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Disaster Preparedness through Traditional DRR-Related Knowledge. A Comparative Study of the Cultures of Prevention in the Pacific Rim and Mediterranean Coastal Communities

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Abstract Traditional autochthonous knowledge and cultural heritage related to disaster risk reduction (DRR) can be found in communities worldwide. The Sendai Framework recognizes that culture plays an essential role in DRR and highlights the importance of local traditions and knowledge in disaster management. This article studies the ancestral DRR-related knowledge and traditions of various communities that inhabit the Pacific Rim and Mediterranean coastal areas. The article aims to provide a perspective into disaster preparedness by comparing the role that long-entrenched cultural beliefs and traditions in those regions play in the prevention of disasters, such as tsunamis and floods, as well as to improve our understanding of how DRR strategies and actions based on traditional knowledge remain meaningful today, especially in the face of climate change.

Keywords: disaster risk reduction, traditional knowledge, culture of prevention, floods, Pacific Rim, Mediterranean

1. INTRODUCTION

Global climate change has intensified the frequency and intensity of extreme events worldwide and caused widespread impacts on human and natural systems. According to McGuire (2013), scientific evidence shows how climate change can contribute to geological phenomena such as earthquakes, tsunamis, or volcanic eruptions. Moreover, while there is still debate about what magnitudes these side effects of global warming can reach, there no

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longer seems to be any doubt that the risk is real. Specifically, climate-related factors involved in these processes include changes in land ice coverage, rainfall, or even atmospheric pressure (McGuire, 2013). Some projections suggest an ice-free Arctic climate could be experienced in the next decade or two, regardless of emissions scenarios (Kim et al., 2023). Even if greenhouse gas emissions are reduced, and the planet's temperature stabilizes, sea levels will continue to rise for several centuries. Therefore, humanity must learn to adapt and develop strategies for future events.

Coastal areas are among the most vulnerable regions to climate change in the world, threatened by rising sea levels, flooded coastal lowlands, and coastal storms (UPC, 2016). Furthermore, in recent decades, climate-related risks have increased in large areas of the earth's surface due to the occupation of territories and the changes in land use, creating significant ecological disturbances. Hence, studying social factors should be a priority in risk analysis (Olcina, 2009) since social adaptation is recognized by policymakers worldwide as an essential climate priority (Magnan et al., 2022).

Preparing communities for disasters is crucial to mitigate the most immediate environmental impacts and foster social resilience in terms of long-term recovery (Paton, 2013; Mulia & Handayani, 2024; Shiroshita et al, 2024). A prominent component of preparedness is knowing what to do when a disaster occurs. This knowledge stems from governments and their emergency organizations in charge of planning formal disaster responses, but it DRR-related knowledge can also be found in local communities that have gained experience from the disasters they have faced over the years (Nakanishi & Black, 2018) and the lesson they have incorporated into their lives.

For millennia, indigenous peoples have used their traditional knowledge to prepare for, cope with, and survive disasters (Scott et al., 2013; Lambert & Scott, 2019) thanks to the traditional knowledge passed on from generation to generation (Prasad & Nigam, 2023). Thus, numerous communities can predict certain events by interpreting the weather patterns, animal behaviour, and atmospheric conditions based on their ancestral knowledge systems of observing nature and the habitats in which they live. Many of these ancestral knowledge and practices evolve in response to the new challenges in the surrounding environment, resulting in continuous learning from the effects of those changes, their causes, and their consequences (Chen & Cheng, 2020).

In recent years, there has been an increasing interest in the relationship between traditional knowledge and disasters. New discussions about indigenous peoples' knowledge of disaster management and the role of government officials responsible for disaster risk management highlight their potential to improve DRR policies through its integration into disaster education (DE) and early warning systems (Hiwasaki et al., 2014; Shaw et al., 2008). However, indigenous knowledge has often been dismissed as unscientific (Haokip, 2023), reason why some of the current practices in disaster prevention management and development ignore traditional values and culture (Rai & Khawas, 2019).

Over time, part of this knowledge has disappeared owing to modernization, lifestyle changes, economic pressures, globalization, and inadequate policies to preserve that immaterial cultural heritage (Nakanishi & Black, 2018). However, autochthonous DRR-related knowledge and scientific early warning systems should be integrated to improve DRR and increase the resilience of vulnerable communities (Haokip, 2023). Therefore, while on the one hand, it is necessary to appraise traditional knowledge for adaptation, on the other hand, recognizing the importance of governance to ensure the application of this traditional knowledge to the adaptive processes required to face the consequences of global warming or the increase in population in risk areas. It is advisable to look at the factors or elements of social resilience of the communities from their relationships with society and institutions outside the community (Oviedo, 2014).

This article explores the role that the ancestral DRR-related knowledge and traditions have played in disaster preparedness for various communities on both sides of the Pacific Rim and in coastal areas bordering the Mediterranean Sea, focusing on high-frequency disasters (namely, floods), and low frequency-disasters (namely, tsunami). The article presents, as short case studies, some of the strategies based on their ancestral DRR-related knowledge and traditions that communities have implemented when suddenly faced by tsunamis and floods. Subsequently, the comparison between those distant regions allows us to envision how traditional DRR-related knowledge has survived until today, whether it is still relevant at present, and how it could contribute to improve our modern disaster risk management systems in the face of climate change.

2. OBJECTIVES AND METHODS

This article explores how the ancestral DRR-knowledge and traditions of some communities in the Pacific Rim compares to that of other territories and societies in coastal areas such as the ones bordering the Mediterranean Sea. The research questions that guide our research are: Are traditional DRR-related knowledge and traditions still relevant today? how can those traditional DRR-related knowledge and traditions can be used at present to reinforce our modern disaster risk management systems? Could they be useful in to face the challenge of climate change?

To answer this question, a non-exhaustive critical review of the existing scientific literature was conducted, focusing primarily on the knowledge and traditions of indigenous peoples who inhabit the Pacific Rim and on the methods they use to prepare for low-frequency and high-frequency disasters, such as tsunamis and floods respectively, and prevent their consequences. Subsequently, a similar literature review revolving around various Mediterranean regions was carried out. Finally, DRR-related beliefs and cultural traditions in both areas were compared.

Pursuing a qualitative analysis and evaluation from an integrative approach, a prospection was made in primary and secondary sources. As for primary sources, reports and other institutional publications from various national and international organizations were identified; as for secondary sources, a search was carried out in bibliographic databases of peer-reviewed articles such as Web of Science and Scopus, as well as the Google Scholar search engine to locate scientific research articles related to the topic of study. The keywords used have been; “Disaster Risk Reduction,” “indigenous knowledge,” “traditional knowledge,” “floods,” “tsunamis,” “Pacific Ring,” and “Mediterranean.”

