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Vulnerable knowledge: responding to the uncertainties of climate change-related disaster

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Abstract

This paper uses uncertainty generated by environmental change and climate crisis as a prompt to rethink the concept of vulnerability within disaster studies. Where some have sought to recover a latent political potential in vulnerability, a togetherness founded in the disclosure of insecurities to others, we argue that there is value in refusing to settle on any single meaning. This is explored directly through an analysis of narrative interviews with persons bearing different vulnerabilities in four European countries. Tracking forms and expressions of vulnerability across research sites, we identify an unease and fragility in knowledge of disaster risk, before assessing how people nevertheless make sense of their experience and act collectively to find ways through uncertainty. The paper also considers vulnerability reflexively in the context of epistemic practices, suggesting that modesty and openness to more localised ways of knowing might contribute to the adaptability and responsiveness of disaster studies. We conceptualise these diverse dispositions to uncertainty as vulnerable knowledge.

KEYWORDS
disaster, gender, intersectionality, knowledge, uncertainty, vulnerability

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1 | INTRODUCTION: CLIMATE UNCERTAINTIES

The current moment of climate change is one of uncertainty. In recent years, global average temperatures have consistently exceeded previous highs (Wysession, 2023; Poynting, 2024), prompting speculation of a fundamental shift in Earth systems. One climate scientist observed in 2023 that if anomalous weather were to continue beyond the expected end of the then ongoing El Niño event, the planet's weather could enter 'uncharted territory' (Harvey, 2023). This alarming and evocative statement conveys a particular sense of unknowing: that state-of-the-art weather models will no longer be able to account for the temperatures being recorded. For many people, including in Europe where the average temperature rise has been the greatest (Rousi et al., 2022), these uncertainties will almost certainly be experienced through a greater occurrence of weather extremes and natural hazards (see, for example, Stott, 2016; Robinson et al., 2021). Changing climate patterns and intensities of wet and dry are likely to lead to greater incidences of floods, landslides, heatwaves, and wildfires (Carrington, 2022).

It is not certain, however, that an increase in natural hazards will mean a parallel increase in disasters. Disaster researchers have long argued that disasters depend less on natural causes than social circumstances (O'Keefe, Westgate, and Wisner, 1976). Structural conditions of poverty, limited resource access, and land use management place communities and areas at differential risk. Not everyone is equally vulnerable to disaster (Blaikie et al., 1994; Chmutina et al., 2021): populations already facing economic deprivation and social marginalisation are at greater risk than those that are not, with the most at-risk being those confronting multiple, intersecting vulnerabilities. This means that to the extent that societies choose to support the most vulnerable and reinforce the social and material infrastructures on which life depends, they also choose to prevent disaster (Kelman, 2020).

That climate change is a force multiplier of disaster risk is also well recognised (see, for example, Kelman and Gaillard, 2008; Mercer, 2010). This is not only because of the increased occurrence of extreme weather and natural hazards, but also because of the reduced capacity of communities, societies, and states to prepare and respond accordingly. Some analysts have expressed concern that climate change will allow governments to avoid responsibility for these risks by re-naturalising disaster (Gaillard, 2010). As climate change is a global phenomenon, it is straightforward to assert that it lies outside the ability of any one country to act. The worry is that this argument will be extended to climate change-related disasters. Yet, it is not clear that nature and society will be so easily separated. It has been contended, for instance, that popularisation of the concept of the Anthropocene heralds a movement in the opposite direction—towards a greater recognition of the interdependency and co-constitution of nature and society (see, for example, Bonneuil and Fressoz, 2016)—and that this has consequences for disaster anticipation and apprehension (Horowitz and Remes, 2021).

What do these climate uncertainties mean for disaster studies? How do they affect the hard-won achievements that stand behind the concepts, models, and methodologies so important to disaster risk reduction? This paper contributes to efforts within disaster studies to respond to climate uncertainty. It does so by drawing on recent critical work on the limits and potential of vulnerability praxis (see, for example, von Meding and Chmutina, 2023). Rather than reject or close down this moment of uncertainty, we argue for it to motivate a pluralisation of thought and action directed towards more inclusive and intersectional disaster risk reduction. The concept of vulnerable knowledge names our epistemic and values-driven disposition to the qualities of climate uncertainty.

The research presented here, part of the ACCTING (AdvanCing behavioural Change Through an INclusive Green deal) project, explores how individuals and groups in Europe that are often labelled as vulnerable are knowledgeable and active in disaster prevention, preparedness, and response. Our approach draws on feminist theory to attend to multiple and intersecting social vulnerabilities (see, for example, Yuval-Davis, 2015). Gender is fundamental to how we think about and respond to inequalities in disaster risk (see, for example, Fothergill, 1996; Fordham, 1998; Enarson, Fothergill, and Peek, 2007). But in considering the ways in which inequality and susceptibility to disaster are experienced, it is important also to consider gender through its intersections with other social identities and categories, including (but not limited to) socioeconomic class, ethnicity and race, sexuality, disability, age, and religious and political beliefs (Fordham, 1999; Vickery, 2018; Andharia, 2020).

