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The Nature of "Natural Disasters": Survivors' Explanations of Earthquake Damage

Alessandro Massazza[1] · Chris R. Brewin[1] · Helene Joffe[1]

Abstract The distinction between natural and human-made disasters is ingrained in everyday language. Disaster scientists have long been critical of this dichotomy. Nonetheless, virtually no attention has been paid to how disaster survivors conceptualize the causes of the disasters they experience. In this mixed-methods longitudinal study, 112 survivors of the 2016–2017 Central Italy earthquakes completed questionnaires 3 and 16 months following the earthquakes, with the aim of assessing attributions of blame for the earthquake damage. In-depth interviews were also conducted with 52 participants at the 3-month mark to explore representations of causation for the earthquake damage. The distinction between disasters caused by nature and disasters caused by humans was not supported by survivors of the earthquake. In the longitudinal surveys, building firms and the State were assigned as much blame as nature for the earthquake damage, at both 3 months and 16 months after the earthquakes. Corroborating this complexity, in the interviews, the causes of the earthquake damage, rather than being understood as purely natural, were perceived as a complex mosaic composed of political, technological, natural, and moral factors. This empirical work shows that disaster survivors combine both nature-based and human-based explanations of disasters, rather than subscribing to one or the other. These findings have practical implications for disaster risk reduction and response.

✉ Alessandro Massazza
   alessandro.massazza.13@ucl.ac.uk

[1] Department of Clinical, Educational and Health Psychology, University College London, London WC1H0AP, UK

1 Introduction

Following the devastation of Lisbon by an earthquake and tsunami in 1755 the philosopher Jean-Jacques Rousseau wrote to Voltaire questioning the common naturalistic interpretation of disaster causation, noting how "it was hardly nature who assembled there twenty-thousand houses of six or seven stories. If the residents of this large city had been more evenly dispersed and less densely housed, the losses would have been fewer or perhaps none at all" (Rousseau 1756). More recently, the field of disaster science has also been vocal in critiquing the distinction between natural and human-made disasters (Kelman 2010), arguing for taking the "naturalness out of natural disasters" (O'Keefe et al. 1976) and stressing the "un-naturalness" (Tiranti 1977) of natural disasters.

The social core of natural disasters has since become a fundamental benchmark of disaster studies, with disasters seen to result from the interaction between hazards and social vulnerability. While earthquakes, tsunamis, and floods can be conceptualized as natural hazards, such hazards are necessary, but not sufficient, for a disaster to take place (Wells 2017), and only become disasters through their encounter with human vulnerability. The United Nations International Strategy for Disaster Reduction (UNISDR) states that "there is no such thing as a natural disaster, only natural hazards" (UNISDR 2019), and the term natural disaster was not included in the UNISDR terminology index (UNISDR 2007).

The importance of human behavior in moderating the vulnerability to natural hazards has long been one of the

fundamental principles of disaster studies (Oliver-Smith 1986; Hewitt 1997; Steinberg 2000; Wisner et al. 2004). As Smith (2006, p. 1) argues: "there is no such thing as a natural disaster. In every phase and aspect of a disaster […] the difference between who lives and who dies is to a greater or lesser extent a social calculus." However, this line of thought has been expressed by experts in the field without empirical attention to the explanatory frameworks that are held by disaster survivors themselves. Independent from what experts think about disaster taxonomies, an important question is whether disaster survivors believe they have been victims of a natural or human-made catastrophe.

1.1 Disaster Taxonomies

The notion that natural disasters are distinct phenomena from human-made disasters is common in everyday language and in media presentations of the subject. The term "natural disaster" is often used to refer to disasters following hazards such as earthquakes, hurricanes, and tsunamis. Using Google Trends, we found that percentage increases in searches for the term "natural disaster" in the United States on Google between 2004 and 2018 tend to correspond to major disasters in which the hazard can be deemed natural (Fig. 1).

Despite critique from disaster scientists, the notion of natural disasters has been, and often still is, used heavily in the academic literature. A Google Scholar search for articles that mention the term "natural disaster" from January 2000 to March 2019 produced a list of 1,370,000 results.

The field of disaster science has long been critical of the distinction between natural and human-made disasters. Kroll-Smith et al. (1991) stressed how this essentialist dichotomy is problematic from a social standpoint because it does not account for the symbolic and interpretative processes through which disaster survivors themselves understand what has happened. This stance is congruent with the position within disaster science that in order to understand disaster causation more attention should be directed at the social dimensions of such events, rather than at the characteristics of the hazards (Quarantelli 1992).

More recently, several authors have made theoretical points that also problematize the distinction between disasters caused by nature and disasters caused by humans or technology. The "pressure and release" model of disaster (Wisner et al. 2004) posits that natural hazards are simply triggers for engrained and latent societal tensions (Zaman 1999). The root causes of disasters do not materialize when a disaster strikes, but are the result of contextual and political factors that slowly build up, what Moseley (1999) terms a "convergent catastrophe." This understanding of disasters as processes, rather than discrete events, was more

precisely formulated by Beamish's (2002) conceptualization of disasters as "crescive troubles," where disasters are the visible epiphenomena of hidden social forces that go unnoticed for long periods of time before they are given the label "disaster" (Lewis 1999). Disasters are conceptualized as catalysts for underlying social processes and "strike places and spaces that have been shaped over time by decisions, policies, and actions that produce disaster vulnerability" (Tierney 2012, p. 64).

