MASARYK UNIVERSITY

Faculty of Social Studies

ENVIRONMENTAL DISASTERS AND POLITICAL ACTIVISM

Habilitation Thesis

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I declare that I have prepared this habilitation thesis independently using only the cited literature, information, and sources and that this thesis has not been submitted for the award of any previous title.

In Brno, 10 April 2024 ……...

Author's signature

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1. Commentary to habilitation thesis

The central objective of this habilitation thesis is to examine political effects of environmental disasters as they relate to protest mobilization and public discontent in general. Environmental disasters frequently present opportunities for political changes; for example, they may alter the progression of violent conflicts or trigger public protests and revolutions (Brancati, 2007; Beardsley, 2009; Carlin et al., 2014; Pelling & Dill, 2009). Disaster events tend to attract large media attention and sometimes they draw a lot of public interest, which sparks protest movements. Under what conditions disasters encourage (or discourage) public protest is, however, not well understood (e.g., Flores & Smith, 2013). My research has been motivated by this empirical puzzle: *Why do some major environmental disasters spark public protests while others do not?*

While my broader work focuses on various political dimensions of disaster events, here I examine just one of their political features – their protest mobilization potential. Together the presented studies provide insights into different factors that may encourage or discourage disaster political mobilization across advanced industrial democracies. To provide a conceptual grounding, this introductory commentary positions environmental disasters in two ways: as events in and of themselves, and as events that produce political responses and, sometimes, political changes. In the following sections I discuss relevant concepts along with a general literature review to situate my work within the prevailing literature on disaster politics. I then provide an outline of the broader methodological framework that supports the four studies that form the bulk of this habilitation thesis. I present an overview of these studies along with their significance. I conclude this introductory commentary with a brief discussion of the remaining gaps in knowledge and future research possibilities.

1.1 Defining environmental disasters

Disasters are destructive events that disrupt societies and cause material, human, and environmental losses (Quarantelli, 2005). Practitioners and some scholars distinguish between disasters and other types of critical events, including emergencies, crises, and catastrophes (Olson, 2000). Further disaster classification may be based on the speed of their onset, size of impact, type of hazard, and potential for (re)occurrence, among other things (Barton, 1963; Barton, 1969; Quarantelli, 2000). My research categorizes disasters according to their source (i.e., from natural or human-made hazards) and speed of onset (i.e., sudden or slow). While disasters from natural hazards arise from natural processes like earthquakes or tsunamis, industrial disasters like major oil spills often stem from human exploitation of natural resources (Gephart, 1984). Sudden-onset disaster events like destructive hurricanes and nuclear accidents may lead to sudden harm, such as loss of life, while slow-onset disasters like desertification or hazardous waste contamination generally take a longer time to manifest (Adeola, 2011).

The focus of this research is on industrial environmental disasters with *sudden effects* in OECD countries, since such countries are comparable in terms of governance, development, and wealth. Environmental disasters, while they may cause human life losses, are mostly characterized by damage and destruction of the environment. The environment in this sense refers to ecological systems and processes that are valued by humans. The studies in this habilitation thesis center on *environmental disasters from human-made hazards* (i.e., industrial disasters or technological disasters), because the politics of these events has not been examined to the same extent as in the cases of disasters from natural hazards. I elaborate on this point in the discussion of disaster politics literature in the next section.

1.2 Political effects of disasters: a brief literature review

Scholars have examined disaster events from scientific as well as social perspectives. Studies of the disaster aftermath tend to focus either on the events' physical damage or social effects. The former examine environmental losses, material damage, and impacts on humans such as life loss and illness (e.g., Jernelov, 2010; Moldan et al., 1985; White et al., 2012). The latter focus on public responses like volunteer mobilization and activist campaigns, or policy responses like regulatory changes (e.g., Birkmann et al., 2010; Hernan, 2010; Macdonald, 1980; Perez, 2003). While the social effects of disasters are linked to their physical impacts, they are also determined by pre-existing social, cultural, economic, and political conditions (e.g., Pelling & Dill, 2009).

This habilitation thesis is primarily concerned with political effects of disasters. In the past, disasters were viewed as non-political events (Hannigan 2012: 8), but they are political for at least two reasons. First, once a disaster occurs the government must both manage and explain the event to the public, which opens space for disaster politicization (Pelling & Dill, 2006; Olson, 2000). Second, disasters may have indirect political effects as they open windows of opportunities for political actors to "entrench or destabilize current power-holders, change power-sharing relationships within recognized sectors, or to legitimise or de-legitimise new sectors" (Pelling & Dill, 2006: 1). As such, disasters may lead to changes in social structures, power arrangements, and institutions (e.g., Hoffman & Jennings, 2010; Perez, 2003). Scholars have examined such changes in the context of voting behaviour and leader survival, regime legitimacy, and disaster-related governance, among other things (Allison, Arceneaux & Stein, 2006; Carlin et al., 2014; Cohen & Werker, 2008; Drury & Olson, 1998; Flores & Smith, 2013; le Billon & Waizenegger, 2007; Wood & Wright, 2015).

Perhaps of most interest to scholars have been political effects of disasters from natural hazards. Many political scientists are interested in these events' relationship with

violent conflict and peace efforts, both internationally and within states (e.g., Bearsley & McQuinn, 2009; Dresse et al., 2018; Kelman, 2006; Kreutz, 2012; Nel & Righarts, 2008; Slettebak, 2012). The prevailing literature on industrial or technological disasters, while also sizeable, is much more fragmented in comparison. Many scholars focus only on a handful of case studies, typically without attempts for any broader, more systematic cross-case analysis (e.g., Fortun, 2001; Hasegawa, 2014; Molotch, 1970). This literature generally considers two types of social effects of industrial disasters: political (i.e., disasters as catalysts for changes in socio-political structures and systems, broadly speaking) and policy (i.e., disasters as focusing events). Studies of disasters as focusing events[1] are less fragmented as a whole; their purpose is to understand whether and how disasters change domestic policy agendas (Birkland, 1997; Birkland, 1998; Bishop, 2014; Busenberg, 2001). It is however unclear in this literature why some events and not others become 'focusing.' This habilitation thesis does not aim to solve these and other problems in the prevailing literature; rather, it builds on the existing knowledge and uncovers issues and drivers that have been largely overlooked.

1.3 The core studies: methodological framework and methods

At the core of this habilitation thesis are societal – and specifically political – effects of environmental disasters. The studies presented as part of this habilitation thesis are divided into two categories: *disaster characteristics* (Study 1 and 2) and *post-disaster dynamics* (i.e., political actors interacting under some structural conditions) (Study 3 and 4). Drawing on the disaster studies literature, the former relies on a social understanding of disasters but also draws attention to unique characteristics of disaster events. Studying post-disaster dynamic requires an understanding of agenda-setting processes and framing. Since the focus of the

[1] Focusing events are defined as "sudden, attention-grabbing events that help politically disadvantaged groups to push through messages suppressed by dominant groups" (Birkland, 1998: 53).

presented work is on non-violent public protest, I also rely on social movements theories and specifically factors believed to determine protest mobilization.

In disaster studies, scholars subscribing to the hazards-disaster tradition have focused attention on the hazards themselves (Burton, Kates, & White, 1978; Rodriguez, Quarantelli, & Dynes, 2007: 9). Then a shift occurred towards understanding disasters as events that produce social, political, or policy changes but not necessarily as unique events. At the center of this tradition is vulnerability due to broader societal, economic, and political processes and structures (e.g., Cutter, 2005; Jones & Murphy 2009; Kelman, 2020). My research incorporates both these traditions, treating disasters as social phenomena, embedded in social relations and structures, but at the same time recognizing these events' uniqueness. Such approach opens an opportunity for a more comprehensive assessment of disasters' political effects.