As for our choice of the Pacific Rim and the Mediterranean Sea, it is driven by the findings of our critical review of the existing scientific literature, where we found some illustrative testimonies of the use of traditional DRR-related knowledge to counter the effects of natural disasters, as well as to our interest to identify some points in common between the two areas to validate our arguments. Moreover, both regions are frequently exposed to high-impact natural disasters that could be further exacerbated in the face of climate change.

Although there are other important risks in the regions studied, such as earthquakes, wildfires, drought, or volcanoes, the article focuses on the risk of floods caused by storms and tsunamis because, owing to their frequency and impact, they have left a lasting impression on the communities. Consequently, the bitter lessons learned from disasters have not only remained in the collective memory but have also triggered the need to pass on what has been learned to future generations. These lessons attest to human ingenuity have been incorporated into tradition as both tangible and intangible cultural heritage. In terms of tangible cultural heritage, for example, they can be found in construction techniques, whereas in intangible cultural heritage, the lessons persist in oral narratives or dances, which are taught to children at home, as well as in the informal environment of traditional community festivities. Based on the results of primary and secondary sources, some relevant case studies of Pacific Rim and Mediterranean communities were selected. Table 1 summarizes the case studies that are examined in the article.

3. NATURAL DISASTERS IN THE PACIFIC RIM AND IN THE MEDITERRANEAN SEA

The Pacific Ring of Fire is one of the subduction zones characterized as the world's most important active seismic and volcanic region. Around 90% of the world's earthquakes occur throughout this area, making it one of the most prone to tsunamis. On the other hand, in the Mediterranean basin converges various tectonic and sub-tectonic plates that are at the origin of earthquakes and volcanic eruptions; this makes it one of the regions with the highest seismic activity in the world and the second-largest generator of tsunamis (Birkmann et al., 2010). However, since the occurrence of large tsunamis producing massive damage is infrequent in the Mediterranean, misleading assumptions about the real hazards they

represent prevail (Cugliari et al., 2022a). Nevertheless, even though the risk of tsunamis in the coastal areas of the Mediterranean is lower than the risk of other disasters, it acquires special relevance due to the current extent of urban development and the exponential growth of the population in Mediterranean coastal regions, with the ensuing increase of possible risks and damages from tsunamis. Furthermore, the rising sea level exacerbates the danger of tsunamis and, consequently, the risks of flooding in coastal areas.

Table 1. Disaster preparedness methods/strategies based on traditional knowledge. Summary of the cases analysed in this article.

Areas studied	Risk	Community or region	Kind of traditional knowledge involved	Disaster preparedness methods/strategies
PACIFIC RIM	TSUNAMIS	Community of Baie Martelli (Vanuatu)	Cultural values	Ability to recognize tsunami precursors, DRR-related knowledge orally transmitted
		Community of Simeulue Island (Indonesia)	Cultural values	DRR-related knowledge orally transmitted
		Community of Ghizo Island (Solomon Islands)	Cultural values	DRR-related knowledge orally transmitted
		Mapuche Community (Chile)	Cultural values	DRR-related knowledge orally transmitted
		Japan	Cultural values	DRR-related knowledge orally transmitted, public monuments dedicated to disasters Japanese culture of prevention (*bosai* culture)
	FLOODS & STORMS	Singas Community (Papua New Guinea)	Cultural values, Building techniques	DRR-related knowledge orally transmitted, Architectural measures against flooding, integral drainage system, river marking to assess river height, mark safe areas, observers
		Palembang Community (Indonesia)	Building techniques	Architectural measures against floods
		Japan	Cultural value, construction techniques	Architectural measures against floods, ecosystems-based DRR, Japanese culture of prevention (*bosai* culture)
MEDITERRANEAN COAST	TSUNAMIS	Mediterranean region	Cultural values	Lack of culture of prevention, Myths
		Ciutadella (Spain)	Cultural values	Ability to recognize *rissaga* (floodwater) precursors
	FLOODS & STORMS	Barcelona (Spain)	Building techniques	Architectural measures against floods
		Finalborgo (Italy	Building techniques	Architectural measures against floods
		Mediterranean region	Building techniques	Ecosystems-based DRR, alerting signage
		Mediterranean region	Cultural value	Religious traditions

Source: Own elaboration based on the research results

Floods are the most common disasters in the Mediterranean, caused by short-duration storms with heavy localized rains lasting for a short period, in which rainfall equivalent to several months can fall in a few hours. Additionally, due to climate change, the climate in the Mediterranean is changing more rapidly than in other areas of the planet. As a semi-enclosed sea, its waters are warming three to five times faster. This situation will exponentially increase the risk of torrential rains (MedECC, 2020). A report presented by the Mediterranean Experts on Climate and Environmental Change (MedECC, 2024) at COP29, warned that "the frequency of flash floods" in the countries of the Mediterranean region has been increasing in recent decades "due to the combined effect of urban expansion" in flood-prone areas, as well as to the effects of climate change.

As for the risk of floods in the Pacific Rim, according to a report by the World Meteorological Organization (WMO, 2024), the rising sea level in the Pacific Ocean due to climate change is exceeding the global average, jeopardizing low-lying island states. According to scientists, tropical cyclones and typhoons could intensify as the temperatures of the sea surface rise as a result of climate change. Finally, the devastating effects of tsunamis in the Pacific Ring of Fire are widely known, owing to the not-so-distant memories of the 2004 Indian Ocean earthquake and tsunami and the 2011 Great East Japan Earthquake and Tsunami, a mega-earthquake that originated off the coast of Japan.

4. TRADITIONAL DISASTER PREPAREDNESS IN COMMUNITIES BORDERING THE PACIFIC RIM

Traditional knowledge related to resistance to earthquakes, tsunamis, and floods can be found in various parts of the world. Older generations' experience and knowledge of disasters are adept to identify warning indicators of natural phenomena, such as flood marks. Moreover, stories about past natural disasters can be found in oral literature, songs, poems, and even lullabies (Haokip, 2023). Generally, these narratives are not codified or written in a formal language but remain primarily oral, passing from generation to generation (Haque, 2019). That knowledge of the past can contribute to DRR today, so that by incorporating them into our modern risk management systems human casualties caused by disasters can be prevented (Pastrana et al., 2022).

