some Dutch examples of the relation between history, heritage and ecological restoration. Environ. Val. 27, 351–375. https://doi.org/10.3197/096327118X15251686827714.
Richards, J., Orr, S.A., Viles, H., 2019. Reconceptualising the relationships between heritage and environment within an Earth System Science framework. J. Cult. Herit. Manag. Sustain Dev. 10 (2), 122–129. https://doi.org/10.1108/JCHMSD-08-2019-0099.
Room for the River, 2019. Rivierverruiming overdiepse polder. https://www.ruimtevoorderivier.nl/project/rivierverruiming-overdiepse-polder/. (Accessed 13 December 2019).
Saldana, J., 2012. The Coding Manual for Qualitative Researchers, 2rd edn. Sage, Thousand Oaks.
Sesana, E., Bertolin, C., Gagnon, A.S., Hughes, J.J., 2019. Mitigating climate change in the cultural built heritage sector. Climate 7 (7), 90. https://doi.org/10.3390/cli7070090.
Sesana, E., Gagnon, A.S., Bertolin, C., Hughes, J., 2018. Adapting cultural heritage to climate change risks: perspectives of cultural heritage experts in Europe. Geosciences 8, 305. https://doi.org/10.3390/geosciences8080305.
Smith, L., 2006. Uses of Heritage. Routledge, Abingdon.
South African Heritage Resources Agency, SAHRA, 1999. National Heritage Resources Act. SAHRA, Cape Town.
Tisma, A., Meijer, J., 2018. Lessons Learned from Spatial Planning in The Netherlands: in Support of Integrated Landscape Initiatives, Globally. Netherlands Environmental Assessment Agency, The Hague.
Tuan, T.H., Navrud, S., 2008. Capturing the benefits of preserving cultural heritage. J. Cult. Herit. 9 (3), 326–337. https://doi.org/10.1016/j.culher.2008.05.001.
United Nations Educational, Scientific and Cultural Organization, UNESCO, 2013. Managing Cultural World Heritage. https://whc.unesco.org/document/125839. (Accessed 14 January 2020).
United Nations Sustainable Development Goals, UNSDG, 2015. Sustainable Development Goals. https://sustainabledevelopment.un.org/sdgs. (Accessed 2 June 2020).
Van Alphen, S., 2020. Room for the River: innovation, or tradition? The case of the noordwaard. In: Hein, C. (Ed.), Adaptive Strategies for Water Heritage. Springer, Cham, pp. 308–323.
Wallimann-Helmer, I., 2015. Justice for climate loss and damage. Climatic Change 133, 469–480. https://doi.org/10.1007/s10584-015-1483-2.
Xiao, X., Seekamp, E., Eaton, M., Van der Burg, M.P., Fatorić, S., McCreary, A., 2019. Optimizing historic preservation under climate change: decision support for cultural resource adaptation planning in National Parks. Land Use Pol. 83, 379–389. https://doi.org/10.1016/j.landusepol.2019.02.011.