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As a research and writing team, we bring a range of experiences and expertise to bear on the study of disaster. This includes disciplinary backgrounds in geography, sociology, and anthropology, and work in gender studies, political ecology, and science and technology studies, all of which have studied disaster. However, it is also important to the argument of this paper to recognise our relative newness to the field. Most of us had not worked on disaster risk reduction before this project, and in collaborating, we have also sought to find a way through the rich and diverse disaster studies literature. We come at the field modestly, acknowledging our vulnerability and willingness to learn. Through our research and engagement with study participants, though, we nevertheless believe that we have a contribution to make. Above all else, our writing team is motivated by a feminist epistemic commitment to multiple and situated knowledges (see, for example, Haraway, 1988; Harding, 1993), including multispecies and more-than-human perspectives (see, for example, Haraway, 2007; Tsing, 2015; Govindrajan, 2018), which also informs the way that we interpret our research data and position it within the literature.

Our presentation and elaboration of vulnerable knowledge unfold over a further five sections. First, we survey the use of the concept of vulnerability within and beyond disaster studies. Vulnerability is understood to be an important way of making sense of differential risks posed by natural hazards, and of organising collectively to apprehend disaster. Despite its significance, the concept is thought about and used in multiple ways and has been an ongoing site of consideration and debate. Significantly, this includes recent efforts to theorise the relationship between vulnerability and political resistance through the work of Judith Butler (2015, 2016). Following this, we describe in more detail the research that was conducted. This sought both to de-centre the voice of the researcher through narrative interviews as well as to represent, refine, and analyse results through standardised reporting mechanisms. Having described what was done, the next two sections present and analyse what was found. An expression of concern for fragility in the knowledge base initiates an exploration of uncertainty generated by altered social, material, and environmental relations. One important way that this is shown to occur is through the loss of traditional ways of knowing and living with the land. While knowledge vulnerability is sometimes coupled with inaction, this need not be so. In the second analytical section, we investigate how sensitivity to historical and geographical specificity fosters connection with human and non-human others. This may occur interpersonally, through asking for and offering aid, or at a more epistemic level, where denial of the unity of knowledge outlines the possibility of alliances between worldviews. These connections, we argue, are not only examples of so-called vulnerable people and groups reclaiming their agency, but also offer promising ways to initiate action despite climate uncertainty. Lastly, in conclusion, we refocus on the problem of uncertainty to think through the ramifications of our approach to vulnerable knowledge for the study of climate change-related disaster.

2 | THE CONCEPT OF VULNERABILITY WITHIN DISASTER STUDIES

To be asked to approach or to label people as 'vulnerable' was, for some of the researchers in our team, a difficult and jarring task. The term seemed to less identify those at risk of disaster than to preclude the agency people have to name their own experience and place in society, and to undermine their manner of coping or indeed thriving in their situation (Bankoff, 2001; Weatherill, 2024). The common distinction between, on the one hand, a conceptualisation of inherent individual vulnerability and, on the other, groups of people made vulnerable by their social circumstances did not help. It was the act of identifying people as vulnerable, baked as it was into the methodological design of our project, that was difficult. This unease prompted inquiries into narratives of the development of 'vulnerability' within disaster studies, and some of the ways that researchers have sought to redefine its meaning and application.

Vulnerability is an important organising concept for the field (Cutter, 1996; Weichselgartner, 2001) and is often understood as marking a demarcation between two ways of thinking and dealing with disasters (Gaillard, 2010; Centemeri and Tomassi, 2022; Oliver-Smith, 2022). Before the rise in prominence of vulnerability, a hazards paradigm is said to have prevailed (Bankoff, 2001). Here, the focus was on the biophysical causes and properties of the natural

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events that precipitate disaster, and responses included the development of better prediction tools and warning systems. By contrast, the vulnerability paradigm signalled growing awareness of the role of ideological, economic, and social conditions in a hazardous event becoming a disaster. In this regard, it is not the event as such that leads to disaster, but rather people's susceptibility to its effects, whether due to underdeveloped material infrastructures, inadequate building and land use standards, poor access to resources, a lack of economic opportunities, social marginalisation, or other factors. This shift, from hazard to vulnerability, signals a move in the theorisation of disaster from the general to the more discrete, and in the epistemology of disaster research, from the natural and earth sciences to the more critical and qualitative social sciences (Hewitt, 1983).

While this narrative is useful for stressing the achievement of the social sciences in de-naturalising disaster, there are continuities and overlaps between the hazards and vulnerability paradigms. Efforts were made quite early on to highlight the social causes and determinants of disaster (O'Keefe, Westgate, and Wisner, 1976), and social scientists have long contributed analyses of the specific circumstances that heighten disaster risks (see, for example, Hewitt, 1983)—even if it would take several decades for the emergence of a more integrated model (Oliver-Smith, 2022). Similarly, the concept of vulnerability has not been the sole preserve of the critical social sciences. There are examples of natural scientists making use of the term in their modelling, just as economists and non-governmental organisations have used it to help measure and compare disaster risks.