My work on the post-disaster dynamic relies predominantly on examining the framing processes that occur in the immediate disaster aftermath. Generally, a frame means 'packaging' of information; it is a message that provides meaning to events (Gamson & Modigliani, 1987; Gitlin, 1980).[2] Framing is a crucial element of disaster politics (and politics in general). Political actors use language or pictures to create specific understandings of the world, including issues, policies, and disaster events (e.g., Edelman, 1985). Often, this framing of reality serves to maintain or improve political actors' positions (Pelling & Dill, 2009).

Framing affects behaviour because of the way in which a piece of information is presented in public discourse and how well such information fits with people's pre-existing

[2] Psychologists have a more restrictive understanding of frames as "informationally equivalent labels" (Keren, 2011: 5). Framing may be about different ways of presenting the same piece of information (i.e., equivalence framing) or about conveying different perspectives on an issue or event (i.e., emphasis framing) (Scheufele & Iyengar, 2017).

ideas, attitudes, and experiences (Benford & Snow, 2000; Druckman, 2001). Social movements scholars are predominantly interested in what frames are meant to achieve (i.e., intended effect) and not necessarily how they are perceived (i.e., actual effect) (Gamson & Meyer, 1996: 283; Zald, 1996: 262). My research focuses on both the framing actors' interests and framing strategies (Study 3) and frame effectiveness among their target audience (Study 4). Since I focus on nonviolent public protest as a political effect of disasters, I build my research on the work of many social movement scholars, utilizing the established social mobilization concepts of grievances, resources, political opportunity structures, and framing. The studies presented as part of this habilitation thesis focus on grievances and framing specifically. I work with resources and political opportunity structures in other manuscripts.

In examining the relationship between disasters and nonviolent protest, this habilitation thesis relies on mixed methods of social inquiry. In the presented studies I utilize various methods and tools, including a geographic information system (GIS) analysis, content analysis, and a survey experiment. The studies rely on a large amount of diverse data. Even though I focus on 38 cases of large industrial environmental disasters from 1900 to present, my broader working dataset (not included here) consists of over a thousand cases of oil spills, chemical spills, mine leaks, and nuclear incidents. For content analysis and survey experiment, I analyzed about 600 newspaper articles in English and German. My experimental sample comprised over 3,600 survey participants.

1.4 Overview of the core studies: summaries and significance

This habilitation thesis consists of three original articles and one book chapter. All three articles have been published in high-ranking international journals listed in the Web of Science (Wos) Core Collection: two in *Environmental Communication* (in 2021 WoS Q2, IF = 3.389; in 2022 WoS Q2, IF = 2.7, AIS Q2) and one in *Environment: Science and Policy for*

Sustainable Development (in 2022 WoS Q2, IF = 3.5, AIS Q1). The book chapter is part of an edited volume published by Springer in 2022. The book is edited by Harvard-based scholars specializing in environmental politics and energy policy. The list of core studies is in Table 1.

Table 1-1. List of published studies.

Study 1	MATEJOVA, Miriam. Silver Linings: Environmental Disasters as Critical Junctures in Global Governance. *Environment: Science and Policy for Sustainable Development*, 2023, 65(1), pp. 4-14. ISSN 0013-9157. doi:10.1080/00139157.2023.2146943. Funding: Grant Agency of Masaryk University (MUNI/A/1502/2021)
Study 2	MATEJOVA, Miriam. What can environmental disasters teach us about grievances? A GIS analysis. In Dmitry Kurochkin, Martha J. Crawford, Elena V. Shabliy. Energy Policy Advancement: Climate Change Mitigation and International Environmental Justice. 1st ed. Cham: Springer, 2022. pp. 39-68. ISBN 978-3-030-84992-4. doi:10.1007/978-3-030-84993-1_3. Funding: Grant Agency of Masaryk University (MUNI/A/1324/2020)
Study 3	MATEJOVA, Miriam. Framing environmental disasters for nonviolent protest: a content analysis. Environmental Communication. Abingdon: Routledge Journals, Taylor & Francis, 2023, vol. 17, No 3, pp. 407-420. ISSN 1752-4032. doi:10.1080/17524032.2023.2195589. Funding: Grant Agency of Masaryk University (MUNI/A/1279/2022)
Study 4	MATEJOVA, Miriam and Eric MERKLEY. Protest Under Uncertainty: Evidence from a Survey Experiment. Environmental Communication. Abingdon: Routledge Journals, Taylor & Francis, 2022, vol. 16, No 2, pp. 163-178. ISSN 1752-4032. doi:10.1080/17524032.2021.1974068. Funding: Grant Agency of Masaryk University (MUNI/A/1324/2020)

I am the lead author on all these publications and the sole author on all but one. Study 4 is co-authored with Eric Merkley (University of Toronto) who provided assistance with the experimental design and data analysis (about 30% of the work). I am the lead researcher and writer as well as the corresponding author for this manuscript. The article's topic, literature, and theoretical framework as well as initial and final manuscript drafts were my

responsibility. I also led the revision process, responding to the peer reviewers' and editor's comments.

Study 1 examines environmental disasters as critical junctures in environmental governance. *The core objective is to demonstrate how examining disasters as unique events with unique characteristics may help us better understand their political effects*. It is a conceptual piece grounded in a case study analysis. The article traces the change-making potential of three prominent oil spills in the USA and UK, revealing how taking the opportunity of crises and disasters may bring institutional innovation and positive change.

In political science, disasters are frequently viewed as events that may open windows of opportunity for political actors to push through their agendas (Pelling & Dill, 2009). Scholars tend to assume that disasters do not change the pre-existing social, political, or institutional trajectories but only speed them up. In this perspective, disasters are triggers, or "the actions [or occurrences] that provide the spark that ignites the fuel provided by the underlying [i.e., structural] causes" (Barrington, 2012: 334). Triggers have not been interesting to social scientists because they are thought to be substitutable – while a trigger may be necessary for events or changes to occur, specific triggers are not important.

This article, however, argues that viewing disasters as triggers that merely accelerate status quo implies that their unique characteristics are negligible. Sometimes disasters are critical junctures, historical turning points that create irreversible changes in affected social systems (Collier & Collier, 1991; Hoffman & Jennings, 2010; Mahoney, 2002). To advance this argument I discuss three prominent oil spills in marine environments: the Torrey Canyon, Santa Barbara, and Exxon Valdez disasters, focusing on disaster damage in specific locations and post-disaster public mobilization. An examination of each of these cases reveals that exposing inadequacies in existing institutional arrangements may lead to positive and unexpected institutional changes. These preexisting inadequacies are, however, only part of

the story – disaster characteristics themselves, like their size and valued locations that suffer damage – are crucial to a better understanding of the change-making character of disaster events.

Study 2 builds on the idea that disaster characteristics may matter in determining the political effects of disaster events. I focus on disaster damage as a prominent disaster characteristic and link it to public grievances. At the core of this study are two research questions: *What is the role of grievances in environmental protest? Why may environmental disasters generate grievances?*

Social movements scholars argue that grievances are one of the main drivers behind people's willingness to participate in social and protest movements (Van Stekelenburg & Klandermans, 2013). There is, however, still scholarly disagreement over how grievances motivate political action (Grasso & Giugni, 2016). This study uses the lens of environmental disasters to re-think the way in which we understand grievances. Environmental disasters and crises generate sudden grievances, which are conceptually different from structural grievances that are always present in any society. While structural grievances are linked to, for example, issues of social and environmental justice, sudden grievances may arise also among non-deprived groups (Walsh, 1981). The chapter outlines how such sudden grievances may be linked to the values that people hold for the environment and the associated emotions that may motivate protest. This is a new, more nuanced way of examining grievances and social unrest in political research.

I rely on a geospatial (GIS) analysis to examine the relationship between large industrial disasters, their proximity to locations that people value, and post-disaster protest. Empirically, the chapter offers the first comprehensive geospatial analysis of large industrial disasters and their social effects. It allows for a visualization and analysis of disaster impacts that would otherwise be difficult to process. Such analysis is still relatively novel in social

science and politics since data gathering tends to be costly and time-consuming. Since disasters are geospatial phenomena that interact with human societies, a GIS analysis provides an important lens for a better understanding of disasters' social impacts.

