

Cultural heritage and risk assessments: Gaps, challenges, and future research directions for the inclusion of heritage within climate change adaptation and disaster management

Kate Crowley¹  | Rowan Jackson¹ | Siona O'Connell² | Dulma Karunarthna³ |
Esti Anantasari⁴ | Arry Retnowati⁴ | Dominique Niemand²

¹School of GeoSciences, University of Edinburgh, Edinburgh, UK

²Faculty of Humanities, University of Pretoria, Pretoria, South Africa

³Centre for Asia Pacific Initiatives, University of Victoria, Victoria, British Columbia, Canada

⁴Gama-InaTEK: Centre of Excellence and Innovation of Disaster Mitigation Technology, Universitas Gadjah Mada, Yogyakarta, Indonesia

Correspondence

Kate Crowley, School of GeoSciences, University of Edinburgh, Drummond Street, Edinburgh EH8 9XP, UK.
Email: kate.crowley@ed.ac.uk

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Abstract

Cultural heritage shapes our identity, delivers capacities, and exposes vulnerabilities, yet cultural heritage value and vulnerability are largely missing from conventional risk assessments. Risk assessments are a fundamental first step in identifying effective mechanisms for Climate Change Adaptation (CCA) and disaster management. However, by ignoring the influence of heritage, decision makers are limiting their understanding of risk and therefore opportunities vital for building and maintaining local resilience. We present findings from a synthesis of peer-reviewed literature from the last 15 years on cultural heritage risk assessment for primarily CCA but with wider implications for disaster management. We identify a significant lack of research examining intangible aspects of heritage and their influence on risk and resilience. Across the literature, risk assessments focus largely on exposure in isolation from vulnerability or adaptive capacity and where vulnerability is included there is no consistent definition or criterion. We highlight that the most frequently used methods have minimal engagement with local community values, experience, and knowledge relating to heritage practice and customs. Community engagement is most often associated with 'professional experts' rather than members of a local community. Furthermore, the Global South is severely under-represented with a research bias towards Europe and North America. We recommend an agile approach to future assessments with the adjustment of risk tool research and development to include participatory approaches. Future climate risk frameworks must incorporate community-scale values to understand the role of cultural heritage in relation to adaptive capacity, vulnerability, and resilience.

KEYWORDS

adaptation to climate change, climate resilience, cultural heritage, risk, risk-based planning, sustainable development

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1 | INTRODUCTION

Cultural heritage influences our actions before, during, and after disasters, yet as Tschakert et al. (2017, p. 6) argue ‘assessments of disaster impacts largely ignore such experiences and understandings’. By incorporating cultural heritage into risk-informed decision-making, the value and role of social memory, identity, symbolic practices, and material relationships can be understood and contribute to building and maintaining resilience (Wilson, 2012). Without attention to cultural heritage, personal histories, memories, and motivations are largely ignored in assessments that should provide the evidence base for Climate Change Adaptation (CCA) as well as wider disaster management decisions. Cultural heritage cannot be reduced to passive objects, sites, and landscapes threatened by climate impacts, but also incorporates values, beliefs, and symbolic practices vital to building capacity in response to climate stressors and other hazards (Adger et al., 2013).

Beyond the built environment and portable objects that dominate cultural heritage literatures, traditional knowledge, beliefs, symbols, and practices constitute group identity and deliver important information between generations about how to observe and respond to environmental change (Berkes, 2009). If globalization causes the loss of local traditions, it will also undermine the capacities of communities to respond adaptively to climate change (Hastrup, 2018). The view that global climate change simply presents a threat to cultural heritage is a misnomer. Harvey and Perry (2015) suggest we need a more creative response to rapid changes associated with climate and social change, which includes embracing loss and sharing diverse forms of environmental knowledge (see also DeSilve and Harrison, 2020).

How we perceive cultural heritage is considered to be situated within a risk context (Harrison, 2013). From a Western perspective, heritage is often framed through a preservationist lens as something to be protected from threats rather than a dynamic and multifaceted resource that delivers resilience. To this end, heritage should not be viewed simply as a stable material to be preserved for the future, but as a shifting interaction between past, present, and future. In order to understand both risks and opportunities, consideration is required of the existing social, political, and cultural contexts in which communities operate, providing a clearer understanding of the threats to, and capacities delivered by, cultural heritage (Harvey and Perry, 2015).

Identifying and developing interdisciplinary methods that can capture the ‘invisible’ vulnerability, value, and capacity of cultural heritage is considered an urgent policy need (ICOMOS, 2019). This need is greatest in developing countries where people often lack the resources and

agency to develop or adopt frameworks for risk-informed natural hazard management. Ran et al. (2020) found that many Low- and Middle-Income Countries (LMICs) rely on stock applications of existing frameworks, with little adaptation to specific cultural, societal, or economic contexts. There has been some progress on an international scale to incorporate heritage within risk thinking. For example, The Sendai Framework for Disaster Risk Reduction (2015–2030) refers to cultural heritage in terms of ensuring a better understanding of the impacts on heritage and of good governance for the protection of heritage:

‘To systematically evaluate, record, share and publicly account for disaster losses and understand the economic, social, health, education, environmental and cultural heritage impacts, as appropriate, in the context of event-specific hazard-exposure and vulnerability information (UNDRR, 2015, p. 15);

To protect or support the protection of cultural and collecting institutions and other sites of historical, cultural heritage and religious interest’ (UNDRR, 2015, p. 19).

To meet the goals of such international agreements, risk assessment methods and tools are developed, tested, and improved. The result is a potential increase in accessibility to risk tools and data for local to national government and other key stakeholders. However, comprehensive and systematic use of holistic risk assessments for sustainable development through adaptation is still limited.

The majority of risk assessment tools and methods that incorporate heritage are developed on a project-by-project basis, for specific contexts, and there is now a need to review progress, share lessons, and address gaps. This paper presents the key findings from a synthesis of peer-reviewed research examining risk assessment and cultural heritage for climate change and disaster management. First, we outline the literature review process. Secondly, we present the emergent themes that provide insight into current risk assessment tools and processes for cultural heritage, including the challenges and gaps. Finally, we highlight future research and policy directions for risk assessment including cultural heritage.

