Received 6 December 2024
Revised 11 June 2025
Accepted 17 June 2025

Unlocking the past: key lessons in human-environment dynamics through cultural heritage analysis

Giovanni Gugg, Mariana Oliveira and Gabriella Duca
Fondazione ISSNOVA – Institute for Sustainable Society and Innovation, Napoli, Italy

Abstract

Purpose – This paper aims to understand human-environment interactions in urban development over time by using historical data, cultural heritage and local knowledge to reduce risk exposure of local communities, prepare for disasters and enhance recovery and resilience efforts.

Design/methodology/approach – The study uses qualitative methods, drawing on anthropology and historical archaeology to analysed historical archives, ethnographic data and grey literature from Italy, Indonesia and the USA. Thematic analysis identified patterns in knowledge production and risk response to disasters like earthquakes, floods and pandemics and systematised traditional knowledge, including oral lore, land use and construction technologies, focusing on tangible and intangible cultural heritage.

Findings – Local and indigenous knowledge are crucial for urban resilience. Anthropological and historical-archaeological research reveals past communities' valuable insights into disaster preparedness, mitigation, response and recovery. Integrating diverse knowledge and power dynamics fosters collaboration, enhancing resilience to environmental, socio-economic and political uncertainties throughout disaster cycles.

Research limitations/implications – The study was conducted within the EU research Project CORE; therefore, collected data were limited to the use case disaster scenarios addressed by the project, namely, terrorist attack, earthquake, flash flooding, wildfire, earthquake & tsunami and pandemic.

Practical implications – Research shows how communities have always found practical, local solutions to disaster-related issues, blending tangible and intangible cultural knowledge. Its insights can inform disaster preparedness, heritage-based risk mapping and community-led resilience efforts. This cultural approach complements scientific understanding, helping develop effective urban resilience strategies for today's disaster prevention and mitigation.

Social implications – Indigenous knowledge, vital for urban resilience, stresses ecosystem harmony, community-environment understanding and local territorial knowledge. Integrating this into risk management and emergency planning unlocks hidden resources, fostering holistic, sustainable social and environmental approaches.

Originality/value – Addressing a crucial gap in disaster risk reduction by highlighting the role of cultural heritage and historical knowledge in building long-term urban resilience. It examines diverse historical data, from the 14th century to 2020, across continents like Italy, Indonesia and the USA. The study also investigates ancient construction techniques, including those from the Roman Empire, in relation to major global disasters.

Keywords Indigenous knowledge, Local knowledge, Disaster resilient societies
Tangible and intangible cultural heritage, Disaster risk management

Paper type Research paper

© Giovanni Gugg, Mariana Oliveira and Gabriella Duca. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence may be seen at https://creativecommons.org/licences/by/4.0/

Funding: European Union Horizon 2020 Research and Innovation Program GA No 101021746 (CORE – sCience and human factOr for Resilient sociEty).

Urbanization, Sustainability and Society
Vol. 2 No. 2, 2025
pp. 48-75
Emerald Publishing Limited
2976-8993
DOI 10.1108/USS-12-2024-0080

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

1. Introduction

The interpretation of disasters is deeply rooted in human perception and historical beliefs. Throughout history, humanity has looked to the sky to understand various phenomena, fostering a belief in a predetermined existence. The term "disaster" originates from the Latin words for "star" and "apart," symbolising a celestial chaos that disrupts human communities (Kroll-Smith, 2018, p. 18). This notion of disruption is echoed in the term "catastrophe," which has evolved from its origins in Greek theatre to encompass significant social and cultural implications. Disasters have consistently been viewed not just as physical events but as social and cultural constructs, prompting societies to seek understanding and protection against their impacts, tackling different aspects of human life. Recent transdisciplinary studies have expanded the concept of disaster from an emergency phase to a continuous process, challenging individuals and communities to confront their vulnerabilities (Revet, 2017, p. 14).

However, despite the growing body of literature exploring the socio-cultural dimensions of disasters, there remains a significant gap in connecting these insights to concrete urban resilience strategies and policy frameworks. Specifically, the integration of indigenous knowledge systems with modern engineering practices is still underdeveloped in both academic research and institutional agendas.

This paper addresses this gap by examining how traditional knowledge, often marginalised in dominant disaster risk reduction (DRR) narratives, can contribute to innovative and inclusive urban resilience planning. By bridging cultural interpretations of disaster with contemporary sustainability and DRR initiatives, it proposes a methodological framework that aligns local epistemologies with global objectives such as the Sendai Framework (United Nations, 2015a) and the Sustainable Development Goals (SDGs) (United Nations, 2015b). In doing so, the paper offers a novel perspective on how resilience can be reimagined through a more pluralistic and context-sensitive lens, ultimately strengthening both academic inquiry and practical policy implementation.

1.1 Coping with risks: a heritage from the past

The intricate relationship between culture and safety encompasses individual, group and organisational attitudes, knowledge, norms and behaviours regarding safety issues (Duca and Gugg, 2023). Cultural heritage plays a crucial role in safety practices, knowledge sharing, risk perception and community engagement, reflecting the significance of both tangible and intangible cultural assets (Duca, 2012a). Historians François Walter, Pascal Delvaux and Bernardino Fantini (Walter *et al.*, 2006, p. 19) note the transition of Western society from an ancient phase of protection to a society of prevention, emphasising a shift toward dominating natural forces. Throughout history, disasters and mythical deluges have prompted civilisations to rebuild on the ruins of obsolete worlds; in this framework the threat of a catastrophe was manipulated by those in power to exert and consolidate authority (Duca and Gugg, 2023).

The instrumentalisation of fear is not a recent phenomenon; it has been evident in various historical and cultural contexts. For instance, in some traditional societies, powerful symbols like the Ndunga mask of the Woyo people of Central Africa evoke power and fear, reflecting the intertwining of political and religious authority. This use of fear is essential for analysing the discourses of doomsayers and the social reactions following shocks, as communities draw on their ceremonial and functional resources to reinvent themselves in the aftermath of inconceivable events (Valentin, 2022). The response to catastrophic events involves not only mourning and commemoration but also practical actions such as relief, reconstruction and

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

economic revitalisation. The nature of these responses is influenced by the interpretation of the disaster, whether it is perceived as of human, natural, or divine origin.

1.2 Strategies for the future

Disasters are multifaceted, causing both destruction and creativity and prompting varied societal responses. Commemoration, as a form of collective memory management, allows communities to remember and rebuild themselves after a disaster, marking time and unifying the present community. However, the balance between the duty of memory and the reconstruction of bonds constitutes an "ideal" horizon that is impossible to fully achieve. Societies draw on past disasters and commemorations to respond more effectively to present risks, but this balance remains a complex and ongoing process (Mangeot et al., 2004).

In various societies, disasters are seen as part of broader social, economic and ecological dynamics. For instance, among the Nuer of Sudan, there is no panic in the face of livestock loss; they collectively manage and accept the crisis. Similarly, the Zoques of Chiapas have built their social, cultural and economic organisation around the existence of the Chichonal volcano, developing empirical knowledge and mythology to deal with its moods (Evans-Pritchard, 1968; Garcia-Acosta, 2002). In European rural societies, such as the Alpine regions, give meaning to the memory of disasters, marked by fear and an ethical relationship of respect and mistrust towards nature (Dall'Ò, 2019; Revaz, 2003).

The relationship between society and catastrophic events reveals the intricate balance and interplay between nature and culture, shaping the practical modalities through which a society defines itself in opposition to the natural order. Disasters are not merely destructive occurrences; they also generate cultural productions and influence the way societies come together. Jean-Jacques Rousseau's perspective on the origin of human associations emphasises how natural incidents, such as floods and volcanic eruptions, bring people together to repair common losses, highlighting the role of catastrophic events in shaping human society and cultural economies (Banda, 2002). The economic function of disasters is not solely to destroy but also to prompt repair, healing, and the generation of institutions. However, the modern world's increasing vulnerability, stemming from technological and scientific advancements, has led to a constant sense of emergency and precariousness. While societies produce artefacts to protect themselves from disasters, they remain entangled in an emergency logic that risks perpetuating itself (Falconieri *et al*., 2022).

The memory of disasters is a complex process that involves mourning, recovery and partial oblivion. It varies significantly from one individual to another and has a profound impact on risk awareness and perception. The concept of resilience, which focuses on perception, coordination of functional and spatial scales and qualitative risk management solutions, aligns with the complex nature of collective memory. Resilience is driven by remembrance, and decision-makers must navigate the emotional implications of disaster memory to ensure its durability and relevance (Falconieri et al., 2022). Therefore, the relationship between society and catastrophic events is deeply intertwined with the construction of memory, the management of risks and the ongoing challenge of balancing emergency responses with long-term resilience.

2. Materials and methods

The research approach encompassed a multifaceted investigation into the relationship between cultural heritage and disaster risk management. The study is one of the outputs of the CORE Project, which focused on developing a harmonised vision of crisis management awareness and capability through transdisciplinary collaboration between environmental and social science communities. The project aims to strengthen disaster resilience at municipal,

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

Member State and EU agency levels by addressing the diversity of European society and the variability of human factors.

Therefore, the study focused on tangible and intangible cultural heritage, traditional knowledge, land use and construction technologies, with the objective of providing insights into their potential contributions to the prevention, reduction and response to current disasters. It aimed to broaden the perspective on disaster risk management by examining how various cultures have historically coped with both natural and anthropogenic hazards, and how their knowledge systems have been embedded into heritage-based practices.

The methodology was built on a combination of theoretical frameworks from cultural geography and social anthropology, particularly emphasising the relational dimensions of place, memory and practice in risk contexts (Bwambale *et al*., 2023). To enhance the understanding of human-environment interactions and identify valuable information for local communities to manage risks effectively, the study adopted a qualitative comparative methodology, combining:

- document analysis, including peer-reviewed literature, grey literature and technical reports from international agencies such as UNESCO and ICOMOS;

Case study review of historical and contemporary examples of disaster-affected cultural heritage:

- semi-structured interviews with experts in heritage preservation and disaster risk management.