The main finding is that while the objective loss of environmental value may be an important element in protest mobilization after industrial environmental disasters, such loss is not sufficient for public protest to emerge or grow. It is likely that the mobilizing potential of grievances is rooted in their meaning to individuals, and that meaning, in turn, is linked to subjective values that people hold for the environment damaged by a disaster. While the chapter is in line with the prevailing literature on grievances (e.g., McCarthy & Zald, 1973), it calls for a more theoretical fine-tuning of the concept in public protest mobilization.

Study 3 explores the framing dynamic after three major environmental disasters in Canada, the USA, and Germany. The main objective was to examine how various framing actors talk about environmental disasters and how such frames may relate to post-disaster public protest (or lack of thereof). To this end, I formulated three research questions: *What frames and tone dominate news coverage after environmental disasters? How do frames and tone vary by framing actor? How much space do specific framing actors get in news coverage after disasters?*

The article is theoretically grounded in the agenda-setting literature, which explains how some issues' salience leads to public demands for government action (e.g., McCombs & Guo, 2014). Media coverage of the issue or event helps attract public attention and activists tend to use such attention to advance their interests, including protest mobilization (Corrigall-Brown, 2016; Thistlethwaite et al., 2019). Disaster framing by various political actors is frequent in the disaster aftermath (Pelling & Dill, 2009; Malone et al., 2000). The theoretical expectations are thus based on both the media framing literature and existing findings of predominantly social movements scholars. For example, I expected to observe environmental

and emotionally charged frames in the post-disaster news coverage, produced mainly by activists. At the same time, I expected governments and responsible corporations to employ blame denial and pro-industry frames.

To evaluate my theoretical expectations, I conducted a content analysis of newspaper coverage after three large environmental disasters: the 2014 Mount Polley mine leak (Canada), the 2010 Deepwater Horizon oil spill (the USA), and the 2011 Fukushima nuclear disaster (Japan, impacts in Germany). I selected over 1,500 news articles and hand-coded over 500 of them (after random sampling). The findings challenge some prevailing assumptions about protest mobilization – specifically, my analysis reveals a somewhat lesser role of environmental and emotional frames that are generally believed to have a major role in (environmental) protest. The analysis also prompts a further investigation of the role of uncertainty in political participation.

Study 4 is an elaboration of an argument from Study 3 about the role of uncertainty in protest mobilization, and specifically public willingness to engage in protest activity such as demonstrations, petitions, or boycotts. At the core is the argument that industrial disasters generate uncertainty, which can be used by various framing actors to advance their interests (e.g., Gill et al., 2012). *The main objective of this article is to better understand whether and how post-disaster uncertainty affects public willingness to participate in political activism in the disaster aftermath.*

The article's theoretical foundation relies on the literature on framing, motivated reasoning, and psychological effects of uncertainty (e.g., Dieckmann et al., 2017; Slothuus & de Vreese, 2010). Specifically, we theorized that uncertainty framing may trigger emotions like anxiety, which reduce people's willingness to engage in protest activity. Since uncertainty frames are often used to reify the status quo, the dampening effect of uncertainty should be stronger among those who are ideologically conservative.

The article consists of two interlinked parts: a content analysis of post-disaster news coverage, and a survey experiment. First, to assess the prevalence of uncertainty framing in the disaster aftermath, we conducted a content analysis of news media after three major environmental disasters: the 2014 Mount Polley mine leak, the 2010 Deepwater Horizon oil spill, and the 2011 Fukushima nuclear disaster. We hand-coded over 400 articles from Canadian, American, and German news sources. This analysis was descriptive, and the findings were used to propose hypotheses about the effectiveness of uncertainty framing, which we tested through a survey experiment. The experiment was fielded to over 3,600 Americans recruited through Amazon Mechanical Turk.

Our findings reveal that uncertainty of disaster impacts may be a critical element in people's willingness to engage in political activism in the disaster aftermath. We explain why some protest coalitions may have more breadth than others after disasters and why we see stark partisan and ideological polarization on other environmental issues like climate change where opponents of policy action have made heavy use of uncertainty framing. Our study also contributes to the broader discussion on different types of uncertainty and conditional effects, helping verify the pattern of uncertainty effects across different topics.

1.5 Conclusion

The presented studies are only part of my broader research on the politics of environmental disasters. Here I chose to focus on social discontent expressed through nonviolent protest movements. Social movements have been crucial in the formation of institutions, regulatory reforms, and even shifts in the prevailing cultures (West, 2013: 154). Protest movements are an important element of politics because they signal citizen discontent with the existing socio-political system. Large public protests threaten government legitimacy; they have the potential to achieve societal change. Due to lower cost of

participation, nonviolent protest movements may gain wide support and thus become politically influential in Western democracies (Chenoweth & Stephan, 2011; McAdam, Tarrow & Tilly, 2001).

In the presented studies I propose a new mechanism that explains how post-disaster uncertainty may affect public willingness to protest – through pre-existing political attitudes rather than emotions. My work also highlights some remaining knowledge gaps, raising new questions for further research. For example, while disasters may motivate individual political action, they do so more often for instrumental rather than moral reasons. It is puzzling that the inherent value of nature does not provide equally strong motivation as the fact that we may find the environment simply useful. Furthermore, the role of cumulative impacts (e.g., in cases of repeat exposure to oil spills) is unclear when it comes to public discontent – theoretically they may either encourage or discourage protest. A process-tracing study may establish conditions under which cumulative effects matter in post-disaster political behaviour. Given the increasing political divisions in democratic societies over environmental and other issues, it is crucial to continue studying the mechanisms and outlets for public discontent.

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2. Study 1: "Silver linings: environmental disasters as critical junctures in global governance"

Environmental disasters – events that may cause widespread environmental damage without claiming many human lives – are frequently thought to be catalysts for social and political change. A growing body of literature has identified disasters as political events that open windows of opportunity for political actors and affect the actions of governments and social movements. For example, disasters may help exacerbate or lessen violent conflicts, serve as focal points and springboards for protests, and even bring down regimes (Beardsley & McQuinn, 2009; Birkmann et al., 2010; Brancati, 2007). Disaster effects are conditional upon some pre-existing social conditions such as economic inequality, regime repression or ongoing violent conflict. In light of the overwhelming scholarly focus on such structural conditions, there tends to be less causal relevance assigned to disaster events themselves.

This article discusses environmental disasters as critical junctures in global environmental politics, emphasizing these events' unique characteristics. Within states, some disasters, like major oil spills, expose the failure of existing institutions and force the trajectory of institutional development down an unplanned path. Through a case study analysis of some of the most impactful oil spills in recent history – Torrey Canyon, Santa Barbara, and Exxon Valdez – this article traces the change-making potential of environmental disasters, revealing how taking opportunity of crises and disasters may help us move forward with institutional innovation and positive change.

2.1 Disasters as political catalysts

Disasters are serious disruptions of societies that often bring widespread destruction, and cause human, material, economic, or environmental losses. According to their speed of onset, disasters may be categorized as sudden-onset (or acute) or slow-onset (or chronic). While the

former result in sudden harm immediately or shortly after occurrence, the latter generally take much longer to manifest (Hannigan, 2012: 13). Events like major oil tanker spills are sudden-onset disasters. Long-term processes like desertification or soil salinization are examples of slow-onset environmental disasters, many of which are increasingly linked to climate change (Porfiriev, 2015). These, however, are not the focus of this article.

