

MUZAYIN NAZARUDDIN

Semiotics of Natural Disasters:
The Entanglements of Environmental
and Cultural Transformations



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LIST OF PUBLICATIONS INCLUDED IN THE DISSERTATION

- I. Nazaruddin, Muzayin. 2022. The role of natural disasters in the semiotic transformations of culture: the case of the volcanic eruptions of Mt. Merapi, Indonesia. *Semiotica* 246: 185–209.
- II. Nazaruddin, Muzayin. 2023. Contestations of cultural memory at a disaster monument: the case of the Aceh Tsunami Museum in Indonesia. *Social Semiotics* 33(3): 560–579.
- III. Nazaruddin, Muzayin; Magnus, Riin. 2023. The post-disaster transformation of interspecies dependencies: From talkative buffalo to desemiotized cows on the slope of Mt. Merapi. *Sign Systems Studies* 51(1): 128–152.

This paper was jointly written. I contributed to the empirical findings and conclusions from my fieldwork, analysing them within specific socio-economic conditions and placing the findings within a semiotic framework.
- IV. Nazaruddin, Muzayin. 2024. Religious modeling of a natural disaster: a cultural semiotic study. *Chinese Semiotic Studies* 20(1): 187–209.

INTRODUCTION

When I began this research, I held a semiotic assumption that a disaster is fundamentally based on acts of interpretation. The ways we perceive extreme natural events, such as volcanic eruptions, earthquakes, or tsunamis, as disasters involve interpretation and meaning-making. However, this assumption has led to more specific questions that have accompanied me throughout the research: What counts as a disaster in the first place? How do people actually make sense of disasters? Why do they happen? Are they the result of natural events, human error, or something else? Moreover, every disaster, regardless of its scale, is followed by recovery efforts that often involve various social actors, including governments and aid organisations. I believe that the way people interpret disasters is closely linked to the social dynamics both before and after the event. These dynamics shape how people understand disasters, and in turn, these interpretations can influence how recovery efforts unfold. But how can these dynamics be truly grasped, and how can semiotics help explain them more coherently and methodologically?

The relationship between an extreme natural event and the pre- and post-event sociocultural dynamics led me to another critical question that persisted throughout this doctoral research: Do extreme natural events, commonly referred to as disasters, bring about cultural changes within affected communities? If so, how do those changes happen, and which socio-cultural factors contribute to those transformations? How can a semiotic approach illuminate the process of cultural transformation in the wake of disaster?

Although it is possible to approach these questions from a more deductive and theoretical stance, I have deliberately selected an approach that begins with first-hand empirical data gathered through fieldwork. Subsequently, I analysed the data gathered and examined them through various theoretical lenses, especially the legacy of Lotmanian semiotics, ecosemiotics, and political ecology. This is especially relevant for our historical epoch given the rising frequency of natural disasters and the escalating environmental and climate crises, which do not have uniform effects globally.

Since its inception in the 1960s, disaster studies has been an inter- and trans-disciplinary field, incorporating insights from diverse disciplines, such as anthropology, sociology, public policy, and engineering, with a strong emphasis on pragmatic knowledge application. I believe semiotics, with its focus on the signs and meanings involved in the formation of disasters, has significant potential to contribute to disaster studies and vice versa, although this potential has not yet been fully realised. While engaging with both fields during my doctoral research, I realised a fundamental difference in their ways of doing research on, and writing about disasters. Semiotic approaches to disasters are often predominantly theoretical, and focus on intricate discussions of fundamental concepts that often do not require any empirical data and do not consider any practical applications. Disaster scholarship emphasises empirical research, utilising both qualitative and

quantitative methods. This observation, though seemingly trivial, highlights the lack of dialogue between these fields. This thesis, both with its empirical research as well as theoretical elaborations, aims to further the dialogue between the two fields of study. In addition, this semiotic study of disasters will address a research gap in disaster studies, specifically the limited research on long-term socio-cultural processes following a disaster and the historical context preceding it, as disaster scholarship is largely focused on immediate behavioural and organisational responses (Oliver-Smith 1996).

While the papers of the thesis all have an empirical starting point, the current frame opts to provide more comprehensive theoretical reflections on the different topics of the papers, involving both semiotics and disaster studies. This thesis frame is organised into six chapters. Chapter One introduces the research sites of my thesis and the data gathering methods. Chapter Two provides a review of existing semiotic studies of disasters. In Chapter Three, I bring the semiotic lines of investigation into dialogue with the main paradigms in disaster studies. This chapter also investigates the different kinds of semiotic phenomena involved in disasters, enabling a consideration of both socio-cultural features and natural hazards. Additionally, it provides an understanding of how these natural and cultural elements intertwine in shaping natural disasters. Chapter Four focuses on post-disaster continuities and transformations as one of the key issues both for semiotics and disaster studies. Chapter Five explores meaning-making contestations and the hierarchy of knowledge in disaster interpretations, particularly between indigenous knowledge and scientific frameworks. In Chapter Six, I provide final reflections on this doctoral project, with a focus on the methodological and ethical considerations that emerged during this doctoral research.

1. RESEARCH LOCATIONS AND METHODS

This thesis provides empirical insights from qualitative longitudinal studies conducted in two post-disaster research sites in Indonesia: the Banda Aceh and Aceh Besar Regencies after the 2004 tsunami, and several high-altitude villages on the slopes of Mt. Merapi in the Sleman, Magelang, Klaten, and Boyolali Regencies following the 2010 Mt. Merapi eruption (Figure 1). The Indian Ocean Earthquake and Tsunami on December 26, 2004, the largest natural disaster in modern Indonesian history, resulted in over 160,000 deaths. It washed away several coastal villages, and destroyed nearly all infrastructure within a few kilometres of the coastline in Banda Aceh and some other districts along the west coast of Aceh Province. The 2010 Merapi eruption was also an extreme natural event, claiming 353 lives and leading to the evacuation of more than 360,000 residents. This major 100-year cycle eruption (Surono *et al.* 2012) peaked between October 26 and November 5, 2010, with pyroclastic avalanches reaching up to 15 kilometres in Cangkringan District, Sleman Regency, burying and burning the villages in its path.



Figure 1. Research locations (the map was developed using the images captured from Google Earth, the inserted map of Indonesia was modified from the source: https://commons.wikimedia.org/wiki/File:Indonesia_map_of_Timor.png).

My first contact with the local people in both locations happened during the emergency response phases of these two extreme natural disasters, when I was engaged in some humanitarian work. In Aceh, I participated in various tsunami emergency responses from January to April 2005, including distributing aid, managing emergency education, and providing psychological support. On the slopes of Mt. Merapi, in November and December 2010, I volunteered as an editor and reporter for an online community media outlet focused on mitigating the effects of the eruption.

Since then, I have visited both areas regularly for academic research on a diverse array of topics, also for other social purposes, such as accepting locals' invitations, attending local ceremonies, or conducting workshops. I did these non-research social activities much more with the local communities on the slopes of Mt. Merapi as my house is located on the lower slope of this volcano. They are accessible via a short, half hour drive. In addition to these informal visits, I have conducted more structured fieldwork in 2013, 2019, and 2021. This work focused on diverse but interrelated topics, such as the local perceptions of the 2010 eruption, memories and knowledge of past eruptions, cultural and economic changes following the eruptions, the new settlements and their social dynamics, the emerging 'lava tour' tourism business based on the eruption's ruins and materials, relations between the local communities and the government, local engagements with the scientific knowledge about the volcano, local peoples' relationships with their domestic animals, and other related issues. During these three fieldwork periods, I interviewed more than 50 informants, recruited with the snowball sampling method. These informants included the caretaker (*juru kunci*) of Mt. Merapi, village heads, hamlet heads, government officials, volunteers, humanitarian workers, researchers, farmers, local leaders, religious figures, managers of lava tour enterprises, jeep owners, local youth, and elders. Some key informants were interviewed more than three times. Additionally, in 2022, I conducted a survey with 160 participants from four different areas, examining the relationship between trust, government communication models for delivering risk messages, and risk perceptions regarding the eruptions and the COVID-19 pandemic. Although I did not use the survey data directly in this thesis, it provided valuable insights, particularly regarding how the locals socially construct their risk assessments.

In Aceh, I conducted qualitative fieldwork in 2016, 2017, 2019, and 2021, focusing on tsunami memorials and cultural memory of the tsunami, post-tsunami landscape changes and human settlements, post-tsunami spatial organisations, and sociocultural transformations following the tsunami. From 2022 to 2024, I visited Aceh regularly, three to five times per year, with each visit lasting around two to three weeks, to conduct research on fishing communities in Aceh. This research explored their daily interactions with the surrounding environment, the maritime customary law and its social institution called Sea Commander (*Panglima Laot*), and the ongoing disputes between customary laws and modern sea conservation discourse, among other topics. Although this research was not directly related to my thesis, it provided valuable insights, especially from my fishermen informants regarding their tsunami memories and the attachment with their coastal villages. During these fieldwork visits, I interviewed more than 60 informants, using the snowball sampling method, including the Sea Commander (*Panglima Laot*), village head (*keuchik*), religious leaders, fishermen, youth, activists, government officials, researchers, journalists, museum curators, and writers. Some key informants were interviewed more than three times.

The empirical data was gathered through a combination of methods, including participant observations, semi-structured and open-ended interviews, informal

discussions, and some focus group discussions. Participatory observations were conducted by following the daily activities of the locals, such as managing lava tours, farming, raising livestock, and spending free time in a coffee stall. All interviews and focus group discussions were conducted in Bahasa Indonesia, recorded and transcribed. I have translated them into English for the quotations in the papers included in this thesis. Before the interviews and focus group discussions, I asked for, and received, verbal consent from the informants to record the interviews or discussions, and to use the materials in my research.

2. SEMIOTICS OF NATURAL DISASTERS: KEY TOPICS AND LINES OF INVESTIGATIONS

In the past decades, calls for semiotic studies of disasters have emerged both from the fields of semiotics and disaster studies. A call to explore the role of culture and symbolism in comprehending disasters was put forth by David Alexander, the former editor-in-chief of the *International Journal of Disaster Risk Reduction*. In his contribution to an edited volume dedicated to disaster definitions, he proposed that disaster phenomena “are endowed with meaning” (Alexander 2005: 30). According to Alexander, understanding the semiotic significance of disasters is crucial in our contemporary history, where disasters are intricately intertwined with globalisation processes and their meanings are closely tied to media representations (Alexander 2005). He further emphasised that all three branches of semiotics – namely semantics, syntactics, and pragmatics – could collectively contribute to a deeper understanding of the intricate processes involved in interpreting disasters (Alexander 2012). On the semiotics front, Hanliang Chang (2006: 218) built upon Umberto Eco’s (1984: 15) assertion that “any natural event can be a sign”, prompting the question, “why hasn’t there been a semiotics of disaster?”

However, it appears that there are only a few semioticians, who have delved into discussions regarding natural disasters, or conversely, disaster scholars who have adopted a semiotic perspective. Drawing a comprehensive conclusion about the current state of semiotic studies of disasters is challenging, given several factors. Firstly, it is important to note that not all authors who employ a semiotic approach in their research, such as an awareness of the multi-layered and multi-interpreted meanings of disasters, necessarily employ the conventional semiotic terminology or even explicitly mention semiotics in their works. This tendency is particularly evident in anthropological investigations of disasters. In these investigations, researchers frequently emphasise the significance of comprehending disasters through various lenses. Notably, the analyses tend to focus on the emic perspective of those who have experienced the disasters themselves, and delve into the issues of cultural embedding (see Hoffman 2015; Albris 2022a). Secondly, there are instances where authors incorporate semiotic concepts into their work, but their engagement with these concepts might be superficial, merely employing them in a general sense (as seen, for example, in Maldonado 2015). Thirdly, the greater the degree to which semiotic approaches to disasters are merged with specific terminology of different disciplines, from anthropology to human geography, the more difficult it is to delineate the semiotic cores of the studies.

Disaster studies, as an emerging academic field, has been interdisciplinary or even transdisciplinary since its inception. Scholars from diverse fields convene, discuss, and collaborate on complex disaster phenomena. Thereby, certain academic disciplines exhibit more semiotic sensitivities, as evidenced in some major edited volumes consisting of contributions that unfold the dynamics of meaning-

making processes. For example, “The Angry Earth” (Oliver-Smith, Hoffman 1999) and “Catastrophe & Culture” (Hoffman, Oliver-Smith 2002) are two seminal works in anthropology, “Natural Disasters and Development in a Globalizing World” (Pelling 2003) feature significant contributions from geography scholars, “Natural Disasters, Cultural Responses” (Mauch, Pfister 2009) provides contributions from environmental history scholars, while “Interpretations of Calamity” (Hewitt 1983) presents perspectives from human ecology. In addition, “Cultures and Disasters” (Krüger *et al.* 2015) includes contributions from anthropology, geography, history, development studies, and other disciplines.

Given the above-mentioned limitations, this second chapter of the thesis does not aim to provide an exhaustive overview of all existing semiotic approaches to disasters, but rather outlines the landscape of current semiotic studies on disasters by focusing on recurring themes that also relate with the current doctoral thesis. These themes encompass the semiotic definitions and delimitations of natural disasters, the post-disaster social and cultural transformations, disaster memory and commemoration, and the representation of disasters. Concurrently, I will contextualise my own research and the papers of the thesis in relation to these themes.

2.1. Semiotic definitions and delimitations of natural disasters

The initial semiotic explorations into natural disasters have revolved around the fundamental issue of defining and delimiting the phenomenon. Researchers have pondered what constitutes a natural disaster and some scholars have proposed that a natural disaster involves a dual progression of signs: ‘*signa naturalia*’ and ‘*signa data*’ (Chang 2006; Morimoto 2012a). Han-liang Chang (2006) termed the initial stage of a natural disaster as ‘*natsign*’, where a natural event is observed as a prospective indication of an absent event, such as receding sea water potentially foretelling impending tsunami waves. In this preliminary level, a natural event functions as a *natsign*, representing sheer potentiality (Morimoto 2012a). Employing Peircean semiotics, especially Peirce’s idea of habit or law, Chang (2006) and Ryo Morimoto (2012a) argued that when an individual perceives a natural event and interprets it as a *natsign* for another impending natural event, an indexical relationship between these events is forged, grounded in prior experiences that give rise to established laws or habits. The subsequent stage occurs when this indexical connection is realised and thereby the *signa data* is brought about (Morimoto 2012a). For instance, this occurs when tsunami waves follow the earlier receding sea water.

As also mentioned by Morimoto (2012a), the differentiation between *signa naturalia* and *signa data* originates from Augustine in his “De Doctrina Christiana”. Yet, in Augustine’s work *signa naturalia* refers to signs that exist without any intention or will to signify, while *signa data* refers to signs intentionally conveyed for the purpose of communication (see Jackson 1969: 13–15). Given the definitions of Augustine, a natural disaster, as an event, may be preceded by

both *signa naturalia* and *signa data*. For example, a tsunami may be preceded by *signa naturalia*, such as earthquakes and rapid receding of sea water levels. Similarly, a volcanic eruption may be preceded by *signa naturalia*, such as earthquakes and rumbling sounds, as well as by *signa data*, such as wild animals fleeing the forest and communicating the potential threat to each other.

It is important to notice, however, that in the previous examples, the natural phenomena can be discussed in semiotic terms only when they are recognised as signs of the subsequent hazard. This aligns with a basic semiotic principle that a sign only functions as such when it is recognised as a sign (*cf.* Parmentier 1994: 4). However, it is also possible that humans do not recognise them as signs, and merely perceive them as natural phenomena without a representational quality. In the third chapter of this thesis, I will refer to this as a ‘lack of semiotic awareness’. It is very possible that a community, after experiencing a natural disaster, may reflect on their experience and come to understand the relationship between the *signa naturalia* and the extreme natural event.

Han-liang Chang (2006) and Sungdo Kim (2006) also proposed another temporal model of natural disasters. In this framework, the semiotic aspect is delineated as a distinct phase within the disaster processes. They contend that a natural disaster encompasses three phases: the occurrence of a natural event, the interpretation of this event, and the aftermath of the event (Chang 2006: 224; Kim 2006: 236). It is worth noting that since a natural event is only understood as a disaster when it brings adverse effects to humans (Chang 2006), one can observe an intertwined interdependence among these phases. The classification of a natural event as a disaster hinges on its detrimental impact on humans, with interpretation serving as the link between them.

This definitional issue is fundamental for the current thesis, and the third chapter of the introduction will delve deeper into that. In doing so, I will compare these semiotic characterisations of natural disasters with existing disaster definitions in disaster studies and the delimitations of disasters in the current thesis.

2.2. Post-disaster cultural and social transformations

Another important topic addressed by semioticians, as well as by disaster scholars, concerns the social and cultural aftermath of the disaster, specifically whether a disaster will result in cultural continuity or discontinuity. In general, existing semiotic studies suggest that natural disasters may serve as crucial events, revealing the continuity of sociocultural systems (see Parmentier 2012; Morimoto 2015).

Richard Parmentier (2012), a semiotic anthropology scholar, proposed that we should discuss this matter through the lenses of cultural models of change with regards to a given culture. He suggested that responses to disasters, often perceived as sudden changes, should not be easily interpreted as signs of cultural changes. Parmentier (2012: 240) concluded that “responses to sudden change might not be self-evidently about change at all.” Similarly, Ryo Morimoto,

another semiotic anthropology scholar, has suggested that “Disaster does not destroy a structure; it only reveals existing thick layers of sedimented structures through its defence against a threat of the experience of discontinuity, or a ‘change of system’” (Morimoto 2012a: 272). This conclusion stems from the notion that culture resembles a palimpsest, wherein norms and values are layered akin to a manuscript, and fundamental norms become more deeply entrenched over time. A sudden disaster, as an event that disrupts the norm, has a significant impact – highlighting the semiotic awareness of these norms and their regulations (Parmentier 2012). However, a disaster merely exposes the ‘deep social grammar’ of a particular culture without fundamentally transforming or impairing it. While a disaster may induce a ‘change in the system’, allowing for the continuity of the fundamental social structures, it doesn’t typically engender the more comprehensive ‘change of system’, which often unfolds gradually. In this sense, we may compare disaster as a sudden change, for example, with Lotman’s (2009) exploration of explosive change, which discusses more fundamental changes that take place over an extended period. Likewise, Morimoto (2015) has emphasised in subsequent works that a disaster is indeed a sudden change, unveiling the deeply rooted social grammar and facilitating change in the system, but not triggering a change of system. According to Morimoto (2015: 559), ethnographic studies of societies experiencing swift social transformation and traumatic disruption of their assumptions provide insight into the beginnings of sociocultural continuity.

This topic is also especially important for the current thesis, which I will discuss in more detail in the fourth chapter of this introduction. Apart from the fact that this issue has been an enduring topic of debate among disaster scholars, Papers I, III, and IV included in this thesis offer arguments that disasters are closely related to profound cultural transformations. Paper I examines how the periodic eruptions of Mt. Merapi, entangled with ongoing social processes, have played a fundamental role in accelerating cultural changes within the local communities. The changes include the adoption of new scientific signs for understanding the activities of the volcano, which further fundamentally transform the way humans perceive and interact with their environment. Paper III focuses on the human and non-human animal relations on the slope of the Merapi volcano, and argues that eruptions may serve as the final propulsion for broader transformations already taking place within a society. The shift from plough buffalo to dairy or beef cattle reflects an extensive adoption of a market economic system within local communities, as well as deeper semiotic transformations of human-environment relations. Paper IV discusses the relationship between disaster and religion in the aftermath of the 2004 tsunami in Aceh. It demonstrates how the tsunami had a significant impact on the practice of Islam in Aceh, as reflected in the post-tsunami transformation towards the implementation of the Islamic system of legal codes known as Sharia Law.

These papers demonstrate that we should not unmoor disasters from their historical contexts, especially in the long-term analysis. Birgitte Sørensen and Kristoffer Albris (2015: 66) have argued that “disasters have a continuous life as part of the history and organisation of communities and societies. They are

created by the conditions of society, and in turn reshape society.” Long-term, historical and contextual analysis may reveal how natural disasters play important roles in the ongoing cultural transformations of affected communities. This argument is congruent with some archaeological and historical studies, which have revealed that disasters, when viewed from a long-term perspective, have led to fundamental cultural transformations, or have served as significant explanations for certain cultural evolution (Oliver-Smith 1996; Hoffman 1999). On the other hand, most anthropologists also argue that the paths and trajectories of changes or continuities after the disasters are almost impossible to predict (see Oliver-Smith 1996; Sørensen, Albris 2015).

2.3. Disaster memories and commemorations

Another topic that has been explored from a semiotic perspective is disaster memories and commemorations. One of the most basic tenets here is that remembering and forgetting are two sides of the same coin: in the aftermath of a disaster, affected communities are in a two-fold state of remembering and forgetting the disaster (see Paper II of this thesis; see also Miller, Bunnell 2011; Samuels 2019; Ullberg 2010). Based on her ethnographic fieldwork in Aceh after the 2004 tsunami, Annemarie Samuels (2019: 84) described the tension as originating from the fact that the disaster is “not always remember[ed]”. In this sense, “These ways of dealing with memory may open up the possibility of forgetting: remembering but not always having the memories at the forefront of one’s awareness, not always being confronted with the sadness that memory may bring” (Samuels 2019: 94).

Some studies have explored how disasters can bring attention to pre-existing social values and memories that are layered like a palimpsest (Morimoto 2012a; Madsen, O’Mullan 2013). According to Ryo Morimoto, in the aftermath of a disaster, the past is inherently uncertain, existing as a potential for multiple interpretations that are all available for present activation. However, as memory does not exist in isolation within society, its actualisation should be facilitated by certain acts of commemoration that selectively articulate, delimit, and solidify its reference (Morimoto 2012b). At the same time, disaster memory is always selective and political (Le Blanc 2012; Ullberg 2010), “People not only remember by something [...] they also use memory for something” (Morimoto 2012b: 165). Remembering the past is a struggle of interpretations, which may be intense when multiple beliefs about the past exist. Fundamental questions arise, such as which aspects of disasters should be remembered and which elements should be forgotten. In this context, remembering or forgetting disasters is not merely about selecting elements deemed worthy of remembrance; rather, it is the result of “an active exercise, combining strategies for absencing, or silencing some elements of the past, present, and future” (Monteil *et al.* 2020: 287).