Communities that inhabit disaster-prone areas in the Pacific Ring of Fire have developed over time DRR-related knowledge and practices of their own that have been shaped through their experience with disasters and have become part of their survival skills. Mikulecký et al. (2023) point out that disaster risk prevention measures can be classified into categories according to the similarities in their application between communities, according to how DRR-related knowledge is preserved (materially or immaterially), and how preventive measures are applied (their purpose and how their correct application leads to a desired result). In their study of indigenous cultures, Mikulecký et al. (2023) concluded that the most

common forms of preservation were cultural values, stories, and construction processes, whereas the most common purpose was early warning notwithstanding other purposes such as reducing the consequences of tsunami or preventing construction in high-risk areas.

There are numerous examples of how valuable DRR-related knowledge is for indigenous communities in the Pacific Rim. The following sections analyse the strategies used by communities on both sides of the Pacific Rim to counter the effects of tsunamis and floods. As anticipated in the preceding lines, cultural values and oral narratives play a central role in the transmission of DRR-related knowledge and traditions.

4.1 How Communities Use Traditional Knowledge to Reduce Tsunami's Consequences

Community of Baie Martelli (Vanuatu)

The November 1999 tsunami in north-central Vanuatu affected most of the coasts in the area. One of the most affected areas was Baie Martelli, a bay located south of Whitsunday Island. Tsunami waves reached about 5.5 meters in the western part of the bay and about 6.5 meters in the northeastern area of Baie Martelli. The tsunami claimed only five lives out of a total population of about 300 people, something that is attributed, among other factors, to the ability of key individuals to recognize the precursors of the tsunami and use orally transmitted knowledge to help the local community (Walshe & Nunn, 2012).

Community of Simeulue (Indonesia)

Another example of transmission of DRR-related through stories and oral traditions is that of the Indonesian community of Simeulue Island, recognized by the United Nations for saving tens of thousands of lives in 2004 during the December 26 tsunami (ISDR, 2005). The Indian Ocean Earthquake and Tsunami devastated Aceh province, causing massive loss of life and widespread destruction (Bryant, 2014; Doocy et al., 2007; Ismail et al., 2018; Lambert & Scott, 2019). The lack of awareness and preparation contributed to the high casualty rates and extensive damage in Aceh province (Benazir et al., 2023). Despite the 10-meter-high waves that hit the island. Only 7 of the 78,000 members of the Simeulue community died during the disaster (Baumwoll, 2008; Borrero et al., 2011; McAdoo et al., 2006; Rahiem & Rahim, 2020).

The story of "*Smong*", a word that derives from the Devayan language, meaning splash of water or tidal wave, and is deeply rooted in the Simeuluan narrative acting as an early warning system for earthquakes (Syafwina, 2014). Lambert and Scott (2019) point out how the story about buffaloes running into the hills when a tsunami approaches was more effective than modern early warning systems to face the 2004 Indian Ocean Earthquake and Tsunami. Over time, the people of Simeulue Island have preserved the ritual and passed it from generation to generation, through the daily life of family and community activities (Syafwina, 2014). The story covers understanding the tsunami phenomenon and the

appropriate response during pre-disaster, disaster, and post-disaster phases (Meyers & Watson, 2005; Rahman et al., 2017).

Community of Ghizo Island (Solomon Islands)

On April 2, 2007, a tsunami hit Ghizo Island, western Solomon Islands, in the southwest Pacific. Thirty-three people died in Ghizo, of whom 31 were from a relatively small Gilbertese immigrant community, while only two were from the Melanesian community. Apparently, the Gilbertese community had not assimilated Melanesian behaviors and cultural values governing this community. This case study attests to the important role that the indigenous DRR knowledge of the Melanesians played in saving lives during the 2007 tsunami (Hagen et al., 2021; McAdoo et al., 2008).

Mapuche Community (Chile)

On February 27, 2010, Chile suffered the consequences of the fifth-largest earthquake ever recorded worldwide, with a magnitude of 8.8 on the Richter scale (Duputel et al., 2012). It claimed more than 500 lives and affected two million people. However, the voluntary evacuation of all residents of the coastal settlements of Tirúa in the Bio-Bío Region of Chile to high areas, which was done before any official evacuation notice arrived, saved the lives of all residents. There were no deceased amongst the residents thanks to effective risk communication performed through ancestral stories of the Mapuche people, an Amerindian people from the central and south-central regions of Chile.

One of them is the tale of two giant snakes called Kai-Kai and Treng-Treng. Wicked Kai-Kai lives in the sea and wants to get rid of humanity, while Treng-Treng loves and protects people's lives and lives in the land camouflaged among the mountains. One day, Kai-Kai wanted to destroy everything and began to flood the territory, but Treng-Treng soon appeared and fought against Kai-Kai until he defeated her, causing strong earthquakes and arching her back so that people could climb on her and saving them from the flood (Cadierno, 2018).

Japan

Japan boasts a cultural tradition steeped in natural disasters (Ito-Morales, 2017), especially due to the large earthquakes that have marked the country's history (Pastrana et al., 2022). The Japanese have developed a unique approach to preserving the collective memory of disasters through various public monuments dedicated to disasters that seek to convey those experiences and their repercussions and educate individuals and society on how to face them. Thus, memories of past catastrophes are found in monuments called *tsunamihi* (tsunami stones) erected in coastal areas over the centuries (Good, 2016; Garnier & Lahournat, 2022), marking the level reached by the waters of tidal waves and bearing inscriptions with warning texts that transmit traditional local knowledge. Thanks to this entire system of stone monuments, it is possible to get an excellent view of the damage caused by the tsunami in the past (Mikulecký et al., 2023) and people are aware that they should not build anything

beyond that point because another tidal wave might wash buildings away. Nevertheless, the advice has not always been followed.

The most devastating disaster in recent history is the 2011 Great Eastern Japan Earthquake and Tsunami (GEJET). The earthquake had an intensity of 9 points on the Richter scale, the highest magnitude ever recorded in Japanese history, while the tsunami hit the coast of Tohoku, a region in the northern area of Honshu Island, causing an accident at the Fukushima Daiichi nuclear power plant. The GEJET killed 15,894 people, leaving 2,585 missing (Pinter et al.,2019). When the GEJET hit the village of Murohama, located in Miyagi Prefecture, most of its population saved their lives by seeking refuge on higher ground (Pescatore et al., 2014).

The coast of Tohoku has a long history of tsunami-related disasters, and people's experiences have been coded as an oral tradition passed down within families, from fathers and mothers to children and, in turn, to grandchildren, aiming to save lives. Since old times, the population of the region of Tohoku (especially from the coastal villages in Iwate and Miyagi Prefectures) has used the aucthothonous expression "*Tsunami tendenko"* (Yamashita, 2008). This regional expression is well-known by the locals and means that, in case an earthquake or tsunami occurs, each person should escape and act independently. Since Japan is a group-oriented culture, this mindset relies on the idea that individuals should firstly think of themselves instead. If everyone complies with the shared rule of individual evacuation, children and parents can escape separately from schools, houses, or workplaces without worrying about each other (Ishigaki et al., 2013).