2 | A RESEARCH SYNTHESIS

Systematic review methodologies have become increasingly common for their utility in surveying and assessing the academic literature for trends and research gaps

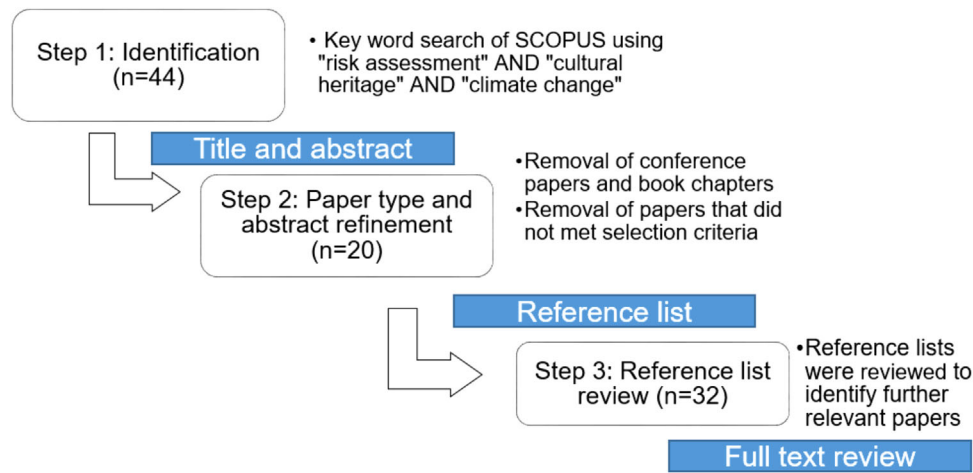


FIGURE 1 Literature identification and refinement flow chart

(Berrang-Ford et al., 2015). Using a systematic synthesis of academic literature, this paper examines peer-reviewed research and the discourse on risk assessment and cultural heritage for disaster management and CCA during the last 15 years. The selection of peer-reviewed papers provided an overview of gaps and trends across this discourse, yet the authors acknowledge the body of learning within the practitioner publications or grey literature that was excluded from this review. This approach aimed to provide a rapid and focussed critique of peer-reviewed risk assessment methods.

To interrogate the nuanced use of risk assessment in cultural heritage literature, we used a qualitative analysis that limits the scope of the literature to a manageable corpus of 20–50 articles (Berrang-Ford et al., 2015). Accordingly, our methodology follows a hybrid of meta-synthesis and realist review that focuses on the qualitative content of the text, examined using discourse analysis (Berrang-Ford et al., 2015). We followed a three-stage review process outlined in Figure 1 and limited our search to English language peer-reviewed literature published since 2005. The first stage consisted of a keyword search within the Scopus academic search engine. A search of academic peer-reviewed articles only using 'risk assessment' AND 'cultural heritage' AND 'climate change' was first employed resulting in 44 articles. At this stage, the words 'method' and 'disasters' were added but no additional papers were found. Any conference papers, books, or book chapters were removed given a possible duplication of research. The second step involved the reading and review of all the paper abstracts and removing those papers that did not meet a predefined search criteria. The criteria discounted any papers that did not discuss a risk assessment or cultural heritage in any way or focused solely on heritage, risk, or natural hazards. The results of this filter removed 24 papers that did not meet the criteria. The third stage reviewed the reference

list of all 20 remaining papers to identify further papers that were not identified in the first stage. This final stage identified 12 additional papers. In total, 32 papers were then thematically coded using NVivo software (QSR International release 1.4(4)). Texts relating to pre-identified and emerging questions and themes were coded accordingly for each paper. The predefined questions included: 'What were the methods applied?'; 'Is value noted or evaluated at all?'; 'What were the challenges or opportunities identified?'; and 'What were the types of heritage and geographic location of focus?' These questions provided a structure for the coding process, whilst additional codes and sub-codes were constructed as common topics emerged.

3 | KEY FINDINGS

3.1 | Age and demographics of papers

As Figure 2 shows, the majority of reviewed papers were published from 2007 onwards with a significant increase in 2020. This aligns with a general increase and uptake of risk assessment approaches for disaster management and the acknowledgement that risk assessment can go beyond the conventional examination of just the hazard. Predictably, there is a lack of geographic diversity across case study sites as illustrated by Figure 3. There is a lack of case study sites outside Europe and North America. This may be in part due to a focus on English language papers; however, this geographic skew is not uncommon. Fatorić and Seekamp (2017) note a similar geographic bias in their literature review that examines whether cultural heritage was under threat from climate change. They also note a similar trend in the increased interest in cultural heritage and climate risk. These trends may be related to the small and relatively recent increase in research funding. For example,

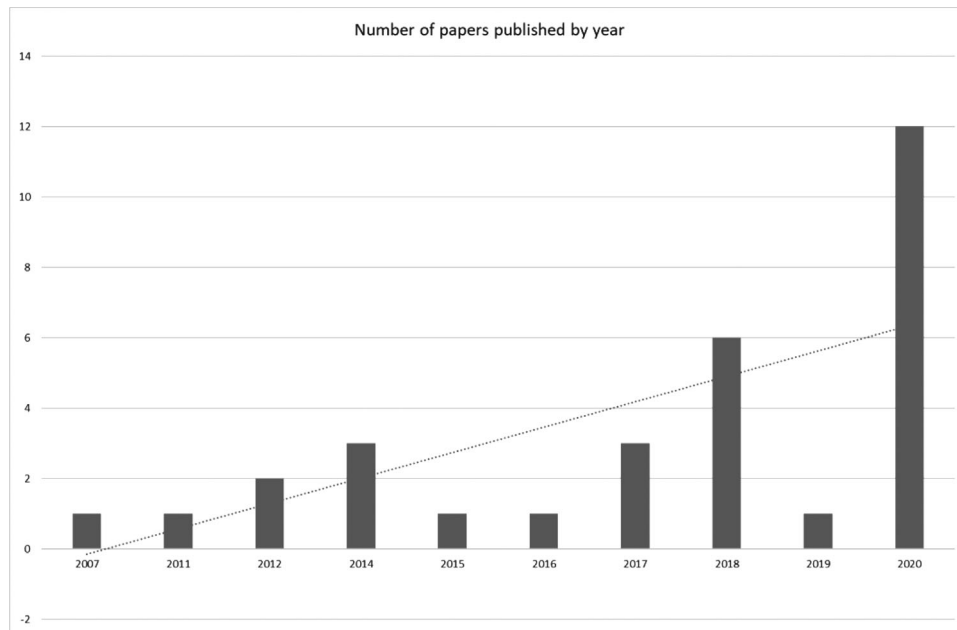


FIGURE 2 Graph showing the number of academic publications per year identified in both search phases. This graph omits 2021 publications as incomplete year.