Recent scholarship understands disasters as long-term processes where human and ecological factors intersect (Kelman, 2020). Disasters in part result from human (i.e., society's decision-makers') choices like allocation of resources and investment in knowledge and capabilities since such choices determine societies' vulnerability to hazards. Hence, while disasters may stem from natural or human-made hazards, disasters themselves are not "natural" as they occur when hazards overwhelm the existing systems in human societies. Disasters are therefore social events. They are also political as the need of the government to not only manage but also explain a disaster to the public opens space for politicization of the event. Furthermore, because they create power vacuums and highlight power failures, disasters open windows of opportunity for various groups to push through their agendas (Birkland, 1997).

Disasters as catalysts can be understood in two ways: 1) triggering events, and 2) critical junctures. The former assumes that disasters *accelerate* the existing conditions. In this perspective, disasters are viewed as triggers. A trigger is 'a stray spark from a match' that is often mistakenly understood as the cause of the fire, while it is in fact only an ingredient in 'a potentially explosive environment' (Kimmel, 1990: 10). Triggers have been of less interest to social scientists because they are believed to be substitutable – while some trigger may be necessary for a causal chain to unfold, specific triggers are usually viewed as unimportant. Similarly, disasters are often interesting to scholars as events that, given some structural

conditions, help produce socio-political or policy changes but not necessarily as events in themselves.[3]

A slightly different view of disasters understands these events as historical turning points that create irreversible changes in affected social systems. Institutions are characterized by long periods of stability that is path-dependent, meaning it is influenced not as much by current conditions as by past events and decisions. When institutions change, it tends to happen during brief and occasional periods (i.e., critical junctures) when some decisions send the institution down a new path while closing alternative pathways. These historical moments have occurred in the past in the context of party systems, economics, technological progress, and regime and state development, among many other things (Collier & Collier, 1991; David, 1985; Mahoney, 2002).

When specific environmental disasters act as critical junctures, they 'highlight breakdowns or failures of existing institutional arrangements, thereby creating *chaotic shifts* [emphasis added] in the trajectory of institutional development' (Hoffman & Jennings, 2010). How to conceptualize and measure such critical changes? One way is to trace notable transformations of environmental culture as such culture encompasses long-standing environmental beliefs, norms, and attitudes that are difficult to dislodge or change. Presence of environmental culture implies both internalization and codification of environmental protection values in different parts of the society, both public and private. Such values are slow and difficult to change. Shifts in environmental culture, however, can be observed in the creation of state-led environmental institutions and new legislation linked to unprecedented stringency of environmental regulations.

[3] Note that this is a shift away from the hazards-disaster tradition in disaster studies where the focus was on attempts to understand the events (hazards) and their characteristics (see Rodriguez, Quarantelli, & Dynes, 2007: 9).

The distinction between a critical juncture and a trigger is rarely acknowledged in disaster studies. Viewing disasters as triggers that merely accelerate status quo implies that their unique characteristics are negligible. Yet, disaster characteristics such as size and location matter in specific contexts and viewing disasters as triggers may obscure these critical events' potential causal implications. As noted earlier, some major environmental disasters become symbols that open political opportunities or fuel social mobilization. Among environmental disasters, major oil spills, for example, frequently become objects of framing and counter-framing by different political actors struggling to delegitimize each other's claims in order to sway public opinion to their side.

As discussed in the following sections, prominent oil spills in marine environments, including the Torrey Canyon, Santa Barbara, and Exxon Valdez disasters, became critical turning points in institutional development with respect to environmental legislation. What these sudden-onset disasters have in common, aside from the damage they caused to the marine life and ecosystems, is that by exposing inadequacies in existing institutional arrangements they led to positive and unexpected institutional changes both domestically and internationally. Pre-existing inadequacies, like fragmented legislation on governing oil spills and lack of coherent policies, equipment, and personnel to respond to pollution, are however only part of the story. Some attention to disaster characteristics – such as their size and/or the valued locations they damage – is also needed to better understand the change-making character of these events.

2.2 An unparalleled peacetime disaster: the Torrey Canyon oil spill

World's first large oil spill from a tanker occurred in March 1967 off the coast of southwestern England near Land's End, a holiday destination in Cornwall. The Torrey

Canyon tanker, carrying some 119,000 tons of crude oil, ran aground on rocks due to a misjudgment by its captain.

Approximately 30,000 tons of oil immediately leaked into the sea, with some 70,000 more over the following days during the unsuccessful attempts to salvage the ship. The disaster resulted in damages to the recreation industry, fisheries, and wildlife; it was followed by catastrophic narratives in the media amidst local fears and worries for destroyed livelihoods. Thousands of birds were oiled and killed, and hundreds of kilometers of coastline were polluted with oil. The government response was improvised due to lack of experience with large oil spills (Green & Cooper, 2017; Jernelov, 2010).

At the time of the disaster there was a general lack of scientific knowledge about the damaging effects of oil on the environment and no government strategy for a coordinated emergency response at this unprecedented scale (Burrows, Rowley & Owen, 1974; Walsh, 1968). The community affected by the Torrey Canyon spill was an important tourist destination. Economic concerns and the pressure to "save the beaches" forced the British government to drastic pollution combatting measures such as the use of harmful caustic detergents that the local community opposed (Walsh, 1968). The legal environment was also such that it favoured potential polluters and their ability to 'detract from the property of others without bearing the associated costs,' and there were little provisions in international maritime law to compensate for pollution damages (Burrows, Rowley & Owen, 1974; Hovanesian, 1970). The disaster redefined this institutional environment.

The Torrey Canyon oil spill played a major role in the beginnings of the UK environmental discourse, the emergence of British environmental consciousness, and international governance of maritime pollution. Domestically, the British political response to the disaster 'had no parallel at the time' in terms of both the improvised government response and the subsequent regulatory changes that were to set up 'some kind of permanent machinery

for coping with peacetime disaster.' (Sheail, 2007: 486 and 500). The location of the disaster played an important role in the political response. Oil from Torrey Canyon contaminated 40 holiday beaches and wildlife protection sites in an area where the tourist industry was valued at about £100 million annually (Sheail, 2007: 498).

A major shift in the British – and soon after international – environmental discourse occurred as institutional changes reflected new attitudes towards the role of technology in society. Technology and science were suddenly no longer viewed as mere forces of modernization but also as threats to the environment, which suddenly took political spotlight. Internationally, the disaster led to expansions of maritime law linked to maritime safety, including the 1969 International Convention on Civil Liability for Oil Pollution Damage and the 1973 International Convention for the Prevention of Pollution from Ships (Gold, 1991; McKay, 2004; Wells, 2017).

2.3 Pollution in a middle-class paradise: Santa Barbara oil spill

In January 1969, an oil well blew out just off the cost of Santa Barbara, California. The spill continued for almost 24 hours as the spewed gas and oil travelled through the waters and onto the coastline where they polluted over 50 kilometers of beaches and killed thousands of birds, marine mammals, and fish. In the midst of unprecedented media attention, protests, grassroot movements, and a lawsuit followed as the locals mobilized against the devastation of their picture-perfect community (Molotch & Lester, 1975).

The oil damage drew attention of the public across the United States as well as globally, exposing the inadequacy of existing protection against oil pollution. The country lacked a coherent policy to control pollution in general, and there were not enough resources and equipment available for responding to large oil spills. The scientific knowledge about the impacts of oil in water was limited and the water contamination detection tools were not

available. The federal government had also allowed the oil industry to manage its offshore oil production without having a strategy for responding to large-scale pollution (Clarke & Hemphill, 2002).

While the Santa Barbara oil spill could be seen as an accelerator of pre-existing conditions (especially when it comes to US environmental policy), in some areas it led to unexpected outcomes and directions. The creation of Earth Day, a now global reminder of the importance of environmental protection, was in part inspired by the Santa Barbara disaster albeit in the context of preexisting environmental degradation in the USA, primarily from toxic pollution of air, soil, and water (Lewis, 1990). The spill occurred in a regulatory environment without contingency plans and without federal involvement in states' antipollution policies. In the preceding years the US Congress had been largely unable to regulate states' management of water and air, and the disaster created fertile grounds for comprehensive federal regulations pertaining to pollution control such as the 1970 and 1972 Clean Water Acts (Spezio, 2018).