In their presentation of the term, Methmann and Oels (2014) distinguish between three broad approaches: biophysical; social; and resiliency-based. The biophysical uses historical data on the size and scope of natural hazards and disasters to define an at-risk population. This tends not to take social or economic context explicitly into consideration, but attend to the distribution of people within areas classified as having experienced disaster. Vulnerability is thus treated as a spatial rather than social category, to be managed in a largely undifferentiated manner. The social approach, by contrast, is far more interested in the social, political, and economic causes of people's differential vulnerability. It focuses on structural forces in the identification of at-risk groups, often taking geographical and biophysical data into account. The goal becomes one of ensuring the safety of these groups, ultimately through state-provided or -sanctioned security. Resiliency asserts that those subject to disaster risks are best able to address them. This approach prioritises individual and community agency and leverages standardised tools and measures to encourage vulnerable populations to participate in disaster preparations and securitisations. With its emphasis on local awareness raising and education, resiliency responsibilises those most at risk of disaster into taking control of their own situation, with the consequence of ignoring higher-level decision-making.

Recently, efforts have been made to rethink the meaning and role of vulnerability in disaster studies (von Meding, 2021; Chmutina et al., 2023; von Meding and Chmutina, 2023). The argument begins with a critique of how the dominant use of the term plays out in disaster prevention, preparedness, and response. Too often, vulnerability becomes a label for individual weakness, generating paternalistic concern and pity, and in turn reinforcing patriarchal gender norms through a framework of liberal charity. The lack of local agency entailed in this approach to vulnerability has, so the argument goes, led to the emergence of resiliency-based approaches. But these are little better. For despite its aspirational intentions, resiliency is too easily captured by neoliberal funding frameworks that prioritise the figure of the autonomous individual and downplay the conditioning role of social and economic structures. The dominant use of vulnerability and its rejection both lead to an insufficient and undesirable policy response.

Rather than do away with the concept altogether, the goal of these researchers is to recover an alternate capacity of vulnerability. Drawing on Butler's (2015, 2016, 2020) work on public assembly, they position vulnerability as a feature of social relations and a condition for resistance to dominant power structures. In expressing vulnerability as a need for the care and assistance of others, one also allows for it in the formation of mutuality and commonality. Yet, not all expressions of vulnerability are progressive. The disavowal or displacement of vulnerability is a common tactic of the right, typified by the figure of the invulnerable male leader. As such, it is not the identity of the vulnerable *per se* that Butler is prioritising, but rather its emergence in situations where social and material infrastructures are taken away. It is this form of vulnerability that disaster researchers have identified as holding potential for more

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politicised and shared agency, wherein fundamental resistance to the conditions of disaster vulnerability may emerge.

While we have found inspiration in this rethinking of vulnerability, we worry that it is in too much of a rush to offer answers, and so may foreclose the productivity of the critical moment. Rather, our goal is to stay with the uncertainty and leave the definition unresolved. In this way, we hope to better come to terms with the multiplicity of vulnerability as expressed by our research participants.

3 | ACTIVE LISTENING, REFLECTIVE REPORTING

The research entailed 38 narrative interviews, which were conducted from October–December 2022 by seven researchers in four countries: Italy; Portugal; Sweden; and Turkey. Researchers identified interviewees in a variety of ways, including through personal and professional contacts, by reaching out to bottom-up initiatives working in potential, actual, and post hoc disaster zones, and by consulting state and municipal social services. The approach was exploratory, with the objective that interviews should encompass diverse intersectional vulnerabilities related to disaster, including gender, class, ethnicity, migration/citizenship status, sexuality, age, and disability. Interviewees ranged from 22 to 82 years in age, and were balanced between genders. While an effort was made to identify people with intersectional vulnerabilities, the impossibility of reaching everyone of relevance to the study was alleviated, in part, by asking participants about vulnerability and marginalisation in their area.

Ten interviews were conducted in each of Italy, Portugal, and Turkey, and eight in Sweden, usually in the native language of those countries but also in English where appropriate. The interviewee profiles varied by country. In Portugal, a significant number of interviewees were migrants reached through a social centre; many of whom also had gender- and class-related vulnerabilities. One interviewee was a migrant and the caregiver of a seriously disabled child. In Italy, the researchers made a special attempt to reach out to the elderly who had experienced floods in the late 1960s. They also interviewed migrants, one of whom was homeless, and two disabled persons. In Sweden, the research shed light on the ways climate change unfolds in the lives of Sámi reindeer herders, people who use the land for hunting and foraging, and practitioners of sustainable tourism. In Turkey, researchers addressed the 2021 wildfires, the largest in the country's recent history, focusing on Antalya and Muğla Provinces, and including among their interviewees small-scale farmers, firefighting volunteers, forestry engineers (who are responsible for managing the risk of forest fires), a non-binary person, and a member of Sarıkeçililer, a fully nomadic goat herder community in the Taurus Mountains, Mediterranean region.