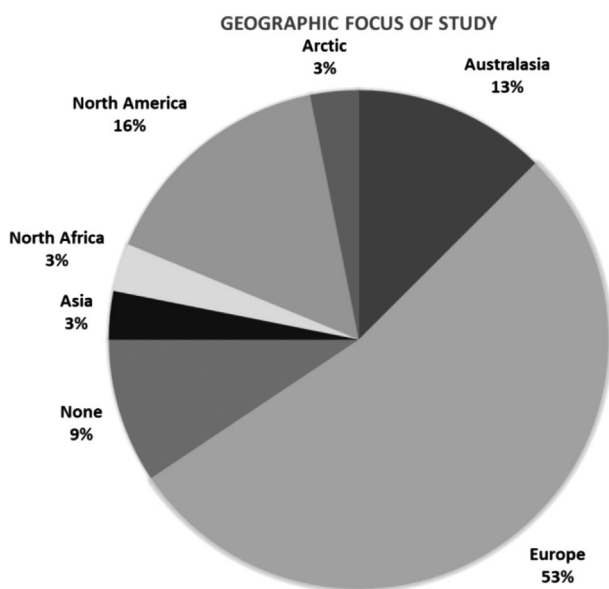


FIGURE 3 Chart showing the geographic focus of each academic paper reviewed. European study sites make up the majority of study sites, whilst ‘None’ refers to papers that did not have a specific geographic focus such as a generic literature review or commentary.

during the literature review ‘search and refine’ process, it was clear that a few large European funded projects punctuate the literature and could partly explain the publication increase in 2020. Single large research funds, such as the European Union’s Horizon 2020 Research and Innovation Programme or EU Climate for Culture project,

produced multiple academic papers and may exacerbate the geographic skew (e.g. Sardella et al., 2020; Fatorić and Biesbroek, 2020; Huijbregts et al., 2012).

3.2 | Thematic analysis

This section outlines the most significant themes emerging from the literature. These relate to the most common codes and code hierarchies that emerged from the thematic analysis. There were three significant clusters of codes relating to (1) risk assessment tools and frameworks, (2) risk assessment methods, and (3) barriers to adaptation. Cross-cutting threads were also identified and these relate to codes that were common across a majority of texts but did not fall within an overarching thematic area or ‘parent code’. These threads included participation, value, and significance as well as preservation over dynamic change. These threads as well as issues around definitions, gaps, and opportunities and the implication for current risk assessment for cultural heritage approaches are discussed in Section 4.

3.2.1 | Risk assessment tools and frameworks

Risk assessment for disaster management and CCA can take many forms. There is no standard risk assessment method for CCA or disaster management but rather a plethora of approaches from large-scale quantitative assessments using vulnerability functions to focussed qualitative narratives. A general convention defines risk

as the result of combining hazard, exposure, vulnerability, and capacity (Wisner et al., 2012). An understanding of risk therefore requires information about the hazard or threat including its severity, frequency, and location, in addition to vulnerability and exposure. In other words, what is exposed to that hazard and how susceptible it is to negative consequence due to the interaction with a hazard?

According to the IPCC's Special Report: *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* (SREX), 'Exposure refers to the inventory of elements in an area in which hazard events may occur' (IPCC., 2012). Exposure is critical for understanding risk, but not a sufficient analysis on its own. Vulnerability can be considered for multiple assets including buildings, people, and infrastructure as well as natural assets. For example, social vulnerability is a core element of risk, yet this is a dynamic and complex area to consider. Fatemi et al. (2017) provide a systematic literature review of social vulnerability indicators for disaster risk. Hazards are generally considered as single events, although there is considerable debate about the effectiveness of this approach when multi-hazards are far more likely to occur (Kappes et al., 2012). Bringing this information together into a useful narrative is the role of risk tools or assessments. These tools are diverse from software packages that calculate loss to community-based participatory storylines. Yet the majority of tools experience common challenges including a lack of systematic and quality risk data, lack of user-centred tools, as well as lack of capacity for the use and implementation of risk assessment tools and their outputs (e.g. GFDRR, 2016).

A core aim of the literature review was to examine current progress and discourse related to the development of risk assessment tools and frameworks. Sixteen papers specifically discussed the development of a risk tool or framework. However, despite many of these papers discussing the importance of risk assessment and all its components (vulnerability, hazard, exposure, and capacity) the majority focus on just exposure or hazard modelling. The tools developed and discussed in these papers identified the exposure of cultural heritage to hazards but not the degree of vulnerability or contribution towards capacity. Those that did discuss vulnerability did so largely in relation to exposure or focussed substantially on the structural vulnerabilities of the built environment. Furthermore, the analysis identified an inconsistency in the use and definition of the term vulnerability itself. Papers used a wide range of definitions with only five describing vulnerability according to the definition of Cardona et al. (2012) that includes exposure, sensitivity, and adaptive capacity.

The most common subcode within the broader 'risk assessment tools and frameworks' theme was 'challenges

in risk assessment'. Challenges predominately focus on a lack of data, tools, and capacity. One concern, relating to studies developing tools to map exposure, was the lack of surveys noting the geographic location of heritage assets (e.g. Rowland et al., 2014). A lack of geospatial data is a fundamental barrier to risk assessment across the sector and not a specific challenge for heritage only. Other papers describe a future research need for the further development of risk tools, and a clear methodology for their implementation.

3.2.2 | Risk assessment methods

The methods provide an insight into the type of risk assessment framework used and the driving ethos behind it. For example, the use of participation indicates an effort has been made to engage with experts or local community members beyond simple interviews or questionnaires but using participatory activities. However, 84% of those papers that did engage people did so only with 'professional experts' such as archaeologists or heritage managers. A lack of stakeholder involvement is linked to the noted lack of understanding and inclusion of a diversity of heritage types. These are inherently connected given that heritage is defined by those who experience and live with it. For example, only two papers mention or attempt to include intangible heritage with the majority focussed on physical heritage structures or sites.

Figure 4 provides a summary of the most commonly used methods and these range considerably from mapping exposure via Geographic Information Systems (GIS) to interviews with heritage managers.