The selection of case studies followed three specific criteria:

(1) diversity of geographic and environmental contexts;
(2) documented historical continuity in coping practices; and
(3) relevance to contemporary disaster scenarios as identified within the CORE Project.

This methodological approach captured data and provided insights into the following natural and manmade disaster scenarios: floods, earthquakes, wildfires, landslides and armed conflicts. This allowed for a comprehensive understanding of the diverse impacts of disasters on cultural heritage (CORE Project - D2.2, 2023; CORE Project - D3.2, 2023). To analyse these cases, the research applied interpretative coding techniques to the interview transcripts and historical materials, allowing for the identification of recurring patterns, adaptive practices and cultural-symbolic meanings associated with risk.

In parallel, the study investigated traditional construction technologies with potential relevance for contemporary DRR strategies. This involved a two-stage literature review:

(1) identifying resilient and efficient construction technologies in recent publications, including journal articles and technical reports; and
(2) tracing the historical and cultural origins of those technologies in diverse communities.

This process aimed to overcome the challenges related to identifying the ancestries of construction techniques and to assess their contemporary applicability. The review incorporated both traditional and indigenous knowledge as well as modern engineering solutions, offering a comprehensive overview of how different construction approaches have evolved and been used in DRR contexts.

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

Overall, this methodological framework enabled the integration of cultural heritage, local epistemologies and contemporary scientific knowledge, fostering a pluralistic and inclusive perspective on urban resilience that aligns with international frameworks such as the Sendai Framework and the Sustainable Development Goals (SDGs).

3. Results

This section presents a selection of historical and contemporary practices rooted in traditional knowledge, offering valuable insights for DRR. While primarily descriptive, each subsection includes analytical commentary to link past experiences with present-day strategies for resilience.

For the sake of clarity, the knowledge and historical data in the following sections are organised into two topics:

(1) Intangible and tangible cultural heritage, and traditional knowledge; and

(2) Specific and typical construction technologies, typologies and use of the territory developed according to lessons learnt from a calamitous event.

3.1 Intangible and tangible cultural heritage, and traditional knowledge

This subsection has been enriched with a more balanced focus between intangible expressions (songs, legends, rituals) and tangible heritage (landscapes, forests, settlements, objects), while integrating reflections on their potential or proven contributions to modern DRR strategies.

3.1.1 Tsunami, when the sea engulfs the landscape. 3.1.1.1 Folk songs for tsunami protection (Indonesia). The ocean has always held profound significance for Indonesian coastal communities, serving as a source of both joy and trepidation while imparting invaluable lessons. Through generations, traditional wisdom transmitted via stories and songs has guided these communities, including crucial practices like seeking higher ground following earthquake-triggered low tides, a measure that proved lifesaving during the 2004 tsunami. For instance, the Mentawai people view earthquakes as auspicious events, reflected in their uplifting earthquake songs (Zulfadrim *et al.*, 2019), while the Kaili tribe in Palu Sulawesi recognises key earthquake indicators, underscoring the importance of swift action to avert disaster (Kurnio *et al.*, 2021). Sadly, during the 2004 tsunami, this indigenous knowledge was disregarded, highlighting the critical link between traditional responses and ecosystem relationships in managing tsunami risks (Rafliana, 2018).

This case underscores how intangible heritage, such as songs and oral traditions, can function as early warning systems when properly integrated with formal DRR mechanisms. The failure to heed local knowledge in 2004 illustrates the need for hybrid systems that combine community wisdom with scientific alert protocols.

Notably, the devastation of the 2004 tsunami was exacerbated by the progressive loss of mangrove forests along the Indian Ocean coast, which could have mitigated its impact (Alongi, 2008). Mangroves, known for their resilience and ability to reduce wave energy, offer vital protection against tsunamis, with wider forests providing more significant mitigation effects. However, Southeast Asia, home to a significant portion of global mangrove forests, faces rapid deforestation and degradation due to human activities (Spalding *et al.*, 2010).

Here, the tangible dimension of cultural landscapes becomes evident: mangroves represent both ecological infrastructure and a traditional buffer zone. Their degradation

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

highlights the vulnerability induced by disconnection from traditional environmental management practices.

Recognising the urgent need for mangrove conservation, initiatives like Indonesia's "Mangroves for Coastal Resilience" project aim to restore and manage mangrove ecosystems to bolster coastal resilience and enhance the livelihoods of coastal communities. The Indonesian Government's commitment to restoring 600,000 hectares of mangroves by 2024 marks a substantial stride towards addressing the threats facing these vital ecosystems (Aquino, 2022).

These initiatives reaffirm the importance of integrating traditional environmental knowledge into state-led ecological strategies. Recent coastal engineering research confirms the wave-reducing function of mangrove roots, supporting their role in ecosystem-based disaster risk mitigation (BADOLA and HUSSAIN, 2005; Mazda *et al*., 1997).

3.1.1.2 The rock of sleeping monsters that cause tsunamis (Puget Bay, USA/Canada). The traditional stories of Native American populations on the northwest coast, passed down through generations, associate earthquakes with the actions of supernatural creatures, such as A'yahos, often taking the form of a giant serpent (Ludwin *et al*., 2007). These stories have been passed down for over 1000 years and are still treated with great respect by the indigenous inhabitants, suggesting severe effects of the earthquake and tsunami on the coastal community (McMillan and Hutchinson, 2002). According to some studies, a tsunami in the period between 1690 and 1715 likely gave rise to this belief, possibly on January 26, 1700, when a wave reached the shores of Japan without being preceded by an earthquake. The most plausible hypothesis is that this wave was caused by an earthquake in the "Cascade Subduction Zone" on the western coast between present-day Canada and the USA (Dziak *et al*., 2021; Solow *et al*., 2019).

In Alutiiq culture, such paintings and associated stories were used to preserve knowledge of past events that had threatened the community (Bressan, 2018). Similar stories are told and documented through specific objects in almost all coastal populations of the Pacific Ocean, serving as genuine reminders to settle villages in sufficiently elevated areas to reduce the risk of wave inundation if they were to come from the vastness of the sea they face.

This example illustrates how material heritage (e.g. symbolic artefacts, settlement patterns) reinforces intangible memory. Together, they contribute to spatial planning practices that inherently reduce risk. Modern tsunami risk mapping and historical tsunami deposit analysis (Minoura *et al*., 2001) increasingly validate the spatial accuracy of these cultural narratives.

3.1.1.3 The legend of the oarfish: from earthquake and Tsunami Harbinger to early warning strategy (Pacific Ocean). In mid-July 2022, a series of earthquakes occurred between Arica in Northern Chile and Arequipa, Moquegua and Tacna in Southern Peru, with a notable event reported on July 13 when a large "oarfish" (regalecus glesne) was captured, considered an ominous sign of an impending severe earthquake. This deep-water creature, known as the world's longest bony fish, has sparked folk beliefs across the Pacific Ocean, associating its presence near the coast with seismic activity (Semana, 2022). Similar legends exist in Japan, where the fish is regarded as the servant of the Dragon King (Figure 1), with past sightings preceding significant earthquakes, such as the 2011 Fukushima disaster (Yamamoto, 2010). Despite media speculation linking oarfish sightings with seismic events along the San Andreas Fault in California, no scientific evidence supports this connection (BBC, 2013; Serna, 2015).

While the notion of earthquake-predicting oarfish lacks scientific grounding, it persists as a social reminder of vulnerability and uncontrollable natural forces (Orihara *et al*., 2019).

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

Figure 1. The catfish Namazu, representing the earthquake that destroyed Edo (modern Tokyo) in October 1855
Source: Bressan, 2019

These disaster myths may not provide predictive accuracy, but they remain culturally effective in maintaining awareness and fostering a precautionary ethos. They act as symbolic sentinels that mobilise community memory, much like public drills or alerts.

Such disaster legends, prevalent worldwide throughout history, convey societal anxieties and uncertainties, serving as allegorical narratives that make unsettling aspects of reality visible (Gugg *et al*., 2019). In the contemporary era, these myths and legends offer effective forms of early warning by engaging specific social audiences and highlighting the importance of collective memory and communication strategies.

3.1.2 Volcanoes, a bunch of necessary rituals and rites. 3.1.2.1 A barrier of saints against the volcano eruption (Vesuvius, Italy). In times of crisis, affected communities often turn to religious rituals, such as processions and public prayers, seeking divine intervention to mitigate or overcome disasters, serving as both explanations and coping mechanisms (Gugg, 2023). Examining centuries of religious practices around Italy's Vesuvius volcano, two main types of rituals emerge: "emergency rituals" and "commemorative rituals" (Gugg, 2014). The eruption of Vesuvius in 1631 triggered extensive emergency rituals, including processions with Saint Januarius's statue in Naples (Figure 2), believed to calm the volcano through fervent supplications (Gugg, 2018). The collective memory of this event, sustained through the miraculous liquefaction of Saint Januarius's blood, perpetuates the commemorative ritual, shaping the community's identity and resilience (Gugg, 2023, 2014).

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

Figure 2. Emergency ritual for the eruption of Vesuvius in March 1944
Source: Pesce and Rolandi (2000)

These rituals represent intangible heritage with powerful performative and mnemonic functions. At the same time, the routes of processions, sacred landmarks and sanctuaries constitute a tangible topography of protection, embodying a spatialised memory of risk.

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

Despite their apparent irrationality, these rituals serve as symbolic languages, transmitting memory, strengthening community bonds and preserving cultural heritage, illustrating the profound significance of religious practices in times of crisis.

Recent studies in social psychology and disaster sociology (Dynes, 2006; Perry and Lindell, 2006) confirm that collective ritual practices can reduce anxiety, reinforce social cohesion, and facilitate post-disaster recovery. Therefore, these expressions may be reinterpreted today as components of psychosocial resilience and community-based DRR.