Following an introduction to the project and its research objectives, interviewees were asked an open-ended question, the intention of which was to initiate the telling of a narrative (Hollway and Jefferson, 2000; Ayres, 2008). The narrative interview technique is well suited to an engagement with situated knowledges. Instead of having the interviewer play the role of interrogator, they are positioned as an active listener. Participants in the research become narrators of their own stories. Narrative interviews generate rich data from informant experience rather than interviewer expectation. This is not to deny the role (and relative power) of the interviewer in framing and producing narratives, nor to flatten the agencies and expressions of participants. While there is a place for prompts and follow-ups in narrative interviews, the initial question aims to be as open as possible to enable the participants to speak from their own standpoints.

For each interview, researchers constructed a narrative report. These combined systematic categorisation and summarisation of the interview data with a more open-ended narrative retelling (that is, the story of the participant as summarised by the interviewer) for the purpose of communicating the research findings to the wider research group. Difficulties entailed in translating narratives into English and accurately representing them within the report template structure were discussed collectively. An effort was made to preserve the tone and meaning of the interview, and researchers at times included explanations of difficult to translate words or expressions. The narrative reports were combined and analysed quantitatively and qualitatively, to pinpoint important and recurring themes,

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and then synthesised in a wide-ranging project report. In preparation for this paper, a second phase of thematic coding was undertaken by the writing team to identify how interviewees reflect on their knowledge and feelings of uncertainty. Our approach to this analysis has been interpretivist (Schwartz-Shea and Yanow, 2012), with emphasis placed on the qualitative intersections and diversities (rather than quantitative measures) of positions and perspectives.

Many of the indicative quotes that have been included in the analysis originate from the narratives compiled by the researchers and not translated interview transcripts. Care has been taken to ensure that these are an accurate representation of the words and views expressed by the interviewee, with the interviewer returning to the recording where this was felt to be important. Pseudonyms are used and identifying information has been removed.

4 | FRAGILITY IN THE KNOWLEDGE BASE

On 17 June 2017, following a heatwave during which much of Portugal experienced temperatures of more than 40 degrees Celsius, a series of wildfires broke out in the centre of the country. The fires, which are believed to have been sparked by dry thunderstorms, resulted in the deaths of at least 66 people, many in vehicles caught on a road outside Pedrógão Grande, and injured more than another 200. In excess of 1,700 firefighters were deployed to the site of the fires, with Portugal receiving international assistance from France, Italy, Morocco, and Spain. A three-day period of national mourning was later declared.

Pino was only around a kilometre from where fire broke out in Castanheira de Pera and considers himself lucky to have escaped its devastation. In his interview he described how quickly a nearby village was destroyed, with the fire easily overwhelming the preparedness efforts: the clearing of brush and installation of water tanks. Pino lives in the Lisbon municipality of Amadora. Among his various community activities, he is a volunteer for the municipal senior civil protection academy. Affected by what he witnessed during the fires, Pino made the claim: 'Our society is fragile on many levels. In the knowledge base itself there is fragility'. He worried that people, particularly those of a certain age, are not interested in thinking about disasters. But Pino also described how important social relations and conditions can be, both for communicating the risks of disaster and for making available to people the means to shift towards better preparedness.

We take Pino's provocation of fragility in the knowledge base as the starting point for exploration of our empirical material. His identification of age as a marker of difference, like many of the interviewees, appears to implicate not the young or the old but those of a working age. Often in our research we encountered a feeling of intergenerational knowledge loss, where many people are believed to be too busy to be involved in efforts to prevent or prepare for disaster, or too concerned with their material well-being to make the kinds of sacrifices that a response to environmental risk and climate change demands. The young are seldom blamed for this loss—often, hope and energy are invested in their potential to act as knowledge recipients and drivers of greater change.

For others, the principal social difference used to make sense of knowledge fragilities is not rooted in age but geography. Many rural regions of Turkey that were affected by the 2021 wildfires, such as those around İzmir and Muğla, have undergone significant development and been host to new arrivals from larger cities in the country, including holidaymakers and those looking for a permanent change of pace. Other areas have faced economic pressures that have required young people to leave home in search of work. It is sometimes said that these demographic shifts have entailed a loss of knowledge, whether due to the inability of older generations to pass on their way of life to their children, or because new arrivals are ignorant of how their behaviour affects the local environment and are unable or unwilling to learn.

Uncertainty can also be a gendered phenomenon. Disaster and the threat of disaster may reveal damaging forms of ignorance characterised by an emphasis on individual survival, heroism, and protection of the family and the home(land) from invasive others. We understand these tendencies, in part, to arise from and reinforce the prevalence of heteronormative masculine gender norms. This was evident in the misinformation and rumour that circulated

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alongside the Turkish wildfires. One of our interviewees described how local male youths, responding to speculation that the fire had been started by the outlawed and recently self-disbanded Kurdistan Workers' Party, set up a neighbourhood watch group in the nearby mountains. These young Turkish men are vulnerable to disaster in different ways than their female peers. They have fewer economic opportunities, being unable to work in the tourism sector, are exposed to nationalist and militarist discourses through compulsory conscription, and bear patriarchal expectations to protect the women and children of their families and communities. In a moment of stress and uncertainty, their vulnerability produced unsubstantiated knowledge that had the potential to turn into violence.