At this point, Morimoto (2012a) introduced the concept of semiotic regimentation as a significant semiotic process in the aftermath of a natural disaster. The

process minimises variance in interpretations of a disaster by endorsing a specific version that represents the collective memory of the event. The need to anchor past disaster experiences and construct a collective memory of disasters is primarily driven by the desire for stability and certainty, particularly during recovery periods marked by uncertainty, conflicting interests, and anxieties (Monteil *et al.* 2020). Paper IV of this thesis illustrates how the regimentation of tsunami memory into a single dominant meaning – as a trial from God – has enabled locals to accept the disaster, view their deceased families and relatives as God’s martyrs, and consequently move on with their lives (see also Samuels 2019).

Combining Juri Lotman’s (2019; see also Lotman, Uspensky 1978) and Aleida Assmann’s (2008) theory of cultural memory, I termed this process ‘the canonization program of the cultural memory of the disaster’. This canonization program is reflected in disaster monuments, commemorations, and other mnemonic tools, through which the elites in power propose their version of the disaster memories (see Paper II of this thesis). In this process, the nation-state or the ruling elite facilitates the propagation of a comprehensive narrative of the disaster, determining “what aspect of the event is to be remembered, which image(s) comes to be highlighted, when does the interpretative ground become anchored symbolically, and who regiments and regulates the multiple degrees of semiosis?” (Morimoto 2012a: 267). This canonization or regimentation is essential to capture the traumatic experiences of individual victims through commemoration. This enables the nation-state to impose an organised sequence of events, thereby promoting the act of forgetting the past and erasing subjectivity from the ‘experience’ of the disaster. By doing so, the nation-state transforms the individual experiences of trauma into a shared experience of victimhood.

However, it should be noted that such semiotic regimentation will never exert a totalising impact. It cannot create a fully encompassing semiotic structure wherein powerless subjects are compelled to solely adhere to the dictates of the system. The articles of this thesis demonstrate how various subjects, including suffering survivors and local communities, may negotiate and even transgress such top-down regulations (see especially Paper II and IV of this thesis). At this point, a disaster memorial, on the one hand, becomes a strategic site for the regimentation processes. At the same time, a disaster monument, beyond its official disaster narratives as depicted in its architectural design and exhibition layouts, becomes a locus for contested interpretations of the disaster (see Paper II of this thesis). Likewise, investigating two different ways of processing photographic archives in the context of the 3.11 disasters in Japan, Ryo Morimoto (2014) argued that the rhetoric of the photographs becomes the ground of struggle over disaster memories.

Furthermore, some studies have focused on the social element of disaster memorials: how people interpret and interact with the memorials, also how memorials take on roles in everyday life (see for example Paper II of this thesis; Boret, Shibayama 2018; Garnier, Lahournat 2022). Applying Maurice Halbwachs’s (1980) theory of collective memory and Jan Assmann’s (2008) concept of communicative memory, Antoine Le Blanc (2012) argues that memorials and

monuments alone are insufficient to effectively remind people of past disasters. Instead, memorials or tributes must be integrated into daily communication and social life as the primary transmission media of disaster memories. Such daily activities in the vicinity of the memorials and communication about them may further involve various counter-memories and diverse interpretations, as explored in Paper II of this thesis.

Special attention has also been paid to the role of memorials in reducing vulnerabilities, enhancing resilience, and contributing to disaster risk reduction programs. Sébastien Boret and Akihiro Shibayama (2018) have emphasised that disaster memorials should not be conceived as only mnemonic devices of the past disaster events, but rather as catalysts for post-disaster recovery, psychological recovery, disaster educations, and community resilience. Similarly, Emmanuel Garnier and Florence Lahournat (2022) have suggested that memorials may fulfil the need for mourning, contribute to disaster-related educational activities, and should therefore be integrated into disaster risk reduction policies. Despite such an optimistic perspective, Susan Ullberg (2010) has warned that the political nature of disaster memorials, in which “not all disasters are equally remembered in a community” (Ullberg 2010: 15), may contribute to increasing social vulnerability of the given society. Therefore, acknowledging the political and dynamic nature of disaster memorials may help in developing methods for preserving disaster memories while also sharing lessons and knowledge with future generations in a way that increases disaster risk awareness (Monteil *et al.* 2020). Michelle Ann Miller and Tim Bunnell (2011: 14) have remarked that, as time goes on, these memorials will play crucial roles “to encapsulate the collective trauma experienced by today’s generation and provide entry points for indirect memory-making among the next generation.”

Additionally, some studies have demonstrated how disaster memories are intricately woven into everyday landscapes and cultural identities. They argue that the way people remember and respond to disasters are strongly affected by their cultural identities (see for example paper IV of this thesis; Madsen, O’Mullan 2013; Miller, Bunnell 2011). While studying a bush culture within a small community in Queensland, Wendy Madsen and Cathy O’Mullan found that social memory may influence the recovery and contribute to the social resilience of the community in the wake of adverse events. The narratives of bush culture play an important role in how communities respond to disasters. Madsen and O’Mullan (2013: 68) concluded that “social memory can have a positive or negative impact on how communities see themselves and thus how they react to difficulties because it is the stories and beliefs that the communities have of themselves that determines that reaction.” Other studies have demonstrated that the remembrance of disasters is not only triggered by specific disaster memorials, but may also be provoked by everyday landscapes (see Kronmüller *et al.* 2017; Ullberg 2010). Edmundo Kronmüller *et al.* (2017) have shown that, within indigenous communities, sacred oral histories, traditional ecological knowledge, and everyday landscape may become key sources for remembering past disaster experiences as well as for making sense, responding to, and surviving future

environmental hazards. In this sense, disasters may be remembered by the local communities “in a way that is embedded in facts of their symbolical, physical, social and cultural worlds” (Kronmüller *et al.* 2017: 246).

2.4. Disaster representations

The topic of disaster representations may generally be divided into two strands: warning representations and media representations. The first strand focuses on the warning systems of certain hazards, while the second one focuses on the issue of how disasters are represented in media and how such media representations further shape the understanding of disasters.

The initial foray into semiotic study of warning systems is often attributed to Thomas Sebeok’s report for the Human Interference Task Force (HIFT), titled “Communication Measures to Bridge Ten Millennia” (Sebeok 1984). In 1981, Sebeok received a mandate from this task force, a consortium of scientists and scholars convened by the US Department of Energy and Bechtel Corporation, to develop recommendations for warning future generations about the dangers of buried radioactive waste at the Yucca Mountain nuclear repository in Nevada. Reflecting on this endeavour in his book “I Think I am a Verb”, Sebeok (1986: 149–150) framed the task force’s mission as the creation of “a reasonably fail-safe means of communicating information about the repository and its contents, such that the system’s effectiveness would be maintained for up to 10,000 years.”

Sebeok proceeded to offer a series of recommendations, including the design of a warning system modelled after folkloric systems, supplemented by pertinent mathematical symbolism. He also proposed the establishment of a relay system that would require periodic updates across subsequent generations. Notably, Sebeok (1984) introduced the concept of an atomic priesthood, an autonomous commission featuring rotating members in future generations. This body’s principal responsibility would involve reinterpreting and adapting the warning system in response to evolving cultural, societal, and technological shifts. Following Sebeok’s report, a special issue on nuclear semiotics was published in *Zeitschrift für Semiotik* in 1984. This issue was distinctive as it focused on the highly specific hazard of nuclear danger. The recommendations provided therein were intricately linked to the unique characteristics of nuclear hazards, encompassing their enduring threat, imperceptibility, and spatial aspects (Danesi 2022). However, the foundational challenges underpinning their discourse – namely, the efficacy of conveying danger or hazard and the construction of messages resistant to the erosion of meaning – potentially extend to other categories of hazards as well.

Marcel Danesi (2022: 134) recently expanded upon and delved deeper into Sebeok’s inquiries of warning representations. He sought to understand how existential threats have been perceived throughout history in different cultures, and to utilise this knowledge to craft emotionally impactful warnings for such dangers. Through an analysis spanning prehistoric cave paintings, ancient flood myths, and contemporary pictorial signs denoting various hazards, Danesi (2022)

delineated a set of semiotic principles underpinning these warning signs. These principles include representationality, emotivity, metaphoricity, iconicity, folkloricity, and narrativity. Furthermore, Danesi (2022: 155) concluded that “humans have always connected existential dangers to broader questions of human life”, underscoring that the recognition of this linkage “can presumably help combat denials of existential dangers by connecting them to the deterioration of life.”

The second strand of scholarship on disaster representations centres on media representations of disasters, focusing on various disaster-related media and texts, such as films, literature, photos, while explicating their role in shaping the understandings of disaster events. For example, Frank Furedi (2007) compared how British newspapers represented the 1950s and the 2000 flood events. In the 1950s, within a post-war circumstance, media representations asserted resilience, resourcefulness, and adaptability. In contrast, the representations of the floods in the year 2000 highlighted vulnerability and individual trauma, depicting people as powerless and lacking agency, which further hindered the support of community initiatives during emergency responses and recovery.

Tong King Lee’s (2018) examination of Hideo Furukawa’s novel, “Horses, Horses, in the End the Light Remains Pure: A Tale That Begins with Fukushima,” showcased how the ambiguity, nonlinear narrative structure, and fractured style of the work mirrored the crisis of the 3/11 disaster in Japan. Lee argued that this approach reflected a semiotics of flux, where signifiers continuously fragmented, proliferated, and mirrored the unfolding “semiotic world event” of 3/11 and its connections to other global disasters (Lee 2018: 888).

Karl Patrick R. Mendoza’s (2018) analysis of online news reports on Typhoon Lando in the Philippines demonstrated how social semiotic analysis can provide insights into journalists’ choices within a multimodal communication landscape. This revealed how de-politicised disaster representations both influenced and were influenced by power dynamics in the characterisation of such events. Sungdo Kim (2006) took a broader approach to media discourse on disasters, proposing semiotic models for understanding natural disaster narratives. He asserted that the narratives of the 2004 tsunami played a pivotal role in shaping media narratives of natural disasters, and argued that contemporary natural disasters were integral to and catalysed by globalisation processes (Kim 2006).

The representations of the 2010 Mt. Merapi eruption, a case examined in this thesis (Papers I and III), have also been scrutinised by some scholars. Arief Maulana Hasan (2015) analysed Kemal Jufri’s photos of the eruption, highlighting collective efforts amidst suffering. In my own previous research, I investigated the media representation of the eruption in two articles. The first article analysed the headline photos of Indonesian newspapers, uncovering deep-seated representations rooted in a modern scientific discourse characterised by binary oppositions between Mt. Merapi as a powerful and sacred subject versus people as weak and profane objects. Additionally, the article analysed the opposition between the state as powerful and the local populace as powerless (Nazaruddin 2017). The second study focused on representations in a Facebook group, capturing local perspectives on living harmoniously with the volcano and highlighted

the contrast between the mainstream media's 'dangerous Merapi' narrative, and the 'beautiful Merapi' depicted on social media (Nazaruddin 2020).

These existing studies indicate that disaster representations are closely tied with power relations, discursive structures, and broader socio-cultural processes. These relationships may be understood through two interrelated concepts. The first links a disaster as a specific event with broader ongoing social and cultural processes taking place within the affected societies, such as globalisation (Kim 2006), modernisation (Nazaruddin 2017; see also Papers I and III of this thesis), or cultural politics of the government and other elites in power (Schlehe 2009). Paper IV of this thesis investigates how the representation of tsunami victims as 'martyrs' is rooted in a broader Islamic interpretation of the tsunami as a divine trial. Secondly, disaster representations are influenced by power dynamics and discursive structures governing such representation practices, such as community media discourses (Nazaruddin 2020) or media organisations (Mendoza 2018).

From a production perspective, disaster representations are often intertwined with larger societal and discursive forces, underscoring the potency of such representations as communication tools. Conversely, from the standpoint of the receiver, disaster representations invariably become arenas of meaning contestations, fostering diverse interpretations, some of which may diverge from the producer's original intentions (see Hall 2001 on the dynamics of encoding and decoding). Paper II of this thesis has explored how disaster monuments, imbued with certain official narratives, serve as sites of meaning contestation, where visitors interpret and utilise them in diverse ways.

3. SEMIOTICS OF DISASTERS MEETS WITH DISASTER STUDIES

The question “What is a disaster?” has been debated extensively among disaster scholars for decades. Several collections of articles aimed at targeting this question have been published, offering theoretical insights from the forefront of disaster studies (Quarantelli 1998; Perry, Quarantelli 2005) as well as various other disciplines and research fields (Aronsson-Storrier, Dahlberg 2022). However, as noted by several authors in these volumes, the proposed disaster definitions often take a distant stance, overlooking the diverse meanings, especially those held by affected communities (see Hewitt 1998; Buckle 2005; Le Dé, Gaillard 2022). In addition, as will be explained in the following chapter, the proposed definitions are strongly reliant on specific paradigms of disaster research.

This chapter will explore this matter, arguing how semiotic characterisations of natural disasters can further significantly contribute to ongoing discussions on disaster definitions and delimitations. The chapter begins by outlining the competing paradigms within disaster studies that fundamentally shape how disaster scholars conduct their research. Following this overview of existing disaster paradigms, I will examine how semiotic definitions and understandings of disaster could be positioned with respect to those paradigms. This will be followed by theoretical reflections on disaster definitions and delimitations from a semiotic perspective. As this thesis focuses on disasters partly triggered by natural hazards, such as volcanic eruptions, tsunamis, or earthquakes (see Wachtendorf 2022), discussions surrounding the definition of disaster in a broader sense will be contextualised within the specific context of disasters triggered by natural hazards.

3.1. Three paradigms of disaster studies

There are different ways to review and categorise the existing approaches in disaster studies. Claude Gilbert (1998) has differentiated theoretical approaches to disasters into three main paradigms: disaster as a resemblance to war, disaster as an explication of social vulnerability, and disaster as a crisis characterised by uncertainty. Ronald Perry (2007) has divided social studies on disaster, especially within sociological studies, into three traditions, i.e., classic, hazard-disaster, and disaster as a social phenomenon. Later, he added the human ecology tradition that focuses on vulnerability and resilience as the fourth tradition (Perry 2018). In this thesis, I have followed a more common categorisation of disaster studies that divides them into three paradigms, i.e., hazard, vulnerability, and resilience (see for example Le Dé, Gaillard 2022; Bankoff 2019; Tierney 2019).

These three paradigms emerged sequentially and in relation with one another. The hazard paradigm was developed in the early days of disaster studies, dominating the field until the 1970s. The vulnerability paradigm emerged in the 1980s, serving as a critique of the hazard paradigm. Subsequently, the resilience paradigm

emerged in the 1990s, as a reaction to the vulnerability paradigm. Although these three paradigms emerged sequentially, the emergence of a new paradigm has not rendered previous ones obsolete. For instance, the hazard paradigm, being the oldest, continues to be widely utilised by scholars from engineering approaches. Nowadays, these paradigms are also often used in combination in academic studies, but typically one of them holds greater prominence for a particular scholar or in a particular study. In disaster management practices, such integration is even more apparent, as managers often adhere to specific paradigms, while also incorporating ideas from others.

3.1.1. Hazard paradigm: Natural forces, social disruptions, and social adjustments

The hazard paradigm of disaster studies characterises natural disasters as social disruptions caused by extreme and rare natural events, which occur outside of the social, cultural, and historical context of the society they impact (cf. Le Dé, Gaillard 2022). Charles Fritz's oft-cited definition of disaster represents this understanding of social disruption as the main characteristic of disaster. According to Fritz (1968: 202) disaster may be defined as:

an event, concentrated in time and space, in which a society, or a relatively self-sufficient subdivision of a society, undergoes severe danger and incurs such losses to its members and physical appurtenances that the social structure is disrupted and the fulfilment of all or some of the essential functions of the society is prevented.

In his review of the sociology of disaster, Ronald Perry (2007) observed that the perspective which regards disasters as social events with adverse consequences, such as fatalities, physical destructions, and social disruptions, has been prominent since the early days of disaster studies, especially within sociological traditions.

The disruptions that result from disasters force people to make adjustments in their behaviour and social arrangements. It is commonly assumed that social norms and structural arrangements previously accepted as sufficient, are perceived as useless during disasters, thereby requiring different norms, arrangements, or behaviours. People need to do something different or make certain social adjustments when the original behavioural patterns and social configurations are no longer appropriate or simply when no plan is in place in disaster situations (Wachtendorf 2022). In one of the earlier works on disaster research, Lewis M. Killian (1954) argued that disasters disrupt social functions, cause human casualties and injuries, and destroy physical infrastructure, compelling people to adjust and change their behaviour. Meanwhile, Robert Stallings (1998: 137) framed disasters within the social order or routinisation and contended that disasters are disruptions of routines. Jean-Christophe Gaillard (2008) called this approach the 'perception-adjustment paradigm', which dominates the study of

disaster risk perception. It assumes that when dealing with rare dangers from nature, people will make certain adjustments to their actions in response to such threats, depending on how they perceive the hazard and the risks arising from it. According to the hazard paradigm, these behavioural adjustments are required until people return to normal life. In this sense, disaster is a social event in which ‘disruption’ and ‘adjustment’ are the main characteristics, beginning when normal conditions are suppressed by disruptions caused by extreme natural events, and ending when normality is restored and special adjustments are no longer needed (see Perry 2007). This focus on stability and disruption cycles illustrates one of the basic ideas of the hazard paradigm, which views disaster as a social event having a specific temporality or a time frame, with a concrete beginning and end. As previously mentioned, Charles Fritz (1968: 202) described disaster as “an event concentrated in time and space.” With this definition, Fritz intended to distinguish between events like volcanic eruptions, which may result in hundreds of fatalities over the course of a few days, and traffic accidents, which may result in thousands of deaths over the course of a year (Lindell 2013).

On the one hand, such emphasis on disaster as an event has induced one of the classic and ongoing debates among disaster scholars: whether a disaster is an event or a process (Wachtendorf 2022). Avoiding the notion of disasters as events, some scholars have chosen to use the term ‘social situations’ (see for example Britton 2005; Barton 2005). On the other hand, for practical disaster management, this ‘event’ perspective was indeed fundamental for governmental agencies and other disaster managers to determine clear-cut boundaries of emergency management and recovery phases (Buckle 2005). Some scholars have also tried to distinguish disaster phases, such as Barry Turner (1978: 85) who identified six sequences of a disaster: normal starting points, incubation period, precipitating event, onset, rescue and salvage, and full cultural readjustment.

3.1.2. Vulnerability: Structural and historical root causes of disasters

In the 1970s and 1980s, some scholars began to criticise the basic assumption of the hazard paradigm (see for example O’Keefe *et al.* 1976; Hewitt 1983; Maskrey 1989). In a seminal article on disaster studies, Phil O’Keefe, Ken Westgate, and Ben Wisner (1976) contended that the concept of natural disasters should be re-evaluated to emphasise that there is nothing inherently natural about them. They analysed the rising incidence of disasters over the past fifty years, especially within developing countries, asserting that this trend cannot be attributed to an increase in extreme natural events. Instead, they argued that vulnerability of the population is “the real cause of disaster – a vulnerability that is induced by socio-economic conditions that can be modified by man, and is not just an act of God” (O’Keefe *et al.* 1976: 567).

“At Risk” (Blaikie *et al.* 1994 – the first edition; Wisner *et al.* 2004 – the second edition), another seminal text of the new vulnerability paradigm, proposed the notion that natural disasters are not consequences of extreme natural events, but

rather outcomes of complex and dynamic interrelations between hazards and the structures and conditions of social vulnerabilities in the impacted societies. Vulnerability, from this perspective in disaster scholarship, refers to the susceptibility for suffering when a hazard happens, “the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard” (Wisner *et al.* 2004: 11).

In this sense, disasters may be understood as expressions of the vulnerabilities that have gradually accumulated over time until a natural event eventually disrupts the system, and exposes what is hidden beneath the surface (Aronsson-Storrier, Dahlberg 2022: 2). Thus, disasters are political and historical in their nature, pointing to unequal access to resources among members of society, such as access to land, housing, food, livelihood, infrastructure, social security system, institutional supports, political rights and security, and financial resources (Wisner *et al.* 2004; Hewitt 1983). People can exhibit various levels of vulnerability, ranging from least vulnerable to the most susceptible, manifested in a variety of ways, including economic, social, political and geographical factors, or a combination thereof (Wisner, Luce 1993). Ronald Perry (2007: 13) argued that vulnerability “is to be found in social structure and disruption is the outcome of vulnerability.” This idea aligns with the political ecology approach, which emphasises power relations in resource extraction and wealth distribution and their consequences on both social and natural systems (Oliver-Smith 2004; Barrios 2017b: 154). Anthony Oliver-Smith (2020: 43), one of leading scholars in the anthropology of disaster, with a strong political ecology approach, argues that disasters are “the outcome of exposure and the unequal distribution of risk in society, affording some sectors greater or lesser security.”

The focus on the social structural roots of disasters has prompted vulnerability scholars to critique the use of merely tactical measures aimed at reducing disaster risk, such as constructing dams or devising contingency plans. For them, these actions are insufficient because they do not target the fundamental problem of social vulnerability. A disaster is created in a social structure and can only be solved through social structural manipulations (see Dombrowsky 1998). Thus, disaster risk reduction must be integrated into broader development programs based on fair and sustainable principles, such as poverty reduction, adequate social protections, fair access to resources, and open political participation. Hence, effective mitigation of natural hazards should go beyond merely preventing ‘rare’ and ‘extreme’ hazards; it also necessitates equitable resource access and tailored social and societal protection (Gaillard 2008: 325).