The disaster opened at least one unexpected pathway for US institutional development. Richard Nixon had become president several days before the spill, which profoundly re-directed his administration's environmental agenda as he had not foreseen the changes in public mood that the disaster brought on – in fact, his presidential campaign had not focused on the environment at all (Flippen, 2012: 19). In the wake of the Santa Barbara disaster, Nixon grappled with the complicated mess of existing environmental policies and the growing pressure from the environmental movement, eventually signing the 1969 National Environmental Policy Act, which later established the Environmental Protection Agency (Clarke & Hemphill, 2002).

The characteristic of the disaster mattered, and specifically the type of damage it inflicted in the specific area, an area inhabited by mostly (upper) middle-class white

Republicans and visited by millions of tourists interested in the mountains, beaches, and the waters of the Pacific. Harvey Molotch has argued that the upper and upper middle-class residents of Santa Barbara were a crucial element in the public response to the 1969 Santa Barbara oil spill. They were 'a large number of worldly, rich, well-educated persons – individuals with resources, spare time, and contacts with national and international elites – [who] found themselves with a commonly shared disagreeable situation: the pollution of their otherwise near-perfect environment' (Molotch, 1970: 131). The location of the disaster mattered – as Spezio (2018) explains, the spill meant a sudden and unexpected change in the understanding of wealthy Americans that they cannot escape pollution by moving away from industrial centers to picturesque places like Santa Barbara. Such shift in perception was crucial in the environmental consciousness and subsequent public pressure to change antipollution legislation.

2.4 'Everyone's secret nightmare': the Exxon Valdez oil spill

The Exxon Valdez oil spill occurred in March 1989 along the southeastern coast of Alaska in an ecologically sensitive area of Prince William Sound. The vessel carried 550,000 tons of crude oil of which about one fifth spilled out after it ran aground. Hundreds of harbour seals and thousands of sea otters and birds were oiled and killed as a result.[4]

In the immediate aftermath of the spill, the US media drew attention to the visible and apparently unchecked danger of the disaster. Images of oil-covered dead birds swiftly followed along with references to an 'environmental nightmare' and 'everyone's secret nightmare' (Daley & O'Neill, 1991: 46). The "crime narrative" about the drunk captain Joseph Hazelwood was also at the centre of public attention. The media and various other actors

[4] For details on the spill and its immediate aftermath, including impacts on the environment and local communities, see US Coast Guard Dept. of Transportation (1993).

involved in the politics of the disaster aftermath perpetuated the Exxon Valdez story as 'a story of addictions: not just a tank captain's addiction to alcohol but widespread addictions to power, money and energy consumption' and presented the USA as 'a country completely drunk on oil' (Larabee, 2000: 83). The symbolism was ubiquitous and powerful, permeating disaster origins, clean-up, and the political aftermath.

The Exxon Valdez spill occurred in a US political environment that was not unfamiliar with the challenges of oil pollution. Yet, the US body of law governing oil spills was fragmented, with various laws covering only specific activities or affected locations (Morgan, 1994). This fragmented governance of oil pollution stemmed from decades long efforts by the Congress to protect the US shipping industry but also from institutional learning from other major oil spills. For example, after the Santa Barbara disaster Congress added oil pollution within the scope of the Federal Water Pollution Control Act, establishing liability for oil spill clean-up. At the time of the Exxon Valdez disaster, however, the oil pollution liability limits were still too lenient and the attempts to streamline the various oil pollution laws repeatedly failed in Congress.[5]

The Exxon Valdez spill led to a political storm in the USA, a storm in which questions about the national energy policies, the environment, and multinational corporations swirled around the socio-political public space. The disaster led to both domestic and international shifts in public-private relationship when it came to transport of oil. The emotional and widespread media attention had major social effects where the dissatisfaction with clean-up and the impacts of the spill gave rise to public support and pressure for better mitigation efforts. On the corporate side, the disaster revealed the power of the public opinion and led to creation of 'public relations crisis management industry' and its growing concern with "image

[5] For a detailed explanation of the US federal oil spill policies prior to the Exxon Valdez spill, see Birkland (1998).

management" (Birkland, 1998: 109). This shift in perception of the role of crisis management spilled outside of the USA as American models of crisis management spread globally (Birkland & Nath, 2000).

Domestically, the US Congress passed the 1990 Oil Pollution Act (OPA) that substantially increased the penalties for oil spillers and mandated, among other things, development of contingency plans and spill drills as well as the double hulls for all oil tankers operating in the US waters (Birkland, 1998). These requirements eventually gained an international dimension in the midst of considerations of compensation and liability for oil pollution as part of a global regime. In the USA, OPA constituted a dramatic shift in US congressional discussions on oil spill response policies. A series of unsuccessful attempts to create a federal oil spill policy in the 1970s preceded OPA (Morgan, 1994). These attempts failed despite other large oil spills in the US waters (e.g., Argo Merchant near Massachusetts, Corinthos near Delaware).[6] The Exxon Valdez disaster, however, differed significantly in its contextual setting.

In cases of environmental disasters, context – and specifically geographic location – matters as a characteristic of the disaster itself. Alaska's pristine setting (as well as its image of America's remaining frontier) played a crucial role in forging a new chapter of American social and political history. Alaska's environment was an unspoiled canvas and the spill vividly demonstrated environmentalists' worries, highlighted environmental thoughts, and gave support to the environmental movement (Birkland & Lawrence, 2002). Birkland and Lawrence (2002) argue that 'the stunning setting of Prince William Sound together with Alaska's powerful resonance in the American imagination transformed an important industrial accident into an icon of the American environmental movement.'

[6] See NOAA database of spills at https://www.noaa.gov/education/resource-collections/ocean-coasts/oil-spills

2.5 Beyond oil spills: the change-making potential of environmental disasters

Environmental disasters sometimes act as critical junctures; they do not merely accelerate the existing conditions but change societies in unexpected ways. The distinction is important, because it draws attention to the unique characteristics of disaster events – these may be location and severity but also type of pollution and even the surrounding uncertainty. Disaster effects, of course, interact with prevailing structural conditions, but to better understand why some lead to broader changes while others do not, we may have to pay more attention to the disaster events themselves instead of treating them as substitutable and thus causally irrelevant.

The disaster events discussed in this article reveal some factors that may shape public attitudes and environmental culture in unprecedented ways. One factor is the "shock value" that may result from a combination of disaster severity and the underlying unpreparedness, either institutional, as in the case of Torrey Canyon, or perceptual (i.e., thinking "this cannot happen to us") as in the case of Santa Barbara. A shocking event brings the emotional charge needed for a sudden change of direction in policies or societal attitudes.

Individuals and communities also tend to place specific types of values on the environment they inhabit, use, and depend on.[7] Some communities, especially indigenous groups, may attach a very high value to the environment that becomes damaged by pollution from a disaster. For example, the location of Exxon Valdez spill was not only significant because of the general image of Alaska's pristine wilderness but because of the impact it had on the local indigenous communities and their livelihoods (Dyer, 1993). Similarly, the area where Torrey Canyon spill occurred was not only valued by vacationers but, importantly, by the locals whose livelihoods depended on the health of the fishery and the influx of tourists

[7] Sometimes individuals also value natural environments that may be far away (and even those environments that they may never visit) (see Matejova, 2022).

(Green & Cooper, 2015). Santa Barbara's beaches, too, were highly prized by visitors as well as the locals for their recreational and aesthetic values. Pollution threatens and reduces these values, generating grievances that may transform into wider public discontent and subsequent public pressure.