"*Tsunami tendenko*" began to be used in villages that had been swept away in past disasters so that future generations would not forget. Thus, in Tohoku's not so distant history, experiences of two tsunamis occurred in 1896, and 1933, are key to understanding local survival experiences in 2011 (Grau, 2023). Since 2019, the Iwate Memorial Tsunami Museum, built in Rikuzentakata (Iwate Prefecture), highlights the local code "*tendenko*" value during the 2011 tsunami. For example, the testimony of Yamashita Fumio, born in 1924 in Ofunato (Iwate Prefecture), already places the use of "*Tsunami tendenko*" at the time of the 1896 tsunami.

Yamashita grew up hearing it from his father, as nine members of his family, including his grandmother, perished in the 1896 tsunami. Yamashita would later survive the 1933 tsunami at the age of 9. After that, he studied the history of his region and dedicated himself to promoting disaster prevention and tsunami awareness. In 1990, Yamashita gave a speech at the First All-Japan Tsunami Summit for Coastal Cities, Towns and Villages introducing the "*tendenko*" concept for the first time nationwide. Nowadays, and especially after the 2011 experience, the regional proverb works as a disaster prevention tool in other regions of Japan in community manuals and booklets.

Another tradition worth highlighting in the Japanese *bosai* culture or culture of prevention is that of the *kataribe*, a practice related to DE that helps transmit the memory of a

community and keep it alive (Fulco, 2021). *Kataribe* is a Japanese word that could be translated as storyteller/storytelling. It has become a topic of interest in various fields that address DRR, especially education (Nagamatsu et al., 2021). The narrative developed from the experiences allows us to understand how the memory of disasters can be actively transmitted to future generations to strengthen their resilience in the face of tsunamis or other disastrous events (Fontanella, 2024; Grau, 2024). In sum, collective memory plays an important role in determining how quickly a society can recover, and consequently, the Japanese have a spiritual strength that arises from a history marked by misfortune and subsequent resurgence (Hogge, 2016).

4.2 DRR in Indigenous Communities Facing Floods and Storms in the Pacific Rim

The existence of legends in many societies that speak of an apparently synchronous global flood shows that storms and their destructive potential have been a concern for communities worldwide. A possible explanation is that such legends have been passed down from one culture to another and incorporated into existing flood stories (Nunn, 2014).

Singas Community (Papua New Guinea)

Mercer and Kelman (2008) illustrate how Indigenous knowledge can contribute to DRR through the experiences of members of the Singas village in the Morobe province of Papua New Guinea. The town is situated on the banks of the Markham River and is affected by annual floods during the rainy season. Despite the risks, the community is aware of its situation and proactively responds to the floods. The main DRR strategies practiced in the Singas community are grouped into five categories: construction methods, social ties, land use planning, food strategy, and environmental strategy.

The Singas community depends on the environment for its livelihood and has developed vast knowledge that allows them to identify risks. Oral traditions are passed down from generation to generation through legends, visions, and stories that guide what to do when disaster strikes. Aware of the possibility of flood, they build their houses on stilts, constructing large mounds under the houses to stop rising water and an integral drainage system surrounding their land so that water is directed away from critical areas. They mark safe areas so that the community can move to higher ground in case of flood, and 'observers' are sent upstream based on weather conditions to determine the behavior of the river and report through person-to-person messages. They also establish prevention plans by using river markers to assess changes in river height (Mercer & Kelman, 2008).

Palembang Community (Indonesia)

Another example of this type of construction on pilots can be found in the Indonesian town of Palembang, located on the banks of the Musi River, where many years of experience with floods have improved indigenous skills in flood-proof construction. Indigenous knowledge of

this kind plays an essential role in flood risk reduction because it allows people to cope with hazards and disasters. It also raises social awareness about floods, shaping a flood-resistant society. This resilience to floods is not only considered in the technical aspect, but also the socio-ecological aspect. Palembang's DRR-related knowledge can be categorized according to: its implementation and its acquisition. On the one hand, it is knowledge inherited from ancestors; on the other hand, knowledge learned from previous experiences (Hapsari & Hardayani, 2023).

Japan

Japanese communities boast strong cooperation amongst residents in disaster preparedness, which results in greater citizen participation and high effectiveness when a disaster occurs (Paton et al., 2010). Traditional knowledge of flood mitigation in Japan has been developed and tested over time, demonstrating its effectiveness, which can be shown with various examples. Due to its location and topography, the Noubi Plain suffers from frequent disasters caused by floods. For more than 200 years, people have fought to protect lives and property from floods.

Circular dikes known as *Waju* (inner ring) have been built to cover houses and cultivate land areas to reduce the impacts of flooding. A key point of the circular dike is its maintenance by the communities; in each town a special committees overseas these dams.

Cooperation helps develop self-esteem and strengthen ties with the local community (Takeuchi & Shaw, 2008). Others examples of Japan's long tradition of using ecosystem-based solutions for DRR to prevent or mitigate floods is the construction in the 16th century of a dam known as "*Shingen Tsutsumi*," at the place where the Midai and Kamanashi rivers converge in Yamanashi Prefecture by the clan chief Shingen Takeda; and, the integrated irrigation and flood control project along the Chikugo River of Bizen Domain, Saga Prefecture, created in 1610 by Shigeyasu Narutomi (MOFA, n. d.).

5. THE TRADITIONAL CULTURE OF PREVENTION OF MEDITERRANEAN COMMUNITIES

According to Gallegos (2021), the Mediterranean region is a scarcely resilient area and especially sensitive to natural risks. In the case of floods, the European Commission emphasizes the need to reinforce the study and knowledge of the particularities of each territory to improve the analysis and management of this type of event (Gallegos, 2021). In Mediterranean countries, the general population's perception of the danger posed by floods is poor (Brilly & Polic, 2005). Floods are a risk that tends to be considered natural and familiar, and these characteristics can reduce the perceived severity of the danger (Correia et al., 1998; Enander, 2005).

Several European investigations describe this lack of risk perception on the part of the individuals, expressed in phrases such as “this will never happen to me” (Deeming, 2008), “if it did not affect me in the past, I could also escape its consequences in the future” (Mileti & O'Brien, 1992), or “nothing worse could happen” and “it will not happen again” (Deeming, 2008). Such saying might be related to a normalization process.