The majority of methods focussed on understanding and modelling the hazard with over half the 'methods codes' relating to this theme. This suggests that a significant number of papers that aim to discuss the development of risk tools are in fact discussing the development of hazard modelling tools. The second most frequently referred to method is the use of GIS, a software system that assists the mapping of geospatial features. The predominance of hazard modelling and use of geospatial analysis tools raise questions about the authors' definition and use of the term risk. Those papers focussed on hazard modelling and/or applying an analysis of exposure through GIS are at best identifying assets exposed to that hazard footprint and draw no conclusion on the degree of vulnerability or capacity, yet they frame their approach as 'understanding risk'.

3.2.3 | Barriers to adaptation

When discussing the connection between risk assessment and decision-making, the majority of papers introduce the

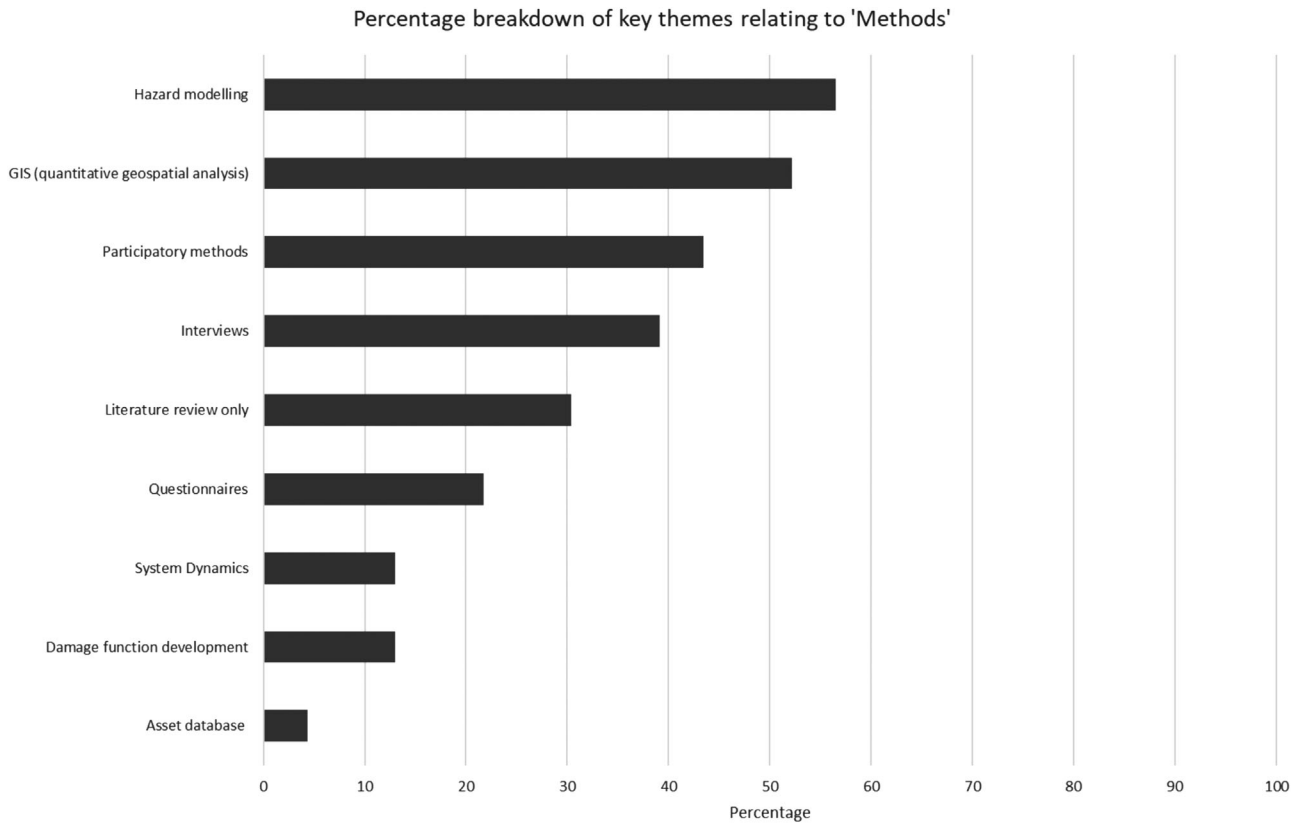


FIGURE 4 Breakdown of common sub-codes under risk assessment methods parent code. GIS refers to Geographic Information Systems and the use of this tool for risk assessment, whilst 'Asset database' refers to investigations that have used an existing database for analysis.

need for, and the role of, risk assessments for planning adaptation action. Papers highlight a significant range of barriers to adaptation including a lack of understanding of vulnerability, a conventionally 'top-down' approach, lack of decision maker awareness, low level of communications between different stakeholders, and a lack of policies or regulations (e.g. Carmichael et al., 2020; Fatorić and Biesbroek, 2020; Fenger-Nielsen et al., 2020; Sesana et al., 2020).

As Carmichael et al. (2020) highlight, although work has been done to explore risk assessment, very few studies explore translating the risk outcomes for 'whole-of-community' CCA. This is expanded by Sesana et al. (2020) who suggest a lack of capacity and data at scale available to decision makers, as well as a lack of communication and connections between stakeholders, which leads to an inability to adapt. This raises questions on the purpose of risk assessment and whether the majority of papers analysing exposure, or not interacting with local communities, are more interested in conventional academic pursuits than applying a knowledge exchange and local-level resilience.

The discourse across the literature is dominated by the drive to protect or conserve heritage, whilst Fatorić and Biesbroek (2020) are the only authors who discuss the lack of awareness of heritage benefits for adaptation. Furthermore, only one other paper notes the lack of understanding between the threats to cultural heritage and well-being of the local communities (Brady and Leichenko, 2020). Table 1 outlines a range of barriers to adaptation for cultural heritage taken from the literature. These barriers have been categorized according to four overarching areas of challenge: institutional, technical, socio-cultural, and financial (Fatorić and Biesbroek, 2020).