The vulnerability paradigm also rejects the idea of a disaster as an ‘event’ with a clear-cut temporal boundary with a beginning and an end. Understanding a disaster as the expression of vulnerability means understanding “the historically produced pattern of vulnerability, evidenced in the location, infrastructure, socio political structure, production patterns, and ideology, that characterizes a society” (Oliver-Smith 1999: 29). This implies that the principal significance of an extreme natural phenomenon lies in exposing those vulnerabilities rooted in history. Thus, instead of considering disasters as events, it will be much more appropriate to

regard them as “processes that render people unsafe and vulnerable as a result of political, economic and social forces in society evolving over time” (Albris 2022a: 35). With regards to the 1970 Peru earthquake, Oliver-Smith (1994) has shown that in order to fully comprehend why the earthquake had such a profound impact on the region, one has to trace the 500 years of historical processes through which the vulnerabilities were created. In many cases, especially in the slow onset of natural hazards such as drought and sea-level rise, drawing a temporal boundary between normal times and disaster periods is almost impossible. Thus, instead of distinguishing between normal times and disaster crises, ‘normalcy’ should be considered as a precondition of disaster, contributing to its formation. From a historical point of view, this precondition may be seen as the postcondition of the previous disaster. Thus, disasters are part of daily routines, and the traditional responses to such hazards are rooted in everyday life (Campbell 1990).

In addition to these historical processes of creating vulnerability, the new understanding of disasters encompasses the processes after certain natural disruptions. Based on anthropological studies, Kristoffer Albris (2022a: 36) notes that “disasters continue to impact societies and communities long after the tremors of an earthquake have stopped, or floodwaters have receded.” In this sense, instead of talking about post-disaster recovery as something with predetermined objective measurements, it will be much more helpful to look closely at how the survivors feel or do not feel ‘recovered’ (Barrios 2014) and how the aftermath of a disaster may continuously shape culture and society (Albris 2022a). In this sense, post-disaster recovery projects may prolong the disaster experiences long after the triggering event. Disasters and their aftermath may involve the processes of exclusion and marginalisation, which will further increase social vulnerability (see for example Balgos *et al.* 2012).

The vulnerability scholars have also criticised the perception-adjustment paradigm, which seems to assume that people have many choices when responding to hazards. Exponents of the vulnerability approach have argued that peoples’ reactions to natural hazards are restricted by social, economic, and political conditions beyond their control (Wisner *et al.* 2004). Social neglect and marginalisation, political exclusion, poverty, and lack of access to necessary resources force people to live in places that are highly vulnerable to hazards, such as on river banks and volcano slopes. When extreme natural events occur, such as volcanic eruptions or heavy rainfall that causes flooding, these people are very vulnerable to suffering and adversely affected by those natural events. These people do not necessarily have the option to temporarily relocate, or file insurance claims in case of losses and damages. Thus, the source of disaster lies in the social vulnerability embodied in everyday socio-economic contexts. In this sense, disasters amplify this difficult and vulnerable daily life (Hewitt 1983; Maskrey 1989). Using examples from La Soufrière’s eruption in St. Vincent and the Grenadines, Jazmin Scarlett, Ailsa Naismith, and Ashleigh Rushton (2022) have shown how, for example, the higher planter class has more options to compensate for their losses due to volcanic eruptions, compared to the powerless peasant class.

3.1.3. Resilience: Cultural and social capacities in dealing with natural hazards

In the 1990s and the 2000s, the vulnerability paradigm was criticised for portraying people as powerless when faced with environmental hazards and for paying too little attention to their capacities in dealing with hazards and adversities (Le Dé, Gaillard 2022). A new perspective, called the resilience approach, does not deny the existence of social vulnerabilities in the communities living in vulnerable areas, such as the slopes of a volcano or riverbanks. However, the resilience paradigm holds that instead of focusing solely on those vulnerabilities, policymakers should put their attention on the local peoples' adaptation to the hazards, that they have capacities to learn, organise, resist, change, and adapt, and therefore will be able to support those resilience capacities. Assuming that all people are, in one way or another, vulnerable, John Handmer (2003: 55) suggested that "the issue of 'vulnerability' should be turned around and approached positively as resilience or as the capacity to cope with or adapt to change." Tricia Wachtendorf (2022) also noted that current sociological studies of disasters have significantly shifted from discussing vulnerability and marginalisation to accentuating peoples' capacities in dealing with hazards. Furthermore, Siambabala Manyena (2006) observed this shift as focusing on 'building something up', such as capacities, skills, and knowledge, rather than just 'reducing something', such as vulnerability or poverty.

In the context of volcanic threats, many studies have shown that people choose to live on volcanic slopes not because they lack the necessary skills or access to live in valleys, towns, or other places, but because their choices are related to soil fertility and abundant resources in these locations. People have compelling reasons to live on Mount Etna in Italy (Duncan *et al.* 1981) and Volcanic Manam Island in Papua New Guinea (Mercer, Kelman 2010) for example, primarily because of the fertile soils and the reliable supply of fresh water. On several other volcanoes, people also get their sources of livelihood from mining and tourism, such as on Mt. Soufrière in St. Vincent and the Grenadines (Robertson 1995) or Mt. Ruapehu in New Zealand (Paton *et al.* 2001). On the slopes of Mt. Merapi, one of the locations of my study, people engage in agriculture, livestock farming, mining, and tourism (Dove 2007; see also Paper I of this thesis). Those who live on the slopes of the volcanoes have developed specific skills to take advantage of various natural resources available in their environment, as well as adaptive capacities to cope with the threat of eruption. They know how to respond when volcanic activity increases and how to return to normal, or even improved conditions after being affected by the eruption. Paper I of this thesis illustrates how residents living on Mt. Merapi have perceived eruptions also as blessings. For them, eruptions bring along ash that naturally enriches soil fertility, expansive and lush pastures for their livestock, plentiful stone and sand that remain available for sale for several years after an eruption, and materials and ruins that can be exposed and managed as touristic sights. Ilan Kelman and Tamsin Mather (2008: 191) have even proposed a sustainable livelihoods approach for volcanic culture,

which involves creating and maintaining habitats and livelihoods using available resources.

The resilience approach proffers a participatory model in disaster risk reduction, often called ‘community-based disaster risk reduction’, emphasising the active participation of local communities to assess various threats and risks they encounter, their vulnerabilities and capacities to deal with these threats, and necessary measures to reduce disaster risks (Anderson, Woodrow 2019). Community involvement will encourage better disaster risk reduction programs, including pre-disaster steps such as mitigation and preparedness, and post-disaster phases such as emergency response and recovery (e.g. Lewis 1999; Wisner *et al.* 2004; Mercer, Kelman 2010). Therefore, risk management and disaster preparedness should not be viewed as separate activities that only occur in response to disaster threats. Instead, they should foster the community’s ability to discuss hazard issues within the context of daily life (Sagala *et al.* 2009).

The resilience paradigm marks a cultural turn in disaster studies, which emphasises how culture shapes people’s understanding and interpretation of disasters, while at the same time shaping people’s responses to pre-disaster mitigation and post-disaster recovery (Mori *et al.* 2019). Susanna Hoffman (1999) argued that the ways people respond to disasters are shaped by cultural attitudes and dispositions. On the one hand, societies transform as a result of disasters, and on the other hand, disasters and their impact will change as a consequence of those social transformations. Thus, as Kristoffer Albris (2022a) has emphasised, disasters are not something exterior to societies, but a part of the ongoing change within them.

3.2. Synthetic approach to natural disasters

One of the key tenets of the vulnerability paradigm is to question the phrase ‘natural disaster’. The staunch advocates of this paradigm have argued that the word ‘natural disaster’ is totally wrong. They argue that its use is potentially very dangerous as it diverts attention away from the issue of vulnerability as the core problem of any disaster, and therefore relinquishes those in power – who play important roles in shaping social and political inequalities and vulnerabilities – of responsibility (see Chmutina, von Meding 2019; Chmutina *et al.* 2019; Kelman 2020; Benadusi 2022; Albris 2022b). Kristoffer Albris (2022b: 108) pointed out that “by framing disasters as natural, those who are responsible for preventing such events seek to evade their responsibility with reference to the inevitability of disasters as events that simply happen since there is no escaping the wrath of nature.”

Examining the use of the term ‘natural disaster’ by disaster researchers in key academic journals on disaster scholarship, Ksenia Chmutina and Jason von Meding (2019) found that, while awareness of the core issue of vulnerability increases among scholars, the usage of the term ‘natural disaster’ persists in academia, due to the need to leverage popularity or to delineate natural and human-

induced hazards. They criticise researchers, who are already aware of the issue of vulnerability, but still keep on using the term ‘natural disaster’ for the sake of popularity or reaching lay audiences, without carefully considering the implication of such use (Chmutina, von Meding 2019: 287). *Disasters*, a leading journal in disaster studies, explicitly mentions in their author guidelines, “The erroneous and misleading term ‘natural disaster’ is not acceptable in *Disasters*.” Tricia Wachtendorf (2022: 14) calls this ‘vernacular slippage’ when people, even scholars, “refer to *natural disasters* when instead – upon a more careful reading – they are actually referring to disasters that are triggered, at least in part, by natural hazards.” Kristoffer Albris (2022b: 107) emphasised that:

While we can talk of natural hazards (floods, storms, earthquakes, etc.) that inevitably will occur due to the moving of the earth, wind, and water, disasters are caused only if such hazards intersect with pre-existing patterns of vulnerability in societies. According to this logic, the term “natural disasters” is simply an error of linguistic convention, a phrase that should not exist in our language.

In this academic context, I am fully aware that this thesis with its use of the term ‘natural disaster’, may attract criticism for implying erroneous causes and for misdirecting focus. Let me explain my choice based on three interrelated grounds: referential, ontological, and emic. Ksenia Chmutina and Jason von Meding (2019) suggested simply using the word ‘disaster’ to avoid the term ‘natural disaster’. However, this proposal does not work for this thesis. The word ‘disaster’ is too broad in its reference, as it also includes a broad range of human-induced disasters, such as technological disasters (nuclear meltdown, water pollution, industrial fire, etc.) or other disastrous events (terrorist attacks, war, etc.). The arguments of this thesis pertain to disasters triggered in part by extreme natural events, such as tsunami and volcanic eruption as in the two cases of this study. The explanations and lines of investigation might not hold or be sufficient for human-induced disasters, such as holocaust, war, and genocide, where human intention plays a crucial role. I therefore find it important to distinguish between different kinds of disasters.

From a political semiotic point of view, Peeter Selg and Andreas Ventsel (2020: 152) emphasised that the act of naming is fundamental to establish a hegemonic relation, or in contrast, to resist certain hegemonic ideas. In this sense, by insisting on using the term ‘natural disaster’, I aim to critique the current trend within the vulnerability paradigm, which strongly emphasises the unnaturalness of natural disasters, highlighting the political economy of disasters, while not providing any place for environmental agency at all. The idea that all disasters stem from social and political relations only is fundamentally anthropocentric. It suggests that by rectifying political inequalities and social vulnerabilities, humans may be able to combat nature and prevent disasters. A modernist utopia lies in the heart of this paradigm, assuming that once humanity achieves a perfect state of civil society, disasters will cease to occur and humans will be safeguarded against any detrimental natural impacts. Related to this idea is the emic stance of

several local communities (see Paper I of the thesis), for whom nature possesses certain agencies, albeit not necessarily destructive ones. Maintaining the term ‘natural disasters’ helps to acknowledge this stance and put it into dialogue with the study’s own ontological grounds.

Despite the firm stance of some vulnerability scholars who reject the term ‘natural disaster’, some disaster scholars argue that natural disasters are formed at the confluence of extreme natural events and certain social systems (Burton *et al.* 1993; Oliver-Smith, Hoffman 1999; Aronsson-Storrier, Dahlberg 2022). In this sense, disasters occur where humans exhibit “a lack of capacity to cope with the negative impacts that exposure might bring to individuals or human systems” (Pelling 2003: 4). Thus, natural disasters are complex processes involving both agencies of nature and culture. However, the role of the two and their types of interaction vary from case to case. Thus, this thesis aims to propose a processual and contextual understanding of natural disasters that would allow for the emic perspectives to be accounted for as well.

Furthermore, I argue that the three basic concepts of the major paradigms, namely ‘natural hazard’, ‘social vulnerability’, and ‘cultural resilience’, complement each other in comprehensively understanding disaster phenomena. Thus, I consider them to have different focal points that do not necessarily conflict with each other. For example, a disaster scholar who adheres to a classic hazard paradigm does not necessarily ignore vulnerability or resilience issues. Therefore, the most comprehensive approach to studying disasters considers the role of natural hazards, while also properly addressing social structural problems highlighted by the vulnerability paradigm, and cultural adaptations to the given hazards as proposed by the resilience approach.

3.3. Semiotic aspects of natural disaster research

This thesis argues that semiotics can significantly enhance disaster scholarship by conceptualising disasters as semiotic processes. This approach enables a comprehensive understanding of the role of natural hazards as well as sociocultural processes and elements in the formation of disasters, particularly in terms of vulnerability and resilience. I propose that natural disasters involve four phases of semiosis: recognition, denomination, evaluation, and anticipation. These phases broadly correspond to the established stages of pre-disaster, disaster, and post-disaster. However, the focus on semiosis highlights how meaning-making and interpretive actions unfold at different stages of a disaster, offering an alternative lens for disaster studies to examine the complex socio-economic and cultural dynamics, tensions, and intricacies that accompany disasters. Understanding these semiotic processes can further provide disaster managers with insights into appropriate policies and actions.

A semiotic perspective also allows disaster scholars to explore how the inter-paradigmatic debates in disaster studies reflect the classic modernist dichotomy between nature and culture. While the hazard paradigm views natural disasters as

events triggered by nature, the vulnerability paradigm argues that the root causes of disasters lie within society and culture. A semiotic approach, particularly through ecosemiotics, offers the potential to move beyond this dichotomy, to examine the diverse ways in which natural and cultural processes interact across different societies and historical periods. This semiotic awareness also underscores the importance of balancing etic and emic perspectives, ensuring that both viewpoints are proportionally considered in disaster analysis.

3.3.1. Four phases of semiosis of natural disasters

As I have described in the second chapter of this introduction, early semiotic inquiries into natural disasters have primarily focused on defining and delineating the phenomenon. The existing semiotic definitions predominantly centre around the natural event as the sole cause and essence of the natural disaster. If we align such definitions with the ongoing debates in disaster studies, they can be categorised under the classical hazard paradigm. As I have discussed beforehand, this paradigm views a disaster as a compilation of adverse effects on humans, particularly the disruption of social functions, brought about by an extreme and infrequent natural event. What this kind of definition lacks is the inclusion of social vulnerability and cultural resilience as key components.

I argue that natural disasters, as sign processes, involve four interconnected phases: recognition, denomination, evaluation, and anticipation. Each phase may, in turn, involve a range of diverse and complex sign processes. Taking these processes into account allows disaster studies to properly address issues of vulnerability and resilience while still acknowledging the crucial role of natural hazards. Recognition includes both the identification of natural signs of hazards and the recognition of sociocultural elements of disasters, including social vulnerabilities that contribute to disasters and cultural resilience that enables communities to cope with them. The denomination process transpires as an extreme natural event unfolds and is interpreted as a disaster. Following this, the evaluation process ensues while affected societies engage in cultural self-reflections about what just happened. This reflection will be followed by forward-looking cultural anticipations, driven by efforts to avert similar disasters in the future. As the processes are interlinked, they also feed off one another – cultural self-reflection may, for example, impact denomination (e.g., so that it is not considered a disaster any more), or anticipation may impact evaluation.

3.3.1.1. Recognition

The initial semiotic processes involved in natural disasters can be broken down into two elements: recognising the natural signs of a hazard, and understanding the risks and social capacities in dealing with such hazards, particularly in terms of vulnerability and resilience factors.

At this point, it is analytically beneficial to distinguish between hazard and risk as two distinct yet closely related concepts (see for example Fox 1999).

Hazard is typically defined as “a potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation”, while risk can be understood as “the probability of harmful consequences, or expected losses [...] resulting from interactions between natural or human-induced hazards and vulnerable conditions (UN 2004: 16). According to Anthony Oliver-Smith and Susanna M. Hoffman (2002: 4), hazard encompasses “the forces, conditions, or technologies that carry a potential for social, infrastructural, or environmental damage.” Accordingly, risk can be conceptualised as “potentiality for a negative occurrence which must be understood for the purposes of avoidance or control” (Rikagos, Law 2009: 80). From these definitions, we may consider risk to be a social interpretation involving social vulnerability, social trust, social capital, collective memories, and other relevant socio-cultural contexts; linking a hazard to its potential impact as a function of estimation. Peter Sandman (1993), who has developed a model of risk as a function of hazard (technical assessment of risk) and outrage (cultural view of risk), emphasises that risk is a social construct shaped not only by objectively assessed hazards, but also cultural perceptions of those hazards (see also Reynolds, Seeger 2005). However, I should add that in the sociocultural realm, such a differentiation is often not made: once people interpret certain natural phenomena as signs of a hazard, it already implies, to some extent, that the hazard is dangerous and that they are at risk of being affected by it.

The first aspect of recognition is the ability to discern the indexical relationship between certain natural occurrences and impending natural phenomena. This helps predict potential hazards and may, in turn, prevent natural disasters. For example, a receding sea water level following an earthquake is a sign of an approaching tsunami; wild animals fleeing the forest or bamboo trees breaking and making loud sounds are signs of an eruption (see Paper I of this thesis). Conversely, a lack of semiotic capacity inhibits the identification of these natural phenomena as signs of hazard. In such cases, receding sea water or wild animals fleeing the forest are merely natural occurrences, not ‘signs’ (see also chapter 2).

At this point, we may argue that a natural disaster may be triggered by a failure to recognise these indexical relationships. The 2004 tsunami in Aceh and Simeulue Island exemplifies the significance of recognising the indexical relations between different natural phenomena. On Simeulue Island, the populace identified specific natural signs as indicators of an impending tsunami (referred to as ‘*smong*’ in the local language), i.e. the rapid shrinking of sea water following big earthquakes. Consequently, upon recognising these signs, while five fatalities did occur, Simeulue Island’s inhabitants displayed a much higher survival rate when compared to the populations of other areas ravaged by the 2004 tsunami (Rahman *et al.* 2018). Unfortunately, a few minutes after the major earthquakes and the receding sea water level, people in Banda Aceh and other surrounding areas rushed down to collect fish, unaware of the massive tsunami that would soon follow. This resulted in the tragic loss of thousands of lives. Unaware of the

indexical relations between these two natural phenomena, they were unable to anticipate the impending disaster.

In their works, Chang (2006) and Morimoto (2012a) employed Peircean ‘habit’ as an explanation for the recognition of these indexical relations. In addition to that, I would suggest another theoretical framework based on Lotmanian cultural semiotic inheritance, especially his idea of cultural memory (see Lotman, Uspensky 1978; Lotman 2019; see also Paper II of this thesis). In this sense, while the indexical relationships are grounded in natural relations and processes, these connections are made relevant through cultural mechanisms: recurring experiences that are internalised as part of cultural memory.

The fundamental premise of cultural memory lies in the understanding that not every experience will be translated or retained within the cultural memory of a given society. Cultural memory selectively holds onto chosen past experiences collectively deemed as significant. Thus, cultural memory entails not just remembering, but just as importantly forgetting (Lotman, Uspensky 1978; Lotman 2019; Assmann, A. 2008). In this context, it is important to recognise that cultural memory is not a static construct but a dynamic one. Certain experiences preserved as integral facets of cultural memory may, at certain historical junctures, become relegated to archival preservation, the cultural storehouse, or the passive reference of memory, which preserves the past as such (Assmann, A. 2008), or even fall into complete oblivion. Conversely, forgotten archives might be rediscovered and reactivated in different historical epochs. We may argue that disasters as harmful and traumatic experiences will be remembered and preserved in the cultural memory of a given society, which can aid in responses to similar disaster events in the future (see Paper II of this thesis).

On Simeuleu Island, during the 2004 tsunami and earthquake, the interpretation of the rapid receding sea water following big earthquakes with ‘*smong*’ undoubtedly embodies a specific cultural memory where this experience was encompassed. Such cultural memory was related to their previous tsunami experiences, especially the 1907 tsunami, which killed more than half of the population on the island, but also with the specific means of remembering those events that were out of perceptual reach (Rahman *et al.* 2018; Rahman *et al.* 2020). At the same time, in Banda Aceh and some other surrounding areas, the traumatic experiences of the 2004 tsunami prompted them to delve into their cultural archives. There, they discovered accounts of seemingly analogous tsunami experiences documented by their ancestors, denoted by local terms like ‘*ie beuna*’ or ‘*gloro*’. Presently, these cultural archives have been revitalised and disseminated to enhance preparedness and mitigate future tsunamis (see Rahman *et al.* 2024).

An important point to consider is that the initial phase of interpreting natural signs may also involve non-human interpreters. This observation is crucial, particularly given that most disaster studies take humans as the sole interpreters within the chain of disaster interpretations. As I explored in Paper I regarding the semiotic transformation of culture on the slopes of Mt. Merapi, the indexical relationships between different natural processes could potentially be mediated by non-human animals that are inherently more attuned to the presence of an atypical natural

occurrence. Similar attendance to animal behaviour has been observed in the context of Aceh (Syahputra 2019). Non-human animals might respond to some potentially dangerous natural events with distinct behaviours, which humans subsequently interpret as an index of an impending natural event. It is conceivable that the potential consequences of some natural events may be only comprehended by non-human animals, who make the initial interpretations which are further interpreted by humans. The wildlife inhabiting the slopes of Mt. Merapi, owing to their physiological and sensory attributes, are likely more attuned to variations in the volcano's activities. Although animals' responses to these volcanic events lie beyond the realm of language, they may still be intended for communication. They might function as effective messages, at the very least for members of their own species.

The second aspect involves recognising the sociocultural elements that shape the capacity to anticipate, deal with, and recover from the impacts of hazards. On the one hand, people will identify socio-economic conditions that make them more vulnerable and unable to cope with hazards. On the other hand, people will also consider their possibilities to withstand and recover from these impacts. In this context, people develop their interpretations of what should be considered as signs of vulnerability and signs of resilience. These interpretations are dynamic and vary, based on the specific context of 'here' and 'now.' A social feature perceived as a sign of vulnerability in one context may be seen as a sign of resilience in another. For example, staying on the highest hamlets near a volcano's peak is commonly considered to lead to high vulnerability. However, the local people of Mt. Merapi perceive it as a sign of resilience, particularly in terms of maintaining ownership of their lands and fields. Additionally, an element of resilience in one period may turn into a part of vulnerability in a different historical period, and vice versa. Before the major 2010 eruption of Mt. Merapi, reliance on elders who were believed to receive messages from the volcano was a key feature of cultural resilience. After the eruption, however, locals concluded that the sole reliance on the beliefs of elders and mystical signs placed them in a vulnerable position (see Paper I of this thesis).