1.2 Empirical Literature on Disaster Taxonomies

Notwithstanding this debate, in the vast majority of the literature presented, researchers impose their own perception of whether a disaster is natural, human-made, or neither, rather than actually investigating the perceptions of survivors. This is a considerable limitation, particularly in light of the critique that the traditional disaster taxonomy does not consider the social components and experiences of individuals exposed to such events (Kroll-Smith et al. 1991). An established principle of the social psychology of risk is that the perceptions of lay people might differ considerably from those of experts (Slovic 2000). As Stallings (1988, p. 569) stated "the reality of complex events like natural disasters exists in the *images that people have of these events*" (emphasis added).

The limited existing empirical evidence, however, supports this blurring of the distinction between natural and human-made disasters in the eyes of survivors. Following a flood in Tulsa, United States, in 1984, 65% of the study participants held human agents and technology failures responsible for the disaster (Blocker and Sherkat 1992). Tulsa city officials were blamed for having allowed building developments in the floodplain of the river Arkansas and for failing to properly maintain the drainage system. Another study following a flood in Houston in 2001 reported that 50% of the study participants blamed the city, 20% the county, and 7% the national response (Arcenaux and Stein 2006). Similarly, following the 2002 Rodeo-Chediski wildfires in east-central Arizona, United States, blame was directed towards firefighters or local managers (Carroll et al. 2005), while 46% of individuals exposed to the 1999 Butte Complex Fires in California, United States attributed the causes of the fires to other individuals, 39% to nature, and 13% to their own actions (Kumagai et al. 2004). Conversely, Damm et al.'s (2013) study on perceptions of responsibility following a series of landslides in Austria found that most of the affected individuals deemed climatic factors responsible for the damage (73%), followed by anthropogenic factors (36%), and geological factors (16%), with study participants generally holding a combination of these factors responsible. This suggests that different interpretations might follow from
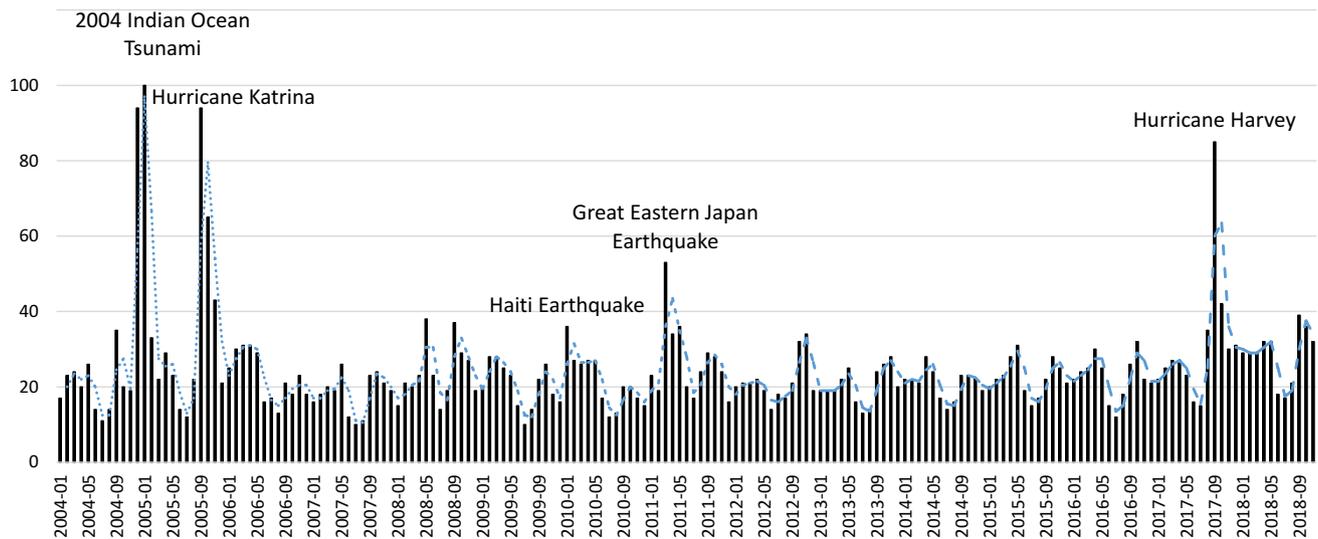
Fig. 1 Percentage increases in Google searches using the term "natural disaster" in the United States from 2004 to 2018. Analysis conducted using Google Trends

distinct hazards. Some exceptions aside (Sezgin and Punamäki 2012; Stephens et al. 2012), very few studies have systematically assessed attributions of responsibility following an earthquake, and no study has done so using a mixed methods and longitudinal design.

Our mixed methods longitudinal study explored local explanations for earthquake damage in a sample of 112 severely exposed disaster survivors. Our main research question addressed whether survivors' views on the earthquake damage aligned with a clear-cut distinction between natural versus human-made disasters. Based on previous literature on the topic we hypothesized that survivors' explanations would elude a simplistic understanding of the disaster as purely natural or human-made. We were also interested in investigating whether such explanations were stable over time. Due to the complex and nuanced nature of disaster explanations, we wanted to explore such narratives both quantitatively and qualitatively. This allowed us to triangulate, corroborate, and expand on the quantitative findings with more detailed and fine-grained qualitative data. We were not interested in whether such explanations were correct or not, but rather in how such explanations were constructed by the participants in our study.

2 Methods

Quantitative data were collected 3 and 16 months following the earthquakes from 112 survivors. Qualitative data were collected at 3 months from a stratified subset ($n = 52$) of participants.

2.1 Participants

At 3.36 a.m. on 24 August 2016, a 6.0 M_W earthquake struck several regions in Central Italy at a depth of around 8 km, triggering widespread human and material loss. The towns of Amatrice, Arquata del Tronto, and Accumoli were virtually razed to the ground. In Amatrice, the town where the research took place, 238 people died, out of a total death toll of 299. The total population of Amatrice prior to the earthquake was approximately 2500 people. A large percentage of the community perished during the disaster. Further powerful shocks struck the region in October 2016 and January 2017, and smaller shocks continued to strike the region at the times the research was being conducted in April 2017 and May 2018. All study participants ($N = 112$) were directly exposed survivors.