3.1.3 Flash flooding, water that erases the land. 3.1.3.1 Equipped space of First Nations when the ice melts (Canada). Indigenous Services Canada (ISC) collaborates closely with First Nations communities in Canada to address the risks posed by seasonal floods, implementing tailored emergency preparedness and response plans (Indigenous Services Canada, 2023). In regions like Saskatchewan, ISC has integrated Indigenous knowledge to mitigate flood risks, employing strategies such as reducing snow cover and managing water channels. In Ontario, ISC-funded initiatives in Kashechewan and Fort Albany First Nations enable temporary relocation to higher ground during spring floods, minimising the need for evacuation to urban centres. Similarly, in Alberta, ISC's inclusive approach involves full integration of First Nations communities into the emergency management system to enhance resilience against future flood events.

This example highlights how tangible measures (e.g. infrastructure for planned relocation) can be successfully co-designed using intangible local knowledge and seasonal indicators. Indigenous spatial planning, often informed by cyclical environmental understanding, aligns with modern adaptive strategies promoted in climate change adaptation frameworks (Indigenous Services Canada, 2023).

Scientific studies in hydrology and climate modelling (Pomeroy *et al.*, 2016) have demonstrated the benefits of combining snowmelt forecasting with local observational knowledge to improve flood anticipation and mitigation in northern regions.

3.1.3.2 Floods tell us the river is sick (Australia). The severe flooding in the Lismore area of New South Wales, Australia, in February and March 2022 sparked controversy over authorities' handling of the emergency, notably in Rosebank, where Coopers Creek overflowed, inundating the town. Indigenous communities hold crucial knowledge for managing such extreme events, emphasising the importance of respecting the natural environment and the wisdom of traditional practices. Indigenous perspectives view rivers as vital entities that hold truths and require care and respect, with the health of the river reflecting the well-being of the people (Costello, 2022).

This perspective reframes the flood not only as a hazard, but as a signal of disrupted ecological equilibrium. In this view, the river is a subject with whom one interacts, not merely an object to be managed – a relational ontology that informs ecosystem-based DRR.

This viewpoint aligns with Gugg's reflections on Mount Vesuvius, underscoring the interconnectedness between humans and the environment, advocating for sustainable coexistence and ecosystem restoration (Gugg, 2021).

The notion that floods are symptoms of a "sick river" resonates with scientific research on riverine degradation, sediment overload and land-use change as flood risk multipliers (Allan, 2004). A convergence of indigenous perspectives and hydrological science can thus inform more holistic water governance and risk reduction.

3.1.4 Fire, the world in flames. 3.1.4.1 Local knowledge against fires (Canada, USA). The increasing frequency and severity of large fires globally have prompted a shift towards understanding the multifaceted nature of fire to better address the associated emergencies. Amy, a researcher at the Canadian Forest Service, underscores the importance of reclaiming indigenous fire management practices, which historically used controlled burns to maintain

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

landscape health and support subsistence lifestyles. However, colonisation led to the suppression of traditional fire practices, contributing to the escalation of fire risks (Christianson, 2015).

Andrew, a firefighter with the US Forest Service, highlights the wisdom of Indigenous perspectives on fire management, emphasising the necessity of frequent, low intensity burns to mitigate the risk of catastrophic fires and maintain forest health.

This case reveals how traditional ecological knowledge (TEK) corresponds to preventive action now reintroduced by modern forestry services. Controlled burns, long dismissed as primitive, are now validated by ecological fire science as key to reducing fuel loads and regenerating biodiversity.

This growing recognition among professionals underscores the value of integrating traditional knowledge into contemporary fire management strategies, highlighting the importance of collaboration between Indigenous communities and modern firefighting agencies in addressing the challenges posed by wildfires (Avitt, 2021).

Recent studies in fire ecology (Fernandes and Botelho, 2003; Keeley and Fotheringham, 2001)confirm that low-intensity cultural burns can reduce fire severity and increase landscape resilience – confirming the scientific relevance of ancestral practices.

3.1.4.2 Controlled traditional fires (Europe). In Europe, there is a growing recognition of the necessity to revive eroded or lost knowledge surrounding fire prevention, particularly through the reintroduction of controlled burning practices (Figure 3) known as “debbio” in Italian. These practices, which have been used for centuries, are now being reconsidered as part of sustainable natural resource management and fire risk mitigation strategies (Sereni, 1981). The loss of traditional ecological knowledge regarding fire has contributed to the escalation of catastrophic fires, highlighting the importance of reintroducing low-intensity fires to reduce combustible debris build-up, nourish the soil and protect the tree canopy.

The tangible heritage of these landscapes – shaped by centuries of agro-pastoral burning – is a testimony to human-nature symbiosis. Their abandonment has coincided with more severe wildfire outbreaks, as demonstrated in the Mediterranean basin (Moreira *et al.*, 2020).

Embracing indigenous perspectives on fire management, which view “cultural fires” as integral to landscape cultivation and biodiversity enrichment, provides valuable insights into achieving balanced land management and reducing the risk of extreme fires.

This convergence of historical land-use patterns and contemporary ecological restoration supports the idea of “pyro diversity” as a strategy for resilience, integrating cultural practices with biodiversity and hazard mitigation.

Collaborative efforts involving local communities and the integration of traditional practices into contemporary land management strategies are crucial for promoting landscape diversity, supporting traditions, and restoring a harmonious relationship with the ecosystem (Kimmerer and Lake, 2001).

3.1.5 Pandemic, coexistence in times of contagion. 3.1.5.1 Indigenous knowledge to address AIDS/HIV (Namibia). In Namibia, the construction of local meanings regarding HIV/AIDS is deeply intertwined with indigenous knowledge and cultural perceptions. High school students in Namibia associate HIV/AIDS with indigenous names and symptoms, revealing derogatory terms and descriptions such as “prostitutes”, “bone disease” and “useless person” (Chinsembu *et al.*, 2011). Understanding these indigenous perceptions is crucial for designing effective HIV prevention and management programs, as indigenous knowledge forms the foundation for sustainable solutions that bridge cultural beliefs and health practices (Nkondo, 2010).

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

Figure 3. Slashing-and-burning in Eno, Finland, 1893 – Author: I. K. Inha
Source: Wikipedia (2015)

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

These cultural interpretations, while sometimes stigmatising, also shape explanatory models and behaviours. Engaging with them critically is essential for building inclusive health campaigns that foster both scientific literacy and cultural resonance.

Cultural factors play a significant role in health-related patterns, with disease narratives shaped by individual schemas and explanatory models embedded in unique life circumstances (Garro, 1994; Landrine and Klonoff, 1992). Activation of students' indigenous schemas is essential for processing new information about HIV/AIDS, emphasising the importance of integrating indigenous knowledge into educational initiatives to combat stigma, promoting effective prevention strategies (Armbruster, 1986; Chinsembu *et al.*, 2011).

Public health anthropology confirms that locally grounded interventions are more effective than top-down biomedical messaging alone (Baer and Singer, 2018; Destoumieux-Garzón *et al.*, 2018). This underlines the potential of indigenous cultural heritage in enhancing community-based health resilience.

3.1.5.2 Birds as sentinels of pandemics (China and Eastern Asia). Avian influenza, first described in Piedmont, Italy, in 1878 and later attributed to the type A influenza virus, has periodically affected poultry markets and wild bird populations, highlighting its highly contagious nature and zoonotic potential (Alexander and Brown, 2009). Frédéric Keck, an anthropologist specialising in poultry farming in China, suggests that anthropology, alongside other disciplines, can contribute to pandemic prevention by adopting the perspectives of bats or birds. Keck advocates for techniques such as using sentinel chickens, which, by remaining unvaccinated against avian influenza, serve as valuable indicators of pathogen presence, emphasising the importance of animal surveillance in disease prevention (Keck, 2020). Similarly, David Quammen suggests engaging in dialogue with bats to tap into their "indigenous knowledge" and better understand potential disease threats (Quammen, 2020).

These speculative approaches challenge traditional epidemiological models, suggesting a multispecies and intersensorial alert system. While metaphorical, they open space for novel biosurveillance strategies based on early detection from animal behaviour.

These approaches underscore the significance of interdisciplinary collaboration and indigenous knowledge in anticipating and mitigating future health crises.

Considering zoonotic spillover risks, One Health frameworks now explicitly call for integrating local ecological knowledge into global surveillance networks (Destoumieux-Garzón *et al.*, 2018), confirming the relevance of these insights for contemporary risk governance.

3.2 Construction technologies

This section explores traditional building techniques and spatial strategies developed in response to past disasters. To improve critical analysis, this revised version includes not only examples of successful adaptive designs but also failures and limitations that have exposed communities to risk. These insights aim to inform contemporary DRR planning through a balanced evaluation of traditional knowledge systems.

3.2.1 Volcanoes, a complex mix of hazards. 3.2.1.1 Eruption preparedness (Indonesia). When devising DRR strategies in coastal regions, it is crucial to consider the potential hazards associated with volcanic activity, which can trigger tsunamis, earthquakes, landslides and rockfalls. The Baduy communities in Pandeglang regency, Indonesia, exemplify traditional building techniques rooted in local wisdom, designed to withstand natural hazards like volcanic eruptions, earthquakes and tsunamis. Situated in a remote area of Banten province, their isolation has preserved their unique language, culture and solid

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

Figure 4. The Baduys' house: the designed roof to slip volcanic ash to the ground
Source: Firdaus *et al.* (2023)

connection to the natural environment. Pandeglang regency, located in western Java, Indonesia, lies in a complex tectonic environment prone to various natural disasters, including landslides, floods, tornadoes and tsunamis. Baduy construction methods use easily accessible bush materials, featuring houses with traditional long sloping roofs designed to shed volcanic ash and withstand its weight, thus reducing fire risk (Figure 4). Structures made of bamboo and rattan provide flexibility during earthquakes, while construction details eschew nails in favour of interlocking supports and pegs, ensuring resilience to seismic events (Firdaus *et al.*, 2023).