These complex processes of recognising hazards and identifying vulnerability and resilience contribute to a phenomenon called risk perception, which in turn shapes people's responses to hazards. An important point to consider is the notion that people take into account all the hazards they face in their daily lives, not just natural hazards. In this context, a natural hazard is considered as just one of many hazards, alongside threats such as the loss of livelihoods and assets, severed social ties, adaptation to a new environment with unfamiliar risks, and more. As a result, people often choose to cope with hazards they are confident they can manage, while avoiding those they do not know how to handle. This leads to complex responses that may appear as unpredictable and irrational behaviours to outsiders. In this way, natural occurrences commonly considered as signs of hazards may be interpreted differently by local communities. While these natural signs may still be recognised as signs of a hazard, the locals will also consider other hazards, along with their social vulnerabilities and resilience.

As discussed in Paper III of this thesis, volcanic hazards are evaluated alongside other hazards, such as the threat of losing cattle while staying in evacuation camps. On the one hand, the government focused on evacuating residents based on scientific observations of volcanic activities and abstract spatial mapping, viewing certain communities as highly vulnerable. However, for local communities, livestock was a key sign of resilience. They could sell cattle to meet their daily needs during the emergency. Furthermore, after the emergency, when fields were still covered with volcanic ash and could not be cultivated, livestock became the only source of subsistence. In this sense, the risk of losing livestock exposed them to severe vulnerability, and was therefore seen as a more tangible risk compared to the eruption itself. As a result, they were reluctant to be evacuated as the government did not consider livestock evacuation in their plan at all (see also Lavigne *et al.* 2008; Donovan 2010).

3.3.1.2. Denomination

The second semiotic phase occurs after extreme natural events, such as volcanic eruptions, earthquakes, or tsunamis, have already impacted human societies, non-human entities, and ecosystems. These impacts include casualties, economic losses, environmental damage, and species loss. One of the most widely accepted characteristics of disasters is their detrimental effects on humans. Quarantelli (2005: 347) asserted, “An earthquake is simply a physical happening, a movement of land. [...] If there are no negative social consequences, there is no disaster.” I would add that impacts of natural events to non-human animals and ecosystems should also be considered for delineating natural disasters (see for example Paper III of this thesis).

Thus, in the very fundamental sense, a natural disaster is already an act of interpretation, linking an extreme natural event to adverse consequences in human societies. Understanding natural phenomena, such as earthquakes, volcanic eruptions, tsunamis, or floods, and their negative impacts on humans, such as deaths and social disruptions, as disasters is an act of interpretation. The interpretation of an event as a ‘disaster’ might lead to the cultural translation of the experience into cultural memory. When a community experiences a traumatic event from which they lack the experience to cope and that has caused negative impacts, the event would be ‘remembered’ as a disaster. This is an interpretation through denomination.

This implies that the same phenomenon could be interpreted as something other than a disaster. Many studies show that natural events labelled as disasters by outsiders are often not perceived the same way – or not solely as disasters – by local communities (Bankoff 2004: 110; Dove 2008: 326). In most Southeast Asian value systems, catastrophic natural events are usually interpreted as signs of other phenomena, such as the divine destiny or spirit world, where the disaster is often understood as a warning or a destiny from God (Chester 2005; Dove 2010; Schlehe 1996). Paper I of this thesis illustrates how local people on the slopes of Mt. Merapi traditionally perceived eruptions as signs of ceremonies

conducted by the spirit residing on the volcano's peak. Believing in harmonious and mutually beneficial relations with the spirits, local communities viewed eruptions primarily as blessings rather than disasters. Similarly, Paper IV explored how the Acehnese interpreted the 2004 tsunami as divine destiny: as a sign of God's love for Aceh.

3.3.1.3. Evaluation

The third semiotic process involves evaluation, marked by cultural self-reflections regarding a fundamental question: why and how an event which was interpreted as a disaster happened. This phase, which I term 'interpretation through evaluation', underscores another fundamental semiotic characteristic of a disaster: the increasing semiotic consciousness of underlying semiotic structures and systems of the given society (see also Parmentier 2012; Morimoto 2012a), prompting a re-examination of such deep-seated structures. Discussing the 2013 Typhoon Haiyan in the Philippines, Nimrod L. Delante (2021) demonstrated how, in the aftermath of the event, survivors reframed their self-image and worldview, shifting from a negative sense of self-blame and feelings of deserving punishment toward a more positive sense of empowerment and emancipation. This transformation was achieved by reflecting on their post-disaster roles, which enabled them to expand their social awareness. In the case of natural disaster, this heightened awareness encompasses one's relationship with the environment, as illustrated in Paper I of this thesis. In the aftermath of the 2010 eruption of Mt. Merapi, local residents began to critically assess magical and sensorial sign systems that had previously shaped their semiotic interactions with the volcano. In many instances, disasters fundamentally induce change in the relationship between nature and culture and force people to rethink their relationship with the environment (Hewitt 1983).

This cultural self-reflection is facilitated by the role of disasters as 'revealers' (García-Acosta 2002: 57). Anthony Oliver-Smith and Susanna Hoffman (2002: 9–10) suggested that disasters "unmask the nature of a society's social structure" and "reveal the deeper social grammar of a people that lies behind their day-to-day behavior." In this sense, some disaster scholars argue that disasters are crucial and strategic sites for scholarly research, as they reveal the core of human experiences. Disasters strip away the layers that hide social constructs and structures (Fothergill 1996), power distributions (Oliver-Smith 2002), invisible exploitative social orders (Hewitt 1983), as well as kinship, alliances, and institutions (Hoffman 2020). Disasters are "events that create temporary societal cracks and social and cultural dizziness" (Bergman 2020: 313). Therefore, disasters can unveil the vulnerable conditions within a society while also revealing its resilience potentials.

Here, the hazard paradigm and the vulnerability paradigm provide two contrasting yet complementary indexical interpretations. The hazard paradigm views the relationship between an 'extreme natural event' and a 'negative occurrence' as indexical, suggesting that the negative outcomes originate directly from the extreme natural event. In contrast, the vulnerability paradigm presents another

form of indexicality, where negative occurrences serve as indexes of vulnerable conditions and structural inequalities within the affected society.

Moreover, we may also observe different contrasting ways of interpreting these indexical relations. The interpretation of hazard signs as indexes of an extreme natural event involves a forward-looking approach from present to the future where the predicted natural event may or may not exist. Conversely, interpreting a disaster as an index of vulnerabilities adopts a retrospective perspective: an evaluation from the present oriented towards the past. In a way, it reveals a paradox: without a disaster, vulnerability will only remain dormant, located at the very depth of the cultural palimpsest. It will only manifest through a disaster. In other words, vulnerability is revealed socially through disasters. In the realm of disaster management, many cases show that public awareness and discussions of the issue of vulnerability will sharply increase in the aftermath of a disaster.

3.3.1.4. Anticipation

The fourth semiotic process involved in natural disasters is anticipation. Reflecting on a disaster event, people will inevitably return to their ideas about the past. At the same time, such contemplation will envision a new imagination of the future. Thus, the post-disaster cultural self-reflection will also concern a basic question oriented to the future: how to continue life after a disaster? In Lotman's words, "the individual turns back to seek in the past that which appears able to forecast the future and, as a consequence, to facilitate his orientation toward the present" (Lotman 2013: 165–166). Here, cultural self-reflection will facilitate and introduce a 'new past' – a conception of the past that is contemplated and re-imagined. It will also introduce a 'new future' – a conception of the future that is collectively anticipated based on a correction of the past (see Lotman 2009, 2013; see also Pärn 2021).

According to Katre Pärn (2021: 114), anticipation of the future is rooted in how it is modelled, "anticipation pertains to the modelling of the future as well as the present action taken with regard to the model of the future, in order to ensure that the desired future becomes actuality – or that undesired future does not." With this perspective, we may argue that vulnerability and resilience discourses suggest different models of the future. In constructing these models, vulnerability emphasises existing problems, while resilience focuses on the current capacities of the society.

Drawing on Lotmanian concepts of cultural memory, particularly his notion of program, we can understand how new cultural practices are formed. Program refers to the creation of practices that are oriented toward the future and are expected to become part of a society's cultural memory (Lotman, Uspensky 1978: 214). Hence, we may say that a disaster can trigger cultural programs within affected societies to anticipate potential future disasters. This process shapes societies along new trajectories, dictating which specific actions and behaviours should be taken or avoided in an effort to minimise their likelihood, and thus becoming a fundamental aspect of disaster risk reduction. Ann Bergman (2020:

318) highlighted that “regardless of whether it is a potential, a risk, or a manifested disaster, a disaster can trigger social change since it carries with it a possibility for society to, through people’s actions, develop in new directions.” This is clearly evident in the adoption of modern disaster knowledge, including the concepts of vulnerability and resilience, which usually encourages other fundamental cultural shifts, notably through a series of implementations of such knowledge within the framework of disaster risk reduction.

3.3.2. The entanglement of natural and cultural processes in natural disasters

The modernist dichotomy of nature and culture seems to form the core of the confrontation between the two paradigms of disaster studies that were discussed above: the hazard and vulnerability paradigms (see also Boret 2022). On one side, the hazard paradigm insists that natural disasters are produced by external natural forces. Here, the problem is perceived to have stemmed from nature, which is deemed irregular and unpredictable, in contrast to culture, which is seen as ordered and predictable. In this view, culture is continuously forced to adapt to natural processes and cycles that are often not fully understood or predicted. The engineering of nature, as well as human society, to mitigate natural disasters, demonstrates the modern desire to conquer nature for human interests.

On the other hand, the vulnerability paradigm emphasises that the core problem lies within culture or society, not nature; specifically, social vulnerability rather than natural extreme events. Thus, disasters are viewed not as natural, but as consequences of the structural inequalities and polarities of human societies. In his “Disaster by Choice”, a prominent representative of the vulnerability approach, Ilan Kelman (2020), strongly argues that if human actions are fundamental factors in the social production of disasters, then human actions may also prevent disasters (see also Kelman 2022).

Criticising the nature/culture dualism and arguing for its role in creating the current environmental crisis has been one of the most critical debates in social sciences and environmental humanities in the past decades (Haila 2000; Plumwood 2002: 51–52). Thus, for example anthropologists Philippe Descola and Gísli Pálsson (1996: 12) argued that going beyond this “key foundation of modernist epistemology” will open up “an entirely different intellectual landscape, one in which states and substances are replaced by processes and relations.” Although implicitly, much of the central debates in disaster studies have to do with the division of the two and the role of one or the other in shaping disasters, explicit debates about the relations between nature and culture have not been prominent in disaster studies. Among a few disaster scholars concerned about this issue, Anthony Oliver-Smith (1999) argued that the ways in which people adapt to their environmental circumstances and hazards after experiencing a disaster illustrate the deep intertwining of nature and culture. He thus emphasised that “disasters occur at the intersection of nature and culture and

illustrate, often dramatically, the mutuality of each in the constitution of the other” (Oliver-Smith 2002: 24).

One of the current essential criticisms of the nature-culture dichotomy involves the attempt to remove the difference between nature and culture altogether (see for example Latour 2004; Haraway 2003). However, I would argue, along with authors such as Andreas Malm and Alf Hornborg (Malm, Hornborg 2014; Hornborg 2009; Malm 2018) that it is important to maintain the differentiation between nature and culture, especially as a methodological tool. Completely removing these two interconnected concepts and undermining them with an alternative concept, such as ‘actant’ in Latour (2004) or ‘natureculture’ (Haraway 2003), could lead to an inability to capture the subtleties and diversity of the entanglements of cultural and environmental processes. This may also raise ethical problems; the total diffusion of the nature-culture distinction also diffuses human responsibility and accountability for current environmental issues, such as climate change and biodiversity loss. Collapsing the difference between nature and culture may also result in the succumbing of one into another, resulting in an extreme ‘culturalism’ which argues that ‘nothing really exists outside the limits of culture’, or on the contrary, radical naturalism, which maintains that ‘everything is ultimately of natural origin’.

The contention that certain maintenance of the division is of use, does not mean that the dichotomy and its applications should not be rethought and reconsidered. In the past decades, this nature-culture division has been subjected to restructuring and cultural specifications (e.g. Descola 2013), political ecological revisions (Malm 2018; Hornborg, Pálsson 2000; Malm, Hornborg 2014), post-colonial criticism (Roothaan 2019), as well as ecosemiotic rethinking (Kull 1998; Hornborg 2009; Maran 2020, 2021). Merging ecosemiotics with the semiotics of Juri Lotman, Timo Maran (2020: 35) has argued that “nature is essentially important for the culture due to nature’s otherness, strangeness, hiddenness, and partial inconceivability.” Maran (2020: 47) emphasised that:

Lotman does not, at least in his later works, treat culture as all-encompassing, yet neither does he try to remove the difference between culture and nature, nor does he describe the border between nature and culture as impenetrable. Rather, culture keeps its subjectivity, autonomy, and dynamics, but does this in relations with the outer space that allow culture to change and regulate itself in relation to the surroundings.

The boundary differentiates nature and culture, but simultaneously facilitates and encourages communication between those two spheres. We may further argue that only with the help of such boundaries the dialogues between nature and culture may take place.

However, it is crucial to investigate those nature-culture boundaries on a case-by-case basis, and also to take into account the temporal dimension. Hence, it is almost a semiotic truism to say that the same natural phenomenon, which occurs in different places or periods, may be interpreted differently. The same perspective on the nature-culture relations may also not be shared by all members of a

society. This implies that there are power relations and contestations in society shaping those relations. So, the problem, to some extent, lies not in distinguishing between nature and culture, but rather in treating this dichotomy as a universally shared ontological condition, assuming that every society operates with certain hierarchical separation of nature from culture, and consequently, a disaster can be debated as being caused either by nature or culture, but not as an integration of both. Hence, instead of treating such distinction as a universal ontological state, the semiotic study of natural disasters could be fully aware about the very diverse modes of relations between natural and cultural processes across societies and historical epochs.

At this point, ecosemiotics, with its basic tenet that human-environment relations are fundamentally semiotic, will allow us to carefully reconsider nature-culture relationships in the context of natural disasters. Some theoretical sources have attempted to categorise the semiotic relations across different cultures, thus providing classifications of cultural systems based on the semiotic relations of humans and their environment. Although these efforts may be criticised as another attempt to universalise certain dichotomies, they point to certain commonalities in types of relations that are at the same time central to cultural self-descriptions. Philippe Descola (1996, 2013) has proposed different structural models of nature-culture interrelations based on modes of identification, modes of relation, and modes of categorisation. One of his earlier categorisations concerns three modes of identification: totemism, animism, and naturalism; and three modes of relations: predation, reciprocity, and protection (Descola 1996). Later, based on that structural differentiation, he proposed some further animistic, totemic and naturalistic variations (Descola 2013). In a more general way, Kalevi Kull (1998) has differentiated two modes of human-nature relations, i.e., inclusion (integration) and exclusion (separation). According to Kull (1998: 359):

Depending on either the exclusion the nature from one's self, or the inclusion of nature into it, there are generally two basic approaches of humans towards living nature. According to the first, humans try to repel wild animals and plants from the neighbourhood of their homes. According to the second, humans attempt to live together with plants and animals.

Timo Maran's works on culture-nature relations assume that 'locality' is an essential characteristic of the semiotic relations between humans and environments. Working from an ecosemiotic standpoint, Maran (2002: 70) understands locality as "the characteristic of semiotic structures by which they merge into their surroundings in such a way that they cannot be separated from their environment without significantly altering their structure or information contained in this structure." In this definition, locality connects cultural and environmental semiotic processes. On the one hand, environment prescribes some basic features to humans, to which they may adapt and designate reflexive meaning. On the other hand, humans may develop certain meanings for environmental features surrounding them, and change these features based on their meanings. So, if the environmental

features are different, the meaning system will be different in relation to them, and vice versa (Maran 2002: 71).

Furthermore, as I have explored in Paper I of this thesis, the structure of nature-culture semiotic relations may be the basis for cultural identity. The local inhabitants of Mt. Merapi have strongly tied their identity to the volcano, calling themselves '*wong Merapi*' (people of Merapi), while local fishermen in Aceh are attached to the sea and coast, not only as the source of daily livelihood, but also as the root of their cultural identity (see Nazaruddin 2023; see also Paper I of this thesis). Such strong human-environment connections are evident in many local cultures, where identities are intertwined with their respective environments (Maran 2002: 76–77). During a long period of living in a specific environment, individuals acquire a wealth of knowledge and insights that connect them to their environments, enabling them to comprehend, interact with, and anticipate environmental processes. In areas prone to natural hazards, where extreme environmental processes happen periodically with high intensity, such as earthquakes in Japan, periodic eruptions of Mt. Merapi Indonesia, or annual floods in Bangladesh, such long-term adaptation processes will form unique identities called 'cultures of disaster' (Bankoff 2002), in which the constant hazard from the environment, "has been integrated into the schema of both daily life and attitude" (Bankoff 2004: 111). In these areas, local communities have usually established specific patterns of adaptation to the disasters that regularly occur in their environments. They have their own explanation on how and why the disaster happens. They have their own approach on how to respond to the disaster, what actions should be taken and what should be avoided. As a result, the local environment, including its permanent hazards, gets integrated into the cultural memory of the given society, and reflected in many cultural texts, such as myths about the spirits dwelling on the peak of Mt. Merapi (see Paper I of this thesis), or *smong* narrative of the Simeulue people (Rahman *et al.* 2018).

Paper I of this thesis illustrates so-called co-volcanic societies (Bankoff 2020): volcanic cultures and landscapes that result from dynamic interactions between people and the environment. On the one hand, nature, especially through eruption cycles, shapes the patterns of habitation and the culture of communities in its vicinity. On the other hand, the pattern of the integration of natural processes within the societies ultimately influences the eruption's impact (although not the timing). Greg Bankoff, Chris Newhall and Alicia Schrikker (2021: 156) conclude that "adapting to the daily dictates imposed by the volcano became integrated into community culture and formed part of local identity." Marta Mori *et al.* (2019) have shown how culture shapes the Karo people's reaction to the eruption of Mount Sinabung in North Sumatra, which in the later stages has implications for recovery steps. In addition to some previous studies which have explored how local communities on the slopes of Merapi have developed patterns of adaptation to the threat of very frequent eruptions from their volcano (Donovan 2010; Lavigne *et al.* 2008; Dove 2008, 2007; Schlehe 1996), Paper I of this thesis argues that such adaptation patterns are fundamentally semiotic systems, consisting of dynamic and interrelated sign systems that connect humans to their environment.

The boundary between nature and culture will further constitute the characteristics of semiotic systems regulating the whole ecosystem, which includes human societies. In many traditional societies where the nature-culture distinction is not built on strict dichotomies, the cultural readings of catastrophic events are integral parts of the culture's understanding of how to interact with the environment. In this sense, an extreme natural event is a part of the given semiosphere (*sensu* Lotman 1990: 123–130), whereby the local people try to make sense of it or to provide meaning to it, and then generate certain responses to it. At this point, a natural disaster event can provide a moment of auto-communication: a crucial moment of cultural self-reflection through which the culture is able to adapt and rejuvenate itself with regards to the constant environmental changes it endures (Maran 2020: 35). In Paper I of this thesis, following Timo Maran, I called the totality of the semiotic systems regulating such nature and culture entanglements 'ecossemiosphere', defined as "a semiotic system that comprises all species with their umwelts and the diverse semiotic relations (including humans with their culture) that they have in the given ecosystem, as well as the material support structures that enable the ecossemiosphere to thrive" (Maran 2021: 524). Embedding disasters in ecossemiosphere highlights their natural and social constitution.

In modern societies, where nature is generally perceived as something external to culture, we may suppose two possible semiotic interpretations of extreme natural events. The first takes place when a natural event simply exists as merely a prospective sign, potentially referring to another natural phenomenon (Chang 2006; Morimoto 2012a). In this sense, a natural event, due to its peculiarity, might be considered as a foreign sign, i.e. when an interpreter supposes that such an unusual natural occurrence is a sign, but does not know the interpretant of such a sign. From this perspective, such a sign of nature is similar to cultural texts imported from foreign cultures, or to historical texts that have been long forgotten and then retrieved (Maran 2010: 81). As I previously mentioned, the inability to identify or interpret a sign of nature may occur due to the lack of cultural memory within a given society, such as the ignorance or misinterpretation of the receding sea water at the Aceh coastline in the moments before the grand waves of the tsunami crashed ashore in December 2004.

However, once a causal relation is completed, such as when tsunami waves follow the earlier receding sea water, and the perceivers experience and comprehend this as an indexical relation, the new disaster experience might be included into the cultural memory of the given society. Disasters as harmful events and processes will be remembered and preserved in the society's cultural memory as part of the preventive function, so that the same natural events will be associated with different rules of behaviour. As a result, when a similar extreme natural event happens in the future, it will no longer appear as a foreign sign. Thus, natural disaster experiences may lead to stronger nature-culture entanglements.

In addition to such basic features of nature-culture relations of the given society, the exclusion or inclusion of extreme natural events into the cultural memory is, to some extent, constituted by the frequency of contact with the

events. In this sense, certain types of extreme natural events may be excluded from the cultural memory of a traditional society due to its rare contact with such an event. This is exemplified in the case of the 2004 tsunami in the Aceh society. Scholars have found that in the prehistoric period, the coastlines of Aceh were struck by several tsunamis, with an average interval of 450 years between events (Rubin *et al.* 2017). This prolonged period of dormancy likely allowed the Aceh society to forget previous tsunami experiences. In contrast, people of Jakarta, the capital city of Indonesia, maintain an active cultural memory of flooding, attributable to the nearly annual occurrence of such events (Marfai *et al.* 2015).