Population density is still increasing in most flood-prone areas in the Mediterranean while land use is changing for the sake of urban development, affecting the flood regime and flood risk, increasing the problem by producing migratory movements towards flood-prone areas in which many of its inhabitants do not know or do not care that they live in a flood-prone area (Llasat et al., 2008; Ribas et al., 2020).

Social capital and social networks contribute to resilience and disaster recovery by encouraging information sharing and fostering positive normative behavior. Beyond individual behavior, structural and relational embeddedness affect organizational attitudes to collective action (Song et al., 2020). This points to the fundamental role of social cohesion as a cultural factor, which has positively impacted the disaster resilience of the respective community. Several studies in the southern European and Mediterranean area confirm that it is a region with traditionally strong family values and community cohesion. However, other studies in this region rarely explore the relationships between culture and risk behavior, focusing on the lack of a link between knowledge, risk perception, and behavior (Appleby-Arnold et al., 2018).

In some Mediterranean and Arab cultures, there is a strong sense of fatalism or predestination, which makes risk communication difficult (IRM, 2012). In Mediterranean cultures influenced by the monotheistic religions linked to the influences of the Judeo-Christian and Muslim traditions prevailing in the region, according to some authors such as Stern (2007), disasters are interpreted as a divine punishment, which makes risk prevention difficult. As disasters are considered a punitive reaction of God against the community’s deviations or sins, there is little the communities can do to prevent the catastrophic effects of disasters, except to implore divine mercy through various invocations depending on the nature of the disaster (León, 2016).

5.1 The Risk of Tsunami in the Mediterranean Region

Along with the Pacific and Indian Oceans and the Caribbean Sea, the Mediterranean Sea and adjacent areas are among the most seismically active regions in the world (Frisch et al., 2011), as well as the second-largest generator of tsunamis in the world (Birkmann et al., 2010). The possible magnitude of a tsunami in the Mediterranean is comparable to the 2004 Indian Ocean Earthquake and Tsunami since earthquakes in the Mediterranean region can reach a magnitude of 7.5 to 8 points on the Richter scale and could generate waves that reach heights of between five and six meters (Lauterjung, 2014a). Possibly for this reason, the myth

of Atlantis, its destruction, and its possible geographical location in many places in the Mediterranean has attracted a great deal of interest and has been the topic of numerous investigations (e.g., Balch, 1917; Cline & Fawkes, 2017; Dušanić, 1982; Godwin, 2010; Kühne, 2004).

Mediterranean region. Lack of a culture of prevention

Several devastating tsunamis have been documented in the Mediterranean in the last 2,500 years. The tectonic situation of the Mediterranean is complicated since, in addition to the African Plate, which is subducted beneath the Eurasian Plate, there are also microplates such as the Aegean and the Anatolian microplates. Along the Hellenic Arc, the African Plate subducts beneath the Aegean Plate. Earthquakes and volcanic eruptions occur repeatedly along this subduction zone.

In 1650 BC, the eruption of the Thera volcano on the Greek island of Santorini caused a tsunami, as did the 1956 Aegean Sea earthquake (Lauterjung, 2014b). Tsunamis in the eastern Mediterranean have a lengthy history. Even though the Aegean Sea and its surroundings have experienced numerous tsunamis, the generation and propagation of tsunamis in the eastern Mediterranean have been studied by few researchers compared to other areas of similar geothermal activity (Samaras et al., 2015).

Reicherter and Becker (2009) suggest a potential tsunami hazard in the western Mediterranean region. They note that in 1522, a 6.5-magnitude earthquake whose epicenter was in the Gulf of Almería produced several underwater landslides that could have created a tsunami. This earthquake affected large areas of the western Mediterranean, causing more than 1,000 deaths. (Reicherter & Becker, 2009).

On May 21, 2003, the Algerian earthquake generated a tsunami that affected the Balearic Islands. Most damage occurred inside the ports due to high-frequency and relatively large-amplitude oscillations caused by the combined effect of the tsunami and local resonances. Several pleasure boats and sailboats sank in the port of Palma de Mallorca. Part of the promenades within the port was also seriously affected by the tsunami (Vela et al., 2014).

Ciutadella de Menorca (Balearic Islands, Spain)

Another phenomenon that we can also observe in the Mediterranean, especially in the port of Ciutadella de Menorca in the Balearic Islands (Spain), is that of the "*rissaga*" (the local name for large amplitude oscillations in sea level) or meteorological tsunami, an event very similar to tsunami. One or two large sea level oscillations accompanied, before and after, by more minor amplitude oscillations. The total duration can range from a few hours to a few days. Parallel to the appearance of rissaga events in Ciutadella, sea level oscillations are also observed in other inlets of the Balearic Islands and on the Mediterranean coasts of the Iberian Peninsula, but with much smaller amplitudes (Jansa et al., 2007).

The *rissaga* occurs several times a year, mostly during the summer, and usually only causes minor problems in the port's functionality. The local community could predict these oscillations by observing the weather and recognizing the warning signs. On July 21, 1984, a sudden rise in sea level affected the Port of Ciutadella de Menorca, destroying most of the fleet (Jansá, 2014). On June 15, 2006, another extraordinary *rissaga* event occurred when sea level fluctuations reached six m. (Marcos et al., 2009), with catastrophic consequences: around 100 ships were damaged and 35 sunk (Jansá et al., 2007), as well as economic losses of about 30 million euros (Marcos et al., 2009).

Mediterranean region. Lack of awareness

Research works on tsunamis affecting European coasts often provoke scepticism among the public, since most people are unaware that the European Mediterranean or Atlantic coasts are prone to tsunamis and consider them to be more of an Asian phenomenon. This lack of knowledge is prominent among people who live far from these shores and those directly exposed to potential dangers (Birkmann et al., 2010). Cugliari et al. (2022a) suggest that perhaps the most plausible explanation is that the low frequency of tsunami occurrence is one of the variables that directly affect the perception of risk in some areas of the Mediterranean, which is why they seem to be out of the collective awareness, underestimating the importance of the perception of tsunami risk, and failing to take adequate measures to reduce the risk. Lossing the memories of past events affects citizens' and communities' perception of risk, making risk mitigation actions more complex and even ineffective in the face of risk (Cugliari et al., 2022b).