Very few papers discuss the need for engagement with local or indigenous communities or to better understand the contextual framing of value for heritage sites, and the lack of frameworks to translate risk for adaptation planning. Further to these challenges is the ability to incorporate assets that influence people's behaviours or a community's ability to cope. If cultural heritage represents our past, current, and future, then we must identify ways of ensuring we capture its value, significance, and

TABLE 1 Barriers to adaptation for cultural heritage identified from the literature and categorized according to four overarching themes

Institutional	Low indigenous involvement in formal decision-making processes; top-down approaches	Carmichael et al. (2020); Sesana et al. (2020)
	Lack of management capacity	Carroll and Aarrevaara (2018); Sesana et al. (2020)
	Lack of leadership	Sesana et al. (2020)
	Poor connections, trust and communications between local and national level governance	Fatorić and Biesbroek, 2020; Carmichael et al. (2020); Sesana et al. (2020)
	Lack of institutional frameworks/policies/law and regulations	Heilen et al. (2018); Fatorić and Biesbroek (2020)
	Lack of political will	Serdeczny et al. (2018); Fatorić and Biesbroek (2020)
Financial	Lack of resources	Carroll and Aarrevaara (2018); Fatorić and Biesbroek (2020); García Sánchez et al. (2020); Howey (2020); Sesana et al. (2020)
Socio-cultural	Lack of learning capacity	Sesana et al. (2020)
	Lack of awareness and sense of urgency	Fatorić and Biesbroek (2020); Carroll and Aarrevaara (2018)
Technical	Lack of incorporation of different heritage types	Sesana et al. (2020)
	Ability to rank multiple threats at regional scale	Fenger-Nielsen et al. (2020)
	Targeted monitoring and mitigation efforts	Fenger-Nielsen et al. (2020)
	Lack of ability to prioritize heritage assets for adaptation action	Heilen, Altschul and Lüth (2018); Fatorić and Biesbroek (2020); Howey (2020)
	Lack of knowledge about vulnerabilities and risks to diverse heritage types and uncertainty	Carroll and Aarrevaara (2018); Fatorić and Biesbroek (2020); Howey (2020)
	Little scientific research of climate impacts on heritage	Fatorić and Seekamp (2017); García Sánchez, García Sánchez and Ribalaygua (2020)
	Lack of known heritage sites and accompanying databases	Heilen, Altschul and Lüth (2018); Howey (2020)
	Uncertainty associated with long term climate change scenarios	Hassler (2006)
	Few guidelines on direct adaptation for heritage	Hassler (2006); Heilen, Altschul and Lüth (2018)

contribution to our understanding of risk and therefore adaptation.

4 | DISCUSSION: CHALLENGES AND OPPORTUNITIES FOR RISK ASSESSMENT

Various cross-cutting thematic threads that have emerged from the literature review include conflicting and multiple definitions for risk and its component parts; the emphasis on preservation over considering heritage as dynamic; the focus on tangible heritage; efforts to consider value or significance of heritage; and a lack of community-level participation. These threads drive some of the barriers and limitations of current risk assessments.

4.1 | Conflicting and multiple definitions of risk

There are numerous definitions of risk and its component parts, which leads to misunderstandings between sectors

especially between terms that are often confused such as vulnerability and exposure. Fifteen papers that considered and defined vulnerability did so in terms of the geographical location of an asset in relation to a hazard extent, in other words exposure only.

Table 2 provides definitions for risk by the Intergovernmental Panel for Climate Change (IPCC) as well as the UN Office for Disaster Risk Reduction (UNDRR). Vulnerability is commonly referred to as a combination of exposure, sensitivity, and capacity. According to the definitions in Table 2, examining only exposure addresses one aspect of risk only and therefore does not constitute a risk assessment. As Carmichael et al. (2018) note, the prioritization of sites for adaptation, where it takes place, is based on the likelihood of impact alone in terms of proximity to a specific hazard.

An extension of an exposure study is to identify and rank sensitivity variables. Those papers that attempted to implement this process did so through predefined criteria for sensitivity, focussed on material sensitivity to damage

TABLE 2 Definitions for risk from both the Intergovernmental Panel for Climate Change (IPCC) and the UN Disaster Risk Reduction (UNDRR)

	IPCC (Cardona et al., 2012; IPCC., 2012)	UNDRR (UNDRR Terminology., 2021)
<i>Disaster Risk or Risk</i>	The likelihood over a specified time period of severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic, or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery.	The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society, or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability, and capacity.
<i>Vulnerability</i>	The propensity or predisposition to be adversely affected	The conditions determined by physical, social, economic, and environmental factors or processes which increase the susceptibility of an individual, a community, assets, or systems to the impacts of hazards
<i>Capacity</i>	The positive features of people's characteristics that may reduce the risk posed by a certain hazard.	The combination of all the strengths, attributes, and resources available within an organization, community, or society to manage and reduce disaster risks and strengthen resilience.
<i>Exposure</i>	The presence of people; livelihoods; environmental services and resources; infrastructure; or economic, social, or cultural assets in places that could be adversely affected.	The situation of people, infrastructure, housing, production capacities, and other tangible human assets located in hazard-prone areas.

(e.g. Sardella et al., 2020). However, only one paper discussed the need for vulnerability functions, which are a quantitative approach of describing the relationship between a hazard and an asset in terms of loss. Finally, none of the papers estimated how the heritage or heritage sites may or may not contribute towards adaptive capacity. It appears that only one risk assessment outlined in the papers reviewed attempted a complete risk assessment, examining the hazard, exposure, vulnerability, and capacity. Sesana et al. (2020) provide a framework for risk assessment that encapsulates all components using a qualitative interview-based approach to capture adaptive capacity, yet these interviews focus on practitioners or academics and do not include local community voices.

4.2 | Preservation over processional change

Historically, it was assumed that in order to incorporate cultural heritage within a risk assessment framework, it first needs to be clearly understood and defined. Yet cultural heritage is multifaceted ranging from traditional belief systems and symbolic practices to built structures such as castles and places of religious practice. Cultural heritage can be considered a physical structure or site, but it can also be considered as our traditions, our lived experiences, and our beliefs. Cultural heritage is therefore often categorized as tangible or intangible, yet even this differen-

tiation can be considered controversial as they are deeply connected. For example, a spiritual site such as a church or mosque has both tangible and intangible value and meaning to different people. What we choose to protect or save from disasters is therefore a result of what we, as a society, value. However, understanding 'value' is complex because it is influenced by context, perceptions, and experiences.