3.2.2 Flooding, the rainwater management. 3.2.2.1 The channels against the water force (Italy – 17th until 20th century). The Regi Lagni, a remarkable hydrographic engineering project dating back to the fifteenth century, exemplifies effective flood prevention and land reclamation efforts in Southern Italy, particularly in the Campania Felix region (Liotto, 2011). Spanning approximately 100 thousand hectares (Figure 5), this network of canals, initiated during the Bourbon reign, successfully mitigated Clanio River floods for over four hundred years, significantly impacting the provinces of Napoli and Caserta (Pica *et al.*, 2016). The primary canal, stretching 55 km and supported by 210 km of secondary canals, serves as a crucial hydrographic network, regulating water flow, preventing floods and ensuring water availability during droughts for the region's 3 million inhabitants. Historically, the Bourbon Kings expanded and maintained the Regi Lagni, enacting regulations to ensure water cleanliness and healthiness (Alta Terra di Lavoro, 2020). Additionally, similar hydraulic regulation projects, like those found in Casamicciola Therme (Figure 6), have proved effective in preventing landslides and floods in fragile areas, showcasing the integration of traditional peasant wisdom with modern engineering solutions

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

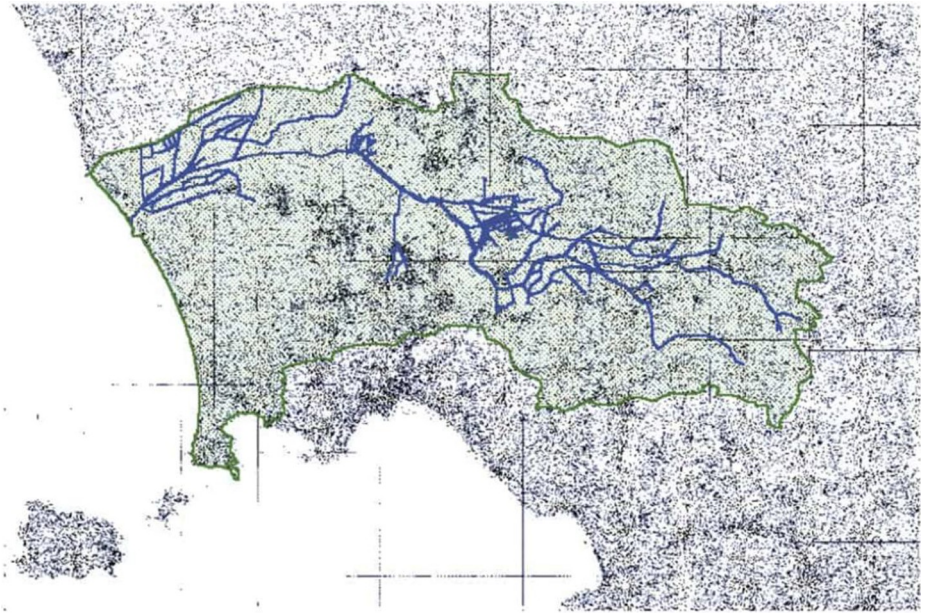

Figure 5. Regi Lagni Hydrographic Basin, including the hydrographic network
Source: Morlando (2018)

(Frattasi, 2022). Through the combination of historical infrastructure and local knowledge, these projects have safeguarded communities from the devastating effects of pluvial waters.

3.2.3 Earthquake, an upheaval of the territory. 3.2.3.1 The New Cerreto Sannita (Southern Italy, 18th Century). The earthquake of June 5, 1688, profoundly impacted Cerreto Sannita, causing extensive damage and significant loss of life (Franco, 1966). Witness accounts, including that of future Pope Benedict XIII, testify to the devastation suffered by the region, with thousands of fatalities recorded (Savoia, 1973). In the aftermath, Cerreto Sannita underwent socio-economic transformations, marked by population movements, and shifts in economic activities, with agriculture supplanting pastoralism as the predominant livelihood. The reconstruction efforts, spearheaded by influential families like the Carafas, commenced around the 1730 s, guided by a blend of Renaissance city models and emerging industrial city layouts. While early 18th-century construction practices lacked advanced seismic resistance knowledge, certain urban design features, such as wider streets and specific building arrangements, hinted at considerations for earthquake resilience. Notably, Cerreto Sannita's post-earthquake organisation reflected a transition from Renaissance idealism to Enlightenment practicality, evident in the delineation of distinct urban blocks serving various social and functional purposes (Ciaburri, 1984).

The reconstruction of Cerreto Sannita after the 1688 earthquake exemplifies a convergence of feudal, urban planning, and royal interests driven by pragmatism and rationality. The town's internal organisation, characterised by diverse block types catering to different societal needs, reflects this transitional phase from ideal city planning to practical urban design. Despite the lack of advanced seismic engineering knowledge, the town's layout and building arrangements subtly incorporated elements aimed at

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

Figure 6. Photo collected from Facebook published by Francesco Emilio Borrelli, originally recovered by Umberto Mercurio and depicting canals on Monte Epomeo in the 1930s
Source: Frattasi (2022)

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

enhancing earthquake resistance, showcasing an early attempt at disaster mitigation in urban planning. Through a pragmatic approach guided by reason, Cerreto Sannita emerged from devastation as a testament to the resilience and adaptability of its inhabitants and the strategic vision of its reconstruction planners (Ciaburri, 1984).

3.2.3.2 The resilient public spaces of L'Aquila (Central Italy, 14th–21st century). The city of L'Aquila, situated on a fault line in the central Apennines of Italy, has a long history of seismic activity, with six significant earthquakes recorded since its foundation in 1254. Geographer and historian Serena Castellani's research highlights the resilience of specific public spaces in L'Aquila following seismic events, serving as socio-topic spaces where the community reappropriates its identity and participates in collective action. These spaces, including market squares and cultural hubs, play vital roles in facilitating the healing process and democratic engagement post-disaster. Castellani's study emphasises the importance of urban planning and community engagement in fostering resilience and recovery in earthquake-prone regions like L'Aquila (Castellani, 2018).

Furthermore, the historical cartographic analysis conducted by Castellani identifies resilient public spaces in L'Aquila, such as Piazza del Mercato/Piazza Duomo and Piazza S. Francesco/Piazza Palazzo, which have maintained their significance over centuries (Castellani, 2021). These spaces, characterised by their strong identity and functionality, contribute to the city's ability to recover and rebuild following seismic crises (Castellani, 2018). Additionally, legislative measures, such as the technical standards issued after the 1915 earthquake, aim to improve the seismic safety of buildings in Italy (Regio Decreto Legge n. 573 del 29/4/1915, 1915; Robinson, 1915). By integrating historical insights with contemporary urban planning practices and legislative initiatives, L'Aquila and other earthquake-prone regions can enhance their resilience and mitigate the impact of future seismic events (Castellani, 2018; Robinson, 1915).

3.2.4 Earthquake, the house is not a trap. 3.2.4.1 The archaeological evidence of seismic resistance (Roman Empire times). Archaeological studies demonstrate the existence of seismic-resistant cultures in ancient times, employing construction techniques like wooden frame structures and metal reinforcements to withstand dynamic loads. Notably, certain periods and areas in antiquity prioritised anti-seismic construction techniques, potentially as a state policy, reflecting the influence of seismicity on building styles (Stiros, 1995). Within the Roman Empire, despite enduring significant disasters such as the eruption of Mount Vesuvius and the Great Fire of Rome, the civilisation adapted and thrived for centuries. Emperor Augustus initiated efforts to improve disaster prevention during his reign, signalling a shift towards addressing structural safety concerns (Toner, 2018). The construction techniques used throughout the Roman Empire varied widely, categorised into stone works and cementitious and walling works, each tailored to regional materials and evolving over time. Stone works included polygonal, ashlar and African masonry, while cementitious and walling works encompassed uncertain masonry, reticulate masonry (Figure 7), and brickwork, reflecting the diverse architectural approaches within the empire. These techniques showcase the ancient Romans' ingenuity and adaptability in constructing resilient structures amidst seismic challenges.

3.2.4.2 Machu Picchu, the extraordinary seismic city of the Incas (Peru). Machu Picchu, constructed by the Incas in the 15th Century, stands as an exceptional testament to ancient engineering prowess, particularly in seismic resistance. Positioned amidst earthquake-prone terrain, the city's strategic use of granite, sourced locally and meticulous stone arrangement reflect advanced seismic engineering principles (Arnaud, 2020; UNESCO, 1983). Using the rustication technique, wherein stones interlock seamlessly without mortar, Machu Picchu's structures achieve remarkable stability, with

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

Figure 7. Opus Reticulatum on the house's walls at the archaeological park of Herculaneum, Ercolano, Italy: buried under volcanic ash and pumice in the eruption of vesuvius in 79 AD
Source: Photos by Mariana Oliveira (September 9th, 2023)

joints so precise that even a knife blade cannot penetrate (Arnaud, 2020). This architectural precision, coupled with wider bases and thick walls, underscores the city's resilience to seismic events, ensuring its enduring presence amidst challenging environmental conditions (Magli, 2010).