2.2 Sample Recruitment

During the first research period (April–June 2017, 3 months after the January 2017 earthquakes) a sample of 127 directly exposed survivors was identified with the aid of the local municipality and the health center. All 127 participants completed questionnaires while only a stratified subset ($n = 52$) participated in interviews. A random probability sample could not be performed due to the emergency setting. The study participants were scattered in the Apennines across 69 hamlets that could often only be reached by foot due to debris blocking the roads. At the time, almost all of the study participants lived in makeshift accommodations, such as containers or campers that did not appear in the pre-earthquake real estate registry, further hindering the possibility of a random sample.

During the second research period (May–July 2018, 16 months after the January 2017 earthquakes) we attempted to follow up with the 127 study participants from the first research period. Out of that original group, 112 participants completed a second round of questionnaires (88% retention rate). The overall structure of the sample is shown in Fig. 2.

During both research periods, participants were asked to read an information sheet and complete a consent form before participating. The University College London (UCL) Research Ethics Committee approved this research (Project ID: 10517/001). The project was also approved by the local national health service, the *azienda sanitaria locale* (ASL) of Rieti, and by the local municipality, Comune di Amatrice.

2.3 Quantitative Section: Questionnaires at Time 1 and Time 2

A total of 112 study participants completed questionnaires at both Time 1 and Time 2. Participants were asked: "How much do you think that the following entities are to blame for the earthquake's damage?" Participants then proceeded with rating on a Likert scale from 0 (not blameworthy at all) to 9 (extremely blameworthy) the following entities: 1. Oneself; 2. One's family; 3. The State/government; 4. God; 5. Chance; 6. Nature; 7. Building firms; 8. Organized criminality, that is, the mafia; 9. The municipality, that is *il Comune*; and 10. The community. These entities were selected on the basis of conversations with key informants, such as municipality and health-care officials, prior to the start of the research. Participants were also given the chance to add specific institutions, entities, or people that were not included in the list. The participants also completed a series of items intended to identify the level of human and material loss experienced as a result of the earthquakes and the sociodemographic characteristics of the respondents.

2.4 Qualitative Section: In-Depth Interviews at Time 1

At Time 1, in-depth interviews were conducted in Italian by the first author (native speaker) with a subset of 52

participants who were selected from the overall sample to achieve a matched stratified sample for gender and age (Table 1).

Fifty-two participants were asked to participate in an in-depth interview during the first research period (Time 1). If the participants accepted, they were interviewed before being given the questionnaire in order not to prime their responses. The researcher presented each participant with the following spoken prompt: "What are the first thoughts, emotions, or images that come to your mind when you think about what has caused the earthquake's damage?" Prompts such as "could you expand a bit more on this?" and interview techniques such as echoing, summarizing, paraphrasing, and encouragement were used in order to inject the least content possible into the interviews and allow narratives to arise naturally (Joffe and Elsey 2014). Interviews lasted an average of 1 hour and were recorded and transcribed.

2.5 Data Analysis

For the quantitative section descriptive statistics for the attribution variables were calculated. Independent sample *t* tests were conducted to assess for differences in demographic variables between dropouts during the second research period (Time 2) and the remaining participants. Wilcoxon ranked comparison of means were conducted to test for differences in levels of attributions of blame towards distinct entities. Wilcoxon ranked comparison of means were also conducted to assess for differences in level of attributions from Time 1 to Time 2 for the same entity. Non-parametric statistical testing was used to account for the non-normality of the attribution data. All statistical analyses were conducted using the statistical software SPSS (version 25).

For the qualitative section all 52 interviews were transcribed verbatim and translated from Italian into English by the first author for qualitative analysis. While transcribing, the main themes running through the interviews were noted and categorized into a preliminary coding frame. This inductive method allowed themes to arise naturally. The various codes were then grouped into families of codes to facilitate analysis. In order to assess the reliability of the coding frame, the author explained the coding framework to a second coder who then proceeded to blindly code approximately 10% of the entire qualitative data set. A substantial interreliability rate with an average Kappa of 0.72 was achieved. Discrepancies were discussed between the coders and resolved. All 52 interviews were then thematically analyzed with the finalized coding frame in order to explore the most frequent themes in depth (Joffe 2012). The entire qualitative data analysis was conducted on ATALS.ti (version 7).

	TIME 1	TIME 2
QUANTITATIVE	127 participants	112 participants
QUALITATIVE	52 participants	
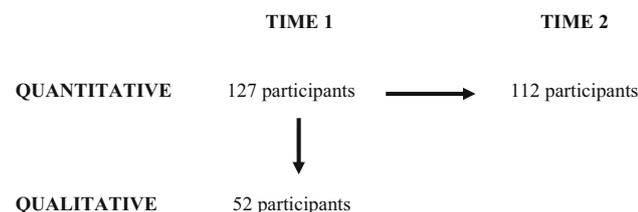
Fig. 2 Structure of the study sample in Amatrice, Central Italy, after the 2016–2017 earthquakes, divided according to method and time period (Time 1 = April–June 2017; Time 2 = May–July 2018)

Table 1 Matched stratified sample of participants in the qualitative component of the study in Amatrice, Central Italy, after the 2016–2017 earthquakes

Total sample at Time 1 ($N = 127$)			
Subset sample for interviews ($n = 52$)			
Male ($n = 26$)		Female ($n = 26$)	
Age < 50 ($n = 13$)	Age > 50 ($n = 13$)	Age < 50 ($n = 13$)	Age > 50 ($n = 13$)

3 Results

The results from the questionnaires completed at Time 1 and Time 2 are presented followed by the results from the thematic analysis of interviews conducted at Time 1 with a subset of participants.