5.2 The Risk of Floods in the Mediterranean Region

In Europe, and by extension, the Mediterranean, floods constitute the most damaging natural risk over time due to extended material damage and loss of human life (López et al., 2021). Floods are the most common type of natural hazard in the Mediterranean region after earthquakes; in the last decades, all Mediterranean countries have faced some large flood episodes associated with catastrophic effects (Guerrieri, 2002). The Mediterranean coastal zones are particularly vulnerable to climate-induced sea-level rise due to rapid coastal development, leading to increased flood exposure in coastal areas (Lincke et al., 2020). Llasat et al. (2007) contend that, according to a 2003 European Union report, the European countries most affected by floods in recent decades were the ones in the Mediterranean basin, with France accounting for 22% of the total of events and Italy for 17%. On the other hand, most deaths caused by floods occurred in Italy with 38%, Spain with 20% and France with 17% of the total.

Floods in the Mediterranean region are usually sudden, qualified as flash floods. This is due to the local climate, which is prone to short, heavy rain showers. The reliefs surrounding the Mediterranean Sea force the convergence of low-level atmospheric flows and the uplift of

warm, humid air masses that move from the Mediterranean Sea towards the coasts, thus creating active convection (Gaume et al., 2016). The coastal and pre-coastal mountain ranges favor torrential rain concentrated in small basins and heavy rains. Although there is no definition, this type of flood is characterized as a flash flood in a small catchment area, occurring within 6 hours or less of the event and often within 2 hours after the onset of high-intensity rain. Flash floods are generally caused by heavy rainfall that can be local, affecting only one or two catchments, or more widespread, producing flash flooding as part of the framework of a significant flood event. (Llasat, 2020).

We can observe many of these events throughout the Mediterranean, such as, for example, the 1954 spots of rain on the Amalfi Peninsula in southern Italy, considered the most catastrophic ever occurred in the area, which caused the collapse of numerous houses and almost total interruption of communications, with 318 victims and 350 people injured (Mazzoglio et al., 2021). The flash flood in northeastern Spain on September 25, 1962, caused 441 deaths and 374 missing. In northwestern Italy, the October 16, 1996, Piedmont flood caused 100 victims. Torrential rains began to fall in the department of Gard (southeast France) on September 8 and 9, 2002, causing the rivers in the area to overflow. The event caused 23 victims and more than 800 million euros in damages. (Llasat et al., 2006). In October 2018, two severe floods occurred in the Iberian Peninsula. One in Mallorca caused the death of 13 people as well as numerous material damages; the other in Campillos and the surrounding area in Malaga left rainfall of more than 300 mm in a few hours. The two situations were derived from processes associated with a DANA, a low-pressure system that manifests mainly in the middle and upper layers of the troposphere, originating in critical storm systems (Gómez et al., 2020).

The European Environment Agency (2024) reports that marine heat waves in the Mediterranean Sea have created the conditions for Mediterranean cyclones. In September 2023, the deadliest Mediterranean tropical cycle in history began, known as Daniel. The storm, which formed as a low-pressure system around September 4, 2023, affected Greece, Bulgaria, and Turkey with significant flooding (Davies, 2023). It soon acquired tropical characteristics and moved towards the coast of Libya, where it caused catastrophic floods. In just 24 hours, 414 millimeters of water fell in the Libyan city of Al Baida, equivalent to 18 months of average rainfall. In the Libyan city of Derna, flooding caused two dams to collapse, forcing water to sweep away entire neighborhoods (BBC, 2023). According to the Red Crescent, the death toll rose to 11,300 in Derna (Magdy & Murad, 2023). The United Nations Office for the Coordination of Humanitarian Affairs (OCHA), citing estimates from the World Health Organization, set the death toll at 3,958 and 9,000 missing in Libya (OCHA, 2023).

Finalborgo (Italy)

Over the years, various adaptive techniques have been developed, mostly in response to local needs. The benefits and costs of adaptation can characterize their optimal grade

(Guerrieri, 2002). Tools and procedures were developed in many parts of Europe in the Early Middle Ages to protect towns and cities from floods. An example is the behavior of the borough head of the medieval village of Finalborgo, located near Savona, Liguria, Italy. To prevent flooding, a system of barriers or boards was employed to close the main gate when a flood was feared. The rule that the burgomaster used was left in a local saying used to describe the meteorological behavior leading to extreme precipitation in that region: "When the clouds head towards the sea, take your shovel and get to work; when they head towards the mountains, take your shovel and look for a good hiding place," (Llasat & Siccardi, 2010).

Barcelona (Spain)

In Spain, the medieval walls surrounding Barcelona played a similar role against floods to those of the Italian city of Finalborgo. In Barcelona, an open-walled perimeter was designed not only for military purposes but also to manage floods, diverting the waters away from neighborhoods. The relationship between human occupation and environmental conditions generated and continues to create the most definitive urban configurations and the location of infrastructures in the city (Barrera et al., 2006). The main difference with the town of Finalborgo is that, in this case, the Barcelona bastion was a permanent structure, and the authorities considered it a preventive measure to avoid or mitigate the impact of floods (Llasat & Siccardi, 2010). However, we can see how construction has been done, especially throughout the 20th century, in areas with a high risk of floods, ignoring its dangers, for example, along the Spanish Mediterranean coast.

Ecosystems-based DRR in the Mediterranean region

In numerous regions of the Mediterranean, we can observe the construction of terraces formed by a wall and a pile of masonry stones as a containment system that prevents the rapid flow of rainwater towards the sea (Martínez & Rodríguez, 1992). The construction of terraces has been essential since ancient times to avoid landslides and flooding, take advantage of scarce rainfall, and maintain the soil during periods of heavy rain, generally occurring at the end of summer. (Garnier, 2019). Thus, the sediments carried by the rain accumulate behind the walls of the terraces arranged in the form of a waterfall. Implementing terraces reduces the slope and divides them into flat or gently sloping sections, making them suitable for agriculture. This type of traditional construction in the Mediterranean is in danger due to rural exodus, increasing the risk of disasters.

Traditional beliefs in the Mediterranean region

According to Christian perceptions, humanity is subject to the will of God. The popular tradition of turning to saints or virgins to intercede in the face of inevitable natural and climatological adversities is a constant throughout history; this phenomenon is recurrent in Mediterranean countries with a long Christian tradition. The material and human disasters caused by extreme hydrometeorological, geological, or biological episodes were responded to with prayers, songs, masses, penitential processions, and rogations (Alberola & Campos,

2020). Monitoring changes in the atmosphere and being attentive to the arrival of threatening clouds and storms were essential to trigger these protection mechanisms. In Spain, many towns entrusted to farmers and shepherds the mission of warning of the storm's arrival. These preventive tactics are mixed with “spells” to protect oneself from adverse phenomena.