4. NATURAL DISASTERS AND CULTURAL TRANSFORMATIONS

As I have mentioned in the second chapter of this introductory frame, there is an extensive and ongoing discussion about socio-cultural continuity and change following a disaster (Hoffman 2016, 2020). Susanna Hoffman (2020) has noted that sociologists traditionally argue that disasters do not lead to significant social change. This perspective is based on the belief that conditions before a disaster represent normalcy, while disasters themselves are seen as anomalies or social issues that require immediate resolution by returning to pre-disaster normalcy. However, for example, Enrico Quarantelli (1987), a key figure in disaster studies with a sociological background, challenged this view in the 1980s, proposing that disasters should be seen as catalysts for social change rather than mere social problems.

Also, anthropologist Anthony Oliver-Smith (1986) has suggested that studies of disasters and their effects on communities should address not only the immediate impact but, more importantly, issues of adaptation and change. In a way, all disasters are inherently unpredictable and unexpected, and can potentially lead to the emergence of new semiotic systems within society through post-disaster renewal and revitalisation processes (see Hoffman 2020). Examining extensive historical records, Garcia-Acosta (2002) contends that calamity not only reveals the deep structure, but also engenders transformation and adaptation of such structure.

This line of argumentation rests on the basic assumption that cultures are inherently dynamic, constantly undergoing change and reshaping themselves in response to historical circumstances. While maintaining a certain degree of stability, culture exists in a state of dynamic equilibrium, evolving over time by incorporating innovations introduced through invention, acculturation, or diffusion (Wallace 1961: 143). Kluckhohn (1964), perceiving culture as a system of knowledge, considered that, although resistant to shift, culture still undergoes alterations. More recent conceptualisations of culture emphasise its dynamic, fluid, less-coherent, and contested natures, acknowledging that disasters may initiate critical phases of such cultural dynamics (see Hoffman 2016, 2020).

Some semioticians have also explored this topic of post-disaster change, often arguing that disasters reveal cultural continuity rather than significant shifts. As I have mentioned in the second chapter, the main argument in these semiotic studies is that disasters may take a role as ‘revealers’ of the deep structure or the grammar of the society. Disasters, however, only explicate such ‘deep grammars’, but do not change them (see Parmentier 2012; Morimoto 2012a, 2015). Natural disasters typically trigger immediate, temporary changes, such as the adoption of new habits, the establishment of new rules, or the formation of new social organisations. This perspective commonly arises from the experiences of the survivors and humanitarian workers, especially in the immediate aftermath of the natural disaster. However, as time goes on and the reconstruction and recovery

phases progress, a common sentiment will usually emerge among people, asserting that everything is returning to normal and that nothing has fundamentally changed after the disaster. Daily taskscapes are recovered, old social structure re-established, and further social vulnerabilities and inequalities are reproduced. In this sense, disasters may be compared to rites of passage (Van Gennep 1960) – disasters are just like transitional rituals, bringing temporary alteration of positions and rules, while the structure of society and culture remains unchanged.

In this chapter, I will relate a semiotic approach to disasters with the above-mentioned discussions and provide my own synthesis. In doing so, I will mostly apply Lotmanian semiotic inheritance, especially his theory of cultural explosion.

4.1. Lotmanian explosion and post-disaster cultural transformations

The Lotmanian framework of cultural semiotics, particularly the differentiation of gradual and explosive change, offers valuable insights into the discourse of cultural transformations in the aftermath of disasters. In some aspects, changes on the surface level are somewhat similar to what Lotman explained as gradual change. If we apply the Lotmanian spatial model – the semiosphere (Lotman 2005) – then surface changes are common dynamics that take place within the peripheries which do not affect the dominant – the highly organised and structured elements at the centre. Yet, in the Lotmanian temporal model, which is introduced in his later works (Kim 2014), surface changes unfold as gradual linear processes or cyclical movements. In this framework, a culture, after completing one full cycle, returns to its original point and begins to repeat the cycle again (Lotman 2009, 2013).

At the same time, Lotman characterises fundamental structural changes as explosive transformations. In the spatial centre-periphery model, these changes signify fundamental alterations to the basic rules governing the entire system. The transition is fundamental in this kind of transformation, causing the break of existing semiotic structures, which is accompanied by a sharp increase in the semiotic shifts. These shifts include alterations to names and designations, and the fight against old rituals may itself be ritualised (Lotman, Uspensky 1978: 212). Lotman (2005) further argued that the peripheral phenomena may move to the centre and hence trigger fundamental changes of the cultural system. From the Lotmanian perspective, the central concepts of ‘continuity’ and ‘discontinuity’ should be understood within a broader contrasting context. Lotman (2013: 183–184) asserted that:

In opposition to a stable state, cyclical repetition appears as movement. In contrast to linear evolution, however, cyclical development is viewed as static. But even within linear processes, gradual linear movement differs from explosive linear movement. From the point of view of explosive change, linear movement also appears as stasis, or pseudo-movement.

In his later works, Lotman explored the intricacies of explosive change. Shifting from a spatial to a historical model, Lotman maintained that “Processes that are cyclical and evolve gradually do not create unpredictable situations. From this point of view, predictable situations cannot produce something fundamentally new. In the usual sense of the word, novelty is the result of an essentially unpredictable situation” (Lotman 2013: 64). Lotman emphasised that the essential characteristic of explosive change is its inherent unpredictability. The explosive moment is like an individual standing at a crossroads, confronted with a myriad of paths, some of which were previously non-existent. Each path holds equal plausibility, rendering the choice truly unpredictable. Lotman emphasised that “the selection of any one of these is determined by neither the laws of causality nor those of probability: at the moment of explosion these mechanisms are wholly inactive. Future choice comes about by chance” (Lotman 2009: 14). He aptly describes, “Every time history lays probability on the table, we find ourselves at the intersection of several different paths” (Lotman 2013: 65).

Lotman further posited that after an explosive moment, a gradual phase follows, signifying the actualisation of one path from the bundle of equally probable choices. As a historical turning point, this phase exhausts indeterminacy, establishes a new phase of gradual future development, and fosters historical self-awareness “retrospectively interpreting all that has occurred” (Lotman 2009: 16). Thus, the moment of explosion is ensued by another gradual phase, “a very curious process then occurs: the event, once completed, casts a retrospective reflection” (Lotman 2009: 125).

From Lotman, as well as other scholars emphasising the dynamic nature of cultures, we may point out several fundamental theoretical propositions concerning natural disasters and cultural transformations. Firstly, a natural disaster should be framed within its historical trajectories, i.e. pre- and post-disaster cultural processes, through a long-term analysis. Secondly, explosive changes triggered or accelerated by a disaster may unfold alongside gradual changes across diverse cultural spheres, suggesting that disasters very rarely result in complete discontinuity or, conversely, total continuity. At certain historical turning points, disasters may play a crucial role in explaining profound cultural transformations, while in other historical contexts, they may symbolise cultural continuities. Thirdly, disasters will usually be followed by cultural self-reflection within the affected societies concerning the disastrous event they have just experienced. I referred to this as the evaluation phase (see chapter 3 of this introductory frame). This moment of self-reflection may result in explosive changes, but may also lead to the reestablishment and continuities of the pre-disaster situations. These theoretical propositions suggest that there is no universal rule applicable to all historical contexts regarding whether disasters will lead to continuity or discontinuity of previous cultural systems. Therefore, semiotic studies of natural disasters should fully aim to understand the dynamic interplay of processes leading to continuity and discontinuity of cultural structures following a disaster. Such an understanding should recognise how these two seemingly contrasting phenomena can coexist and be interconnected.

4.2. Natural disasters and their temporal trajectories

The primary methodological emphasis, as also demonstrated in the papers of this thesis, is the necessity of contextualising disasters within their historical frameworks. This methodological emphasis should encompass both pre- and post-disaster phenomena, particularly in long-term analyses. Therefore, the question of cultural continuity or discontinuity following a disaster should be approached comprehensively, taking into account social processes preceding a disaster, as well as the dynamics of post-disaster recovery processes.

On the one hand, disasters are intimately connected with pre-existing processes and transformations within a society. Susanna Hoffman (2020: 375) has emphasised that “the basal rule is the long-term path of the culture through time, with marks denoting both era and incident.” She noticed that typically profound social change following a disaster “is near imperceptible, more mutability than leap,” in which “the glide of reformation, despite occasional jolts, is slow and the fluctuations are usually subtle” (Hoffman 2020: 375). Examining from a long-term perspective, some anthropological, archaeological and historical studies have demonstrated that disasters have often precipitated profound cultural transformations (Oliver-Smith 1996; Hoffman 1999). Papers I and III of this thesis have demonstrated how the periodic eruptions of Mt. Merapi have accelerated modernisation within the local communities.

On the other hand, post-disaster recovery and reconstruction projects themselves may become another pivotal source for post-disaster transformations. On the slopes of Mt. Merapi, the adoption of an urban housing model for post-disaster development, following the widely used post-disaster housing approach (Barrios 2017a), has resulted in complex socio-cultural changes, such as weakened community bonds, a failure to foster a sense of place for the residents, and the emergence of new social issues, including social envy and family disputes (see also Saul 2019). In the aftermath of the tsunami in Aceh, the surplus of aid during the recovery phase catalysed a novel trajectory in post-disaster humanitarian efforts. This trajectory transcended immediate relief and reconstruction efforts, transitioning towards sustained initiatives in economic development and societal transformation (see Paper IV of the thesis; see also Feener 2013; Daly *et al.* 2016). Nandini Gunewardena and Mark Schuller (2008) have demonstrated how governments, humanitarian organisations, and corporations employ neoliberal strategies to orchestrate post-disaster recovery and reconstruction, channelling their efforts towards a singular goal: economic growth.

At first glance, this theoretical premise about cultural continuity seems to contradict the Lotmanian perspective on explosive change. It seems to suggest that disasters merely perpetuate ongoing socio-cultural processes within affected communities, portraying disasters as a continuation of these processes. However, an explosive change does not have to manifest as a single revolutionary event (see Kim 2014). Lotman himself often illustrated explosive changes as long processes that could last for several years, decades, or even centuries. For example, the fall of the Roman Empire lasted for several centuries, while the

Russian revolution, i.e. the fall of the Tsarist Empire, took place for several decades (Lotman 2009, 2013). Lotman pointed out the fundamental characteristic of an explosive change as a ‘transitional period’, “Explosive ages periodically replace those marked by gradual progression. As a rule, they introduce a transitory quality into the social and cultural sphere, replacing the relatively more extensive periods of ‘determinate evolution’” (Lotman 2013: 196).

Given the lines of discussion provided above, a question still persists: what is the relationship between these long-term explosive changes and a comparatively brief episode of a natural disaster? I propose two potential scenarios: a natural disaster could serve as the initial trigger for these prolonged explosive processes, or it could occur within this extended transformational trajectory, acting as an accelerator for ongoing changes. Therefore, I suggest comprehensively considering the entire transformational journey by juxtaposing the antecedent circumstances with the post-shift conditions.

Disaster as a trigger of change may be illustrated by the case of the 2004 tsunami in Aceh. This catastrophic event initiated a sequence of explosive moments that led to unpredictable events, presenting new opportunities for the future trajectory of Aceh. This ranged from the signing of the Helsinki peace agreement on 15 August 2005 (which was only possible due to the 2004 tsunami) to the delivery of abundant and excessive aid during the recovery phases, which created novel options that did not exist previously (see Paper IV of the thesis). In the Aceh context, the tsunami initiated an explosive moment, followed by other explosive sequences. This illustrates Lotman’s (2009: 120) assertion that, “explosion can also be realised as a chain of sequential explosions, each of which changes the other, creating a dynamic, multi-levelled unpredictability.” Gillen D’Arcy Wood (2014) extensively demonstrates how the Tambora eruption in 1815 triggered substantial cultural shifts on a global scale, even influencing the development of new modes of transportation, such as the early prototype of the modern bicycle. He mentions that the departure from horsepower during this period resulted from the loss of thousands of horses due to the climate crisis in Europe between 1816–1818 as a direct consequence of the eruption.

In alignment with some anthropological studies revealing that disasters often accelerate ongoing societal changes (Oliver-Smith 1996), my research on local communities residing on the slopes of Mt. Merapi illustrates that volcanic eruptions can serve as pivotal moments that expedite the modernisation of these communities, including accelerating the acceptance of modern scientific sign systems to comprehend the conditions and activity of the volcano. The acceptance of such systems had slowly begun in the mid-1990s, particularly among young people. The 2010 eruption marked an explosive moment, leading to widespread acceptance of this modern knowledge system among almost all segments of society residing on the slopes of this volcano (see Paper I of the thesis). The 2010 eruption also served as the final force in an ongoing transition towards contemporary methods of communication and livestock management, which had been initiated in the 1990s (see Paper III of the thesis).

Susanna Hofmann (2020) provides an illustrative case study from Thera Island. The 1956 earthquake, which claimed four lives and inflicted significant physical damage, exacerbated the ongoing depopulation of the island. This trend, initiated in 1917, accelerated sharply after the seismic event, resulting in a 40 percent drop in population. Moreover, the earthquake-induced depopulation precipitated fundamental cultural shifts, including increased rates of outside marriage, the influx of newcomers, a rise in urban culture, and the advent of tourism. Hoffmann (2020: 381–383) thereby noted “Disasters accelerate processes of change already underway. Indeed, the changes that have occurred since the earthquake are quite profound. They reflect more than surface detail; they indicate alteration at deep levels where rules of marriage, naming, residence, and class category lie.”

4.3. Contemporaneity of cultural continuities and discontinuities

Gradual and explosive changes, though contrasting, are at the same time complementary and can occur concurrently. Lotman often illustrates how certain cultural elements change rapidly, such as clothing fashion or the adoption of new technology, while other aspects change slowly, like shifts in language: “The wheels of the various mechanisms of a culture move at different rates” (Lotman 1990: 103), and therefore, “[...] any one of its synchronic sections reveals the simultaneous presence of these different stages. Explosions in some layers may be combined with gradual development in others” (Lotman 2009: 12).

In the context of disasters, we may argue that explosive changes triggered or accelerated by a disaster may take place along with other gradual movements at different cultural spheres. Disasters usually change certain socio-cultural aspects, rather than eliminating an entire society or creating a total discontinuity. It would be a very rare occasion if a disaster caused a total destruction of the entire society, leading to a total cultural discontinuity as the existing society was erased by the disaster. An example of such a rare case was perhaps the 1815 Tambora catastrophic eruption that entirely erased three local kingdoms on its slope: the Tambora, Pekat and Sanggar reigns (Wood 2014). By contrast, societies and cultures usually continue to exist after a disaster, as disaster only destroys some cultural aspect or segment of society, leading to partial change and continuity (Hoffman 2020).

However, it does not mean that disasters serve as markers of continuity. I would argue that continuity does not imply a lack of change. Following a disaster, the desire to maintain continuity is paramount for affected communities. This desire is often encapsulated by the phrase ‘back to normal’, which signifies a return to previous places and livelihoods. Nonetheless, this does not suggest that a given society will fully revert to its pre-disaster state. It is the researchers’ task to observe and reveal that amidst the return to normal, some aspects remain unchanged while others undergo alteration. Thus, the focus should be on nuances:

recognising that continuity and change can simultaneously coexist, identifying which social elements remain stable, and which have changed and in what context, and whether these changes have affected the entire population or only specific segments (see also Hoffman 2016, 2020). A shift in a certain aspect of society and culture may be related to another shift or even to the continuity of a different aspect.

Also, seemingly trivial and superficial changes may actually represent a deeper transformation. Livelihood shifts within local communities on the slopes of Mt. Merapi following the 2010 eruption, with a lot of residents now pursuing opportunities in the tourism sector, might initially seem to be superficial alterations. However, this change signifies a broader and more profound transformation, especially the adoption of a modern market economic model, as well as a linear progressive way of thinking (see Paper I and III of this thesis).

Changes in religious practices within Acehese society following the 2004 tsunami vividly illustrate the complexity of this structural layering, revealing a nuanced interplay of various strata rather than a clear-cut dichotomy between centre and periphery. For instance, after the 2004 tsunami, the attire and style of Acehese individuals, particularly that of Acehese women, became more conservative – often colloquially referred to as more ‘Islamic’. This transformation in clothing signifies a deeper and broader shift in Islamic practices within Acehese society, from traditional models towards more formal-literal norms, which place a greater emphasis on symbols, appearance, and outward manifestations. Thus, at a deeper level, Islam in Aceh underwent changes following the tsunami. However, this transformation occurred concurrently with continuity at the same profound level, such as the persistence of the *tengku* (Islamic scholar) as one of society’s leaders. Furthermore, we can assert that what changed was the ‘Islamic practice’ or ‘Islamic model’ in Aceh, rather than Islam itself as a religion and system, which persisted after the catastrophic 2004 tsunami.

Discussing the history of Indonesia, historian Anthony Reid (2015: 77) has argued that, “in a zone as seismically active as Indonesia we must expect history to be discontinuous, through the effects both of volcanic eruptions alternately enabling and destroying intense agricultural production, and of tsunamis periodically destroying coastal settlements.” However, recently, such an argument was criticised by Susie Protschky (2022), who emphasised that in Indonesian history, natural disasters are markers of historical continuity. In an introductory article to the journal *Indonesia’s* (special issue on disasters in Indonesia), Protschky (2022: 4) writes: “Several authors here cast catastrophic events in Indonesian history not only as turning points but also as occasions for tracing important continuities.” I would add to this dialogue that, rather than making general claims about culture as such, during certain historical junctures, disasters serve as pivotal markers of change, while in other instances, disasters signify continuity in Indonesian history. However, in methodological terms, I would still propose that researchers focus on significant and fundamental cultural, social and environmental changes following a disaster. Focusing merely on continuity may obscure attention and thoroughness in identifying transformations, while focusing on transformations may allow for a deeper analysis of their depth, scope, and

context, and eventually allow the dynamic interplay between continuity and change to be revealed.

4.4. Self-reflection and anticipation in the cultures of disaster

In chapter 3 of this thesis, I have posited that one of the key semiotic phases following a disaster is the post-disaster evaluation. During this phase, affected societies engage in self-reflection regarding the disastrous experience they have just undergone. I would further argue that this self-reflection is a pivotal moment that may lead to explosive transformation (Lotman 2009; 2013), but may also result in the glorification of the past and the reestablishment of previous conditions.

Arguments regarding post-disaster continuity often draw upon Greg Bankoff's thesis on 'cultures of disaster'. For instance, Susie Protschky (2022: 4) contends that Indonesians residing in disaster-prone regions have well comprehended "how to *live with* disaster, not just survive it." Similarly, Wayan Jarrah Sastrawan (2022) analyses Indonesia's disaster history from the eighth to the twentieth centuries, asserting that Indonesian society, particularly the Javanese and Balinese, has constructed a conception of time that normalises disasters as predictable events and part of cultural life, especially through practices of augury and resilience strategies. In this sense, as they have been domesticated and become an integral part of cultural rhythms, disasters would not provoke any transformative cultural self-reflections.

In the context of Indonesia, I concur with the idea that Indonesian society has integrated disasters into its daily existence, viewing them as routine components of everyday life (Protschky 2022). However, I would like to further argue that domestication or adaptation is not a one-time process where society's understanding and response to natural disasters will remain constant over time. In other words, cultures of disaster are not a fixed set of cultures; instead, they entail continuous dialogues with and adjustments to the very unstable environment of the given cultures. Regardless of the extent or type of adaptations that occur, natural events will never completely merge with culture; instead, natural processes will always retain some aspects of 'otherness' and unpredictability in relation to the specific culture. When analysing local communities residing on the slopes of Mt. Merapi through the lens of the 'cultures of disaster' thesis, which suggests that these communities have normalised and domesticated the hazards from the volcano, Paper I of this thesis arrived at a somewhat different conclusion. This study found that the 2010 eruption played a significant role as a catalyst for the adoption of new scientific sign systems, which in turn led to broader social and cultural transformation within these communities. Similarly, Michael Dove (2008), applying the same 'cultures of disaster' thesis to the same local communities but at a different historical epoch (particularly before the 2010 eruption), arrived at a conclusion that resonates with the findings of Paper I. He proposed that Merapi eruptions serve as "routinized catalysts for productive change" (Dove 2008: 330).

Thus, both analyses underscore the dynamic role of volcanic eruptions in driving social and cultural changes within the affected communities, rather than merely being domesticated hazards.

Disasters pose myriad challenges, necessitating adjustments and solutions. They expose inequalities, power struggles, and social vulnerabilities. Disasters prompt existential questions as well, including core questions regarding the interaction of communities with their environment (Hoffman 2020; see also Paper I and IV of this thesis). As I have mentioned beforehand, during those ‘revealing’ moments, peoples’ semiotic awareness of such underlying social norms, structures, regulations, as well as inequalities, will significantly increase (see Parmentier 2012; Morimoto 2012a). In this sense, we may argue that peoples’ self-reflection on their own social and cultural structures may further provide strong motivation to alter such conditions.

At this point, I would like to focus attention back on the notion of post-disaster anticipation, as elaborated in the third chapter of this introduction. In this context, disasters act as agents of social transformation not only during actual disaster events but also in anticipation of potential future disasters. These events may steer societies toward new directions within the broader global discourse aimed at mitigating disaster risks and addressing social vulnerabilities. This concept is particularly relevant for developing countries, as a disaster in these places could serve as a pivotal event that introduces a new paradigm of modern disaster management ideas.

Disaster sites often become meeting points for diverse interpretations, including the perspectives of both locals and outsiders, which may involve cooperation, contestation, or a mix of both. By closely observing this meeting and dynamic contestations, we will find that modern disaster management agencies usually bring in some common predominant new ideas, encompassing a range of new scientific concepts, such as preparedness, risk, vulnerability, resilience, disaster management cycle, and disaster risk reduction. The inclusion of science in the cultural sphere, according to Lotman (see Lotman, Uspensky 1978; Lotman 2013), is an obvious example of contemporary cultural explosive changes.

My research on the 2004 earthquake and tsunami elucidates how this catastrophic event served as a pivotal historical moment for the adoption of new modern disaster knowledge in Indonesia. A few years following this disaster, the Indonesian government for the first time ratified a disaster management law, subsequently establishing disaster management agencies at the national, provincial, and district levels (see Paper IV of this thesis). Furthermore, these programs are not merely reactive responses to actual disaster events; they are proactive measures aimed at averting future potential disasters and fostering greater societal resilience. In the aftermath of the 1985 Mexico City earthquake, the Mexican people embraced a novel understanding of vulnerability (Hoffman 2020). Likewise, John Niroa’s and Naohiro Nakamura’s (2022) studies on local communities at Sulphur Bay, Tanna Island, Vanuatu, exemplify how volcanic eruptions serve as entry points for the introduction of new scientific ideas of volcanic risk reduction within local communities.