Not all environmental disasters however lead to societal changes, whether accelerated or unexpected. Many disasters, in fact, fail to generate any kind of public response. Since the beginning of the 20th century, there have been at least 38 major tanker oil spills, large mine leaks, and nuclear disasters in OECD countries alone. Only a handful of these events were followed by notable public response – specifically, by various forms of public protest like petitions, boycotts, or demonstrations.[8] It is perhaps intuitive to argue that a structural condition – namely established environmental or anti-industry movements – would be responsible for the occurrence of post-disaster protests. In many Western countries, anti-nuclear movements, for example, shape the intense polarization and political struggle of the nuclear debate, and nuclear accidents often lead to spikes of public opposition to nuclear energy. Due to much media attention, large oil spills, too, tend to lead to public outrage. Yet despite established movements not all nuclear disasters and not all major spills lead to protest and regulatory change. Studying specific events' characteristics may help us better understand why.

Type, for example, is a characteristic of a disaster event. Environmental disasters from human-made hazards are generally of three types: chemical (including oil) spills, mine leaks, and nuclear accidents. Different types of disasters are associated with different kind of damage and geographic context as well as diverse societal conditions (e.g., nuclear powerplants situated in urban areas, mines located in rural places). They also tend to be linked

[8] For data, see Matejova (2022).

to distinct narratives created by anti- and pro-industry groups and therefore surrounded by varying degrees of uncertainty and public fear (e.g., mining processes are more straightforward and easier to understand than nuclear energy). Such conditions then have implications for public reactions (and public pressure) in the event aftermath.

Disasters, whether from natural or human-made hazards, expose societies' vulnerabilities. Environmental disasters specifically expose weak spots in environmental legislation, environmental protection, coordination of response, and contingency planning. Subsequently, these spotlights on vulnerabilities may become opportunities for improvements in resilience not only against similar disasters but also environmental degradation in general, both domestically and globally.

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3. Study 2: What can environmental disasters teach us about grievances? A GIS analysis

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4. Study 3: Framing environmental disasters for nonviolent protest: a content analysis

Globally, environmental protests have been on the rise. Climate strikes, demonstrations against "dirty" energy production, and protests against the destruction of biodiversity are but a few that have recently made the news headlines. Protests sometimes follow damaging environmental disasters, but more often, disasters fail to trigger large-scale protest movements (e.g., Flores & Smith, 2013). Since most people form opinions about dramatic events through news media, an examination of media framing[9] in the aftermath of environmental disasters may begin to shed light on this variation in public protest response.

The principal aim of this study is to expand our understanding of how different framing actors talk about environmental disasters in their aftermath. The presence of specific types of frames in the post-disaster news coverage in cases of disasters with varying public response may also indicate protest (de)mobilizing potential of such framing. To examine this potential, I conduct a content analysis of news media coverage of three major industrial environmental disasters[10] linked to varying scales of post-disaster protest: the 2014 Mount Polley mine leak, the 2010 Deepwater Horizon oil spill, and the 2011 Fukushima nuclear disaster. The content analysis considers both the tone of coverage and different frames, including disaster impacts, moral and emotional appeals, and industry positions.

There is, of course, a difference between reading the news, willingness to protest, and participation in protest. This analysis neither can nor aims to address all these factors as many of them are likely structural or individual. At this stage, the analysis is descriptive as it seeks

[9] A frame is a message that provides meaning to events based on receivers' pre-existing schemas (Gamson & Modigliani, 1987).
[10] These are disasters from human-made hazards that primarily affect the environment.

to uncover patterns in the media coverage of environmental disasters linked to a diversity of post-disaster protest response.

While they do not suggest causality, my findings challenge established assumptions about the frames that may be necessary for large-scale protest mobilization. The analysis points to a lesser role of frames frequently believed to play a significant role in (environmental) protest – especially environmental frames and frames linked to emotions. This study also highlights the need for further examination of the role of uncertainty in political participation.

4.1 Disasters in framing research

The literature on media content after disasters tends to focus on disasters from natural hazards (e.g., Albrecht, 2021; Bohensky & Leitch, 2013; Houston et al., 2012). There has been a smaller interest in analyzing the prevailing narratives in the aftermath of industrial environmental disasters, which are a different type of phenomenon. Studies of industrial disaster framing tend to be of two types. On the one hand, scholars are interested in the presentation of specific types of information after disaster events. These studies have identified the types of frames that frequently appear in post-disaster news coverage, namely destruction, economy, and blame frames (e.g., Anderson & Marhadour, 2007; Friedman, 2011; Pantti & Wahl-Jorgensen, 2011; Tomkiv et al., 2016). Some have also identified factors that affect frame appearance in news coverage, including geographic scope of news media and proximity to disaster event (Molotch & Lester, 1975; Turcotte et al., 2017). These types of descriptive studies lack potential links to the intended or actual behaviour of the recipients of frames.[11]

[11] A notable recent exception is the study by Thomas et al. (2016) that combines a descriptive analysis of media frames with examining audience interpretation (but not impacts on behaviour) of those frames.

On the other hand, scholars investigate the role of news coverage of disasters in policy making. In this context, disasters are frequently understood as "focusing events" or 'sudden, attention-grabbing events that help politically disadvantaged groups to push through messages suppressed by dominant groups' (Birkland, 1998: 53). At the core of this literature is the desire to understand how disasters change domestic policy agendas, not how they encourage or discourage public protest, although the two are connected (e.g., Birkland, 1998; Birkland & Lawrence, 2009; Bishop, 2014). Destructive or otherwise costly events like major oil spills, for example, may gain widespread public attention quickly and there is generally little convincing that activists must do about the need for a policy solution (Crow et al., 2017; Thistlethwaite et al., 2019).

Protest mobilization, however, requires a different set of conditions from those needed for policy change. Media framing of the issue at hand is an especially pertinent one (Cooper, 2002), understudied in the context of industrial environmental disasters and environmental protest. My research thus aims to identify the prevailing frames and tone of post-disaster news coverage and link the use of such frames and tone to political actors who may attempt to maintain or disrupt post-disaster public order. To this end, I pose three main research questions:

RQ1: *What frames and tone dominate news coverage after environmental disasters?*

RQ2: *How do frames and tone vary by framing actor?*

RQ3: *How much space do specific framing actors get in news coverage after disasters?*

Answering these questions may reveal (de)mobilizing frames or patterns that are unique to environmental disasters. Furthermore, an examination of media framing after environmental disasters may have implications not only for crisis communication but also post-disaster political stability. Communication of ill-preparedness for example, may decrease

public trust in government, while communication of uncertainty may affect information seeking (and thus potential susceptibility to disinformation). It is thus important to know how frequently these types of frames appear in the post-disaster news coverage. The amount of space that specific political actors get in the media after disasters and the frames they use reveal both the degree of access and the choice of political strategies in disaster communication.

While my study cannot causally link specific frames to protest behaviour, it goes further than previous descriptive studies in evaluating potential impacts of framing – its comparative design allows for an examination of patterns between the appearance of (de)mobilizing frames and observation of the size of post-disaster protest. In other words, the varying scales of protest in the examined disaster cases are indicators of the (de)mobilizing potential of specific types of frames, tone, and actors who use them. The following theoretical framework discusses these expectations in detail.

4.2 Framing industrial environmental disasters: theoretical framework

The agenda-setting literature explains how some issues become salient enough for the public to demand government action (e.g., Kingdon, 2014; McCombs & Guo, 2014). Crucial in this process is activists' role in shaping the public opinion through the news media (Johnston & Noakes, 2005). Environmental interest groups, for example, strive to attract media attention to disseminate specific types of frames to achieve their aims, including mobilization for protest (Corrigall-Brown, 2016). Extensive coverage of a specific issue by the media increases that issue's salience and thus the public sense of urgency to act (Thistlethwaite et al., 2019).