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

3.2.4.3 The baraccata system in Casamicciola Terme, Ischia Island (Southern Italy, late 19th century). Ischia, an Italian volcanic island, has been marred by seismic tragedies, notably the devastating earthquake of 1883, which claimed over 2,300 lives and obliterated vast swathes of Casamicciola and Lacco Ameno (Polverino, 1996). This catastrophe marked Italy's first major post-unification disaster, prompting the enactment of pioneering anti-seismic regulations, such as the "Building Regulations for the Municipalities of the Island of Ischia damaged by the earthquake of July 28, 1883" (Tobriner, 1983). These regulations advocated for innovative building techniques like the "baraccata" system, which used wooden reinforcements within masonry to enhance seismic resilience (Ceccotti *et al.*, 2013; Tobriner, 1983). Notable figures like Minister Francesco Genala and scientist Giulio Grablovitz played crucial roles in post-disaster recovery, with Grablovitz pioneering geological studies and establishing monitoring systems for the island's active volcanoes

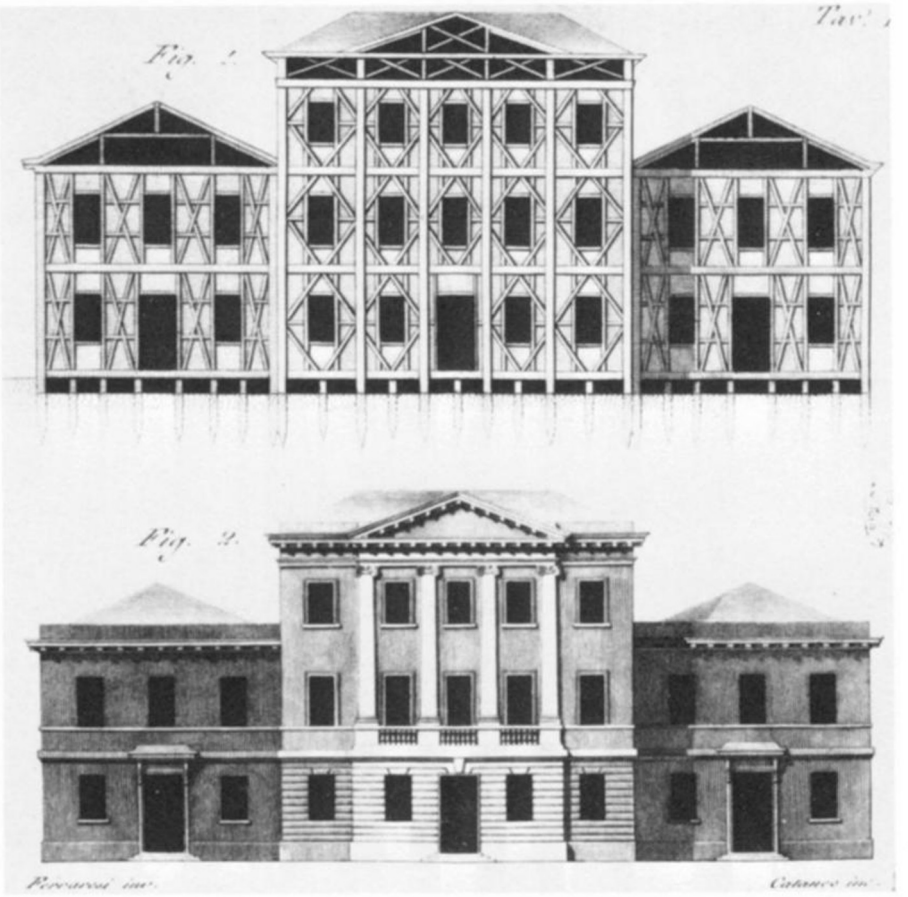

Figure 8. Giovanni Vivenzio's earthquake-resistant house, 1783
Note(s): Elevation and transverse section illustrating barracks' wall composition
Source: Tobriner (1983)

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

Figure 9. Barrack house – Shack house in Casamicciola after the 2017 earthquake
Source: Photo by Giovanni Gugg – May 24th, 2018. (Gugg, 2024)

(Carlino *et al.*, 2011). Today, experts recognise the enduring potential of barrack houses (Figure 8 and Figure 9) as an engineering solution for mitigating Ischia's building fragility against seismic activity (Ceccotti *et al.*, 2013).

3.2.4.4 The origins of seismic isolation design (From Italy to Japan, New Zealand and USA). The earthquake of 1905 in Calabria left a profound mark on the region, exposing the dire consequences of substandard construction practices and the urgent need for improved building standards to withstand seismic activity. With extensive damage to infrastructure and a staggering toll on human lives, the earthquake highlighted the vulnerability of Calabria's buildings, particularly in rural areas where traditional agriculture dominated the economy. Peasant houses, constructed with inadequate materials and basic techniques, crumbled under the quake's force, emphasising the necessity for resilient construction methods (Tiberti *et al.*, 1967). In response to this catastrophe, Italy formed a commission that recommended seismic isolation techniques, such as building separation from the foundation with sand layers or rollers – a pioneering step in European seismic engineering (Kelly, 1986). Subsequently, seismic isolation gained traction globally, with architect Frank Lloyd Wright implementing these techniques in the design of the Imperial Hotel in Tokyo, Japan, which proved resilient during the 1923 Tokyo earthquake (Kelly, 1985). Further advancements in seismic engineering introduced energy dissipation systems, exemplified by R.W. de Montalk's patent for shock-absorbing mechanisms to minimise earthquake damage. These innovations have enabled structures to withstand seismic forces, as demonstrated during events like the 1933 Long Beach earthquake in the USA, where buildings using seismic isolation techniques fared significantly better than their conventional counterparts (Makris, 2019).

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

While traditional knowledge offers a rich reservoir of adaptive strategies, it is not infallible. Historical successes coexist with failures and understanding both is crucial for effective DRR. Modern science and engineering can validate, adapt and enhance traditional designs, ensuring they continue to serve in a changing world.

4. Discussion

Anthropological and historical-archaeological research allows us to understand that local and indigenous communities' roots in their environments have led them to develop knowledge and time-tested practices to prepare, mitigate, respond to and recover from disasters. Collectively, these are referred to as "local and indigenous knowledge," which has gained increasing recognition in DRR. As demonstrated by Hadlos *et al.* (2022), communities mobilise many strategies, from risk predictions to livelihood-based adaptations, with research on these concentrated in middle and high-income countries. Efforts are being made to integrate knowledge (local, indigenous and scientific) and socio-political arrangements also tackling spheres of power (top-down and bottom-up) to promote collaboration (Wanzenböck and Frenken, 2020).

However, the results presented earlier in this paper demonstrate that these strategies are not abstract, but embedded in concrete practices related to local topographies, place names and collective memory of past disasters. For example, the case study on the "Baraccata System" in Casamicciola Terme (Ischia Island, Italy) illustrates how a traumatic collective memory – triggered by the devastating 1883 earthquake – was transformed into a vernacular building technique. This system, based on lightweight wooden structures within masonry frames, spread through oral transmission and community-based experimentation, showing how disaster experience can give rise to adaptive and culturally embedded solutions.

Indigenous knowledge is often referred to by various names, such as "traditional ecological knowledge", "indigenous technical knowledge" or "endogenous knowledge". It is associated with terms like "ethnic", "folk" and "vernacular". This variety indicates both the ambiguity of the object and its inherent richness. Therefore, it should be considered holistically, with all its facets and possible adaptations to specific cases. In other words, indigenous knowledge is flexible and, although still in its early stages, it is being recognised as valuable, especially in priority areas of the Sendai Framework (United Nations, 2015a).

Recent studies (Chapin *et al.*, 2005; Rambaldi *et al.*, 2006) have emphasised how indigenous knowledge systems can be systematically incorporated into hazard mapping, land-use planning and even digital risk platforms. In this sense, modern technologies can serve as tools to record, visualise and disseminate traditional risk-related knowledge, thus avoiding its disappearance. For instance, GIS-based platforms and mobile apps have been co-developed with local communities to integrate oral traditions with spatial data, enhancing both heritage preservation and risk awareness.

What emerges from the preceding pages is that local knowledge, both in an ethnological and historical-archaeological sense, reminds us of the essentiality of a more balanced relationship with the ecosystem to prevent and mitigate risks. Duca (2012b) emphasises that even environmental interventions, although often implicitly sustainable, can carry risks in terms of sustainability. Inappropriate transformations of the built environment can lead to the loss of local identity, making it impossible for future generations to experience the identity of the place as past generations did. When this loss of identity pertains, knowledge built upon disasters experienced by a community, the conservation of identity becomes a key issue for the resilience of the built environment. To avoid this possibility, it is important to understand the local perspective on the problem and the community's relationship with its surroundings – how they name the territory and the terms they use to describe various precursor phenomena.

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

In this sense, our findings resonate with the work of Climate Change and Cultural Heritage Working Group International (2019), who analyse how cultural heritage and memory practices can enhance resilience by reinforcing place attachment and community-based monitoring of environmental changes. The integration of heritage-led approaches into DRR is gaining ground, particularly in contexts where vulnerability is not only material but also symbolic.

Indigenous knowledge is not the solution to catastrophes, but it is a valuable additional source of understanding and, to some extent, prevention or mitigation. When a disaster occurs, in addition to spatial, individual and community upheavals, the community always poses a profound question: "Who really are we?" Ariel Dorfman, a journalist and witness of the 2010 earthquake in Chile, believes that every crisis is an opportunity to reflect on how and when to rebuild infrastructure and houses and on "our precarious identity" (Dorfman, 2010). In other words, it involves addressing existential questions that allow us to rebuild the community and ourselves. Earthquakes, tsunamis, pandemics, or any other calamities that befall a territory and its community compel us to confront challenging and almost intimate questions: What is our territory today? What has it become in a couple of generations? What kind of relationship have the inhabitants developed with the ecosystem (Köllner, 2023). Moreover, indigenous knowledge is not solely passed down from previous generations; it can also emerge from direct or experiential knowledge, even though seemingly paradoxical avenues such as technical knowledge – a tangible and visible form of knowledge – and the local system of beliefs – an intangible form of knowledge deeply embedded and shared within a society (Zulfadrim *et al.*, 2019).

Our empirical findings confirm that such experiential knowledge is still alive in everyday practices, including the interpretation of unusual animal behaviour, atmospheric anomalies and ritual responses to threat. These intangible indicators are often underestimated by scientific protocols but remain crucial in local risk perception and response mechanisms.

Recognising and incorporating local knowledge into emergency planning and communication with the population is therefore an imperative that public safety practitioners and local professionals cannot overlook. Indigenous knowledge, oral history and technical advances in land management and building constructions are not conflicting but rather complementary.

Several scholars (Mercer *et al.*, 2010; Shaw *et al.*, 2016) argue that the most effective DRR strategies emerge when scientific and indigenous knowledge are co-produced in participatory frameworks that also respect local epistemologies. This implies rethinking governance structures, planning tools, and even language used in official communication.

In general, experiential-based local and indigenous knowledge has a greater likelihood of being integrated with scientific knowledge. However, research and application in this field are still evolving, and the potential impact of integrated knowledge on DRR programs can further increase. The promotion of local and indigenous knowledge involves promoting the participation of local communities in combination with external knowledge, fostering a dialogue that encourages discussion, exchange, and democracy (Dunlap *et al.*, 2023).