These procedures, where magic and religion were confused, enjoyed great popularity throughout Iberian geography; some have survived until today (Alberola & Campos, 2020). The relationship between the religious sphere and natural disasters is so close that in some cases, when a flood episode occurred, the saint that had been invoked in times of drought was submerged in the river in response to the damages caused by the flood. Cases like the one presented and others represent confirmation that an imaginary discourse of anthropomorphic punishment-salvation was often produced as an explanatory mechanism, widespread in monotheistic religions such as Christianity, Judaism, or Islam, where it constitutes the axis of salvation for humanity (Ayala, 2002).

Within Christian cultures, the most common markers are votive offerings. These small, naive paintings depicting disasters are displayed in churches to perpetuate the memory of destructive events within the parish (Garnier, 2019; Garnier et al., 2018). On the other hand, we find hermitages and sanctuaries throughout the Spanish geography on promontories from where the town is overlooked and to which, in the event of a threatening storm, the priest went to “ward off” it. In the urban area, in many churches and cathedrals, small sentry boxes were built next to the bell towers oriented to the four cardinal points from where conjurers could act against storms (Alberola & Campos, 2020). Likewise, we observe how secular monuments related to disasters, such as commemorative plaques and flood and storm surge markers in France, appeared in the 17th century (Garnier, 2019).

6. DISCUSSION

Comparing the ancestral DRR-related knowledge and disaster prevention techniques of communities in the Pacific Rim with that of coastal areas of the Mediterranean region, despite the physical and cultural distance that separates them, there are some points in common. First and foremost, the human aspiration to improve the lives of future generations by passing on the lessons learned from past disasters, that become patent in cultural heritage. Then, the ties that bind us together as members of a society in which we seek not only protection from the unknown but also support in adversity. Indigenous and traditional DRR-related knowledge is still present in communities worldwide as part of their cultural heritage, as can be inferred from the case studies from the Pacific Rim and the Mediterranean Sea presented in this article.

Preparedness to face disasters in their three basic moments (before, during, and after) is one of the key elements in the case studied above. In the prevention stage (before), different

strategies and techniques are used to recognize the signs that indicate that a disaster is being unleashed. In the case of Simeulue Island early warning systems would have taken at the least 10 minutes to send a tsunami advisory, whereas the tsunami itself would have travelled faster, reaching the shores in about 10 to 20 minutes. The memories of the devastating tsunami that occurred in 1907 have been preserved and transmitted in oral traditions in the story of “smong” (the ocean coming onto the land), through which people assimilated the imperative of running up to the hills as fast as possible after an earthquake. Secondly, knowing what to do in the first moments of fear and confusion (during the disaster) saves lives. Finally, in the after stage, there is the immediate response and later reconstruction (it is a time to build back better), but also the transition from relief to recovery, the moment to collect the lessons learned and focus on prevention.

The traditional cultures of prevention in the Pacific Rim are effective in facing and preparing for disasters, with the greatest chances of survival. The newcomers who have not acquired traditional DRR-knowledge and behaviours are more vulnerable, as can be seen in the case of Ghizo Island, where most of the deceased in the 2007 tsunami belonged to an immigrant community. Likewise, the 2004 Indian Ocean Earthquake and Tsunami claimed the lives of many international tourists who were spending their Christmas holidays in seaside resorts in Thailand, amongst other destinations, and were unaware that the earthquake had caused a tsunami, even though the waves took two hours to reach the Thai shores.

One of the lessons that can be extracted from this is that it is critical to be able to identify the signs that point to the onset of a natural disaster. In the minutes preceding a tsunami, the sea sometimes recedes temporarily from the coast in what is known as the "disappearing sea" effect, then the tidal waves gain momentum and wash ashore. Apparently, the term *smong* refers to an event consisting of consecutive stages: strong earthquake, retreating sea, and big waves and floods (Rahman et al., 2018, cited in Mikulecký et al., 2023). The Simeuluean people instantaneously read the signs and knew how they had to react, but it has been reported that the rare sight of the sea retreating leaving the fish exposed on the beach, attracted people to the shore. The success story of Simeulue Island, where only seven of its 78,000 inhabitants died, is obscured by sadness when one thinks that the 2004 Indian Ocean Earthquake and Tsumani took the lives of almost 230.000 human beings in a dozen countries. Then, the question of what could have been done differently comes to our mind. The answer is clear: even though there is a Pacific Tsunami Warning Center, early warning systems are only one piece of the puzzle, disseminating this traditional knowledge among the general population becomes especially valuable.

Unlike the indigenous communities in the Pacific Rim and Japan, traditional DRR-related knowledge has practically disappeared in the Mediterranean area due to “modernity,” amongst other factors. This lack of cultural memory of past disasters can endanger the effectiveness of emergency plans. Moreover, large scale migration to coastal areas and uncontrolled urbanization without considering past catastrophic events increase the risks exponentially. Recently, the consequences of population growth and uncontrolled

construction in flood risk areas has become patent in the case of the DANA (Isolated Depression at High Altitudes, in its Spanish acronym) storm of October 29, 2024, which affected the province of Valencia, Spain, causing considerable material damage with an estimated economic impact of 22,000 million euros, some 900,000 people affected, and 224 fatalities (Government of Spain, 2024).

Traditional and indigenous DRR-related knowledge and traditions have been widely studied and become an object of interest for many researchers and organizations. These tradition-based disaster preparedness and prevention systems are not only aligned with local circumstances but are also effective in minimizing disaster losses. Therefore, integrating state-of-the-art disaster management systems and technologies with DRR-related knowledge and traditions could contribute to making communities more resilient to disasters.

The arrival of foreigners and tourists without prior knowledge of past disasters leads to a loss of memory of the disasters and ancestral knowledge about DRR. This lack of memory of disasters is more common in coastal areas of the Mediterranean. However, it could also apply to the Pacific coasts, where population growth in coastal areas has been equally exponential, making risk management difficult and potentially leading to the loss of this traditional knowledge in DRR. Therefore, another lesson that can be extracted from the cases presented in this article is that relevant changes are required in the dominant social perception of risk and attitudes toward dangers. Hence, it is necessary to initiate social learning processes in which traditional knowledge plays a relevant role, not only as a way of preserving cultural heritage but also as a way of improving our lives. Educating insiders and outsiders on DRR-related knowledge and traditions, in both non-formal and informal settings would be a step in the right direction.