5. MEANING CONTESTATIONS AND HIERARCHY OF KNOWLEDGE

At the end of chapter 4, I noted that disaster sites often serve as meeting points for diverse interpretations from locals and outsiders, involving both cooperation and contestation, while modern disaster management agencies typically introduce various scientific concepts. Morimoto (2012a: 265–266) posited that a disaster functions as a zero-sign with boundless potentiality, which in turn generates a ‘struggle of interpretants’ (see also Parmentier 1997: 8): a battle to retrospectively represent the experience that was initially unknown or undescribed. However, I will argue that these interpretational potentialities are not boundless, but are bounded by cultural memory, social and political relations, and dominant schemes of interpretations as well.

The contestations or reconciliation of meanings may happen at all phases of semiotic interpretations. For example, at the level of denomination or the question of ‘what’, other cultural understandings of the ongoing processes might exist besides interpreting the situation as a disaster – an interpretation usually taken for granted by the external parties. At the ‘why’ or evaluation level, there are at least two interrelated questions that may lead either to dispute or cooperation: why the phenomenon happened and why there were human losses. Meaning contestations or collaboration may also occur at the level of ‘how’: how to respond and move on from the calamity. Furthermore, these meaning contestations will also take place at the level of risk interpretations, what is perceived as a risk may differ across agencies involved in disaster situations. At this point, it is crucial to pay attention to “how people at risk perceive risks, and how they would like to see their societies changed in the future through adaptation” (Albris 2022a: 41).

The topic of diverse and contested disaster interpretations, particularly the dynamic relations between affected communities and external helpers, is especially important for this thesis. Paper I of this thesis has shown how local communities on the slopes of Mt. Merapi have long relied on their magical and sensorial sign systems in order to understand the activities of their volcano, while the Indonesian government later introduced scientific sign systems to interpret the volcano’s activities. Paper II analysed how the government may propose a grand narrative of the disaster through memorials, or what Morimoto (2012b) called semiotic regimentation. This process refers to actions taken by the nation-state or ruling class in order to homogenise disaster interpretations by promoting specific versions as the official grand narrative of the disaster, thereby preserving them as cultural memory. However, as this paper argued, far from achieving its exhaustive impact, this semiotic regimentation will encounter various forms of resistance, contestation, and alteration. Paper IV explicated how external helpers may further, in the post-disaster recovery step, try to propose certain ideas of how a post-disaster society should be rebuilt. However, these proposals will always be confronted with a diverse set of counter-ideas centred around the question of how to rebuild affected societies after a disaster.

In this chapter, I will explore the dynamics of disaster interpretations, which are inherently diverse and involve both cooperation and contestation among various perspectives. Drawing on the Lotmanian idea of modelling systems, I argue that central to such interpretational conflicts is the co-presence of two different types of modelling systems, i.e. scientific knowledge and indigenous knowledge. I would further argue that the best way to address this issue is through fostering on equal grounds of communication between these two systems. In this regard, I align with Alf Hornborg and Gísli Pálsson (2000: 14), who advocate for a democratic management framework that does not romanticise the past or fetishize traditional knowledge, but instead embraces a “communitarian ethic of muddling through”, allowing for realistic adaptation to the complexities of the world.

5.1. The self and the other

In our contemporary world, disasters primarily occur within specific regions that belong to certain states, given that nearly all human-populated areas on earth have been delineated into state-based spatial and political divisions. Consequently, the state and its disaster-related apparatuses typically assume the primary role in managing post-disaster responses and recoveries within their respective territories. It is very rare for local communities to be left alone to deal with and recover from disasters independently, relying solely on their own capabilities and resources. Depending on the scale of the crisis, governments may involve additional non-governmental entities, such as corporations, non-governmental organisations (NGOs), or global disaster-related agencies. Thus, members of the affected communities and relief workers will come together, bringing different perspectives that may be shared and contested.

In this context, we may generally differentiate two types of human agencies dealing with disasters: the affected communities and the external helpers. I should note that, in many cases, such differentiation may become blurred as affected communities or individuals may also become helpers for their families, relatives, and members of their community. From a semiotic point of view, this differentiation is important to explicate the dynamic interpretation processes throughout the stages of a disaster. This will further lead the discussion to one of the most important cultural semiotic conceptual distinctions: self (insider) and other (outsider) (see Lindström 2014). From the point of view of the affected communities, the external helpers are ‘others’, while for the government, donors, and humanitarian workers, the locals are the ‘others’. The realities may be much more complicated as a disaster may happen across different communities, whereby one may become the ‘other’ for another affected community. This also occurs amongst external helpers who may come from different institutions with practices unfamiliar to one another. Also, the division of ‘self’ and ‘other’ may exist in different layers – a community which appears to be a single homogenous entity may have its own internal division and fractions. Thus, the distinction between ‘self’

and 'other' may vary within and across cultures, as well as across historical periods. Furthermore, a semiotic standpoint will enable us to grasp that such self-other distinctions are based on an act of interpretation. On the one hand, the self-other division will contribute to the creation of plural and contested meanings of disasters. On the other hand, the disaster situation itself may change the self-other division.

Once we acknowledge these characteristics of self and other relations, it is crucial to acknowledge that such encounters may involve imbalanced power relations and differing desires for dialogue. Oliver-Smith (1996: 309) has noted that:

The multiplicity of meanings generated out of the diverse voices in the rapid sequence of events creates an arena in which interpretation becomes a very contested field. In this arena of contestation, the power of representation is particularly crucial in the politics of defining the occurrence and extent of disaster and aid distribution.

On the one hand, exposure to the outside world can broaden the local population's perspective, prompting them to reconsider and potentially change their local viewpoints. This, in turn, can influence their understanding of the catastrophic event they experienced and shape their approach to addressing it. This aligns with Lotman's perspective (2013: 69) that "the explosion itself involves a sphere that was previously situated outside the boundaries of the given culture, which was inaccessible by the usual paths."

On the other hand, external helpers, who typically possess more resources than those they assist, prioritise the implementation of predefined and standardised approaches to disaster response and recovery over fostering cultural dialogue. Disaster managers, government officials, and relief workers arrive at disaster sites with established concepts, such as vulnerability and resilience, and their goal is often not to engage in discussions with affected communities about these ideas, but to apply and refine them through practical action. Susanna Hoffman (2020: 390) has pointed out that:

The legion of agencies governing most communities or commandeering most recoveries rarely comprehends deep culture or such issues as place attachment. The institutions or agencies, being of different cultures or facets of culture, do not fathom, nor attempt to, the holistic character of the culture they ingress, and so they, too, provoke change.

Thus, it may appear that the encounter primarily impacts local communities, rather than the disaster management agencies themselves. Moreover, when viewed from a global bird's-eye perspective, the trajectory of change seems to be moving towards a uniform idea: the adoption of new modern disaster management practices at the expense of diverse traditional disaster knowledge. However, I contend that, while this may be a predominant trend, it is not the sole variant in contemporary disaster management practices. Adhering to Lotman's idea of unpredictability inherent in explosive moments, such encounters can lead to

unforeseeable outcomes. In Tanna Island, Vanuatu, John Niroa and Naohiro Nakamura (2022) discovered that the influence of external agents has resulted in the rejection of external ontologies by the locals. Instead, they perceive the internalisation of external viewpoints as the real risk, rather than the eruptions of the volcano. Similarly, my own research in the aftermath of the 2004 tsunami in Aceh has revealed how the introduction of a new set of ‘democracy’ ideas by international humanitarian workers, such as gender equality, transparency, and good governance, along with post-tsunami recovery processes unexpectedly led to the formal implementation of Islamic law (sharia) in post-tsunami Aceh. Such an outcome diverged significantly from the core concept of ‘democratisation’ (see paper IV of this thesis).

On the other hand, the interaction with local affected communities also exerts influence on the modern discourse of disaster management. This shift is evident in the increasing recognition of traditional disaster-related knowledge within the international framework of disaster management. My previous study, which examined the inclusion of concepts, such as ‘people-centred’, ‘participation’, ‘indigenous or traditional knowledge’, ‘local community’, and ‘community-based’, in the global platforms of disaster risk reduction, observed a significant increase in usage from Yokohama Strategy for Plans and Actions (1994) to the latest Sendai Framework for Disaster Risk Reduction (SFDRR 2015–2030) (Rahman *et al.* 2020).

5.2. The hierarchy of knowledge systems: Between indigenous and scientific knowledge

In many cases, although it is not always homogeneous, the external helpers rely on scientific discourses and modern disaster management practices, while on the other hand, the affected communities mostly rely on their daily experiences and traditional knowledge about hazards and risks originating from their surrounding environments. I consider them to be distinct modelling systems (see Ingold 2000: 14–15) that have their own language or “structure of elements and rules of their combination” (Lotman 2011: 250) to address their objects. As modelling systems, both scientific and indigenous knowledge rely on certain translation processes which are regulated by their own rules.

On the one hand, indigenous knowledge is based on recognising indexical and iconic relations connecting humans with environments or a certain natural phenomenon with another natural occurrence (see also Hornborg 2001; Maran 2020). In a society where nature and culture are not in dichotomic relations, learning about the local environs is often conducted as an integral part of socialisation, or what James Gibson (1979: 254) referred to as the education of attention. During this period of socialisation, local youths are trained to watch, feel, and taste in an effort to fine-tune their perceptual skills with the surrounding environment. Mervyn Meggitt (1962: 285) described how the Walbiri in Central Australia prepared their boys for understanding nature through a two- or three-month tour. Guided

by a guardian, the boys go from place to place, learning about the landscape, plants, animals, and their totemic significations. Javanese people refer to this type of nature comprehension as '*ilmu titen*,' a hereditary knowledge, passed down through generations, to recognise the pattern of relations between certain natural phenomena with other natural occurrences. On the slopes of Mt. Merapi, locals are able to recognise the signs of an eruption through animal behaviour and other natural signs (see Paper I of this thesis).

This inherited knowledge about nature is generally shared among members of an indigenous community. However, there are often individuals who possess more detailed and specialised knowledge about their daily taskscapes, which involve also continuous interactions with natural environments and non-human species. These persons usually hold a special, or even central role of 'wisdom holders' within their communities. For example, in Paper III of this thesis, I interviewed an informant who is considered a 'buffalo expert' by the local people. Traditional Javanese communities rely on rice farming as their main livelihood and have traditional knowledge about different phases of the planting season, called '*pranoto mongso*' (literally meaning 'seasonal regulation'). However, some old farmers are considered to have mastered this indigenous knowledge and thus serve as the role models in the community – when they start to plant rice, other farmers join in. On the slopes of Merapi, some caretakers and elders are considered capable of interpreting signs, both natural and mystical signs, of the volcanic activities (see Paper I of this thesis).

On the other hand, scientific explanations are also constructed from certain chains of translations between different actors (see also Paper I of the thesis). The ranking system of volcanic activities, for example, is determined through a complex translation chain. The field officers interpret the data provided by volcanic observation technology present at the observation posts. It should be followed by translations conducted by the researchers at the BPPTKG head office based on the entire set of data and interpretations from all of the observation posts. This is followed by the local governments' translations into certain actions when Mt. Merapi's emergency status is raised, such as a decision to evacuate certain local communities. Additionally, these scientific models also change over time, as exemplified by the hazard map of Mt. Merapi. It was first introduced by the Dutch colonial government after the big 1930–1931 eruptions, during which the slopes were divided into three areas: restricted areas, danger zones I, and danger zones II (Triyoga 2010). This map was further improved by the Indonesian government based on the past 100 years of eruptions. The latest version was developed after the big 2010 eruption, which includes Disaster Prone Region III, the most dangerous areas surrounding the crater; Disaster Prone Region II, a few kilometres outside of region III; and Disaster Prone Region I, the river banks which serve as pathways for lava.

In many cases, the scientific explanations or predictions of extreme natural landscapes or events obtained a hegemonic position, and furthermore became the basis for constituting hazard and disaster-related public policies. The public, policymakers, and social humanities researchers take these explanations and

categories for granted, even grounding the assessment and evaluation of certain socio-cultural dynamics on them. For example, all eruption-related contingency plans of the local communities on the slopes of Mt. Merapi, whether arranged bottom-up at the hamlet levels or top-down as dictated by the district government, take four categories of Mt. Merapi's status as the basis for developing their contingency plans. The mass media in Indonesia often portray residents who are reluctant to evacuate when Merapi's activities increase as stubborn (Nazaruddin 2017). Some scholars have coined the idea of 'fatalism' to describe the condition of people who rely on God and believe that they have little control over their lives. Thus, people are labelled as 'fatalists' when they continue to live in disaster-prone areas while seemingly disregarding awareness of natural hazards and disaster mitigation efforts (see for example Dibben 1999; Aksa *et al.* 2020).

Julie Dekens (2007), who has reviewed the literature on local knowledge for disaster preparedness, noted that academic attention to the topic of local knowledge in the field of disaster management has grown since the 1970s. The significant increase in scholarly studies on this topic occurred after the 2004 Indian Ocean Tsunami, particularly in response to media reports on how certain types of traditional knowledge helped to save some local communities from the tsunami. The core argument is that disaster management should recognise and incorporate indigenous knowledge and coping mechanisms to empower communities in disaster-prone areas, enabling them to prepare for, mitigate, and recover from environmental hazards (Mercer *et al.* 2007). Nowadays, acknowledging the importance of indigenous knowledge in disaster management continues to increase in academic discourse (Mercer *et al.* 2010). Rajib Shaw, Noralene Uy and Jennifer Baumwoll (2008), for example, have compiled case studies on indigenous knowledge about natural disasters within Asia and the Pacific region. I have collaboratively edited a volume about local knowledge and practices among local communities in Indonesia in the context of disaster management and risk reduction (Rahman *et al.* 2020). A recently published edited volume presents a broad range of case studies on the integration and advancement of indigenous knowledge in disaster management and risk reduction (Panda *et al.* 2023).

At the global level, Sendai Framework for Disaster Risk Reduction 2015–2030 has explicitly acknowledged indigenous knowledge as an important source for disaster risk management and sustainable development. In recognising disaster risk assessment as the first priority of disaster risk reduction, this document stated, "To ensure the use of traditional, indigenous and local knowledge and practices, as appropriate, to complement scientific knowledge in disaster risk assessment [...]" (UNISDR 2015: 15). Furthermore, while explaining the roles of the stakeholders, the document contends:

- (iv) Older persons have years of knowledge, skills and wisdom, which are invaluable assets to reduce disaster risk, and they should be included in the design of policies, plans and mechanisms, including for early warning;
- (v) Indigenous peoples, through their experience and traditional knowledge, provide an important contribution to the development and implementation of plans and mechanisms, including for early warning. (UNISDR 2015: 23)

Despite numerous academic proposals, the integration of local knowledge in disaster management remains largely overlooked in contemporary practices (Gaillard, Mercer 2012; Mercer *et al.* 2007). Disaster researchers widely argue that the integration of local knowledge into disaster risk reduction has not been fully or effectively realised (Cuaton, Su 2020). Two key barriers to integration are the epistemological and institutional gaps (see Kashif *et al.* 2023). The epistemological gap arises from conflicting perspectives on how knowledge is conceptualised and applied by local communities, scientists, and policymakers, complicating the alignment of indigenous knowledge with scientific reports and policy implementation. Julie Dekens (2007) highlights historical colonial legacies and ideological beliefs in the superiority of scientific knowledge as key factors contributing to this gap. Policymakers and practitioners often remain sceptical of the validity and relevance of indigenous knowledge, given the heavy reliance on science and technology in modern disaster management. The institutional gap refers to the lack of institutions or institutional capabilities that can effectively bridge indigenous knowledge, science and policy, hindering the translation of local knowledge and scientific research into disaster policies. Tahir Ali *et al.* (2021) identified this institutional gap in Pakistan, highlighting ineffective government systems that fail to decentralise disaster risk reduction to the community level, where local capacities are essential. Additionally, the complexity, diversity, and evolving nature of indigenous knowledge pose further institutional challenges (Dekens 2007).

The encounter between scientific and indigenous knowledge as two modelling systems may take place in three different modes. The first involves the dominance of one system over the other, typically characterised by the supremacy of scientific knowledge over indigenous knowledge. Some reports refer to this mode as the integration of indigenous knowledge into scientific knowledge. In this mode, translation occurs as the source modelling system is converted into the language of the more dominant target system. The second mode is co-existence, in which indigenous knowledge and science may coexist and fulfil different functions while complementing one another. This mode relies on partial translation, where some elements of each system are altered while preserving their core structures and functions. The third mode entails a deeper level of translation and dialogue between those two modelling systems, resulting in the creation of new hybrid forms of knowledge.

I contend that the second and third modes of interaction between indigenous and scientific knowledge are preferable due to their emphasis on democratic principles in knowledge production and application in disaster risk reduction. This necessitates deconstructing the prevailing belief in the superiority of scientific knowledge in assessing hazards, reducing risks, and managing disasters, while also steering clear of romanticised notions of indigenous knowledge. As noted by Ilan Kelman, Jessica Mercer, and J.C. Gaillard (2012: 19), “Approaches and methods for bringing together different knowledge forms and for ensuring that indigenous knowledge is adequately considered without dominating or being dominated by other knowledge forms require further development.”

5.2.1. Appropriation of indigenous knowledge into science

The most prominent example of the appropriation of traditional knowledge into science for disaster risk reduction and climate change adaptation, is perhaps the project that was conducted by Lisa Hiwasaki, Emmanuel Luna, Syamsidik, and Rajib Shaw (2014a, 2014b) in the Philippines, Indonesia, and Timor-Leste. This is significant because they not only attempted to fit indigenous knowledge into a scientific framework, but they were also supported by some major global institutions in the field of disaster risk reduction. They maintained that “such knowledge needs to be integrated with science and technology before it can be used in policies, education, and actions related to disaster risk reduction and climate change adaptation” (Hiwasaki *et al.* 2014a: 25).

The above quote begs the question: how is the term ‘integration’ being used in this approach? Hiwasaki *et al.* (2014a; 2014b) proposed a two-step ‘validation’ procedure as a way of providing some clarity. The first step proposed was community validation, in which the local communities should validate their own traditional knowledge concerning effectivity, usefulness, intergenerational existence, or relevance. The second was scientific validation, in which certain scholars would assess whether there “was the presence, absence or uncertainty of a scientific explanation to the local and indigenous knowledge” (Hiwasaki *et al.* 2014b: 33). Those scientists were “asked to provide a detailed scientific explanation or to give empirical evidence (or explain the lack thereof) for the knowledge” (Hiwasaki *et al.* 2014a: 22). This two-step validation process was followed by a scientific explanation to the local communities on their own indigenous knowledge. Even though there were two levels of validation, it seems that the latter, scientific validation, was decisive. They concluded that:

[...] local and indigenous knowledge that help communities build their resilience but cannot be explained by or integrated with science are categorised separately. Such knowledge would continue to be practised by communities, away from scrutiny by scientists, policy-makers and practitioners. (Hiwasaki *et al.* 2014a: 25)

Zulfadrim, Yusuke Toyoda, and Hidehiko Kanegae (2019) adopted a similar approach in their study on Mentawai Island, Indonesia. The title of their paper, “The Integration of Indigenous Knowledge for Disaster Risk Reduction Practices through Scientific Knowledge” represents their view that indigenous knowledge must first be validated by scientific standards before it can be applied to disaster risk reduction. Their study suggests that certain forms of indigenous knowledge are more amenable to integration than others. Thus, it is clear that the basic idea is not actually about integration, but an appropriation of indigenous knowledge according to scientific standards. This model is perhaps one of the best representations of scientific hegemony: indigenous knowledge can be applied in disaster management only if it has been validated by science. Furthermore, this scientific hegemony will erode the “community’s capability to deal with disasters and make them dependent on external forces” (Prasad, Nigam 2023: 31). Paper I of this thesis has highlighted that such hegemony can generate a new vulnerability

within local communities, particularly in the form of potential technological and governmental failures.

I would argue that it is not appropriate to evaluate the functioning of a modelling system based on the language of another modelling system. Evaluation of any modelling system should always involve semiotic subjects who make use of it, without eliminating potentialities for dialogue with external subjects. Such evaluation is based primarily on the assessment of the credibility and usefulness of the modelling system. The former refers to how the modelling system is believed to resemble the object it models, while the latter concerns how the modelling system carries certain functions for the subjects. In the disaster context, such functions could be explanation, mitigation, prediction, emergency response, recovery, etc. Paper I of this thesis analyses how local communities on the slope of Mt. Merapi reached the conclusion that their traditional magical and sensory sign systems were insufficient for predicting volcanic eruptions, and then accepted and replaced them with the new scientific methods for predictions. However, the adoption of these new scientific signs does not eliminate the traditional sign systems, as they continue to play important roles in the local community, albeit not for predicting eruptions.

5.2.2. Coexistence of indigenous and scientific knowledge

Indigenous and scientific knowledge systems can complement one another, each fulfilling distinct yet mutually reinforcing functions. Paper IV of this thesis exemplified how different modelling systems can coexist in any phase of disaster management, as each modelling system is believed to represent the object in a specific way and perform important functions for the local communities. There is no need to set indigenous and scientific modelling systems at odds with each other, especially in the context of disaster management and risk reduction.

This coexistence model is crucial in the context of climate change adaptation and disaster risk reduction. On the one hand, indigenous knowledge adds human dimensions to scientific observations, providing insights into the local impacts of climate change that extend beyond what instruments or remote sensing can capture. Clarence Alexander *et al.* (2011: 483) concluded that, “Indigenous knowledge often deepens understanding about what climate change means for livelihoods, cultures, and ways of life beyond the understanding provided by statistically significant changes reported in the scientific literature.” Furthermore, indigenous knowledge may supply complementary information about climate change, serving as valuable proxy records in remote regions where instrumental data, such as temperature records, are limited. On the other hand, as the Center for International Climate and Environmental Research (CICERO) and United Nations Environment Program (UNEP) (2008) have reported, climate change brings new experiences and challenges for many indigenous peoples around the globe. In this sense, scientific measurements can contextualise and explain phenomena that might not be directly observable by the local communities, such as ocean temperature or atmospheric oscillations. External helpers may engage

in discussion with the locals on how to contextualise their existing knowledge with the new environmental hazards (Kelman *et al.* 2012).