Ultimately, the case studies presented in this paper show that such dialogue is possible and productive. They support a growing consensus in the literature (IFRC, 2022) that indigenous knowledge should be seen not as a residual or folkloric element but as a living, adaptive and legitimate form of risk governance.

5. Conclusions

This paper has explored the historical and cultural interpretations of disasters, highlighting how these events have been perceived and managed across different eras. It has traced the

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

evolution of the concept of disaster from isolated emergencies to ongoing processes that unveils societal vulnerabilities. This analysis emphasises the relevance of combining local intangible and tangible culture built upon disasters in sustainable urban development and resilience. By drawing parallels between historical disaster management and contemporary urban challenges, the paper provides insights into how past experiences can inform current strategies for urban sustainability and governance.

The emphasis on cultural heritage, societal activation and the balance between memory and resilience is particularly relevant to community engagement, urban resilience and innovation in the face of socio-economic and environmental uncertainties. Understanding how societies have historically adapted to disasters can guide the development of truly resilient communities within the resilience of their physical environment.

To translate these insights into practice, the paper recommends that urban planners and policymakers integrate historical and cultural knowledge into risk assessments, urban renewal projects and participatory planning frameworks. Engineers and infrastructure designers should consider traditional building techniques and local knowledge as part of their strategies for risk mitigation and adaptive design. Educational programs and public engagement initiatives should also leverage cultural memory to strengthen community-based preparedness.

However, this study is not without limitations. It is primarily conceptual and historical, and further empirical research is needed to evaluate the effectiveness of culturally informed DRR strategies in diverse urban contexts. Future research could focus on comparative case studies across different geographical areas, or on co-designed interventions involving local stakeholders in high-risk urban zones.

In conclusion, integrating cultural insights into disaster management, land management and urban planning is crucial for creating inclusive, safe, resilient and sustainable urban environments. As urban populations continue to grow, the lessons learned from historical disaster responses can help shape adaptive strategies that address the complexities of modern urbanisation and climate change. By offering targeted recommendations for practitioners and acknowledging areas for further inquiry, this approach not only enhances the resilience of urban centres but also fosters a deeper understanding of the cultural dynamics that underpin successful disaster management and recovery within the sustainable development goals.

References

Alexander, D.J. and Brown, I.H. (2009), “History of highly pathogenic avian influenza”, *Rev Sci Tech*, Vol. 28, pp. 19-38, doi: 10.20506/rst.28.1.1856.

Allan, J.D. (2004), “Landscapes and riverscapes: the influence of land use on stream ecosystems”, *Annual Review of Ecology, Evolution, and Systematics*, Vol. 35 No. 1, pp. 257-284, doi: 10.1146/annurev.ecolsys.35.120202.110122.

Alongi, D.M. (2008), “Mangrove forests: resilience, protection from tsunamis, and responses to global climate change”, *Estuar Coast Shelf Sci*, Vol. 76 No. 1, pp. 1-13, doi: 10.1016/j.ecss.2007.08.024.

Alta Terra di Lavoro (2020), “I REGI LAGNI : iMPARATE DAI BORBONE COME SI AMMINISTRA IL TERRITORIO CON ATTENZIONE E AMORE IL REGNO! (in Italian) [WWW document]. difesa della terra”, available at: www.altaterradilavoro.com/i-regi-lagni-imparate-dai-borbone-come-si-amministra-il-territorio-con-attenzione-e-amore-per-la-nazione/ (accessed 31 July 2023).

Aquino, A.R D. (2022), “Indonesia’s green belt – protecting and restoring the country’s mangroves [WWW document]. East Asia and Pacific on the Rise – World bank blogs. URL %0AIndonesia’s green belt – protecting and restoring the country’s mangroves ”, (accessed 5 July 2023).

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

Armbruster, B.B. (1986), "Schema theory and the design of content-area textbooks", *Educational Psychologist*, Vol. 21 No. 4, pp. 253-267.

Arnaud, B. (2020), "Au Machu Picchu, une architecture antisismique (in French)", *Sci Avenir*, pp. 42-45.

Avitt, A. (2021), "Tribal and indigenous fire tradition [WWW document]", USDA/Forest Service/Fire and Aviation Management, available at: www.fs.usda.gov/features/tribal-and-indigenous-heritage (accessed 4 July 2023).

Badola, R. and Hussain, S.A. (2005), "Valuing ecosystem functions: an empirical study on the storm protection function of Bhitarkanika mangrove ecosystem, India", *Environmental Conservation*, Vol. 32 No. 1, pp. 85-92, doi: 10.1017/S0376892905001967.

Baer, H.A. and Singer, M. (2018), *The Anthropology of Climate Change*, Routledge, Second edition. | New York, NY : Routledge is an imprint of the Taylor and Francis Group, an Informa Business, 2018. |, doi: 10.4324/9781351273121.

Banda, D. (2002), *Essai Sur L'origine Des Langues. Une Édition Électronique. (in French). Jean-Jacques Rousseau (1712-1778) Essai Sur L'origine Des Langues (Œuvre Posthume, 1781)*, édition A. Belin, Paris, 1817, Chicoutimi, Québec.

BBC (2013), "Oarfish deaths in California revive earthquake myths [WWW document]", News, available at: www.abc.net.au/news/2013-10-23/oar-fish/5039218 (accessed 31 July 2023).

Bressan, D. (2018), "Ancient stories preserve the memory of tsunami In the pacific ocean [WWW document]. FORBES/INNOVATION/SCIENCE", (accessed 5 July 2023).

Bressan, D. (2019), "Giant oarfish "warning" of coming earthquake and tsunami is more myth than science [WWW document]. FORBES>INNOVATION>SCIENCE", available at: www.forbes.com/sites/davidbressan/2019/02/02/oarfish-warning-of-coming-earthquake-and-tsunami-is-more-myth-than-science/

Bwambale, B., Muhumuza, M., Kahigwa, T.T., Baluku, S.M.B., Kasozi, H., Nyeko, M. and Kervyn, M. (2023), "Foundations of indigenous knowledge on disasters due to natural hazards: lessons from the outlook on floods among the Bayira of the Rwenzori region", *Disasters*, Vol. 47 No. 1, pp. 181-204, doi: 10.1111/disa.12529.

Carlino, S., Cubellis, E., Delizia, I., Luongo, G. and Obrizzo, F. (2011), "Casamicciola milleottocentottantatre", *Il Sisma Tra Interpretazione Scientifica e Scelte Politiche (in Italian). Bibliopolis.*

Castellani, S. (2018), "Disaster resilience e spazi pubblici. Strade, piazze e aree verdi nella storia dei terremoti aquilani (1315-2009) (in Italian)", Università di Padova.

Castellani, S. (2021), "Gli spazi pubblici post-sisma all'Aquila (in Italian) [WWW document]", Il Lavoro Culturale, available at: www.lavoroculturale.org/gli-pazi-ubblici-st-ismallaquila/serenaastellani/2021/ (accessed 31 July 2023).

Ceccotti, A., Franch, M.G., Ruggieri, N. and Kostner, F. (2013), "A costruire case antisismiche ce lo insegnano. i borboni [WWW document]", available at: CNR -Consiglio Nazionale delle Ricerche/News. www.cnr.it/it/news/5595/a-costruire-case-antisismiche-ce-lo-insegnano-i-borboni (accessed 5 July 2023).

Chapin, M., Lamb, Z. and Threlkeld, B. (2005), "Mapping indigenous lands", *Annual Review of Anthropology*, Vol. 34 No. 1, pp. 619-638, doi: 10.1146/annurev.anthro.34.081804.120429.

Chinsembu, K.C., Shimwooshili-Shaimemanya, C.N., Kasanda, C.D. and Zealand, D. (2011), "Indigenous knowledge of HIV/AIDS among high school students in Namibia", *Journal of Ethnobiology and Ethnomedicine*, Vol. 7, p. 17, doi: 10.1186/1746-4269-7-17.

Christianson, A. (2015), "Social science research on indigenous wildfire management in the 21st century and future research needs", *International Journal of Wildland Fire*, Vol. 24 No. 2, pp. 190-200, doi: 10.1071/WF13048.

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

Ciaburri, N. (1984), "La ricostruzione di cerreto sannita dopo il terremoto del 5 giugno 1688 (in Italian). illuminismo meridionale e comunità locali, atti del convegno organizzato dal comune di santa croce del sannio, istituto storico "giuseppe M. Galanti".

Climate Change and Cultural Heritage Working Group International (2019), "The future of our pasts: engaging cultural heritage in climate action outline of climate change and cultural heritage".

CORE Project - D2.2 (2023), "Natural and manmade disaster case study identification, research, and analysis".

CORE Project - D3.2 (2023), "Cultural heritage".

Costello, O. (2022), "The floods tell us the river is sick. We should listen to indigenous knowledge to help country heal [WWW document]. the guardian/news/indigenous Australia/opinion flooding", available at: www.theguardian.com/commentisfree/2022/aug/18/the-floods-tell-us-the-river-is-sick-we-should-listen-to-indigenous-knowledge-to-help-country-heal (accessed 5 July 2023).

Dall'Ò, E. (2019), "I draghi delle alpi. Cambiamenti climatici, antropocene e immaginari di ghiaccio (in Italian)", in: Gugg, G., Dall'Ò, E., Borriello, D. (Eds), *Disasters on Popular Cultures. Il Sileno*, Edizioni International Scientific Publisher, Lago (CS), Italy, Vol. 2, No. 1, pp. 197-222.

Destoumieux-Garzón, D., Mavingui, P., Boetsch, G., Boissier, J., Darriet, F., Duboz, P., Fritsch, C., Giraudoux, P., Le Roux, F., Morand, S., Paillard, C., Pontier, D., Sueur, C. and Voituron, Y. (2018), "The one health concept: 10 years old and a long road ahead", *Frontiers in Veterinary Science*, Vol. 5, doi: 10.3389/fvets.2018.00014.