Heritage has been further categorized as either cultural or natural. Cultural heritage refers to monuments, sites, and groups of buildings, whilst natural heritage is considered as physical or biological formations, geological and physiographical formations, or natural sites of outstanding universal value (UNESCO, 1972). It was only in 2003 that UNESCO included intangible cultural heritage into their policies defining this as '*the practices, representations, expressions, knowledge, skills as well as the instruments, objects, artefacts and cultural spaces associate therewith – that communities, groups and, in some cases, individuals recognise as part of their cultural heritage*' (UNESCO, 2003, p. 2). Although this literature review focusses on cultural heritage, the authors recognize that these definitions are blurred in reality with natural heritage sites being culturally significant and that natural heritage also includes intangible elements that are rarely incorporated within risk assessment.

As Harrison (2013) notes, almost anything can be considered as heritage and society has experienced an expansion of the understanding of heritage resulting in the acknowledgement and inclusion of intangible heritage. However,

Harrison (2013) also notes that the multiple definitions for heritage, including both official and unofficial, have had significant consequences in terms of what is included for preservation or protection and what is not.

As noted above, UNESCO define cultural heritage in several ways: tangible cultural heritage that includes movable cultural heritage (paintings, sculptures, coins, manuscripts), immovable cultural heritage (monuments, archaeological sites, etc.), and underwater cultural heritage (shipwrecks, underwater ruins, and cities) as well as intangible cultural heritage that includes oral traditions, performing arts, and rituals. Yet these 'official' categorizations of heritage are limited as our interpretation of heritage is shaped by our own experiences and the context. Similar to the concept of resilience, heritage is perceived only through a contextual and historical lens. Official definitions and resulting measures of protection can be considered a largely 'top-down' and an authoritarian approach to cultural heritage management. There is, therefore, a tension between locally, nationally, and internationally managed approaches to cultural heritage protection, rather than heritage being considered dynamic and contributing significantly towards resilience.

The majority of papers in this review describe the development of a risk assessment approach that could directly feed into a decision-making process for the prioritization, presentation, or conservation of particular physical heritage sites. This creates a narrow view of heritage as something of value that must be preserved in static form. Heritage is dynamic and changes as new experiences and events take place. Considering heritage as static dismisses the reason for valuing heritage in the first place, because it reflects our history, our customs, and who we are now and into the future. Risk assessment therefore should incorporate mechanisms for better understanding the multiple dimensions of heritage, both tangible and intangible but also as a dynamic and changing component of capacity and vulnerability. This approach would firmly place cultural and natural heritage at the heart of community-based disaster risk assessment.

4.3 | Tangible over intangible

There is a significant bias within the academic literature reviewed towards built structures. With the exception of commentary papers, the remaining papers focus on built structures, archaeological sites, or internal elements of a structure. Yet, as Donovan et al. (2012) demonstrate, the influence of intangible heritage on people's ability to adapt and manage the hazards they face is crucial to understanding risk and should be incorporated within risk assessments. In terms of risk management, intangible

heritage often drives how people react to disaster events and is therefore crucial to consider (Cannon, 2013). A building may be destroyed but how people respond to this loss is framed by their cultural heritage (e.g. Delalande, 2019). Conversely, cultural beliefs and customs are also forged because of past disaster experiences. The logic applies to addressing climate change, in terms of how we adapt and take action to manage the changing weather hazards we face. Traditional adaptation practices specifically draw on heritage to overcome current challenges (Williams and Hardison, 2013). Yet, there appears to be a significant lack of understanding on the connections between heritage, communities, value, and risk assessment.

Critically, tools that attempt to incorporate both tangible and intangible heritage are extremely rare. The tangible and intangible are intertwined and this is important when considering heritage within a risk management lens. Officially recognized tangible heritages such as cathedrals, temples, or castles are more likely to be included within current or future adaptation planning. Yet, many societies do not uphold a strict division between material and immaterial, or culture and nature. This speaks to a dominant Western discourse on risk where intangible heritage is less likely to be recognized and therefore gain less attention within risk assessment processes.

Defining and regulating heritage has its roots in the need to estimate risk for preservation, yet ironically risk assessment for disaster management, including CCA, lacks adequate approaches for the incorporation of heritage, in all forms, as well as its value and significance from a non-expert perspective.

4.4 | Value and significance

Surprisingly very few papers discuss the need to include heritage value or significance within risk assessment. Only one paper attempts a method to capture value from a local-level perspective by engaging with traditional land owners who live, interact, and connect with the heritage site. The lack of local community engagement raises the question of whose value counts?

Defining and regulating our heritage from a Western perspective has led to the preservation of important moments and structures, as well as customs and traditions; however, this regulation has also resulted in a narrow understanding of heritage and barred those who are not considered 'experts' from joining the discussion and ultimately influencing the decisions made. Delineating an area as a World Heritage Site (WHS), or similar, has clear benefits but without local-level engagement through participatory decision-making can result in a

significant deterioration of local community livelihoods and connections with their land. For example, Jimura (2011), Akbar et al. (2020), as well as Keitumetse and Nthoi (2009) discuss the negative impacts of WHS status from a local community lens.

Given the importance of context and experience to understanding heritage value, and therefore significance, it seems crucial that local people are involved in identifying these parameters and ranking them for inclusion within risk assessment. Participation within risk assessment and heritage management has long been advocated (Van Aalst et al., 2008). Despite rhetoric related to engagement with local communities and the multiple arguments to do this already discussed, disappointingly only Carmichael et al. (2018) describe a process that incorporates local value or significance for either tangible and intangible heritage.

Harrison (2013) highlights the discourse on heritage and risk that evolved after the World War II, and further accelerated in the 1970s through the World Heritage Convention. Yet this evolution led to heritage being described as vulnerable, disconnected from contemporary life, and something that needed to be preserved. Of most relevance is the national and international drive to define and regulate heritage and categorize its value at a global level. This shift arguably removed heritage from those that interact with it in their daily lives and into the hands of experts. Furthermore, heritage was defined predominately as monuments, buildings, and sites disregarding the practices, customs, and beliefs until the early 2000s. Harrison's (2013) discourse provides a possible explanation to why the majority of papers focus on physical structures, exposure, and have a lack of local participation.