In our opinion, religion is another cultural factor to consider in risk perception. A number of religious practices and rites are associated to spiritual and moral beliefs about how disasters are perceived and faced. Cugliari et al. (2022a) argue that different cultures can develop ways of representing tsunamis and acting accordingly, as they can be perceived as an inevitable act of God or a call to individual action. These different ways can be perfectly applicable to other disaster risks. In Catholic and Muslim Mediterranean countries, there is a feeling of fatalism and a certain helplessness in the face of disasters influenced by religious beliefs. The perception that many disasters are caused by God's wrath due to our sins persists today in many regions. However, religiosity has decreased considerably in recent decades, especially in European Mediterranean countries. According to Beider (2023), the non-religious population of Western Europe has tripled.

Japan offers an interesting symbiosis of old beliefs and new ways because the country has managed to maintain many of those traditional beliefs in the field of DRR. Lanzaco (2020) defends that Japanese culture presents one of the world's most unusual and intense syncretism examples, thanks to the preservation of original native elements and the assimilation of doctrines and beliefs brought to this country. This preservation of traditional beliefs can be

observed on architectural elements, but also on the above mentioned *tsunamihi* and the use of *Tsunami tendenko*. The country has implemented strict anti-seismic building requirements, early warning systems, and other tehcnological prevention measures, without losing sight of the social systems surrounding these technical systems. Formal, non-formal and informal Disaster Education is a priority in Japan, a country that is conscious that disaster preparedness is key to saving lives (Pastrana et al., 2022). The cases studies presented here come mostly from communities and regions, what is remarkable about Japan is that it is a whole country. Therefore, a third lesson that can be extracted is the importance of educating the population with an all-of-society approach.

7. CONCLUSIONS

This article has analyzed disaster preparedness within the framework of traditional autochthonous DRR-related knowledge, that has been passed from one generation to the next as part of the cultural heritage, both material and immaterial, of communities on the Pacific Rim and around the Mediterranean Sea). Through several short case studies, the article has presented some of the manifestations of this traditional DRR-related knowledge and practices used to deal with tsunamis and floods, and compared how communities in the Pacific Rim and the Mediterranean Sea incorporate disaster preparedness in everyday life. The article sought to find out whether traditional DRR-related knowledge and traditions are still relevant today, how they can be used at present to reinforce our modern disaster risk management systems, and if they could be useful to face the challenge of climate change.

In our opinion, to foster resilience, the intrinsic value of ancestral knowledge in DRR should be recognized as an asset in community disaster preparedness and incorporated into strategies for sustainable adaptation to climate change. Around the world, there is a new way of thinking about risk; authorities have begun to realize the benefits of incorporating indigenous knowledge and traditional techniques in their resilience and disaster risk reduction strategies simultaneously (US IOTWS, 2007). Understanding local strategies used since time immemorial to prepare for, respond to, and recover from climate-related disasters will help define the capacity to adapt to climate-related disasters and events (Fletcher et al., 2013). Likewise, these indigenous communities could benefit from incorporating new technologies for disaster risk management (UNDRR, 2022).

On the other hand, resilience has become one of the priorities for action in responding to the impacts of climate change. First introduced in the Hyogo Framework for Action 2005-2015 (UNISDR, 2005) and also present in the Sendai Framework for Disaster Risk Reduction 2015–2030 (UNISDR, 2015), resilience is key to strengthen individuals' and communities' capabilities in the face of climate change. According to Pelling et al. (2015), integrating local and traditional knowledge into DRR planning improves resilience. Moreover, the need to

protect and harness cultural heritage and the role that local traditions and knowledge play in managing disaster risk is an asset that fosters resilience (UNDRR, ICCROM, 2022).

To favour community resilience against the backdrop of climate change, traditional DRR-related knowledge and practices must be researched and preserved within local communities as part of their immaterial cultural heritage, but they should also be recovered and incorporated in DRR planning by those responsible for disaster risk management. Adaptation to climate-induced changes is not new for many societies. Stories of adaptation to changes and variations in climate and ecosystems abound in many cultures. If those stories are still present, it is because people survived and found a way to manage and adapt to changes.

Therefore, a vital resource for adapting to climate change is learning from those societies' wealth of experiences and knowledge (Oviedo, 2014). In this line, mechanisms to improve social and ecological resilience are often inherent to communities and institutions that must address environmental change and enhance the strength of societies (Tompkins & Adger, 2004). One of the main elements that make social resilience different from ecological resilience is anticipation, which in human communities occurs in two components: the predictive capacity to perceive when a disaster or change may happen and the estimation of the impact of those events on people. Above all, in traditional societies, these two components depend mainly on the accumulated experience and the history of changes experienced by society (Garmestani et al., 2023).

The Sendai Framework (UNISDR, 2015) encourages the inclusion of traditional DRR-related knowledge to complement scientific knowledge to improve disaster risk management. However, much government disaster information has been developed by experts without specific details associated with community characteristics (Agrawal, 2018). Since the 1970s, there has been research about the differences in the perceptions of experts and the general population (Ittelson et al., 1974). The disconnection between the technical knowledge and the beliefs or perceptions of the public to whom this information is directed often creates barriers in real emergencies (Nakanishi & Black, 2018). Therefore, to reduce the adverse effects of future disasters, it is essential to integrate these two divergent visions. Some countries, like Australia and New Zealand, are increasingly incorporating autochthonous knowledge into DRR.

In Australia, Aboriginal and non-Aboriginal researchers and communities collaborate through “Two-Way Partnering” to ensure that traditional knowledge and practices on ecology are respected. Communities engage in disaster preparedness and response planning in various ways, including learning from elders and using traditional environmental knowledge to understand and predict natural hazards. Likewise, drawing on traditional Maori environmental knowledge and cultural values, New Zealand promotes community-led disaster management to enhance disaster preparedness and response. Maori knowledge and practices are also incorporated into DRR strategies through partnerships with local tribes.

Cultural heritage and traditional knowledge are essential to promote resilient societies and foster a Culture of Prevention. The Japanese concept of "everyday-life preparedness" (*seikatsu bosai*) revolves around the idea of incorporating DRR practices into daily life, making DRR part of the community's routine instead of considering it a separate or occasional activity (Kitagawa, 2019). Everyday-life preparedness leverages Japan's cultural heritage and traditional knowledge in community-oriented approach that aims to enhance resilience through culturally relevant strategies.

This article has some limitations, that point to new lines of research. Firstly, the scope of the study was limited to a certain number of cases, which may weaken extrapolation to different cultural settings. Therefore, further studies are required. Secondly, the number of cases studied by the academic literature on traditional DRR-related knowledge in the Pacific Rim is abundant, while such studies are scarce in the Mediterranean. Finally, it is important to highlight that this study provides information in general terms to create awareness and bring attention to the issue. Therefore, future studies should explore the potential impact of traditional knowledge on DRR in communities and its integration into risk management systems.

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