3.1 Quantitative Results

The descriptive characteristics of the participants who took part in the research during both research times ($N = 112$) are shown in Table 2. Individuals who dropped out at Time 2 did not significantly differ from the individuals who remained in terms of age, as demonstrated by independent-sample t tests ($t(123) = 1.15$, $p = 0.25$), and both groups had the same gender distribution (57% of the dropouts were female, and 43% were male), implying that attrition was likely to be random.

The descriptive ratings of the blame attributions for each entity in order of magnitude at Time 1 and Time 2 are presented in Fig. 3. No significant statistical difference was found between mean attribution levels for the three most blamed entities, that is, building firms, nature, and the State following Wilcoxon ranked comparison of means. Attributions of blame for the earthquake damage towards building firms did not differ significantly from attributions of blame towards nature at either Time 1 ($Z = -0.396$, $p = 0.692$) or Time 2 ($Z = -0.692$, $p = 0.489$). Similarly, attributions of blame towards the State did not statistically differ from attributions of blame towards nature at either Time 1 ($Z = -0.904$, $p = 0.366$) or Time 2 ($Z = -0.817$, $p = 0.414$). While there was a tendency for an increase in blame judgments from Time 1 to Time 2 among most

Table 2 Demographic characteristics of the study sample ($N = 112$) that participated in both research periods in Amatrice, Central Italy, after the 2016–2017 earthquakes

Variable	Percentage of total sample or total mean
Gender and age	
Male	43% (mean age = 45.48, range = 18–76)
Female	57% (mean age = 47.16, range = 18–77)
Religion	
Catholic	90%
Atheist	5%
Agnostic	2%
Education	
Primary school	5%
Middle school	22%
Secondary school	54%
Undergraduate	17%
Postgraduate	2%
Human loss	
Lost one close family member (for example, child, parent)	35%
Lost more than one close family member	14%
Lost one or more very close friend(s)	47%
Lost acquaintances	100%
Material loss	
House lost	81%
Left unemployed	35% (for mean of 11.2 months)
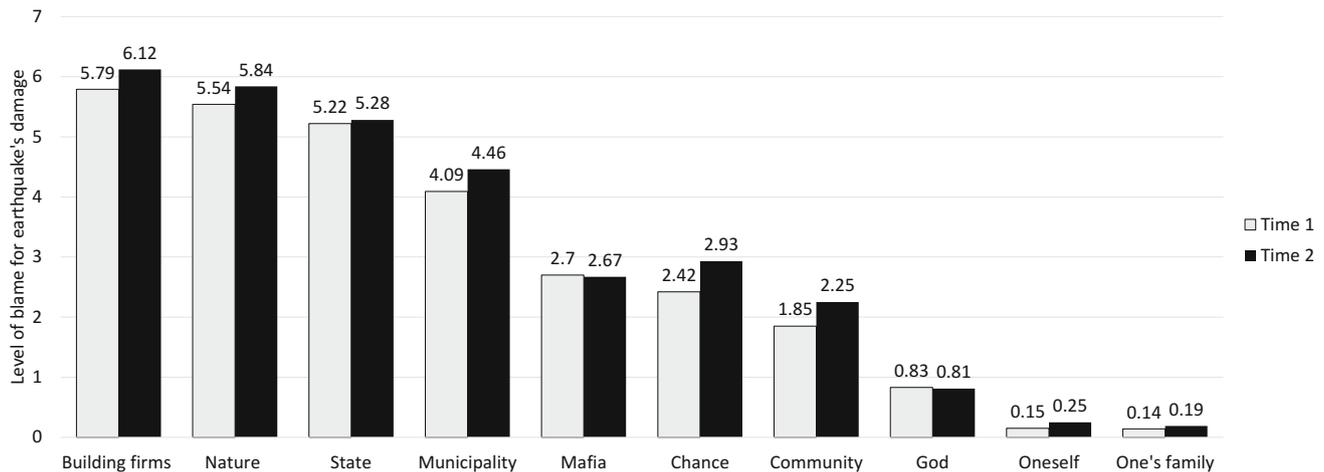
Fig. 3 Levels of blame for earthquake damage in the Amatrice, Central Italy, study after the 2016–2017 earthquakes. Mean attributions rating for each entity at Time 1 and Time 2, where 0 = not blameworthy at all and 9 = extremely blameworthy

entities, Wilcoxon ranked comparison of means between each entity at Time 1 and Time 2 showed these differences to be nonsignificant.

3.2 Qualitative Results

The overall results of the thematic analysis, separated according to attribution-related concepts, are shown in Table 3. Individual participants often upheld a variety of different explanations rather than clearly identifying one single cause. Each of the four attributional themes is discussed in detail in the following sections.

3.2.1 Attribution of Cause to Non-governmental Human Entities: Constructions, Private Citizens, and Technicians (Table 3, Column 1)

While earthquakes were perceived as uncontrollable and unforeseeable, individuals believed that earthquake damage could be, and should have been, controlled for. Houses, rather than the earthquake itself, were identified as responsible for people's deaths, independent of whether participants believed that building safety was the responsibility of the State, of building firms, or of private citizens. Individuals spoke at length of the paramount role of constructions in causing and determining the extent of damage following an earthquake. Technology was conceptualized as the main shield humans had to protect themselves from the blows of nature.