5 | CONCLUSION

This review identified academic papers that showcase or explore risk assessment processes in relation to cultural heritage. Although no review can capture all possible tools and approaches available, or under development, we found the papers identified primarily focussed on tangible assets located in Europe, America, and Australia. Local community-based knowledge, experience, or value have a limited traction across these papers and therefore the approaches applied. There appears to be a significant gap in understanding the role of intangible cultural heritage for adaptation and resilience, and the consideration of heritage as dynamic, responding to local needs and experiences.

The literature review clearly highlights some significant gaps in our academic understanding and therefore future directions for research. These include understanding the

variety of heritage types and their value from a community perspective; developing tools that enable local-level and expert input; and finally, research that examines the positive contribution of heritage to adaptation and resilience building.

Furthermore, research should specifically focus on heritage understanding in the Global South and share the diversity of heritage types that support the most vulnerable communities in the world. We need to understand how people envision their future in the context of climate change. There is a need for a critical appreciation of the colonial reverberations on how communities conceptualize the future of their past.

We argue that the consideration of local philosophies of cultural heritage, as an asset within risk assessment, has an influence on vulnerability and capacity. These heritage assets are therefore not only important for the preservation of that heritage but also the resilience of the local community. We need to move beyond conventional risk assessments that are concerned with declining preservation to understand the processes of change in a culture–climate context. We should not begin this research with the aim to preserve heritage but to understand it and empower communities to embrace their heritage for improved local-level adaptation to climate change and disaster management.

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ORCID

Kate Crowley  <https://orcid.org/0000-0002-7360-4556>

REFERENCES

- Adger, W., Barnett, J., Brown, K. et al. (2013) Cultural dimensions of climate change impacts and adaptation. *Nature Climate Change*, 3, 112–117. DOI: <https://doi.org/10.1038/nclimate1666>
- Akbar, I., Yang, Z., Han, F., & Kanat, G. (2020) The influence of negative political environment on sustainable tourism: a study of Aksu-Jabagly world heritage site, Kazakhstan. *Sustainability*, 12, 143. DOI: <https://doi.org/10.3390/su12010143>
- Berkes, F., (2009) Indigenous ways of knowing and the study of environmental change. *Journal of the Royal Society of New Zealand*, 39, (4), 151–156,
- Berrang-Ford, L., Pearce, T. & Ford, J.D. (2015) Systematic review approaches for climate change adaptation research. *Reg*

- Environ Change*, 15, 755–769. doi: <https://doi.org/10.1007/s10113-014-0708-7>
- Brady, M.B. & Leichenko, R. (2020) ‘The impacts of coastal erosion on Alaska’s North Slope communities: a co-production assessment of land use damages and risks.’, *Polar Geography*, 43(4), pp. 259–279. <https://doi.org/10.1080/1088937X.2020.1755907>.
- Cannon, T., (2013) Disasters, climate change and the significance of ‘culture’. In *Cultures and disasters: understand cultural framings in disaster risk reduction*. Edited By Kruger, F., Bankoff, G., Cannon, T., Orłowski, B., and Schipper, E.L.f. Abingdon, Oxon: Routledge, pp.89–106
- Cardona, O.D., Van Aalst, M.K., Birkmann, J., Fordham, M., McGregor, G., Perez, R., et al. (2012): Determinants of risk: exposure and vulnerability. In: *Managing the risks of extreme events and disasters to advance climate change adaptation: a special report of working groups I and II of the Intergovernmental Panel on Climate Change (IPCC)*. Edited by Field, C.B., Barros, V., Stocker, T.F., Qin, D., Dokken, D.J., Ebi, K.L., Mastrandrea, M.D., Mach, K.J., Plattner, G.-K., Allen, S.K., Tignor, M., & Midgley, P.M. Cambridge, UK, and New York, NY, USA: Cambridge University Press, pp. 65–108.
- Carmichael, B. et al. (2018) ‘Local and Indigenous management of climate change risks to archaeological sites.’, *Mitigation and Adaptation Strategies for Global Change*, 23(2), pp. 231–255. <https://doi.org/10.1007/s11027-016-9734-8>.
- Carmichael, B. et al. (2020) ‘A methodology for the assessment of climate change adaptation options for cultural heritage sites.’, *Climate*, 8(8), <https://doi.org/10.3390/CLI8080088>.
- Carroll, P. & Aarvevaara, E. (2018) ‘Review of potential risk factors of cultural heritage sites and initial modelling for adaptation to climate change.’, *Geosciences (Switzerland)*, 8(9), <https://doi.org/10.3390/geosciences8090322>.
- Delalande, N. (2019) *Notre-Dame: heritage emotions: an interview with Nathalie Heinich*. https://booksandideas.net/IMG/pdf/en_delalande_heinich_notre-dame_2052019.pdf
- DeSilvey, C. & Harrison, R. (2020) Anticipating loss: rethinking endangerment in heritage futures. *International Journal of Heritage Studies*, 26, (1), 1–7, <https://doi.org/10.1080/13527258.2019.1644530>
- Donovan, K., Suryanto, A. & Utami, P. (2012) ‘Mapping cultural vulnerability in volcanic regions: the practical application of social volcanology at Mt Merapi, Indonesia’. *Environmental Hazards*, 11(4), <https://doi.org/10.1080/17477891.2012.689252>.
- Fatemi, F., Ardalan, A., Aguirre, B., Mansouri, N. & Mohammadfam, I., (2017) Social vulnerability indicators in disasters: findings from a systematic review. *International Journal of Disaster Risk Reduction*, 22, Pages 219–227. <https://doi.org/10.1016/j.ijdr.2016.09.006>.
- Fatorić, S. & Biesbroek, R. (2020) ‘Adapting cultural heritage to climate change impacts in the Netherlands: barriers, interdependencies, and strategies for overcoming them.’, *Climatic Change*, 162(2), pp. 301–320. <https://doi.org/10.1007/s10584-020-02831-1>.
- Fatorić, S. & Seekamp, E. (2017) ‘Are cultural heritage and resources threatened by climate change? A systematic literature review.’, *Climatic Change*, 142(1–2). <https://doi.org/10.1007/s10584-017-1929-9>.
- Fenger-Nielsen, R. et al. (2020) ‘Arctic archaeological sites threatened by climate change: a regional multi-threat assessment of sites in south-west Greenland.’, *Archaeometry*, 62(6), pp. 1280–1297. <https://doi.org/10.1111/arcm.12593>.
- García Sánchez, F., García Sánchez, H. & Ribalaygua, C. (2020) ‘Cultural heritage and sea level rise threat: risk assessment of coastal fortifications in the Canary Islands.’, *Journal of Cultural Heritage*, 44, pp. 211–217. <https://doi.org/10.1016/j.culher.2020.02.005>.
- GFDRR Global Facility of Disaster Risk and Recovery. (2016) Solving the puzzle: innovating to reduce risk, Available at <https://www.gfdr.org/sites/default/files/solving-the-puzzle-report.pdf>
- Harrison, R., (2013) *Heritage: critical approaches*. Abingdon, UK: Routledge
- Harvey, D., & Perry, J. (Eds.). (2015) *The future of heritage as climates change: loss, adaptation and creativity*. Abingdon, UK: Taylor and Francis Inc
- Hassler, U. (2006) ‘Implications of climate change on heritage.’, *Building Research and Information*, pp. 175–179. <https://doi.org/10.1080/09613210500491514>.
- Hastrup, K. (2018) A history of climate change: Inughuit responses to changing ice conditions in North-West Greenland. *Climatic Change*, 151, 67–78 DOI: <https://doi.org/10.1007/s10584-016-1628-y>
- Heilen, M., Altschul, J.H. & Lüth, F. (2018) ‘Modelling resource values and climate change impacts to set preservation and research priorities.’, *Conservation and Management of Archaeological Sites*, 20(4), pp. 261–284. <https://doi.org/10.1080/13505033.2018.1545204>.
- Howey, M.C.L. (2020) ‘Harnessing remote sensing derived sea level rise models to assess cultural heritage vulnerability: a case study from the northwest Atlantic Ocean.’, *Sustainability*, 12(22), pp. 1–18. <https://doi.org/10.3390/su12229429>.
- Huijbregts, Z. et al. (2012) ‘A proposed method to assess the damage risk of future climate change to museum objects in historic buildings.’, *Building and Environment*, 55, pp. 43–56. <https://doi.org/10.1016/j.buildenv.2012.01.008>.
- ICOMOS (2019) Future of our pasts: engaging cultural heritage in climate action. <https://www.icomos.org/en/77-articles-en-francais/59522-icomos-releases-future-of-our-pasts-report-to-increase-engagement-of-cultural-heritage-in-climate-action>
- IPCC, (2012): *Managing the risks of extreme events and disasters to advance climate change adaptation: a special report of working groups I and II of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, UK, and New York, NY, USA.
- Jimura, T. (2011) The impact of world heritage site designation on local communities – a case study of Ogimachi, Shirakawa-mura, Japan. *Tourism Management*, Volume 32, Issue (2), <https://doi.org/10.1016/j.tourman.2010.02.005>.
- Kappes, M.S., Keiler, M., von Elverfeldt, K. et al. (2012) Challenges of analyzing multi-hazard risk: a review. *Natural Hazards*, 64, 1925–1958 <https://doi.org/10.1007/s11069-012-0294-2>
- Keitumetse, S. & Nthoi, O., (2009) Investigating the impact of World Heritage site tourism on the intangible heritage of a community: Tsodilo Hills World Heritage site, Botswana. *International Journal of Intangible Heritage*, 4, 144–149, Available at: <https://ssrn.com/abstract=2249856>
- Ran, J., MacGillivray, B.H., Gong, Y. & Hales, T.C., (2020) The application of frameworks for measuring social vulnerability and resilience to geophysical hazards within developing countries: a systematic review and narrative synthesis. *Science of The Total Environment*, 711, <https://doi.org/10.1016/j.scitotenv.2019.134486>