Some other empirical studies have demonstrated how indigenous knowledge and scientific approaches can complement each other in risk reduction and climate adaptation. In Central Australia, Hill *et al.* (2020) found that effective knowledge co-production between scientific and indigenous systems requires respectful partnerships, cultural governance, and mutual trust, ensuring that indigenous cultures and practices are revitalised and integrated into climate adaptation pathways. Similarly, in New Zealand, Māori indigenous knowledge plays a crucial role in verifying and evaluating climate change models and scenarios developed by scientists, providing insights that enhance the accuracy and applicability of scientific predictions (Mannakkara *et al.* 2023). These examples highlight the importance of integrating indigenous perspectives and scientific knowledge equally in environmental and risk management to achieve sustainable outcomes.

Although this type of encounter may not involve extensive translation processes, it still entails a form of communication between the ‘self’ and ‘other’, particularly when confronting new experiences. This process begins with the recognition of new phenomena and the acknowledgment of the other’s existence and value in addressing these challenges. Certain aspects of the other’s knowledge are translated into the language of the ‘self’ while preserving the core identity and function of the self. The outcome is a combination of multiple modelling systems to effectively address emerging environmental hazards.

5.2.3. Translation and the formation of hybrid knowledge

Another effective approach to integrating indigenous and scientific knowledge is to establish a more fundamental translation process between the two modelling systems. In Lotmanian semiotics, the essence of communication is translation or interpretation involving at least two distinct languages or sign systems. This will further become the basis for creating new information, rather than simply exchanging already existing information (Lotman 2009, 2013).

The two modelling systems, indigenous knowledge and science, are translatable and untranslatable at the same time, the combination of which determines the creative function to produce new meanings (Lotman 1990: 15). The untranslatability of the two involves several aspects, particularly their languages, as well as their basic functions and rules. While science aspires to law-like generality, indigenous knowledge is tied to its local and contextual function (Kalland 2000). Indigenous knowledge is strongly tied to its locality (see for example Cuaton, Su 2020; Shaw *et al.* 2008; Haque 2019; Dube, Munsaka 2018), so that the semiotic structures of this knowledge type are entangled in such a way with its surrounding environment, that their decontextualisation is not possible without significant changes in meaning (Maran 2014: 80).

We should also remember that certain features facilitate translation between these two modelling systems. These include the capacity for communication and

memorisation, the use of senses, and the pursuit of certain patterns. While indigenous knowledge is traditionally passed down and memorised orally, science relies largely on written records. However, these methods can intersect: scientific knowledge can be shared through oral traditions, while indigenous knowledge can be preserved through written documentation. Paper I of this thesis identified '*ilmu titen*' as the basic principle of Javanese indigenous knowledge, which literally means the capacity to recognise patterns of relations between different phenomena. This, incidentally, is very close to what scientists are doing when they look for certain patterns in the data presented by technological instruments.

In this sense, contextualisation emerges as a key principle, bridging the gap between locality and generality. On the one hand, applying indigenous knowledge to new environmental hazards or transferring it to different communities in diverse geographic regions requires careful contextualisation (see Dekens 2007; Kelman *et al.* 2012). On the other hand, scientific knowledge, with its broader generalisations, should also be contextualised with local conditions to ensure its relevance and utility for local communities.

I imagine that this type of communication leads to the emergence of a new form of knowledge – neither entirely indigenous nor purely scientific, but a hybrid of the two. This blending can be seen in the translation processes that occurred after the 2010 eruption of Mt. Merapi, driven by both the scientific institutions monitoring the volcano and the local communities living on its slopes. They adapted the four official levels of volcanic status into a cultural campaign called '*Catur Gatra Ngadepi Bebaya Gunung Merapi*' – literally meaning 'four phases dealing with the danger of Mt. Merapi'. This cultural idiom outlines the notion that specific social actions should be taken for each alert level. In earlier periods, the scientific warning system was translated into a traditional practice using the *kentongan* – a traditional wooden siren that produced a loud sound when struck. The rhythms of the sound convey different messages, such as normal conditions, the death of a community member, livestock theft, or volcanic threats.

Participatory three-dimensional mapping (P3DM) in the Philippines is another example of blending indigenous and scientific knowledge, creating a hybrid form of understanding (Gaillard, Maceda 2009; Kelman *et al.* 2012). P3DM involves creating large-scale relief maps from affordable and locally available materials, allowing community members to overlay thematic layers of geographic information, such as landforms, infrastructure, land use, resources, and vulnerable areas. By matching resources with potential hazards, this map empowers local communities to assess disaster risks and collaboratively plan mitigation strategies alongside external experts. This inclusive method facilitates the integration of indigenous knowledge and scientific data, enabling locals, particularly marginalised groups, to engage in disaster risk discussions with scientists who may not fully understand the cultural reality of these locales. At the same time, it enables scientists to adapt their information to align with local language and knowledge.

However, we should be aware that such a coexistence or hybrid form of knowledge results from a long process of dialogue which might require specific situations and the concern of the participants for dialogue (Lotman 1990: 140–

143). Sandeeka Mannakkara, Elrasheid Elkhidir, and Aimee Matiu (2023) have elaborated upon the journey of integrating Māori indigenous knowledge into government legislation and climate change adaptation. Initially, Māori communities and their worldview were inadequately considered and under-represented in climate change planning, often overshadowed by Eurocentric values. However, the participation of indigenous representatives alongside council staff in developing the climate adaptation strategy reflects a commitment from both local authorities and Māori communities to foster collaborative relationships, including commitment to acknowledge the past colonial grievances. Eventually, this recent progress of incorporating Māori indigenous knowledge into government frameworks presents opportunities for genuine partnerships based on mutual trust, which may result in mutually beneficial outcomes, leveraging both indigenous knowledge and scientific approaches.

6. METHODOLOGICAL AND ETHICAL REFLECTIONS

The distinction between the perspectives of the self (insider) and the other (outsider) in understanding disasters, as discussed in chapter 5 of this thesis, introduces fundamental methodological consideration. This perspective is particularly concerned with the ‘etic’ and ‘emic’ understanding of the disaster being studied. Shortly defined, ‘etic’ is the perspective of an outside observer, while ‘emic’ refers to the perspective of the locals (Mostowlansky, Rota 2020). As a semiotician who studies disasters, I not only realised the plurality and complexity of disaster interpretations among involved parties, but also became aware of my own semiotic relations with the people being studied. It was also critical for me to acknowledge the importance of the research axiology or ethics by asking myself: What kind of ethical position do I hold, what values guide my work, and for whom do I engage in disaster fieldwork.

In this section, I aim to spotlight several methodological and ethical questions that emerged while working on this thesis. These queries stem from my interpretation of existing disaster studies literature and are informed by my fieldwork experiences. I will begin this chapter by identifying two general methodological paths for conducting disaster research, followed by a discussion of etic and emic approaches, and conclude with some methodological insights stemming from the reflections of my own fieldwork, framed with Lotmanian idea of dialogue and the topic of engagement during and through research process.

6.1. Two methodological routes: Emergency period or long-term post-disaster process

Generally, disaster scholars believe that their studies employ data collection and analytical methodologies akin to standard social science practices (Tierney 2019: 109). Surveys, observations, interviews, focus group discussions, document and archive collections, participatory approaches, and various methods prevalent in social science and humanities studies are all within the purview of disaster research. However, they also believe that disaster research holds methodological uniqueness compared to other social science inquiries due to its distinctive social context. This context diverges from the circumstances within which social science research is usually conducted. Reflective analyses focusing on methodological aspects within disaster studies consistently underscore this contextual distinctiveness (for instance, Mileti 1987; Stallings 2002, 2007; Tierney 2019). According to Robert Stallings (2002: 21), “What makes disaster research unique is the *circumstances* in which otherwise conventional methods are employed. Put differently, it is the *context* of research not the methods of research that makes disaster research unique.” This social context, described by Quarantelli (2002) as a ‘crisis time period’, presents distinctive challenges distinct from research carried out during the mitigation and preparedness phases or in the final recovery stages.

Stallings (2007) delineated three distinctive aspects of disaster research: timing, access, and generalisability. Timing pertains to the limited window available for planning and executing fieldwork to collect data, closely linked to the sudden and often unforeseen onset of disaster events. Access encompasses the challenges in obtaining data from informants, respondents, or document custodians due to restrictions, such as entry prohibitions in certain areas, information control by specific gatekeepers or institutions, ethical constraints when interviewing distressed informants, and the displacement of affected communities. Generalisability concerns the capacity to derive 'valid conclusions' from disaster research (Killian 2002). The argument posits that no two disasters exhibit identical characteristics and effects, thereby challenging the ability to make generalisations in the realm of disaster studies.

However, these methodological reflections predominantly concentrate on disaster studies during the crisis and emergency phases. This emphasis on the crisis and emergency phase may, to some extent, reflect the influence of the hazard paradigm in disaster studies. We may note some further methodological consequences resulting from the underlying assumptions about this emergency phase: the event that just occurred is defined as a disaster, prompting individuals, communities, and organisations to adapt, with the assumption that affected communities lack the capacity to manage it and need external assistance until conditions return to normal and ordinary behaviours resume. In this sense, when researchers arrive at disaster sites, they often carry a preconceived definition of what constitutes a disaster, which further shapes their inquiries. For example, scholars who conceptualise disasters as social disruptions tend to focus on survivors' behaviour patterns, exploring how individuals and groups respond to both the event and the involvement of external entities like volunteers, donors, journalists, and researchers. The notion of a lack of capacity has become a key rationale for disaster interventions. Wolf Dombrowsky (1998: 13) described it as a 'programmatic declaration', where the problem is defined by available solutions, aligning with organisational capabilities. In this sense, disaster definitions that emphasise a community's inability to cope, have justified external aid and become the primary reason for an organisation's actions and existence. Moreover, this approach often aligns with the disaster management cycle – event, response, recovery, mitigation – leading researchers to adopt its phases without critical examination, mirroring the practical concerns of disaster managers (Hewitt 1998).

These underlying beliefs leave critical questions unexamined: Was it truly a disaster, how do affected communities interpret the event, how do they envision recovery, and what form of recuperation is required? These 'what', 'why', and 'how' questions are seldom explored because researchers have already presumed that the event qualifies as a disaster, and therefore, affected communities will inevitably navigate emergency and recovery phases adhering to predetermined standards. As another consequence, research on mitigation and preparedness, late-stage recovery, or long-term post-disaster socio-cultural changes is undervalued, being often not regarded as the central focus of disaster studies. Indeed,

as demonstrated by several researchers (for instance, Oliver-Smith 1996; Phaneuf, Hollenback 2015; Norris 2006), investigations beyond the crisis phase, particularly those exploring long-term socio-cultural changes in post-disaster conditions, remain rare, yet significantly essential. In their literature review, Anthony Oliver-Smith (1996) and Fran Norris (2006) highlighted that immediate and intermediate effects of disasters, including behavioural and organisational responses, have dominated the trend in disaster studies.

I propose this line of research, focusing on long-term post-disaster socio-cultural changes, as the second methodological path for disaster scholarship. This methodological path is vital for providing a comprehensive understanding of disaster phenomena, by considering how culture and historical contexts influence the experience of disaster and subsequent recovery. The focus here is not on hypothesis testing across various disaster sites but rather on comprehending the progression of a disaster within a society. It involves understanding the social conditions, structures, and long-term historical processes that lead to disasters and observing how local communities recover in post-disaster conditions.

At the methodological level, this path encourages longitudinal studies involving repeated visits to the research location. In studying the long-term changes in Thera Island, which began in 1917 and were exacerbated by the 1956 earthquake, Susanna Hoffman (2020: 381) emphasised, “But only in-depth and in-place ethnographic research over a long span reveals the transformation.” Hence, long-term studies covering wider time spans, including pre-disaster organisations, the event itself, and extended post-event developments, should be an essential part of disaster research.

6.2. Tensions and complementarity between etic and emic perspectives

These two methodological paths reflect an enduring tension in the social sciences and humanities between emic and etic perspectives. Robert Stallings (2002), a disaster scholar with a sociological background, similarly highlighted this tension between involvement and detachment in disaster research. Involvement implies taking a stance in the research, whether aligning with the government and disaster managers or the perspective of the survivors. In contrast, detachment denotes the position of an impartial observer.

Throughout the thesis, I have argued that adopting an emic viewpoint, understanding phenomena through the lens of the locals’ perspective, how a disaster “is experienced, made meaningful and acted upon by different people” (Sørensen, Albris 2016: 70), is crucial in understanding what disasters ultimately are about. Exploring and accommodating the diversity of meanings remains a pivotal agenda for disaster studies, which still often relies on a positivistic hazard paradigm. Anthropology has strongly supported this emic understanding as a departure point to studying disasters, taking the locals’ perspective as the source of knowledge and description (for example Le Dé, Gaillard 2022; Hastrup 2011). Kenneth

Hewitt (1998) has stressed that disaster scholarship requires a new view from within rather than an outsider perspective to better comprehend and understand the diverse disaster experiences expressed in local languages. This emic comprehension is undeniably pertinent for a semiotic understanding of natural disasters, as it pertains to how individuals assign meanings to disasters, interpret the signs of a natural disaster, negotiate, contest, and select these meanings, and subsequently embed the chosen interpretations in the cultural memory of the given society.

However, the emic perspective should always be complemented by etic reflection – the standpoint of the researcher as an external observer. Hence, disaster researchers need to continuously shift between the emic and etic viewpoints. Reflecting on the ethnographic method, Martyn Hammersley (2006: 11) emphasised that “the essence of ethnography is the tension between trying to understand people’s perspectives from the inside while also viewing them and their behaviour more distantly.” Heike Egner *et al.* (2012) described this continual transition as ‘zooming in’ for detailed, close-up views and ‘zooming out’ for comprehensive and distant perspectives.

Thereby, a crucial question emerges: How can researchers navigate this constant shift between ‘zooming in’ and ‘zooming out’? The initial stage of research, which involves the formulation of research questions, typically stems from an etic perspective. A research proposal invariably integrates theoretical frameworks guiding the construction of research queries and, in some cases, especially in quantitative designs, the development of research hypotheses. A research proposal represents the researcher’s early theoretical contemplation on the subject under scrutiny. At this juncture, I contend that every disaster researcher, even those unwilling to explicitly define disasters, retains certain ideas about what constitutes a disaster. These notions might exist in the form of intuitive knowledge, unstructured definitions, or implicit beliefs. Without such foundational concepts, researchers would struggle to determine whether or not to pursue their research.

The subsequent phase of research, involving data collection and analysis, becomes the battleground for the ongoing debate between the etic and emic perspectives. Stallings (2002: 42) vehemently contends that “research methods, properly applied, supposedly ensure sufficient detachment during the research process to constrain the corrupting influence of involvement.” This statement embodies a classic objectivist viewpoint, a fundamental assumption of positivist social sciences. It asserts that research should uphold objective descriptions by maintaining a distance between the researcher and the research subjects throughout the research process. Any involvement with the research subject is seen as disruptive or ‘corrupting’ this objective standpoint.

Similarly, sociologist Enrico Quarantelli (1998: 273), one of the pioneers of disaster studies in the US, was dissatisfied with such an emic methodological orientation. He considered the idea of examining social phenomena from the viewpoint of the actor, specifically the survivors in the case of disasters, as somewhat antiquated, conventionally referred to as interpretive sociology. While re-

cognising its value, he believed it lacked a more comprehensive sociological approach concerning group disruption. He therefore advocated for what he termed as a ‘sociological analysis’, aiming to identify and explicate social facts through the lens of other social facts (Quarantelli 2005: 330).

Based on my fieldwork, I argue that during data collection, while acknowledging one’s own existing assumptions about the studied event or process, it is crucial to stay open to the diverse and contested meanings that emerge. As I have emphasised in chapter 5, disaster interpretations are not singular or static – they are dynamic, diverse, and subject to contestation. Being open to diverse interpretations and ways of thinking that emerge in the field will allow for flexible data collection methods tailored to the necessary data and available access. Returning to the research site provides researchers with the freedom to employ diverse data collection techniques. This variety is critical for data triangulation, enabling comparison and analysis of data obtained from interviews, questionnaires, observations, and other methods. In my fieldwork in Aceh and the slopes of Mt. Merapi, I primarily used observation and in-depth interviews, but alongside these techniques, I distributed questionnaires and took detailed photographs of specific objects, such as those at the Aceh Tsunami Museum.

Acknowledging these diverse interpretations does not mean that researchers should align with any particular understanding. Instead, adopting an etic perspective may be essential in this step. Here, researchers could critically examine collected data for patterns, recurring themes, or general statements, comparing new data with previous findings and data from diverse sources. This step also allows for a fresh examination of relationships within the data. Through a distanced analysis, researchers might identify cultural themes, which may be further linked to relevant theories.

The phases of ‘zooming in’ and ‘zooming out’ are akin to two sides of a coin. During the ‘zooming in’ phase, researchers observe the thickness of culture itself: cultural meanings are stratified and organised. A phenomenon, including one labelled as a disaster, can hold multiple, stratified, and structured interpretations. With semiotic sensitivity, researchers can attune themselves to significant indicators of these layers of meaning: expressions or dialogues in interviews, informal conversations, specific objects, artefacts, locations, daily routines, and more. In the ‘zooming out’ step, semiotic sensibility can help researchers to evaluate empirical findings through compatible theoretical frameworks that account for these meanings. At this step, semiotics serves as a theoretical toolkit offering diverse concepts, models, and theories to examine disaster phenomena.

Thus, this combination of etic and emic approaches may lead to valuable theoretical reflections. While not intended to generalise across diverse disaster events, historical periods, or socio-cultural contexts, these reflections can significantly enhance our understanding of disaster phenomena. This methodological approach offers an alternative to the formulation of disaster-related social facts as suggested by Quarantelli (1998; 2005). In addition, while this route – from empirical findings to theoretical reflections – might seem like standard practice, especially in qualitative approaches, it may help to overcome a theoretical gap in

disaster research in which some theoretical models are overused, while some fundamental theoretical frameworks or models remain underutilised (Quarantelli 2005). For example, Quarantelli observed an over-reliance on certain theories like symbolic interactionism in disaster studies, neglecting other potential and relevant frameworks such as attribution theory, network theory, and social capital frameworks. Such a narrow theoretical focus might be tied to the hypothesis-driven approach prevalent in disaster research, particularly in sociology.

6.3. Research as a dialogic encounter

Within this dynamic interplay of etic and emic perspectives, sensitivity to mutual meaning-making between the researcher and the research subjects becomes pivotal. The researcher-community relationship hinges on a process of mutual interpretations: the locals interpret the researcher just as the researcher interprets them. Moreover, researchers must recognise that their relationship with research subjects is influenced by the concepts, terms, and language used to understand and describe phenomena. Roberto Barrios (2017: 162) has reminded, “there is a dialectical relationship between the languages we use to speak about, interpret, and judge disasters and the phenomenon itself.” The concepts and terms employed in analysing crises and disasters actively shape our interpretations and definitions of these phenomena. Similarly, Eric Waddell (1977: 75–76) highlighted the reliance on standardised questionnaires in disaster studies as an example of research dictated more by methodological constraints than by reality, critiquing a Western scientific tradition that fragments reality and promotes ahistorical functional analysis. Additionally, many research phases are influenced by the researcher’s personal preferences, such as how they delimit research focus, the types of data needed, the techniques employed for data collection, and the perspective through which they interpret data, etc. Consequently, epistemological and methodological decisions should not be seen as arbitrary (Torop 2003: 336).

Ideally, a semiotic description of a disaster should blend both etic and emic perspectives, rather than relying solely on one. The description is not a one-way reconstruction of meaning but always a two-way hermeneutical reconstruction. On the one hand, it is shaped by the researcher’s beliefs, ethical stance, and methodological choices. On the other hand, the epistemological encounters during the research may also reshape the pre-existing ideas. Irene Portis-Winner (1999) proposed ‘dialogic anthropology’ as a paradigm situated in dynamic subject-investigator interrelations. Therefore, disaster researchers might recognise that their interaction with research subjects entails semiotic relations, where meaning is co-constructed through dialogical exchange.

This also echoes Clifford Geertz’s (1973) concept of ‘thick description’: cultural analysis involves a hermeneutical reconstruction of deep meanings and cultural structures through a semiotic sensibility rooted in the researcher’s presence at a specific research location within a socio-cultural context (Alexander 2008). This approach underscores ethnographic work as an interpretive study that

employs microscopic lenses for analysis, requiring the researcher's awareness of semiotic relations with their subjects, as well as the capacity to reconstruct the whole picture from heterogeneous, discrete, or ambivalent data (Geertz 1973).

Here, the Lotmanian notion of dialogue is essential. Semiotic relations between the researcher and the research subjects constitute a dialogic encounter: it involves not just dealing with and analysing their statements or behaviours, but also engaging in a dialogue that necessitates both 'the need' and 'the will' to establish the dialogue itself. As emphasised by Lotman (1990: 143–144), "the need for dialogue, *the dialogic situation*, precedes both real dialogue and even the existence of a language in which to conduct it: the semiotic situation precedes the instruments of semiosis." Dialogue, in this sense, implies communication between the researcher and the studied culture, encompassing their assumptions, prejudices, beliefs, values, and more. Rather than striving to rid oneself of prejudice and assumption, researchers should be aware of these factors, and position their assumptions, prejudices, and values within a 'dialogic situation' in relation to the research subjects.