The resiliency-based approach to vulnerability has the effect of responsibilising individuals to learn about and take steps to mitigate their own disaster risk. Several of our interviews make it clear, however, that this approach to the relationship between knowledge and disaster ignores the day-to-day economic pressures that many people face. The starkest illustration of this is found in the narrative of Mohammed, an irregular migrant from Tunisia who has been living in Florence, Italy, for 31 years. For the past three years, Mohammed has been homeless and, when not in cold-weather emergency accommodation, sleeps rough. When asked about the threat of environmental change and disaster, he said: 'I have my own problems and I can't take care of other people's problems. Even if I want to, I can't help. I do not think about these things'.

Others perceive individual action as contributing little to the systemic institutional and transformative changes that are needed to tackle climate change, and are much more political in how they apportion blame for the failure to respond. Gunilla is a middle-aged woman from the south of Sweden who has been living in the country's north for more than half of her life. She was married to a reindeer herder and has learnt much about traditional Sámi food and cooking, and the forest ecology near where she lives. Gunilla works in tourism, and as a culinary artist and caterer. She says that with one leg in the urban south and the other in the rural north she is the right person to share knowledge about living with and on the land. For Gunilla, it is not differences in gender, age, or geography that explain fragility in the knowledge base, but manipulations of public debate:

> *One thing that hinders positive change is that knowledge is being used in the wrong way. With that I mean that it is possible to find arguments that support different perspectives. It becomes difficult to know who is wrong and who is right.*

Uncertainty is positioned here as an outcome not only of varied interpretations, but also the deliberate spread of information that casts the need for change into doubt. The mediation of information by those in power allows for a dissensus that maintains vested interest to the detriment of the common good.

At times, it is environmental change itself that casts doubt upon the validity and usability of knowledge. This is most evident in our interviews in northern Sweden, where the slowly unfolding effects of climate change are already having a profound impact on the ways that people perceive and relate to their surroundings.

Anders is an elderly Sámi man who owns a cottage in the forest near Jokkmokk. He has been walking, camping, foraging, fishing, and hunting on the same land for more than 50 years. In that time, he has witnessed significant change in the natural environment—an experience that has undone his firm denial of climate change. The problem is not only that nature looks and feels different, or that seasonal patterns and animal behaviours are not what they were, but that this is threatening established ways of knowing and living with the land. Anders described how late snowfall followed by a period of mixed warm and cold weather cause the snow to become crusted over with ice. This makes it difficult for free-roaming reindeer to dig for grass and lichen, meaning that they must be fenced in and given fodder over the winter. He also reflected on how difficult it has become to hunt forest birds. The population and distribution of grouse is in flux, and the ice makes tracking their movements difficult. 'My knowledge does not work anymore', he said. For those like Anders, who live or work very closely with the environment in northern Sweden, climate change is engendering an epistemic loss.

For Bosse, a Sámi reindeer herder who lives near Kiruna, unstable weather patterns mean that longer hours must be spent working on the snowmobile. He described the toll that this takes, mentally and physically, how it affects his

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social life and his family, and yet how difficult it remains to do a proper job and make ends meet. But it is not only humans that are affected, as Bosse noted in his interview:

> *We often have to forcefully herd the reindeer to new areas in search of food. When the reindeer can't find food, they lose their orientation skills and get confused. This means that we need to help them find their way to better grazing grounds and it can be quite stressful for them.*

While Bosse remains hopeful that knowledge can be adapted and built anew, and that he can persevere long enough to pass on what he knows to his children, he also spoke of the cruel contradiction that has been forced upon him. Like other reindeer herders, Bosse works as a contractor in mining and forestry in the slow months. He commented on how sad and hopeless he feels to have 'to sell his body and his labour power' to the very industries that make living as a herder so difficult. 'I feel like a prostitute', he said, implying that the situation is also one of compromised masculinity. Indeed, Bosse reflected on the gendered nature of vulnerable knowledge, stating that the prevalence of climate deniers and 'Greta (Thunberg) haters' is mostly a male phenomenon: 'Women seem to have more knowledge and awareness of these things. But I am often ashamed of other middle-aged men'.

In drawing out various ways that our research participants reflected on the fragilities of knowledge, whether personal, collective, or more-than-human, we traced some of the qualities of climate uncertainty and explored how they come to be implicated in vulnerabilities to disaster. Our purpose has not been to identify the definitive source of this unease, if indeed such a thing were possible, but rather to stress its co-existence with life under climate change. What these examples demonstrate is how shifting economic and environmental relations can undo the social and material regularities on which local and situated knowledges depend. It is this loss as much as environmental change itself that places people at heightened risk of disaster.

The state of vulnerable knowledge often seems to undermine the potential for action. Lorenza was a young woman when, in November 1966, high rainfall led to the flooding of the Arno River in Florence, killing an estimated 101 people and causing extensive damage to the city's famed buildings and artwork. Lorenza still lived there at the time of her interview, but struggled with her old age and a disabling autoimmune disease. She remembered the great collaboration and solidarity among those affected by the flood. Yet, she believes that people have largely forgotten what happened in 1966 and that her experience of the event is not considered of value to those at risk of disaster today. Reflecting on climate change inaction, she said:

> *There is no certainty. Broadly speaking, in my family, with neighbours, we often discuss climate change but in an inconclusive way. However, I repeat, this is also due to a notable lack of information and clarity. It is not known what the real effects of adopting specific climate change mitigation measures would be, while the costs are known. And we are therefore led to say no. … There is no willingness to change behaviours.*

For Lorenza, it is not non-belief or non-knowledge of the science of human-induced climate change that precludes action, but instead the uncertainty of what behavioural and social change would mean and whether this would make enough of a difference.