> The building where my sister died…[1] in the moment in which I was waiting for her to be fetched out from the debris, a firefighter came close to me, I was obviously crying and he took a piece of cement that

in theory had to be cement in his hand and he crumbled it and he told me: "Look this is not cement, this is sand" and this is why I say that there certainly is some responsibility at the level of constructions. (Male, 48)

Houses were conceptualized as spaces of human potential and of agency. Constructions were the only buffers that humans could put between themselves and the fury of nature, the punishment of God, or the callousness of chance.

> It is not that the houses fell randomly, the houses that were made better remained. (Female, 22)

According to the study participants, the key role played by houses as potentially protective entities was exemplified by the existence of places such as Japan or Chile "where a shock of magnitude 8 makes people laugh, whereas here we are counting our corpses." Prevention was thought to be possible, simply not in Italy. Countries such as Japan and Chile were often idealized as hypertechnological safety idylls where humans had been capable of withstanding the forces of the shaking land with engineering techniques. The slowness of the Italian bureaucratic procedures and the corruption of the institutions were identified as insurmountable obstacles that had doomed Italy to seismic vulnerability. The participants also nearly always identified the ancient masonry structures and old construction methods of the old town as paramount variables in exacerbating the damage, not only in Amatrice but in Italy more generally.

However, according to the participants, safety was not only dependent on technical and engineering skills but, more importantly, also on the personal and moral characteristics of the humans involved in the building process. In

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[1] "…" is used to indicate speech pauses.

Table 3 Theme summary of the interview representations of causation for the earthquake damage

1	2	3	4
Attribution of cause to non-governmental human entities (38% of attribution-related content)	Attribution of cause to government entities (29% of attribution-related content)	Attribution of cause to nature (23% of attribution-related content)	Attribution of cause to spiritual/abstract entities (10% of attribution-related content)
• Inadequacy of constructions and lack of anti-seismic adjustments • Private citizens not taking enough responsibility for prevention within their houses • Technicians such as surveyors and engineers not competent enough or easily corrupted, and more interested in profit than safety • Contractors more interested in money than in people's lives • Conspiracy theories about the earthquake itself having been caused intentionally by humans, for example by nuclear experiments • The mafia having led to malpractice in the building industry	• The State not having done enough to prevent such a disaster, especially through lack of control and monitoring of the building industry and malpractice in constructing public buildings, for example Amatrice's elementary school • The role of the bureaucracy in rendering preventive action overly complicated and making seismic improvements difficult to achieve • Past governmental regulation recommending the use of reinforced concrete roofs as anti-seismic adjustment, believed to have resulted in widespread structural damage and deaths • The cultural heritage institutions limiting individuals' choices of adjusting their houses due to heritage restrictions on ancient buildings • The lack of prevention policies from the *genio civile* (civil engineering department) and the *Regione* (Region)	• The role of the strength of the earthquake, that is, the earthquake's intensity and magnitude, type of movement and duration, and the fact that several earthquakes followed one another • The importance of the soil present under the building • Whether the building was close to the seismic fault • The lack of foreshocks that could have warned the population	• The possibility of God having played a role in causing the earthquake damage as a punishment, but also in intervening during the earthquake, for example by saving people • The role of chance or luck, especially in stories about people saving themselves fortuitously from death • People speaking about how reality is structured by destiny, usually in relation to the death of people • Stories of Sant'Emidio, patron saint of the region, who was thought to protect the area from disastrous earthquakes

Within each overall category, subcategories are presented from the most to the least prevalent

Italy, besides engineering techniques, the security of the houses was deemed to depend on the moral integrity of those who built them. The immorality of the builders, the corruption of the State, together with the carelessness of private citizens, were seen as key elements that materially weakened the structures of homes. The houses were thought to reflect and absorb the morality and the integrity of the humans that built them. Participants would often speak about a builder in Amatrice who, despite being a butcher, had built houses that had withstood all the earthquakes. This, according to participants, was due to the fact that he had built them as if they were his own houses, independent from his limited technical skills.

> After the earthquake I went to… since I know who has built our house, I went to thank him… not only me, there had been like a procession, like for the Saints… he isn't a famous architect, he was a butcher. (Female, 38)

Unlike this builder, technicians, engineers, and contractors were generally described as money-driven individuals with profit as their only desire and keen worshippers of the *Dio denaro*, the money God, no matter the costs in terms of human lives. Participants would often cite the episode at L'Aquila when, a few hours after the 2009 earthquake, two building entrepreneurs called each other, laughing about the profits they believed they would make during the reconstruction following the earthquake. One participant described Amatrice as a "toy in the hands of building firms." Building a house was therefore perceived as an act of morality, rather than merely a technical task. One participant compared the duty of engineers or technicians to that of doctors.

> There is maybe the doctor or for example a builder… you are responsible for the life of the other people. What kind of conscience do you have in order to build a house in those ways? And this because the

hunger for money moves the world… it is a stupid world because there are really people that for two euros would kill and they have done that because then at the end they have killed, for me it is murder. (Female, 26)

If houses embodied the moral integrity of the humans that worked on their construction, they were also thought to reflect their owners. Private citizens were often considered partially responsible for the earthquake damage. In particular, participants would sometimes describe the illegal modifications of structures for aesthetic purposes, such as expanding one's sitting room or building a terrace. As one participant put it "parquets in place of iron." People would also often report of individuals who had received State funding for anti-seismic consolidation, only to spend it for nonstructural purposes. The reason why this was thought to happen was a mixture of human greed, what was perceived as the "Italian mentality," and a "it will never happen to me" attitude.