- Rowland, M.J., Ulm, S. & Roe, M. (2014) 'Approaches to monitoring and managing indigenous Australian coastal cultural heritage places.', *Queensland Archaeological Research*, 17(2014). <https://doi.org/10.25120/qar.17.2014.231>
- Sardella, A. et al. (2020) 'Risk mapping for the sustainable protection of cultural heritage in extreme changing environments.', *Atmosphere*, 11(7). <https://doi.org/10.3390/atmos11070700>.
- Serdeczny, O.M., Bauer, S. & Huq, S. (2018) 'Non-economic losses from climate change: opportunities for policy-oriented research.', *Climate and Development*, 10(2), pp. 97–101. <https://doi.org/10.1080/17565529.2017.1372268>.
- Sesana, E. et al. (2020) 'An integrated approach for assessing the vulnerability of World Heritage Sites to climate change impacts.', *Journal of Cultural Heritage*, 41, pp. 211–224. <https://doi.org/10.1016/j.culher.2019.06.013>.
- Tschakert, P., Barnett, J., Ellis, N., Lawrence C., Tuana N., New M., et al. (2017) Climate change and loss, as if people mattered: values, places, and experiences. *WIREs Climate Change*, 8, e476. <https://doi.org/10.1002/wcc.476>
- UNDRR (2015) Sendai framework for disaster risk reduction 2015–2030. <https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030>
- UNDRR. (2021). Terminology. Available at <https://www.undrr.org/terminology>
- UNESCO (1972) Convention concerning the protection of the world cultural and natural heritage, Available at <https://whc.unesco.org/archive/convention-en.pdf>
- UNESCO (2003) Convention for the safeguarding of the intangible cultural heritage. Available at <https://unesdoc.unesco.org/ark:/48223/pf0000132540>
- Wilson, G.A., (2012) Community resilience, globalization, and transitional pathways of decision-making. *Geoforum*, 43, (6), 1218–1231. <https://doi.org/10.1016/j.geoforum.2012.03.008>.
- Van Aalst, M.K., Cannon, T. & Burton, I. (2008) Community level adaptation to climate change: the potential role of participatory community risk assessment. *Global Environmental Change*, 18, (1), 165–179,
- Williams, T. & Hardison, P. (2013) Culture, law, risk and governance: contexts of traditional knowledge in climate change adaptation. In: Maldonado, J.K., Colombi, B., Pandya, R. (eds) *Climate change and indigenous peoples in the United States*. Cham: Springer. https://doi.org/10.1007/978-3-319-05266-3_3
- Wisner, B., Gaillard, J.-C. & Kelman, I., (2012) Framing disaster: theories and stories seeking to understand hazards, vulnerability and risk. In Wisner, B., Gaillard, J.C., Kelman, I. (Eds.), *Handbook of hazards and disaster risk reduction*. Abingdon, Oxfordshire, U.K: Routledge. pp. 18–33

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