In the disaster aftermath, political actors frequently frame disasters in particular ways for "political positioning" (Pelling & Dill, 2009). The media reporting of disaster events shapes public perceptions of relevance of that event as well as the public understanding of

both the event and its solutions, and public willingness to act upon these solutions (e.g., Malone et al., 2000). The portrayal of disasters in the news coverage therefore has consequences for human decisions such as injury prevention or participation in public protest (Smith et al., 2007). In the aftermath of disasters linked to varying degrees of protest we should see frames that both encourage and discourage potential mobilization (depending on the framing actor involved and given the post-disaster political environment). I elaborate on this assumption in my theoretical expectations below.

4.2.1 Expectations: frames and tone

Broadly speaking, the most typical frames in public discourses can be organized into five thematic categories: responsibility, human interest, morality, economy, and conflict (Semetko & Valkenburg, 2000). Two additional types of frames are also likely to occur in the news after industrial environmental disasters: environmental frames and industry frames linked to the public discourse concerning the relevant industry.

First, responsibility frames assign responsibility for the problem's cause to an individual, group, or government. These types of frames are a common feature of the post-disaster dynamic where assignment of blame is a principal task performed by political actors, often activists (e.g., Javeline, 2003). Framing actors may blame some level of government for the disaster, for example by suggesting that the government's pre-existing practices were inadequate. Corporations and governments are more likely to employ 'the vernacular of damage control' (Olson, 2008: 163): excuses and justifications. The former is about denying – partially or fully – one's responsibility. The purpose of the latter is to create 'an alternate political reality' in terms of reframing the undesirable issue in a more favorable light (McGraw, 1991: 1137).

Second, the human interest frames are meant to trigger an emotional response; they often put "human face" on the problem at hand, dramatizing it in order to make the problem more personal. Emotions affect the ways in which people process frames, and specific emotions shape individual's choice to act (Druckman & McDermott, 2008). Emotionally charged frames are therefore likely to be present in the post-disaster framing dynamics. For example, framing actors may discuss the private lives of affected individuals and use metaphors or anecdotes to generate feelings of sympathy or anger (needed for potential mobilization).

Morality frames are the third category of common frames. Their purpose is to place the problem in the religious context or make some moral or ethical prescriptions. Framing actors may refer to the notions of ethics, the right or wrong, and various social norms. In a post-disaster environment, actors may attempt to blame the event on God or claim that the event was impossible to prepare for. The narratives about damage are therefore placed outside of human control, deflecting blame from the governmental and corporate actors (Button, 2002).

Fourth, economic frames emphasize the economic dimensions of the problem, often in terms of economic impacts on individuals, groups, or country. These frames present material gains or losses and various trade-offs (Karlberg, 1997). After an industrial disaster, economic frames may focus on the economic losses (or benefits) of the industrial activity that caused the disaster or emphasize the economic impacts of the disaster itself.

Fifth, conflict frames reflect varying degrees of conflict between individuals, groups, or institutions. These frames' main characteristics are dichotomy (i.e., the problem is framed from a perspective of two distinct, mutually exclusive, stereotypical camps) and extremism (i.e., dramatization of conflict through emphasis on extreme statements and actions; it includes insults, accusations, or angry expressions) (Karlberg, 1997). In the post-disaster

dynamics, such frames may also include accusations of government and/or corporate cover-ups or various relevant wrong doings.

The sixth type of frames likely to appear after industrial disasters are environmental frames. In this context, environmental frames are likely to emphasize harmful environmental impacts of the disaster, including the immediate damage and possible ongoing or future harm. In general, the damage could be framed in two ways: as "natural," for example through comparisons of the industrial disaster to natural processes, or as human caused. The former way of framing "naturalizes" the disaster and removes it from human responsibility, making it seem inevitable (Perrow, 1984). The latter links the disaster damage to the human factor – either to the specific circumstances of the event or to a broader trend (e.g., industry focus as a whole or climate change narratives).

Lastly, some aspects of the national energy policies are also likely to be reflected in post-disaster framing. These can be viewed through the lens of long-time public discourses with three sides with opposing narratives: pro-industry, anti-industry, and neutral/indifferent. Appendix 2 presents these industry-specific frames as well as the remaining six types along with a series of questions used to evaluate the frames' presence or absence in the news coverage. This approach to frame identification helps focus attention on the key features of each frame. The questions have been adapted from Semetko and Valkenburg (2000) and Giannakopoulos (2013).

This research also evaluates the tone of frames after environmental disasters because tone is likely to stir up or dampen specific emotions linked to willingness to protest. Tone is generally positive or negative, but some studies have developed more nuanced tone measures in newspaper coverage. In this study, the descriptors of tone were adopted from Brunken (2006) and Giannakopoulos (2013) and adjusted to better reflect the post-disaster environment: (un)successful, (un)prepared, (un)reliable, obscure/informative, (un)certain, and

(un)relatable. In news coverage, tone is captured in statements by framing actors, including journalists.

The (un)successful tone refers to the government's and/or company's handling of the disaster. A successful tone, for example, is reflected in references to a speedy response with proper cleanup procedures. The (un)prepared tone conveys the preparedness for either that particular disaster or similar disasters or disasters in general. References to weak regulations, for example, suggest lack of preparedness. The (un)reliable tone refers to government's or corporate actor's degree of trustworthiness and dependability. The obscure/informative tone is linked to the framing actors' (un)willingness to provide information on the disaster. The (un)certain descriptor goes a step further – it captures the use of uncertainty framing through, for example, specific words (e.g., potentially, probably) that denote uncertainty. Lastly, the (un)relatable descriptor captures framing attempts to relate (or not) the disaster to the public. Details on the operationalization of specific types of tone are available in Appendix 2.

4.2.2 Expectations: framing actors

After industrial disasters, three political actors are likely to be the predominant producers of frames: activists, governments, and the responsible corporations. In the framing process, communication moves from the political elites to the media to the public, with the news media serving as a principal conduit for (and influencer of) framing competition (Klar et al., 2013).

Activists tend to use diagnostic, prognostic, and motivational frames to focus blame, propose solutions, and provide rationale for participating in a movement (Benford & Snow, 2000). To be effective, frames must resonate with their audiences. Since the public tends to accept rather than resist the status quo, activist frames in the media frequently aim to 'break the frames of quiescence' (Johnston & Noakes, 2005: ch. 1). The extant literature suggests

that emotional and sometimes the closely related injustice frames are crucial in these efforts (e.g., van Troost et al., 2013; Rodgers, 2010). After disasters, activists are thus likely to be linked to blame, human interest, morality, environmental, and industry frames (as well as negative tone).

With respect to the other two framing actors, after a disaster, corporations would want to control damage, re-stabilize their public image, and maintain the policy status quo (Breeze, 2012). Because disasters draw public attention to apparent policy failures, one of their consequences is the erosion of public trust in the government. Therefore, government frames will likely be constructed to serve government's primary interests: to remain in power, prevent a decline in its legitimacy, and implement policies in line with government's preferences. Government interests are unlikely to be homogeneous. Inter-agency differences, divisions between legislative and executive interests, and tensions due to federalism, for example, may result in different framing efforts among different government actors. Government and corporate frames would likely focus on blame (assignment or denial), conflict, economy, and industry positions (as well as both positive and negative tone).
The following section presents the cases, procedures, and findings from a content analysis used to evaluate these theoretical expectations.

4.3 Content analysis

The primary purpose of this content analysis is to assess the types of frames and tone that different political actors produce after environmental disasters linked to varying protest responses. To this end, I have selected three cases: the 2014 Mount Polley mine leak, the 2010 Deepwater Horizon oil spill, and the 2011 Fukushima nuclear disaster. The Mount Polley disaster was a tailings pond spill that polluted the environment in British Columbia, Canada. A small public protest occurred a week after the disaster. The Deepwater Horizon disaster was

a massive oil spill off the coast of Louisiana in the Gulf of Mexico. The disaster caused widespread environmental damage that motivated medium-size protests across the United States. The Fukushima disaster was a meltdown of a nuclear power plant in Japan with devastating environmental impacts. Public responses to the event differed across the world, with notable large-scale protests in Germany. More detailed case descriptions are provided in Appendix 3.