3.2.2 Attribution of Cause to Government Entities: State, Municipality, and Bureaucracy (Table 3, Column 2)

While private citizens, builders, and technicians were all identified as responsible agents in the causal and moral chains leading to the earthquake damage, the ultimate and determinant responsibility was often deemed to reside in the "velvet armchairs of the State," as one participant put it. Responsibility was shifted upwards as the power to do something to prevent the damage increased. The State, often generalized as Le Istituzioni, was described as that entity with the duty of monitoring, controlling, and regulating the insatiable desires for profit and the unruly illegalities of its citizens, of the building industry, and of the mafia. If not that, the State itself was described as the most corrupt, most dishonest, and money-hungry entity in the causal chain.

It all depends on the State… who makes the laws? Who ensures that the laws are applied? But here the State is a joke, you simply need to give bribes to the right people and you construct under the Etna, over the Vesuvius, on a river, here you can construct wherever you want… the important thing is that you know what buttons to push. If there was more firmness in the controls, in the prevention, many things would be avoided, many useless deaths. (Female, 28)

Corruption was believed to be intrinsic to every aspect of the national government. The most common emotions aroused by the State code were anger, disgust, and hate. The State was variously described as Stato ladrone (thief State), Stato magnaccia (literally pimp State), Stato barzelletta (joke State), and la sagra delle minchiate (the festival of bullshit). One participant went as far as stating that he would have rather had his house rebuilt by the mafia because he claimed it would have been constructed in a safer and more legal way than if it had been done by the State. When asked to describe what first came to mind when thinking about the Italian State a participant replied:

"A shit! A shit… it comes to mind… incompetents, people that couldn't care less, people that are there and they are here to mind their fucking business. Cuts here cuts there when they keep receiving the same salary. I really feel pissed towards the institutions… this is what comes to mind… the disgust. (Female, 54)

The nature of the State was contained in the local expression magna–magna, literally translated as "to eat and to eat," where the State was pictured as a creature insatiable for profit that would feed off corruption, criminality, and, ultimately, the life of innocent citizens. Some study participants suggested that the State had purposefully constructed buildings in a precarious way to be able to invest in the reconstruction process. Emergency management was described as a business enterprise rather than a public responsibility. Others hypothesized that the State had intentionally decreased the official reports on the magnitude of the earthquake to avoid having to pay for the damage.

It is true that you can't foresee the earthquake but when the radon is high, we know that an earthquake is arriving and the politicians knew but do you know how much the GDP increases in Italy following an earthquake? For the State it's more convenient to buy a few coffins. (Female, 46)

The recent scandals in Italy over the collapse of several public overpasses on motorways and killing people were often mentioned as metaphors of the brokenness of the public building industry that, like the overpasses, looked clean and solid on the outside, but was internally rotten and corrupt. Participants would nearly always discuss at length several examples of malpractice in the public building industry in Amatrice itself.

Most importantly, the gears of the "bureaucratic machine" obstructed any possibility of prevention and improvement. Many participants mentioned how "the bureaucracy has killed more of us than the earthquake," a sentence used in 1968 following the Belice earthquake in Sicily. Other participants often defined bureaucracy as "the pathology of the Italian State" or as "the ruin of Italy." Often illegality was perceived as the only realistic solution to labyrinthine procedures where stamps, signatures, and

administrative orders hampered the realization of the simplest tasks.

3.2.3 Attributions of Cause to Nature: Faults and Nature's Strength (Table 3, Column 3)

Individuals often identified nature as an important variable in causing the damage. Several participants stated how there was an equal responsibility of humans and nature in causing the damage. According to participants, the destructive violence of the earthquake was due to its particular strength, its duration, the superficiality of the hypocenter, the succession of several strong shocks, the quality of the soil, and the path of the fault.

> It was an apocalypse… buildings rose and before coming down they turned around, like a ballet dancer, as if they had done a pirouette… the cement moved like a wave. (Male, 59)

> I don't give a lot of blame to humans for the earthquake because probably it was inevitable for how this earthquake happened… it was a bit like the Titanic, it was the destiny that it had to sink because maybe… if it had met a smaller iceberg maybe it would not have sunk… but it did because it met that big iceberg, it is the same, this earthquake was so violent that unfortunately humans couldn't do anything against this nature. (Male, 50)

Participants described the strength of the earthquake as a paramount variable in the causal, but not moral, chain of events. Unlike the emotionally laden discussions concerning the moral responsibility of humans, nature was ultimately perceived as a neutral entity one could only adapt to. One of the most common statements made by participants was that "nature is nature" and that nature had "its course." As an entity that existed beyond the human realm and independent of it, nature was believed to be exempt from the human judgments of intentionality, blame, and anger. Earthquakes were, nearly always, perceived to be natural phenomena. Humans, however, could act on the extent of the earthquake's damage and make the difference between an earthquake and a disaster. The neutrality of nature ended as soon as the seismic waves touched the walls of human work. The good or evil essence of nature was always filtered through human lenses.

> I go and do walks and I have done so for all my life in the mountains, nature is that, nature can make you flowers and make you storms, it can make you earthquakes and it can make you the sea with the beautiful days, nature is this. It behaves according to its own things, we can't get mad with nature, we need to get mad with ourselves. (Female, 53)

> We know that in nature there is nothing harmful per se, the mouse is not harmful. They are harmful in relation to humans, because they destroy the product that humans are growing. And the same thing with the earthquakes, if the earthquake finds an environment that is well structured, so-called anti-seismic, it is obvious that it will not make any damage… but nature is not negative for itself, in nature there is a balance. (Male, 69)

Nature was depicted as a neutral agent that was oblivious to human matters. Many participants often repeated that "earthquakes have always happened" and that it is the responsibility of humans to adapt to the tectonic movements by building safe houses. One of the most commonly reported episodes was that of the bishop's speech during the State's funerals in Amatrice. At the time, the bishop had described earthquakes as a source of life through the creation of mountains and water sources, stressing how it was "the work of humans," rather than of earthquakes, that had led to the deaths for which the funerals were taking place.