This pairing of inconclusiveness with stasis is not universal. Indeed, in conceptualising vulnerable knowledge as a practice of engagement, part of our objective is to find ways forward despite the uncertainty. It is to this task that we turn in the next section.

5 | NURTURING SENSITIVITY TO MULTIPLE VULNERABILITIES

Along with the rise of resiliency-based approaches to disaster vulnerabilities, increasing emphasis has come to be placed on the delivery of information to those deemed most in need (see, for example, Benadusi, 2014). The goal of

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such efforts is to raise risk awareness and encourage action that builds capacity to anticipate and respond to disastrous events. We have already discussed the political blindness of this approach. What also emerged from our interviews was the matter of its effectiveness.

Maura is a woman in her late twenties that volunteers for the Italian-wide 'I don't take risks' ('Io non rischio') campaign. 'I don't take risks' recognises that disaster vulnerability has a basis in social relations, and encourages citizens to make informed decisions and adopt preventative measures to minimise their disaster risk. For our interviewee, however, it is not always clear that the campaign is able to motivate change:

> *The reactions of the people, in the immediate term, are very positive. Some even imagine the precautions they will take on their return home. However, I am not at all sure that this has been followed up on later. Many will then have thought that there are other more urgent things to do and therefore their behaviour has not changed at all. They have a greater awareness, but then nothing changes. This is what I fear.*

Many of our research participants spoke about the distractions and difficulties that they and their communities face. But whether Maura correctly diagnosed the shortcomings of 'I don't take risks' is not really the point here. Rather, what we want to stress is the moment of pause that compels her to reflect upon the efficacy of the approach.

Awareness raising treats disaster risk as a problem of information deficit that is best addressed by assigning citizens the role of knowledge recipient. Troubling the certainty of this relationship is of value in that it heightens sensitivity to the multiple ways in which people perceive, understand, and act upon the conditions of their own vulnerability. In this section, we explore both the content and the context of vulnerable knowledge as communicated to us by our research participants, paying particular attention to how their knowing positions them in relation to natural environments and social infrastructures.

Our discussion begins with Aldo who is 82 years old, and a former volunteer and associate with Misericordia in Florence. In his interview, Aldo reflected on the natural hazards, both large and small, that he has experienced during his lifetime. In 1966, he was living in Grossetto, south of Florence, when both cities were flooded. He spoke of how he distributed food and clothing to people in need, and how, along with other young people, he helped clear mud from shops and streets. He remembered another major flood of the Arno River that occurred because of a problem with the Vadarno dams, and many mundane and more localised floodings that were caused by improper drain maintenance. Aldo also has first-hand experience of an earthquake in Florence, and of separate forest fires near Grossetto and Mount Amiata. 'All this by looking only at things close to us. But it happens all over the world', he said. Aldo's narrative, like that of Lorenza above, highlights how knowledge of the past lives on in memory, and that personal recollections have much to teach us about how present vulnerabilities are understood. What is perhaps most interesting here, though, is how his experience, while based in a specific geographical region, nevertheless allows him to make sense of things happening elsewhere.

Several of our interviewees, especially in rural parts of Sweden and Turkey, spoke in detail about the local specificities that inhere in their knowledge and practice of land and multispecies care. For Gunilla, who herself learnt and now teaches traditional knowledge of Sweden's north, this emerges through recognition of non-human life. In contrast to those that find the recent abundance of berries and flowers wonderful, she interpreted this as a sign of distress: 'It is like they want to release as much energy as they can and produce seedlings before they die. … It feels like the plants know that there is a catastrophe coming'. When describing the consequences of fencing in reindeer, she stated that 'there is a risk that reindeer forget the knowledge of retrieving food on their own'. These ways of sensing and connecting with the environment Gunilla aspires to convey to her customers as alternative, non-monetary valuations of the forest.

For others, an intimacy with place is paired not with the desire to teach, but to learn. Rana lives in the same village near Datça, Muğla Province, where she was born. After primary school, her parents did not allow her to continue with her education, and when she was 12 years old, they arranged for her to marry a much older man. Today,

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she and her second husband own three cows and hundreds of chickens, and sell milk, yogurt, cheese, and eggs. The animals are registered in the name of Rana's husband, even though she performs 80 per cent of the work. The gender inequalities that Rana has endured have not prevented her from cultivating a caring relationship with other beings; she described how her animals are never far from her thoughts, how they follow her around, and how they respond to her when she calls for them by name. During the 2021 wildfires, she resisted the authorities' efforts to cut their ropes and free them, fearing that they would become confused by the smoke and run into the path of the fire. Rana and her children endured considerable danger to ensure their safety. And yet while she speaks of the fire as 'like a hell', she also recognised it as a part of a longer cycle of life and death:

> *The trees have already started to sprout after the fire. People plant trees for their own interest. Nature destroys itself but also regenerates. We will have more of yellow morel this year. I don't know if it is bad to say this, but after every fire, there are these mushrooms which are very delicious.*

Rana is connected to her animal companions and to the land where she lives, and understands much about their susceptibilities and responses to fire. At the same time, she resists closing off her way of knowing and being from others. She is happy that people have migrated to her village because it has encouraged locals to learn new and different things. Similarly, Rana said that if she had the power to change, she would educate herself as a nurse for the elderly. While there is pause and self-undervaluation here, we also understand this as a gendered modesty that opens towards the potential for mutual care.