Dorfman, A. (2010), "Solidarity can help Chile prevail [WWW document]", CNN/Opinion, available at: https://edition.cnn.com/2010/OPINION/03/02/dorfman.chile.earthquake.unity/index.html (accessed 5 July 2023).

Duca, G. (2012a), "The implicit sustainability of ancient settlements: a case study", *International Journal of Heritage and Sustainable Development*, Vol. 2, pp. 29-34.

Duca, G. (2012b), "Sustainable rehabilitation of built environment: technical issues in identity preservation", in: Amoêda, R., Lira, S., Pinheiro, C. (Eds), *Heritage 2012 - Proceedings of the 3rt International Conference on Heritage and Sustainable Development 19-22 June 2012, Porto (Portugal), Barcelos, Green Lines Institute, Porto (Portugal)*, pp. 493-500.

Duca, G. and Gugg, G. (2023), "Safety culture in the Disaster-Resilient society context: a conceptual exploration", *Sustainability*, Vol. 15 No. 16, p. 12236, doi: 10.3390/su151612236.

Dunlap, A., Ruelas, A. and Søyland, L. (2023), "Debates in post-development and degrowth", *Tvergastein. Interdisciplinary Journal of the Environment*, Vol. 2, p. 229.

Dynes, R. (2006), "Social capital: dealing with community emergencies", *Homeland Securities Affairs 2.*

Dziak, R.P., Black, B.A., Wei, Y. and Merle, S.G. (2021), "Assessing local impacts of the 1700 CE Cascadia earthquake and tsunami using tree-ring growth histories: a case study in South Beach, Oregon, USA", *Natural Hazards and Earth System Sciences*, Vol. 21 No. 6, pp. 1971-1982, doi: 10.5194/nhess-21-1971-2021.

Evans-Pritchard, E. (1968), *Les Nuer. Description Des Modes de Vie et Des Institutions Politiques D'un Peuple Nilote - Traduit de L'anglais Par Louis Evrard (in French)*, Gallimard, NRF, Paris.

Falconieri, I., Dall'Ò, E. and Gugg, G. (2022), "Emergenza: una categoria stratificata e plurale1 riflessioni introduttive. (in Italian)", *Antropologia*, Vol. 9 No. 2, pp. 7-24, doi: 10.14672/ada202219627-24.

Fernandes, P.M. and Botelho, H.S. (2003), "A review of prescribed burning effectiveness in fire hazard reduction", *International Journal of Wildland Fire*, Vol. 12 No. 2, p. 117, doi: 10.1071/WF02042.

Firdaus, A., Lestari, F., Afiff, S.A. and Herdiansyah, H. (2023), "Integration of knowledge and local wisdom for disaster resilience in Anak Krakatau volcano", *Jamba (Potchefstroom, South Africa)*, Vol. 15 No. 1, p. 12, doi: 10.4102/jamba.v15i1.1457.

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

Franco, D. (1966), "Il terremoto del 1688 nel matese Orientale (in Italian), in: Annuario ASSA", pp. 80-95.

Frattasi, P. (2022), "La foto di ischia nel 1935: "canali sul monte epomeo contro frane e alluvioni" (in Italian) [WWW document]", FRANA A CASAMICCIOLA (ISCHIA), available at: www.fanpage.it/napoli/la-foto-di-ischia-nel-1935-canali-sul-monte-epomeo-contro-frane-e-alluvioni/ (accessed 31 July 2023).

Garcia-Acosta, V. (2002), "Conceptualization and experiences in Mexican disaster research", in: Giordano, C., Boscoboinik, A. (Eds), *Constructing Risk, Threat, Catastrophe*, Anthropological Perspectives. University Press, Fribourg, Switzerland, pp. 161-168.

Garro, L.C. (1994), "Narrative representations of chronic illness experience: cultural models of illness, mind, and body in stories concerning the temporomandibular joint (TMJ)", *Social Science and Medicine*, Vol. 38 No. 6, pp. 775-788, doi: 10.1016/0277-9536(94)90150-3.

Gugg, G. (2014), "Mettici la mano Tu!. Emergenza e commemorazione: vecchi e nuovi riti vesuviani", in: (a Cura Di): Gianfranca, R. and Domenica, B. (Eds), *Linguaggi Della Devozione. Forme Espressive Del Patrimonio Sacro*, Bari, ETNOGRAFIE, BARI:Edizioni Di Pagina, ISBN: 978-88-7470-402-6, ISSN: 1973-9788, Vol. 12, pp. 91-126.

Gugg, G. (2018), "The missing ex-voto. Anthropology and approach to devotional practices during the 1631 eruption of vesuvius", in: Cerere, D., De Caprio, C., Gianfrancesco, L., Palmieri, P. (Eds), *Disaster Narratives in Early Modern Naples. Politics, Communication and Culture*, Università di Napoli "Federico II," Viella, Rome.

Gugg, G. (2021), "Guarire un vulcano, guarire gli umani. Elaborazioni del rischio ecologico e sanitario alle pendici del vesuvio (in Italian)", AM. Rivista della Società Italiana di Antropologia Medica 22.

Gugg, G. (2023), "Crisi e riti della contemporaneità. Antropologia ed emergenze sanitarie, belliche e climatiche (in Italian)", Edizioni Museo Pasqualino, Palermo.

Gugg, G. (2024), "The isolation of the island: the social impasse in Ischia after the earthquake and tourism crises (2017–22)", in: Forino, G. (Ed), *Disasters and Changes in Society and Politics. Contemporary Perspectives from Italy*, Bristol University Press, Bristol.

Gugg, G., Dall'Ò, E., Borriello, D., (Eds), (2019), *DISASTERS IN POPULAR CULTURES. Il Seleno*, EdizioniInternational Scientific Publisher, Lago (CS), Italy.

Hadlos, A., Opdyke, A. and Hadigheh, S.A. (2022), "Where does local and indigenous knowledge in disaster risk reduction go from here? A systematic literature review", *International Journal of Disaster Risk Reduction*, Vol. 79, p. 103160, doi: 10.1016/j.ijdrr.2022.103160.

IFRC (2022), WORLD DISASTERS REPORT 2022 TRUST, EQUITY AND LOCAL ACTION - Lessons from the COVID-19 pandemic to avert the next global crisis.

Indigenous Services Canada (2023), "Flooding in first nations communities [WWW document]. emergency management", available at: www.sac-isc.gc.ca/eng/1397740805675/1535120329798 (accessed 5 July 2023).

Keck, F. (2020), *Les Sentinelles Des Pandémies. Chasseurs de Virus et Observateurs D'oiseaux Aux Frontières de la Chine (in French)*, Zones Sensibles Editions, Bruxelles.

Keeley, J.E. and Fotheringham, C.J. (2001), "History and management of Crown-Fire ecosystems: a summary and response", *Conservation Biology*, Vol. 15 No. 6, pp. 1561-1567.

Kelly, J.M. (1985), "Aseismic base isolation", *The Shock and Vibration Digest*, Vol. 17 No. 7.

Kelly, J.M. (1986), "Aseismic base isolation: review and bibliography", *Soil Dynamics and Earthquake Engineering*, Vol. 5 No. 4, pp. 202-216, doi: 10.1016/0267-7261(86)90006-0.

Kimmerer, R. and Lake, F. (2001), "Maintaining the mosaic: the role of indigenous burning in land management", *Journal of Forestry*, Vol. 99 No. 11, pp. 36-41.

Köllner, F. (2023), "(R)evolution? Exploring the potential of Post-Development approaches for reforming development cooperation".

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

Kroll-Smith, S. (2018), *Recovering Inequality: Hurricane Katrina, the San Francisco Earthquake of 1906, and the Aftermath of Disaster*, Social & Cultural Geography, doi: 10.1080/14649365.2019.1550858.

Kurnio, H., Fekete, A., Naz, F., Norf, C. and Jüpner, R. (2021), "Resilience learning and indigenous knowledge of earthquake risk in Indonesia", *International Journal of Disaster Risk Reduction*, Vol. 62, p. 102423, doi: 10.1016/j.ijdrr.2021.102423.

Landrine, H. and Klonoff, E. (1992), "Culture and Health-Related schemas: a review and proposal for interdisciplinary integration", *Health Psychology*, Vol. 11 No. 4, pp. 267-276, doi: 10.1037/0278-6133.11.4.267.

Liotto, D. (2011), "Regi lagni borbonici ci salvano dal dissesto idrogeologico e dal disastro (in Italian) [WWW document]. blog", available at: www.associazionenewdreams.it/index.php/blog/144-regi-lagni-ci-salvano-dal-dissesto-e-dal-disastro (accessed 31 July 2023).

Ludwin, R.S., Smits, G.J., Carver, D., James, K., Jonientz-Trisler, C., McMillan, A.D., Losey, R., Dennis, R., Rasmussen, J., Angeles, A.D.L., Buerge, D., Thrush, C.P., Clague, J., Bowechop, J. and Wray, J. (2007), "Folklore and earthquakes: native American oral traditions from Cascadia compared with written traditions from Japan", *Geological Society, London, Special Publications*, Vol. 273 No. 1, pp. 67-94, doi: 10.1144/GSL.SP.2007.273.01.07.

McMillan, A. and Hutchinson, I. (2002), "When the Mountain dwarfs danced: aboriginal traditions of Paleoseismic Events along the Cascadia subduction zone of Western North America", *Ethnohistory*, Vol. 49 No. 1, doi: 10.1215/00141801-49-1-41.

Magli, G. (2010), "At the other end of the sun's path: a new interpretation of Machu Picchu", *Nexus Network Journal*, Vol. 12 No. 2, pp. 321-341, doi: 10.1007/s00004-010-0028-2.

Makris, N. (2019), "Seismic isolation: early history", *Earthquake Engineering and Structural Dynamics*, Vol. 48 No. 2, pp. 269-283, doi: 10.1002/eqe.3124.