6.4. Research as engagement

Embracing the locals' perspective encourages researchers to view their relationship with informants beyond a simple 'researcher-informant' dynamic. This outlook fosters a closer, more amicable rapport between researchers and the communities being studied. It further encourages various roles for researchers within these communities, extending beyond the conventional researcher role to that of a friend, facilitator, and more. Personally, I frequently reconnect with local communities in Aceh and on the slopes of Merapi, engaging in casual conversations or participating in their ceremonies and activities. During the 2010 Mt. Merapi eruption, I worked as a journalist-volunteer; while during the 2004 Aceh tsunami emergency responses, I engaged in volunteer work, assisting with educational and trauma-healing activities. In 2017, I facilitated a workshop on the role of community-based media in disaster risk reduction, attended by local disaster risk reduction activists and volunteers from the slopes of Mt. Merapi. Additionally, in December 2018, I led a workshop focused on developing contingency plans for a local community on Mt. Merapi's slopes, again serving as the facilitator.

Taking on different roles beyond that of a researcher can, to some extent, help in building trust with the locals. Establishing this rapport hinges on mutual trust, which not only enables ongoing communication between researchers and locals, but also strengthens the bond between them. This will further allow the researchers to uncover layers of a culture's structure that have accumulated over time (see Parmentier 2012; Morimoto 2015), and to bring in different perspectives or even new agendas. In this sense, I propose that the presence of researchers during crises shouldn't be centred on distributing questionnaires or conducting formal interviews, as this practice, based on my field experience, tends to be counterproductive. Many interviewees expressed disinterest or discomfort with

questionnaires and interview requests during emergencies. Stallings (2007) highlighted access as a unique challenge in disaster research, noting that researchers concentrated in disaster zones during crises can lead to informant disengagement due to boredom. Instead, researchers might assume different roles, such as volunteers or participatory observers, enabling them to directly experience and comprehend how survivors interpret and respond to these situations. This approach fosters a deeper understanding of survivors' perceptions and behaviours during crises.

However, such actions should be approached with caution, particularly to avoid fully adopting the identity of a local or an activist. These positional shifts can obstruct the scholar's ability to take an etic perspective, potentially leading to what Martyn Hammersley (2006) refers to as 'systematic bias'. Hammersley (2006) emphasises that understanding people does not require adopting their beliefs, feeling obligated to support them, or accepting everything they say as true. Instead, he suggests, researchers should maintain an etic stance, critically evaluating the validity of peoples' statements. Although I agree that understanding people does not mean the adoption of their beliefs, I do not agree with the claim that those beliefs should be somehow validated from an external position (see chapter 5). For instance, one of my primary informants in Aceh, a Head of Village (*Keuchik*) as well as a Head of Sea Commander (*Panglima Laot*), with whom I stayed, repeatedly expressed his belief that a tsunami would never strike the same place again, using the metaphor '*bisul tak akan tumbuh di tempat yang sama*' (boils will not grow in the same place), a view I do not share. However, instead of confronting or judging this belief, I sought to understand why and how such a statement was expressed. Over time, through a long-term relationship with him, I learned that this statement was deliberately intended to instil a sense of safety and comfort within the local communities, as they returned to their old villages near the sea – often viewed as dangerous and prone to tsunamis.

In the field of disaster studies, where disaster events and subsequent recovery and reconstruction processes are critical moments for cultural reflection and future planning (see chapter 3), and where unequal power dynamics influence interpretation and decision-making (see chapter 5), I argue that it is crucial to recognise these dynamics and adopt a clear stance in support of vulnerable groups. However, this must be done without compromising the ability to critically evaluate and assess statements, even from the vulnerable groups themselves.

Experienced disaster scholars have advocated for disaster managers to develop a deeper understanding of disasters, promoting culturally sensitive relief efforts. In this sense, recognising that powerful groups often dominate disaster management and recovery with top-down mechanical approaches, researchers have a moral responsibility to challenge this dynamic and align with those whose voices are marginalised. A lack of local knowledge and the exclusion of affected communities from decision-making processes can exacerbate vulnerability (Bergman 2020). Researchers must be attuned to this gap between formal authority and local realities (Hoffman, Barrios 2020). Anthony Oliver-Smith and Susanna M. Hoffman (2002: 16) underscored the role of scholars in aligning

agencies and communities, suggesting a more decentralised approach that integrates local resources. Hence, the researcher's presence during emergencies, not solely as a researcher but also as a volunteer or advisor, isn't solely due to data access challenges. It is fundamentally rooted in an ethical obligation to alleviate suffering and give voice to the marginalised (Oliver-Smith, Hoffman 2002: 14). Disaster researchers need to consider this ethical stance in their work, whether in the field as a researcher or in other roles, discerning the ethical positions they adopt and the values they serve.

This engagement will further enable researchers to carefully navigate their analysis and description, especially concerning post-disaster recovery and reconstruction processes. Bergman (2020: 319) has reminded us that, "Powerful agents use claims about the future as a way to achieve desired outcomes by defining the future in a certain way." Several scholars have pointed out that current disaster management is dominated by a functionalist view with a neoliberal twist, where the main imperative is to return to pre-disaster normality and stability, as this stability is believed to facilitate further economic investments (Gunewardena, Schuller 2008; Barnshaw, Trainor 2007). However, what is considered normal is shaped by power relations; returning to normal may simply mean going back to pre-existing inequalities, marginalisation, and vulnerabilities (Bankoff 2001; Ullberg 2013). Therefore, it is essential to envision alternative, preferable futures, outline the paths to achieve them, and involve a broad range of transformative participation and emancipation (Bergman 2020). Whether they acknowledge it or not, scholars are part of these process, and should therefore pay careful attention to and engage in these future-making initiatives (Adam 2008). Engaging with marginalised groups and advocating for their inclusion in disaster planning and recovery is not only an ethical stance, but also a crucial step toward creating more equitable and sustainable futures.

Considering the perspective of survivors can also lead to embracing a vulnerability paradigm. If we assert that an extreme natural event, what we term as a disaster, primarily impacts vulnerable groups within a society or occurs solely within these groups, then focusing on the perspectives of these vulnerable individuals means amplifying the voices of the voiceless. This approach serves as an initial step toward uncovering the historical underpinnings and structural roots of their vulnerable circumstances. Kenneth Hewitt (1998: 83) contended, "Letting those in hazard speak for and of themselves, is one of the few possibilities for keeping the faces and pain in the foreground of interpretation and response; as part of the social evaluation of problems and responses, not merely as advertisements on the front cover."

A semiotic stance will further allow researchers to acknowledge the tensions in assessing and interpreting vulnerability and resilience. While local communities typically define vulnerability and resilience through daily interactions with their environment, governments and disaster managers rely on abstract scientific measurements. Post-colonial critiques have argued that, as ready-made concepts, vulnerability and resilience ideas are brought by practitioners or disaster managers to the Third World in a top-down manner (Manyena 2006; Gaillard, Jiyatsu

2016; Mochizuki *et al.* 2017; Ruszczyk 2019). Disaster-prone communities are treated as recipients, expected to become more resilient after undergoing programs that rely on pre-existing vulnerability and resilience definitions, standardised assessment tools, and fixed programs. Thus, these two concepts have become weapons to label people as ‘vulnerable’ or ‘resilient’ and further justify external intervention based on specific outsider-driven agendas (MacKinnon, Derickson 2013).

Instead of relying on this prescriptive model of vulnerability and resilience, which often does not align with the perspectives of local residents (Sou 2022), the government and disaster managers should be aware of the complex chains of interpretation involving certain signs believed to represent vulnerability and resilience. Therefore, it is crucial to incorporate local perspectives in disaster risk reduction agendas, reconciling such local perspectives with the scientific assessments. In addition to their predetermined definitions and success parameters, any disaster risk reduction program should prioritise local people as the primary subjects who define, identify, and map their own vulnerability and resilience. Siambabala Manyena (2006: 446) noted that “interventions are more likely to be successful, leading to genuinely positive impacts on human wellbeing, when the emphasis is on building local knowledge and augmenting existing capacity”. Moreover, these phenomena should be understood as a part of a long-term post-disaster socio-cultural change, which cannot be observed immediately after a post-disaster recovery program is completed (Schipper, Langston 2015).

CONCLUSION

Throughout this thesis, I have argued that the most comprehensive approach to studying disasters is to consider both the role of natural hazards and the social factors that make certain groups more vulnerable, along with the cultural adaptations that help people cope with the hazards. Conceptualising disasters as semiotic processes that involve four phases of semiosis – recognition, denomination, evaluation, and anticipation – offers a way to integrate these elements, and provides a deeper understanding of how environmental features, socio-economic circumstances, and cultural dynamics shape disasters. A semiotic approach, especially through ecosemiotics, helps to move beyond the mere nature-culture dichotomy and allows us to explore the entanglement between natural and cultural processes across different societies and times.

This approach allows us to explore the diverse interpretations involved in different phases of disasters, encompassing both accordance and dissonance among various perspectives. The most common semiotic conflicts arise between the affected communities and external aid providers, often reflecting imbalanced power dynamics and differing intentions for dialogue. While exposure to the outside world can expand the perspectives of local communities, potentially leading to shifts in their viewpoints, external aid providers frequently prioritise implementing predefined and standardised disaster responses and recovery strategies over fostering genuine cultural dialogue with the affected groups. Hence, disaster management is still often dominated by powerful entities employing top-down approaches.

Recognising these dynamic interactions, we can observe that some vulnerable groups – those most affected by the disaster – may experience the recovery process as yet another form of crisis, as their voices are marginalised and the processes fail to meet their specific needs. While certain individuals and groups endure significant suffering and disadvantage during both the disaster and its aftermath, others may, paradoxically, gain some benefits from the situation. In this context, researchers have a moral responsibility to confront these dynamics, amplify marginalised voices, and advocate for vulnerable groups, in an effort to create a more equitable and democratic post-disaster society. Adopting this ethical stance is essential for uncovering the historical and structural factors that contribute to the vulnerabilities of these groups.

Applying Lotman's concept of a modelling system, we can see that these conflicts often involve two distinct types of modelling systems: scientific knowledge and indigenous knowledge. The dominance of the former has often led to the appropriation of indigenous knowledge into the scientific framework. In our current historical context, as demonstrated by two cases in this research, disasters have become gateways for the dissemination of modern disaster management knowledge, resulting in the marginalisation of diverse traditional disaster knowledge. Recognising this trend, I suggest a democratic knowledge framework that neither fetishizes traditional knowledge nor asserts the superiority of scientific knowledge. Such a democratic framework could emerge through the coexistence

of both knowledge systems, allowing them to complement each other, or through deeper dialogues that encourage the creation of hybrid knowledge forms.

Engaging in this type of research reveals that the research process itself is inherently a dialogic encounter, emphasising mutual meaning-making between the researcher and the research subjects. This dialogic approach underscores the need to balance etic and emic perspectives, ensuring that both viewpoints are incorporated into disaster analysis. Therefore, a semiotic description of a disaster is not solely etic or emic but a synthesis of both, involving a two-way hermeneutic reconstruction.

This thesis does not provide a definitive or universal answer regarding post-disaster cultural continuity or change. Instead, it situates the discussion within specific contexts. At one historical moment and cultural context, a natural disaster might trigger or accelerate cultural transformations, while at another, it might reinforce the stability of an existing sociocultural order. In this thesis, I have tried to emphasise the depth and nuance of these changes: some disasters may lead to profound, long-lasting transformations, while others may only cause temporary, surface-level shifts. Nevertheless, a semiotic analysis allows us to remain alert to the possibility that surface changes might indicate deeper transformations within knowledge and sign systems. Disasters rarely produce either complete disruption or total stability; rather, explosive changes often coexist with gradual shifts across various cultural spheres. Thus, a semiotic approach could acknowledge the dynamic interplay between continuity and change, distinguishing stable social elements from those undergoing transformation, while also understanding their interconnectedness

To assess cultural continuity or disruption after a disaster, a comprehensive approach is needed that contextualises disasters within their historical frameworks, encompassing both pre- and post-disaster phenomena, particularly in long-term analyses. I have suggested considering the entire transformational journey by juxtaposing the antecedent circumstances with the post-disaster conditions, while paying special attention to cultural memory, representations, hierarchy and power relations, as well as the dynamics of self-other division.

I argue that the contribution of semiotics to disaster studies lies in three main aspects. First, as I have previously argued, conceptualising disasters as semiotic processes enables a more comprehensive understanding of disasters by addressing the issues of vulnerability and resilience while also acknowledging the role of natural hazards, contextualising disaster with pre- and post-disaster socio-cultural processes, and recognising the contestations and power dynamics in disaster meaning-making. Secondly, semiotics serves as a theoretical toolbox, offering some specific conceptual tools and theories that aid in the investigation of disasters, such as cultural memory, culture-nature relations, abrupt and continuous cultural change, etc. Third, semiotics offers a unique fieldwork approach, paying attention to the diversity of signs that mediate disasters and allows for a thorough and detailed observation of micro-level sign processes, such as carefully listening to the stories of informants, examining the design of disaster memorials, or analysing disaster-related texts in various contexts. By examining these

concrete expressions, semioticians can uncover layers of meaning and connect them to broader discourses, such as issues of vulnerability and resilience, or reflect on wider phenomena like cultural changes following a disaster.

On the other hand, if semiotics provides theoretical tools to analyse and understand disasters, disaster studies provide empirical grounds and insights that are useful for the development of semiotic concepts. Disasters provide important moments of self-reflection, marked by a heightened semiotic awareness: people become conscious of the order of knowledge and their position within it. This process of reflection prompts them to reflect on and rethink, and thus potentially change the order. Disasters also highlight the distinction between the self and the other, which becomes increasingly significant: on one hand, this distinction influences people's responses and behaviours, and on the other hand, it is reflected upon intensely, reconsidered, and reconciled.

While the semiotic arguments of this thesis focus on rapid disaster events, such as volcanic eruptions, tsunamis, and earthquakes, it will be a challenge for future research to examine whether these arguments are applicable to other types of disasters, especially slow-onset events like climate change, droughts, and epidemics. Future studies could also benefit from greater engagement with other disciplines, promoting more inter- and transdisciplinary projects, such as those related to memory studies.

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SUMMARY IN ESTONIAN

Looduskatastroofide semiootika: keskkonna- ja kultuurimuutuste läbipõimimine

Käesolev doktoritöö “Looduskatastroofide semiootika: keskkonna- ja kultuurimuutuste läbipõimimine” tõukub eeldusest, et looduskatastroofid on tugevalt tõlgendustega seotud. See eeldus viis omakorda töö kesksete küsimusteni: kuidas inimesed katastroofe mõtestavad ja mõistavad, kuidas saab keskkonnasündmusest katastroof, kuidas saab semiootika aidata lahata katastroofidega seotud tähendusprotsesse? Töö teine eeldus, et looduskatastroofid on läbipõimunud katastroofieelsete ja -järgsete sotsiokultuuriliste protsessidega, viib küsimusteni: kas looduskatastroofid toovad kaasa kultuurimuutused, kuidas need muutused toimuvad, kuidas saab semiootiline lähenemise abil analüüsida katastroofiga seotud kultuurimuutusi?

Doktoritöös analüüsitakse neid küsimusi, tuginedes pikaajalistel kvalitatiivsetel uuringutel kahes looduskatastroofijärgses Indoneesia paigas: 2004 a. India ookeani tsunami järgses Banda Acehis ja Aceh Besaris ning 2010. aasta vulkaanipurske järgses Merapi mäe piirkonnas. Alustasin oma uurimistööd empiiriliste uurimustega, millele järgnesid teoreetilised refleksioonid, et seeläbi tuua välja semiootika võimalused katastroofide uurimisel ning ühtlasi luua dialoogipind katastroofiuuringutega, mille lähtekoht on pigem empiiriline. Töö teoreetilise raami ehitamisel olid kesketeks nt Juri Lotmani kultuurimälu ja ajalooliste muutuste mõisted ja käsitlused, samuti ökosemiootilised käsitlused eri märgitüüpidest keskkonnasuhte loojana.

Töös leitakse, et looduskatastroofidele saab läheneda terviklikumalt, kui arvestada nii looduslikke kui sotsiaalseid tegureid, mis muudavad teatud ühiskonnagrupid haavatavaks. Samas on oluline silmas pidada ka neid sotsiaalseid tegureid ja oskusi, mis tõstavad inimeste vastupanuvõimet. Mõtestades looduskatastroofe semiootiliste protsessidena, mis hõlmavad äratundmise, nimetamise, hindamise ning ennetamise faase, on võimalik ületada looduse-kultuuri lõhe ja uurida, kuidas keskkonna omadused, sotsiaalmajanduslik olukord ning kultuuri-protsessid kõik kujundavad looduskatastroofe.

Looduskatastroofid toovad sageli kaasa vaatepunktide vastandumise, eriti mõjutatud kogukondade ja abiorganisatsioonide vahel. See hõlmab ebavõrdseid võimusuhteid ning erinevat dialoogisoovi. Kui kohalike vaated võivad (ümber)kujuneda väljaspoolt tulnud osapoolte kohalolu tingimustes, tuginevad abiandjad sageli ülalt-alla meetoditel, rakendades etteantud ja standardiseeritud lähenemisi katastroofile, selle asemel, et mõjutatud kogukondadega dialoogi astuda. Selle tulemusel võivad haavatavad grupid, kelle hääli sageli kuulda ei võeta, pidada taastumisprotsessi üheks katastroofi vormiks. Seetõttu peaks teadlased sellistele suundumustele vastu seisma, tuues oma teadustöös välja ja toetades ka marginaliseeritud ja haavatavaid grupe. Selline eetiline hoiak on võtmetähtsusega, et esile tuua ajaloolised ja struktuursed tegurid, mis haavatavuse tekkele on kaasa aidanud.

Ülalnimetatud vastuolu on sageli seotud ka kohalike ja teaduslike mudelite vastuoluga, kus teaduslikud teadmismvormid domineerivad kohalike üle. Katastroofiolukord võib anda võimaluse kaasaegsete katastroofide haldamise strateegiate juurutamiseks, mis lükkab mitmekesised kohalikud teadmised kõrvale. Oma töös soovitan pigem lähtuda demokraatlikust teadmiste raamistust, mis soosib mõlema teadmistüübi kooseksisteerimist või hübriidsete teadmismvormide teket ja mis ei fetišeeri traditsioonilisi teadmisi ega pea teaduslikku teadmist ülimumslikuks. Katastroofide alane uurimistöö võiks seega olla enam dialoogiline, hoides tasakaalus emilised ja etilised vaatepunktid, et jõuda kokkuvõttes terviklikuma arusaamani katastroofidest.

Doktoritöö ei anna ühest ja üldist vastust küsimusele, kas katastroofijärgselt kultuuri põhijooned pigem jätkuvad või muutuvad, vaid paigutab need küsimused konteksti ja näitab, et ühes ajaloolises kontekstis võib katastroof kiirendada kultuurimuutusi, samas kui teisel hetkel võib see tagada olemasoleva sotsio-kultuurilise korra püsimise. Selleks et hinnata nihkeid kultuuris, on vaja seega analüüsida katastroofe nende ajaloolisel taustal.

Käesoleva töö järeldusi oleks edaspidi huvitav testida ka aeglasemate keskkonnamuutuste (nt kliimamuutuste) peal, samuti võiks selle pinnalt luua tihedamat katastroofide alast dialoogi mälu-uuringute, kultuuriajaloo, semiootika ja klassikalisemate katastroofiuuringute vahel.

Doktoritöö koosneb neljast artiklist, millest alljärgnevalt annan põgusa ülevaate.

I artikkel vaatleb, kuidas Merapi mäe regulaarsed vulkaanipursked, mis on läbi põimunud erinevate sotsiaalsete protsessidega, mängisid võtmerolli käimasolevate sotsio-kultuuriliste muutuste kiirendajana. See hõlmas uute elatusallikate kasutuselevõttu, uute teaduslike märkide kasutamist vulkaanilise tegevuse mõtestamisel, mis omakorda muutis põhjalikult kohalike keskkonnataju ja -suhteid.

II artikkel analüüsib Acehi tsunamimuseumi näitel looduskatastroofi mälestusmärkide rolli katastroofi kultuurimälu kujundamisel. Mälestusmärkide kaudu saavad võimuesindajad esitada omapoolse suure katastroofinarratiivi, mida võiks nimetada ka katastroofi kultuurimälu kanoniseerimise programmiks. Kohalikud suhestuvad kanoniseerimisega aga nii vastandudes kui narratiive muutes, mis läbi võib mälestusmärk toimida planeerimata ning ennustamatutes semiootilistes vormides.

III artikkel käsitleb inimese ja teiste loomade suhteid Merapi vulkaani jalamil, leides, et katastroofid võivad olla viimaseks tõukejõuks muutustele, mis ühiskonnas juba aset leiavad. Artiklis analüüsitud nihe künnipühvlitest veisekarja pidamisele peegeldab mitte ainult turumajandusliku süsteemi omaksvõttu kohalikes oludes, vaid ka sügavamaid inimeste-keskkonna suhte muutusi.

IV artikkel analüüsib looduskatastroofi ja religiooni suhteid 2004 a. India ookeani tsunami järgses Acehis, näidates, kuidas religiooni vahenditega antakse selgitusi 'seletamatule' katastroofile ning kuidas selle abil jägnevaid tegevusi kavandatakse. Tsunami tõi kaasa ka plahvatusliku muutuse islami praktikates Acehis, mille tõenduseks on šariaadi ehk islamiõigussüsteemi juurutamine. See uurimus näitas ka, kuidas katastroofi religioossed tõlgendused võivad koos eksisteerida teaduslike selgitustega, olles teineteist täiendavate funktsioonidega.

PUBLICATIONS

CURRICULUM VITAE

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Selected publications

Nazaruddin, Muzayin. 2024. Religious modeling of a natural disaster: a cultural semiotic study. *Chinese Semiotic Studies* 20(1): 187–209.
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DISSERTATIONES SEMIOTICAE UNIVERSITATIS TARTUENSIS

1. **Михаил Ю. Лотман.** Структура и типология русского стиха. Тарту, 2000.
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5. **Ян Левченко.** История и фикция в текстах В. Шкловского и Б. Эйхенбаума в 1920-е гг. Тарту, 2003.
6. **Anti Randviir.** Mapping the world: towards a sociosemiotic approach to culture. Tartu, 2004.
7. **Timo Maran.** Mimikri kui kommunikatsiooni-semiootiline fenomen. Tartu, 2005.
8. **Элеонора Рудаковская-Борисова.** Семиотика пищи в произведениях Андрея Платонова. Tartu, 2005.
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