It is well recognised in disaster studies and in keeping with Rana's narrative that community and collectivity often arise in the midst and aftermath of disaster (see, for example, Matthewman and Uekusa, 2021). This was something that we encountered in many of our interviews, especially in recollections of the 1966 Florence floods and the 2021 Turkish wildfires. One Turkish volunteer, a 35-year-old, non-binary activist, called their experience of dialogue and collaboration that bridged established social divides 'a hopeful moment'. But it was another interview that made explicit the relationship between such assistance and sense of uncertainty that our analysis is most interested in drawing out, that of Bernado.

Bernado is a retired Italian man who has been fully blind since 1990. He described his blindness not principally as a disability, but in terms of what losing his sight has taught him about acceptance and change. After he became blind, Bernado worked and volunteered in social and health services, and became more aware of the geography of the city and the kinds of hazards that it presents to those without sight. Reflecting on how the changes he has endured might inform disaster prevention, preparedness, and response, he said:

> *The heritage and experience of people with disabilities should teach us to believe in our own possibilities and rely on ourselves without being afraid to ask for help if some things cannot be done alone. This approach helps to deal with unforeseen situations such as a scooter or an electric car passing by and you don't hear them because they are silent. So, even when you think you are in a safe condition, there is always the unexpected that is not calculated.*

In adapting to his disability, Bernado has learnt to accept and anticipate the uncertain and unknown, and through this to recognise when to ask for the help of others. This relationship between loss, uncertainty, and assistance aligns with Butler's (2016) assessment of the productive capacities of vulnerability. It also suggests a way to position disaster communitas within the longer tradition of work on the social basis for disaster, such that it is not the event per se that induces collaboration but rather the threat that it poses to the social and material infrastructures on which certainty depends.

This mutuality operates not only at the level of human (and non-human) sociality, but also epistemically, that is, in terms of the methods by which disaster risk comes to be understood. Can is a young herder with Sarıkeçililer, one of the last fully nomadic groups in Turkey, and works to ensure that their lifestyle is sustained. He and his people

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attribute a much more active role to nature than is found in the ontology of scientific rationalism. 'We consider not only animals and plants, but also water, stone, or fire alive. We don't put out water on a fire. The best way is leaving it to subside', he said in his narrative. His perspective is a more-than-human one, in which an enduring relationship with animals and the land on which they live gives rise to a deep knowledge and sense of place. This bears on the way that wildfire risk is managed, such as by reducing tinder through controlled burning and goat herding. In the words of Can:

> *The goats might not prevent the eruption of the fires themselves, but by consuming that dry surface, they prevent the spread of the fires. We know that all the areas where the fire erupted and spread into were areas without goats. In a study of the aftermath of the fire, we collected samples from our goats' excrement. We saw that the seeds in their excrement could sprout even after two years. The goats are like a seed depository*.

One way that Can practices and preserves his people's knowledge is by initiating encounters with mainstream scientific culture. He engages with academic literature and seeks to achieve recognition through practices of experimentation, verification, and validation. While difficult, transdisciplinary exchange has been recognised as improving the translation of science into policy (see, for example, Berkes, 2012; Kimmerer, 2013). Finding ways to bridge worldviews responds to climate uncertainty by strengthening both the knowledge base and the social and political foundations on which action may proceed.

The expressions of agency and collective action assembled in this section suggest a different way of thinking about disaster vulnerability. It is not only that the knowledge, experience, and community of local actors could be drawn upon better, but that the manner of achieving this must be sensitive to the multiplicities, fragilities, and even uncertainties of situated experience. In our concluding remarks, we reflect on what these research encounters and reflections have come to mean for us.

6 | CONCLUSION: TOWARDS A MORE VULNERABLE KNOWLEDGE

Vulnerability has been of great importance in thinking about and organising to prevent disasters and their consequences. It marks recognition of the social context of disaster risk and underlines the importance of social scientific expertise in disaster prevention. However, the concept is not without its problems. For some, it acts as a denigrating label that is imposed unwillingly from above, and reinforces a paternalistic approach to the poor and socially marginalised (Bankoff, 2001; von Meding and Chmutina, 2023; Weatherill, 2024). Rather than identify and win support for those in need, such acts of labelling are felt to counteract local agency. Yet, more bottom-up formulations and approaches to vulnerability, especially those most closely associated with resiliency, are little better. In prioritising local action outside of its social, economic, and political context, they can overload individuals with the responsibility to attend to circumstances that they played no role in creating, and in so doing depoliticise responses to poverty and marginalisation.