3.2.4 Attribution of Cause to Spiritual and Abstract Entities: God, Chance, and Destiny (Table 3, Column 4)

Earthquakes and religion have long been tied together in the local Central Italy tradition. Many participants reported the story of Sant'Emidio, the local patron saint of the protection from earthquakes, who is responsible for protecting religious and faithful communities from the fury of God's wrath. Participants reported a legend of how, when passing through Amatrice, the saint had declared: "I will make you shake, but I will not make you break!"

God and spiritual entities such as the Holy Mary or saints were often described as active agents capable of mediating the damage of the earthquakes. In the majority of instances, God's existence and intervention was thought to have been beneficial, with several accounts of assumed miracles taking place during the earthquakes. A participant reported suddenly being able to see in the dark and saving his nephew from a collapsing ceiling, another participant recounted being awakened by the spirit of his deceased mother seconds before the shock and saving his entire family, while another participant reported being able to emerge from the debris by following a light from above.

> I can't manage to be angry with God because… he[2] saved me and he saved my children… and so I am deeply grateful. (Female, 29)

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[2] The pronoun used by participants when referring to God was always the masculine "he," which is therefore also used in this article.

While God's presence manifested itself in limiting the potentially catastrophic outcomes of the earthquake, the majority of participants thought he had no role in causing the earthquake itself. While God was conceptualized as omnipotent, participants often cited the Christian principle of humans having been gifted with free will. This meant humans, not God, had to decide how much iron to put in their houses' structures. As a man who had lost both his children and his wife under the debris stated:

> Unfortunately, when people lose family members like it happened to me, it is normal that you get mad with the entire world… right? "It is God's fault," people start saying that Jesus does not exist because this has happened, because kids have died… but the reality is different, what does God have to do with this? If the house was badly built… then it is your fault, not God's. (Male, 48)

The responsibility for specific decisions about building practices was deemed to lie in the hands of humans, not in God's will.

> God says "*Aiutati che Dio t'aiuta*" (Help yourself that God will help you). If you do things that you shouldn't do, God cannot help you… so God can give you a hand but… within certain limits. "Oh I go at 200 km/h with my car and then I ask God to not let anything bad happen to me," it is not possible because if you drive at 250 km/h with your car you will crash. (Female, 53)

Participants also often referred to abstract concepts such as chance and destiny as important variables in the causal chains leading to the earthquake damage. Participants would often use interchangeably the concepts of chance, luck, and coincidences to indicate a lack of meaningful patterns in specific events or to provide explanations for absurd situations that defied probability. Those concepts were often presented when describing people's unusual experiences of the earthquake, such as one person dying and the other surviving despite sleeping in the same bed. For example, a young man who had lost his mother described how:

> My father went to the external part of the room and so the floor collapsed and he saved himself because a beam went over his head and… it covered him, whereas my mom didn't even have time to get up from her bed before the internal part of the house fell on her, it collapsed over her… and so… some events you can explain them, but others… I find it hard to explain it… people who slept in the same bed… one yes and one no. (Male, 19)

> There were a series of coincidences… in those days of the earthquake, that one says "For heaven's sake… but if I hadn't done that thing, if that person hadn't come back"… there were my uncles who never came back… this year magically they didn't go on holiday and they decided to prolong their stay here and they died and so for me this is a coincidence. (Female, 29)

Participants' discussions about destiny were very similar to those concerning chance, except for the perception that chance was chaotic and random, whereas destiny was predetermined and "written" in people's lives, with some victims having been "chosen" or "having an appointment with death." However, just as with God, chance and destiny were entities that acted in the contingencies of people's lives rather than in the structure of buildings. They concerned whether the person was on the right or left side of the room, not whether the room had collapsed. The lack or presence of God and destiny in the experiences of people was independent from their own potential to prevent the damage from happening. Free will, agency, and responsibility were depicted as characteristics inherent to being human.

> I was angry on the 18th of January when the church of San Martino fell… I got really pissed… I went to the municipality and the head of my sector said "XXX [*name of interviewee*] is mad with all the world and with destiny" something like that… "But what destiny?!" I told him "I am angry with people not with destiny… we make destiny!" (Female, 49)

4 Discussion

In the first mixed-methods longitudinal study investigating attributions of blame and representations of causation for an earthquake's damage, we provided further evidence for the frailty of the distinction between natural and human-made disasters. Survivors' explanations failed to fit neatly into the natural versus human-made disaster dichotomy in both the quantitative and the qualitative data. Quantitative ratings of blame attributions highlighted how severely exposed earthquake survivors did not represent the earthquake's damage as being inherently natural. Building firms and the State were seen to be just as blameworthy as nature for the earthquake damage. The municipality also scored high on blame attributions. Our findings were further corroborated by the fact that these ratings remained stable from Time 1, 3 months after the January 2017 earthquakes, to Time 2, more than a year after the earthquakes. Findings from the quantitative data were further corroborated by triangulation with the qualitative data that

explored perceptions of causation for the earthquake damage. The most substantial proportion of the conversations focused on the perceived responsibility of human institutions and agents in determining the earthquake damage. Nature and non-human entities, such as God and chance, appeared less frequently in discussions on the causes of the earthquake damage.

The qualitative data also allowed the exploration of reasons underpinning the patterns of the quantitative data. The earthquake damage was conceptualized as having been caused as much by the shakes of tectonic plates as by the malpractice of humans and the corruption of institutions. For most participants, the strength of nature was determinant, but death happened in human-made constructions, rather than in fields. These findings provide support for the few studies on perceptions of responsibility following floods (DeMan et al. 1985; Blocker and Sherkat 1992; Arcenaux and Stein 2006) and fires (Kumagai et al. 2004; Carroll et al. 2005).