Mangeot, P., Renouard, J.-P. and Saint-Saëns, I. (2004), "Une mémoire des corps. Entretien avec Jean HatzfeldJ et Rithy Panh (in French)", *Vacarme*, Vol. 27, pp. 31-36, doi: 10.3917/vaca.027.0031.

Mazda, Y., Magi, M., Kogo, M. and Hong, P. (1997), "Mangroves as a coastal protection from waves in the Tong King Delta, Vietnam", *Mangroves and Salt Marshes*, Vol. 1 No. 2, pp. 127-135, doi: 10.1023/A:1009928003700.

Mercer, J., Kelman, I., Taranis, L. and Suchet-Pearson, S. (2010), "Framework for integrating indigenous and scientific knowledge for disaster risk reduction", *Disasters*, Vol. 34 No. 1, pp. 214-239, doi: 10.1111/j.1467-7717.2009.01126.x.

Minoura, K., Imamura, F., Sugawara, D., Kono, Y. and Iwashita, T. (2001), "The 869 Jogan tsunami deposit and recurrence interval of large-scale tsunami on the Pacific Coast of northeast Japan", *Journal of Natural Disaster Science*, Vol. 23, pp. 83-88.

Moreira, F., Ascoli, D., Safford, H., Adams, M.A., Moreno, J.M., Pereira, J.M.C., Catry, F.X., Armesto, J., Bond, W., González, M.E., Curt, T., Koutsias, N., McCaw, L., Price, O., Pausas, J.G., Rigolot, E., Stephens, S., Tavsanoglu, C., Vallejo, V.R., Van Wilgen, B.W., Xanthopoulos, G. and Fernandes, P.M. (2020), "Wildfire management in mediterranean-type regions: paradigm change needed", *Environmental Research Letters*, Vol. 15 No. 1, p. 11001, doi: 10.1088/1748-9326/ab541e.

Morlando, A. (2018), "Regi lagni: denunce e proposte [WWW document]. Informareonline - Ambiente - PUBBLICAZIONI SCIENTIFICHE", available at: https://informareonline.com/regi-lagni-denunce-e-proposte/ (accessed 31 July 2023).

Nkondo, O.M. (2010), "The future of indigenous knowledge systems in global knowledge innovations", in *Regional Symposium on Indigenous Knowledge and Community Innovations in the Biosciences and Biotechnology in Southern Africa*. KwaMaritane Game Lodge (South Africa).

Orihara, Y., Kamogawa, M., Noda, Y. and Nagao, T. (2019), "Is Japanese folklore concerning deep-sea fish appearance a real precursor of earthquakes? ", *Bulletin of the Seismological Society of America*, Vol. 109 No. 4, pp. 1556-1562, doi: 10.1785/0120190014.

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

Perry, R.W. and Lindell, M.K. (2006), *Emergency Planning*, John Wiley & Sons, Hoboken, NJ.

Pesce, A. and Rolandi, G. (2000), "Vesuvio 1944. L'ultima eruzione. (in Italian). magma, napoli (IT)".

Pica, R., Giuliano, A., Sabia, G., Busi, S. and Gisi, S.D. (2016), "La bonifica dei regi lagni in Campania. Problematiche nella gestione di reti di trattamento delle acque reflue in contesti critici (in Italian)", in: ECOMONDO – The Green Technologies Expo. *Maggioli Editore*, pp. 8-9.

Polverino, F. (1996), "Gli edifici antisismici nel patrimonio edilizio ischitano alla fine del XIX secolo. Elementi per la conservazione e la riqualificazione (in Italian). La rassegna d'Ischia".

Pomeroy, J.W., Stewart, R.E. and Whitfield, P.H. (2016), "The 2013 flood event in the South Saskatchewan and elk river basins: causes, assessment and damages", *Canadian Water Resources Journal / Revue Canadienne Des Ressources Hydriques*, Vol. 41 Nos 1-2, pp. 105-117, doi: 10.1080/07011784.2015.1089190.

Quammen, D. (2020), "The virus, the bats and Us. [WWW document]. the New York times/opinion".

Rafliana, I. (2018), "Indonesia: why local wisdom failed to save lives during the last tsunami? [WWW document]. UNDP in Asia and the pacific", available at: https://undpasiapac.medium.com/indonesia-why-local-wisdom-failed-to-save-lives-during-the-last-tsunami-cd5f0128374a (accessed 5 July 2023).

Rambaldi, G., Chambers, R., McCall, M. and Fox, J. (2006), "Practical ethics for PGIS practitioners, facilitators, technology intermediaries and researchers", *Participatory Learning and Action*, Vol. 54, pp. 106-113.

Regio Decreto Legge n. 573 del 29/4/1915 (1915), "Che riguarda le norme tecniche ed igieniche da osservarsi per i lavori edilizi nelle località colpite dal terremoto del 13 gennaio 1915 (in Italian)".

Revaz, F. (2003), "Les catastrophes naturelles : entre explication scientifique et compréhension mythique (in French)", in: *Mythe and Science*, Presses polytechniques et universitaires romandes, Lausanne, pp. 95-113.

Revet, S. (2017), "Christian delécraz and laurie durussel, (Eds), scénario catastrophe (in French)", *L'Homme*, pp. 204-205, doi: 10.4000/lhomme.28710.

Robinson, E.V. (1915), "A visit to the avezzano eaethquake zone", *Journal of Geography*, Vol. 13 No. 9, pp. 265-269, doi: 10.1080/00221341508983666.

Savoia, P. (1973), "L'episcopato beneventano di papa orsini (in Italian). tipografia La nuovissima, acerra".

Semana (2022), "¿por qué la aparición de un pez remo en arica siembra el temor en los habitantes del pacífico chileno? (in Spanish) [WWW document]. home>mundo>artículo>Chile", available at: www.semana.com/mundo/articulo/por-que-la-aparicion-de-un-pez-remo-en-arica-siembra-el-temor-en-los-habitantes-del-pacifico-chileno/202258/ (accessed 31 July 2023).

Sereni, E. (1981), "Terra nuova e buoi rossi e altri saggi per una storia dell'agricoltura europea (in Italian", Einaudi Paperbacks.

Serna, J. (2015), "Biggest oarfish seen at Catalina Island in years washes ashore [WWW document]", Los Angeles Times, available at: www.latimes.com/local/lanow/la-me-ln-oarfish-catalina-20150817-story.html (accessed 31 July 2023).

Shaw, R., Izumi, T. and Shi, P. (2016), "Perspectives of science and technology in disaster risk reduction of Asia", *International Journal of Disaster Risk Science*, Vol. 7 No. 4, pp. 329-342, doi: 10.1007/s13753-016-0104-7.

Solow, A., Beet, A. and McManus, S. (2019), "The most recent Cascadia earthquake and native American narratives", *Mathematical Geosciences*, Vol. 51 No. 5, doi: 10.1007/s11004-019-09783-y.

Spalding, M., Kainuma, M. and Collins, L. (2010), *World Atlas of Mangroves*, Routledge.

Stiros, S. (1995), "Archaeological evidence of antiseismic constructions in antiquity", *Annals of Geophysics*, Vol. 38, doi: 10.4401/ag-4056.

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026

Tiberti, M.M., Fracassi, U. and Valensise, G. (1967), "Il quadro sismotettonico del grande terremoto del 1905 (in Italian)", Istituto Nazionale di Geofisica e Vulcanologia. Roma.

Tobriner, S. (1983), "La casa baraccata: earthquake-resistant construction in 18thCentury Calabria", *Journal of the Society of Architectural Historians*, Vol. 42 No. 2, pp. 131-138, doi: 10.2307/989827.

Toner, J. (2018), "I disastri di roma antica. Calamità e resilienza (in Italian). LEG editore, gorizia".

UNESCO (1983), "Sanctuaire historique de Machu Picchu (in French) [WWW document]. convention du patrimoine mondial", available at: https://whc.unesco.org/fr/list/274 (accessed 31 July 2023).

United Nations (2015a), "Sendai framework for disaster risk reduction 2015-2030", Third UN World Conference. Geneva, Switzerland.

United Nations (2015b), *Paris Agreement. International Legal Materials*, Vol. 55, pp. 740-755, doi: 10.1017/s0020782900004253.

Valentin, M. (2022), "Les plumes d'oiseau dans les arts africains. Image, sens et matérialité", *Revue de L'art*, Vol. 218 No. 4, pp. 58-69, doi: 10.3917/rda.218.0058.

Walter, F., Fantini, B. and Delvaux, P. (Eds), (2006), *Les Cultures du Risque: (Xvi^{e}-Xxi^{e} Siècle)*, Genève.

Wanzenböck, I. and Frenken, K. (2020), "The subsidiarity principle in innovation policy for societal challenges", *Global Transitions*, Vol. 2, pp. 51-59, doi: 10.1016/j.glt.2020.02.002.

Wikipedia (2015), "I. K. Inha [WWW document]. Wikipedia, the free encyclopedia", available at: https://en.wikipedia.org/wiki/File:Slashingndurning.jpg (accessed 31 July 2023).

Yamamoto, D. (2010), "Sea serpents' arrival puzzling, or portentous? [WWW document]", The Japan Times, available at: www.japantimes.co.jp/news/2010/03/06/national/sea-serpents-arrival-puzzling-or-portentous/ (accessed 31 July 2023).

Zulfadrim, Z., Toyoda, Y. and Kanegae, H. (2019), "The integration of indigenous knowledge for disaster risk reduction practices through scientific knowledge: cases from Mentawai islands, Indonesia", *International Journal of Disaster Management*, Vol. 2 No. 1, pp. 1-12, doi: 10.24815/ijdm.v2i1.13503.

Corresponding author
Mariana Oliveira can be contacted at: oliveira@issnova.eu

For instructions on how to order reprints of this article, please visit our website:
www.emeraldgrouppublishing.com/licensing/reprints.htm
Or contact us for further details: **permissions@emeraldinsight.com**

Downloaded from http://ftp.nowpublishers.com/uss/article-pdf/2/2/48/10329787/uss-12-2024-0080en.pdf by guest on 28 June 2026