While these limits and difficulties have long been recognised by critical disaster researchers, the best way to respond remains problematic. One approach would be to reject the concept of vulnerability completely. While this was something that we discussed at length, it was felt that to do so would be to set aside a rich and valuable research tradition. What is more, by giving up on vulnerability there is a risk of ceding further intellectual and policy ground to neoliberal actors championing resiliency perspectives. Another approach would be to try to frame the concept in different terms. Efforts within disasters studies to do exactly this hold potential. By rethinking connections between vulnerability, resistance, and political change, they overcome the impasse between state-directed and local-responsible disaster preparedness. While we find this work inspiring, we have taken a different approach in this paper. By not settling upon a specific and narrow meaning for vulnerability, we have sought to prolong our feeling of

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uncertainty so that we might engage more closely with the diverse and at times confusing ways that vulnerability emerges within our research data. The result is something ambiguous and incomplete, but nevertheless, we hope, rich with possibilities for thinking through these relationships in new ways.

Building on one interviewee's observation of fragility in the knowledge base, we have explored various ways that the loss of knowledge and certainty is recognised and explained. This moved across grounds for marginalisation and difference, starting with age and geography, before attending to gender, or more specifically the danger of certain vulnerable masculinities, and economic deprivation. Focusing on Sámi populations in Sweden's north, we then encountered epistemic loss engendered by environmental change, the consequences of which are felt not only in terms of traditional knowledge and ways of life, but also familial and community relations, and sense of self-worth. Throughout, we sought to prioritise the intersectionality of people's experiences by giving details about their lives and not overdetermining their views with assumptions about their identity.

In response to the stasis or lack of action that associates with vulnerable knowledge, we welcomed a moment of pause and reflection on method, with the hope that this would promote learning from the multiple ways that people make sense of and respond to their vulnerabilities. This was examined historically, in terms of recollections of hazards and disasters, and geographically, in terms of place-based connections to animals and environments. These expressions of local knowledge often lean towards others, either through learning or care practices, or through wider expressions of collectivity. The narrative and words of an elderly blind man were evoked to thicken the connection between vulnerability, uncertainty, and aid. Finally, we circled back around to knowledge practices to show how the forging of alliances also operates at an epistemic level. These multifaceted examples of people and groups labelled vulnerable, suggest ways to work and act together despite, and in some cases even because of, their basis in uncertainty.

From the plural vulnerabilities discussed in this paper emerge a sketch of an alternate programme for disaster prevention, preparedness, and response, one more committed to intersectional experiences, situated knowledges, and multispecies solidarity and co-existence. Our research participants have multiple subject positions, such that the vulnerabilities they experience and express are an outcome of many and at times conflicting social relations. Unqualified assignment of them to one or another (assumed to be) vulnerable group (such as women, migrants, the poor, the elderly, the indigenous, or the disabled) too easily obscures not only the intersectionality of their position, but also the agency that they are able to find through engagement with their surroundings and, in some instances, at the limits of their perception and understanding. Furthermore, their narratives raise possibilities for affirmative dispositions towards uncertainty, and in each can be found suggestions for how broader social change might be achieved: modesty, curiosity, capacity building, a willingness to connect with others, and recognition of and support for those most affected by climate change-related disaster.

Centring and valorising the local in disaster management has ramifications for academic and other forms of expertise. In researching vulnerability, we have also made ourselves, our authority, and our expertise vulnerable to others. This has been done in accordance with our status as learners. Methodologically, our research has involved active listening to our participants and working closely with their stories. We believe that this has allowed us to think alongside our participants, and draw out the multiple meanings and possibilities of their experiences. But this researcher positionality is also a form of engagement with the uncertainties of climate change. Our suggestion for a more vulnerable knowledge is a call to be responsive to the ongoing ambiguity and indecision of our changing circumstances—a kind of 'staying with the trouble' (Haraway, 2016). This is not only a scientific commitment, but also something felt and lived. Our hope is that this research disposition, applied to disaster studies, will hold open the space for pluralisation and contestation, and so help the field to live up to its ambition to better the involvement of local knowledge in disaster planning (Wisner, Gaillard, and Kelman, 2012; Gaillard, 2019).

Despite the best efforts of research and policymaking, events will always occur in defiance of what has been planned, pushing knowledge beyond the bounds of its applicability. This is true for scientists, and state and non-governmental actors, as well as for local and indigenous knowledge holders. Climate change is likely to make this worse. What can be done when the natural environment cannot be perceived or reckoned with in the way that it

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once could? What is to be done, to recall the words of Anders, when our knowledge does not work anymore? As our interviewees recounted their uncertainties and vulnerabilities not as weaknesses but as sources of attention, care, and change, we have sought to learn from them and apply their approach to the way we think about disaster.

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This research was conducted in accordance with the ethical standards and laws of the research institutes and countries where it took place. All participants were informed about the research goals in clear, accessible language, and written consent was obtained. Their anonymity and confidentiality were strictly maintained. All names mentioned in the article are pseudonyms.

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The data that support the findings of this study are available from the corresponding author upon reasonable request.

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