The earthquake damage, in the experience of the participants, was not a freak event that "just happened" but was a deeply moral occurrence resulting from chains of human responsibilities. The disaster was a sociopolitical phenomenon at its core. Natural disasters tend to be commonly thought of as "random, morally inert phenomena, chance events that lie beyond the control of human beings" (Steinberg 2000, p. 13). However, survivors' narratives were imbued with morality, a sense of injustice, and a firm belief that many deaths could have been avoided if certain actions had taken place. If the earthquake itself was perceived as being uncontrollable, the opposite was true for its consequent damage, which was seen to result from human agency rather than misfortune. Constructions and homes were conceptualized as material projections of one's agency and were imbued with human responsibility, independent from one's faith in God, chance, or destiny. This supports previous work highlighting the inherently political nature of earthquakes in Italy (Alexander 2010) and in other countries (Green 2008), together with a big data study that found a positive association between the frequency of natural disasters and the occurrence of anti-government demonstrations, revolutions, riots, and interstate conflicts in 157 countries between 1990 and 2010 (Choudhury 2013).

A shared belief existed that modern engineering techniques could have prevented, or at least limited, the damage. The disaster was thought to result from a loss of control over human-made structures, rather than from a lack of control over nature (Baum et al. 1983). This is in accordance with the claim that, historically, with advances in technology and in the human ability to moderate the effect of natural hazards, the damage resulting from tsunamis, earthquakes, and tornados is increasingly seen as lying within the realm of human responsibility (Picou et al. 2004). Disaster taxonomies are the direct result of the subjective and historical appraisals of the event filtered through society's interpretative frames (Goffman 1974).

Like nuclear meltdowns or a gas leaks, the earthquake damage was depicted as a "technological failure" (Pidgeon and O'Leary 2000) by the survivors. As stated by Wijkman and Timberlake (1984, p. 11) "today, humans are playing too large a role in natural disasters for us to go on calling them 'natural'." Technology, however, was not sufficient in itself to protect from catastrophe, but had to be sustained by a secure sense of morality on behalf of the humans using it. Buildings were ultimately strengthened or weakened by what lay within the hearts and conscience of builders, engineers, and politicians, rather than by specific materials or techniques, as the example of the houses built by a butcher demonstrates.

The study contains some limitations. First, the non-probability sample hinders generalization to the population of Amatrice as a whole and to other populations. However, having considered the practical limitations of the emergency phase, no other solution was deemed possible. Second, we only focused on explanations related to the earthquake damage, rather than on explanations for the earthquake itself. Future research would likely find differences between attributions of responsibility for the hazard (earthquake) versus attributions of responsibility for the disaster (earthquake damage).

The results of this study point to several potential practical implications for disaster science, disaster risk reduction, and disaster response. At the level of disaster science, the results provide evidence that survivors' explanations of disasters align with the long-held theoretical claims made by disaster scientists concerning the frailty of the natural versus human-made disaster distinction (Stallings 1988; Tierney 2012). Earthquake survivors did not perceive the earthquake damage as being only the result of uncontrollable and unpredictable forces of nature. Rather, the earthquake damage was described as being inherently social and political with human intentionality, corruption, foreseeability, morality, and agency playing a central role in mediating the forces of nature.

In terms of disaster risk reduction, the results provide important insights into beliefs concerning who should have been responsible for preventing the damage from occurring. As Blocker and Sherkat (1992, p. 164) highlight, "the cultural framework which people use to interpret the causes of disasters will affect their determination of responsibility for disaster prevention and mitigation." Building firms, the State, and the municipality were the human entities that received the highest level of blame, while the lowest levels of blame were directed towards one's self and one's own family. This pattern is potentially problematic in terms of

earthquake preparedness interventions where factors such as self-efficacy, behavioral intention, trust in the authorities, perceived personal responsibility, and personal outcome expectancy have been found to be good predictors of preparedness (Joffe et al. 2016, 2019). Blaming external entities, rather than one's self, and shifting the blame upwards towards abstract entities such as "the system" have long been identified as means of maintaining control and a positive sense of self in the face of misfortunes (Douglas 1992; Joffe et al. 2011), including disasters (Drabeck and Quarantelli 1967). However, such beliefs might have dire consequences for implementation of disaster preparedness measures at the individual level by lowering perceptions of personal responsibility, self-efficacy, and personal outcome expectancy while hindering trust in the authorities.

The results also have implications for disaster response as governmental agents should be aware of the likelihood of being blamed for a disaster soon after its occurrence (Kumagai et al. 2004). This can have substantial consequences in hindering the ability of government officials to communicate efficiently with the community in the key phases of the aftermath and reconstruction processes of a disaster. Government officials should bear this in mind when entering a disaster setting and may devise interventions to de-escalate societal conflict and tensions, potentially working in collaboration with non-governmental organizations.

5 Conclusion

Explanations for why misfortunes and disasters have taken place represent complex cultural artifacts that reflect broader social representations and cosmologies about how the world works. Through a longitudinal, mixed-methods investigation of explanations for an earthquake's damage in a large sample of survivors, this research highlights the socially positioned and mosaic-like nature of disaster explanations. While taxonomies are essential for effective communication, in this case, as Carroll et al. (2005) argue, the distinction between natural and human-made disaster masks more complexity than it actually explains. This study provides strong additional empirical evidence for the frailty of the distinction between natural and human-made disasters, showing how the nature of "natural disasters" is problematized among disaster scientists and disaster survivors alike.

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