Three criteria guided the case selection. First, these disaster events occurred within a few years of one another, which allows for controlling for some structural conditions such as broader social, political, economic, and technological environments. Second, they generated substantial media coverage, which makes them data-rich cases. Third, they were followed by varying sizes of protest – from small and localized after Mount Polley to medium-size protests after Deepwater Horizon to mass protests in Germany after the Fukushima disaster. All three disasters were widely publicized in respective domestic news coverage. While the media landscapes differ in these three cases, the Canadian, American, and German news media have had a strong influence on environmental issues in public discourse. There are also well-established environmental movements with broad public support in all three countries. Anti-industry movements are also present in all three cases. In Canada, the anti-mining movement has been closely linked to indigenous concerns (Keeling & Sandlos, 2009). The US anti-fossil fuel movement, while present for decades, has been gaining political traction since the early 2000s, and the anti-nuclear movement has been influential in Germany since the 1970s (Cheon & Urpelainen, 2018; Koopmans & Duyvendak, 1995).

By focusing on the German rather than Japanese news coverage, the Fukushima case not only allows for an examination of prominent large-scale protest (as opposed to the smaller protest in Japan), but it also increases the breadth of the analysis. The German case is the only one of the three where the disaster did not occur but given my interest in the media coverage

of the event rather than specific physical impacts, the German case is suitable for analysis and in fact allows for the largest variation on the protest size. Of course, the proximity to a disaster as well as domestic social, political, or economic conditions are likely to influence public opinion. However, the global consumption of news and especially of reporting on dramatic events means that domestic framing of distant disasters is still likely to have a political impact. This reasoning is also in line with Birkland's (1998, pp. 54–55) idea of the 'communities of interest' whose members may be located far away from the disaster but may still fear the possible harm, which would contribute to the sense of urgency and their calls for action.

4.3.1 Data sources and coding

Using LexisNexis Academic, I have collected all available newspaper articles produced after the disaster, using the keywords Mount Polley, Deepwater Horizon OR (BP AND oil spill), Fukushima. The time period began with the day of the disaster and ended with the disaster's first anniversary. This is likely to cover all significant protest events that occurred in the immediate disaster aftermath and before the recovery period.

The initial sample included all relevant articles in any newspaper pertaining to the cases in national contexts – Canadian, US, and German for Mount Polley, Deepwater Horizon, and Fukushima, respectively. The initial sample was then reduced to publications with highest readership, both national and regional for the Canadian and US coverage. Specifically, I have kept articles in any of the nine major Canadian newspapers: *the Globe and Mail*, *Toronto Star*, *Montreal Gazette*, *Halifax Chronicle*, *Calgary Herald*, *Vancouver Sun*, *Winnipeg Free Press*, and *La Presse*. I have also included articles in major newspapers close to the disaster zone such as *the Prince George Citizen* as well as major provincial newspapers (e.g., *the Province*).

Similarly, I have kept articles appearing in major national and regional US newspapers, including *USA Today, the New York Times, the Wall Street Journal,* and others. I have also included the largest newspapers (by circulation) in the states affected by the disaster such as *the Dallas Morning News, Houston Chronicle,* and others.

Since in Germany the local and regional press is more important than national newspapers (Kleinsteuber & Thomass, 2007), I applied different exclusion criteria, eliminating the Swiss press and some smaller publications from the broader sample. Along with major regional and local newspapers (e.g., *Berliner Zeitung, Spiegel*) the dataset contains the main national papers in Germany, including *Welt* and *die Tageszeitung*.

Across the three cases, the total population was 1,547 articles (543 about Mount Polley, 329 about Deepwater Horizon, and 677 about Fukushima). This sample was reduced one more time to allow for hand coding of the articles – a random sample of approximately a third of the articles yielded 437 texts (200 about Mount Polley, 111 about Deepwater Horizon, and 226 about Fukushima).[12] The list of the newspapers included in the sample is in Appendix 3.

The articles were coded by two trained coders (see Appendix 2 for coding scheme) and intercoder reliability test was conducted by randomly selecting 10% of the articles from the sample. Intercoder reliability scores (Krippendorff's alpha)[13] for the frames, tone, and framing actors are provided below in Tables 4.1 and 4.2. The scores suggest a suitable level of intercoder agreement. All coded data were analyzed using descriptive statistics. The results of the analysis are presented and discussed below.

[12] During hand coding some articles were omitted if deemed irrelevant.
[13] Krippendorff's alpha is a conservative measure of intercoder agreement that accounts for chance agreement (Lombard et al., 2002).

Table 4-1. Krippendorff's alpha for frames and associated framing actors.

	Blame assign.	Blame denial	Human interest	Moral.	Econ.	Confl.	Env.	Pro-indus.	Anti-indus.	Neutral
Frame	0.836	1	1	1	0.856	0.864	0.959	1	0.912	0.848
Actor	0.844	1	1	1	0.864	0.864	0.864	1	0.912	0.848

Table 4-2. Krippendorff's alpha for tone and associate framing actors.

	Management	Preparedness	Reliability	Info provision	Uncertainty	Relatability
Tone	0.864	1	0.792	1	1	1
Actor	1	1	0.792	1	0.864	1

4.3.2 Results: frames and tone

Three types of frames dominated the post-disaster news: blame assignment, economy, and environment. These types of frames are present in all three cases, but their prevalence is not equally strong (see Table 4.3 below). For example, environmental frames have a much stronger presence in the Canadian case than in the other two cases. Yet, since the post-Mount Polley protest was minimal, environmental frames may not be a significant protest motivating factor – at least not in the Canadian context. In Germany, however, environmental frames were most prevalent after the Fukushima disaster.

Table 4-3. Incidence of frames in disaster news coverage (in percent, rounded).

Frame	**Mount Polley (N=183)**	**Deepwater Horizon (N=99)**	**Fukushima (N=206)**
Blame assignment	43	56	18
Blame denial	8	12	0.5
Human interest	14	2	12
Morality	4	3	4
Economy	26	35	30
Conflict	11	14	14
Environment	66	38	39
Pro-industry	4	1	5
Anti-industry	3	9	17
Neutral	7	5	4

Note: N = number of articles analyzed. The percentage of specific frames is based on the total number of sampled articles for each case. Most articles contained multiple frames.

It may be useful to look at different aspects of the dominant frames more closely. Environmental frames, for example, may have greater mobilization potential if they emphasize the scale of damage. However, sending competing messages (e.g., the damage is large vs. minimal) could have a dampening effect due to the resulting uncertainty (Johnson & Tversky, 1983). Similarly, economy frames are likely to have mobilizing potential if they emphasize negative economic impacts but may be less effective if they employ pro-industry narratives. Lastly, blame assignment frames are likely to be effective in mobilization if there is only a small number of factors to blame. Having too many scapegoats is likely to result in uncertainty, which may have a dampening effect on mobilization. Appendix 4 (Table A-5) presents a breakdown of the frames into several dimensions and their respective incidence in the post-disaster news coverage. Below I focus on the three predominant frames: blame, economy, and environment.

After the Mount Polley disaster, blame assignment was the second most prevalent frame (after environment). Blame was predominantly assigned to two actors – the BC Liberal Party in power at the time and the Imperial Metals Corporation (the owner of Mount Polley) where the former was in a sharper focus. For example, in one article executive director of Sierra Club noted: 'The Mount Polley Mine disaster in the Cariboo reminds me of the thoughtless approach to mining and pollution in Third World countries.'[14] After the Deepwater Horizon disaster, blame assignment was also the predominant frame. Although, in this case, multiple companies took part in blame assignment and deflection. For example, BP and its main contractors Transocean and Halliburton were accused of 'a suite of bad decisions' and 'a culture of complacency.'[15] In Germany, the blame assignment frames after the Fukushima disaster were somewhat different – mostly the focus was on the inadequacy of

[14] *Times Colonist.* (2014, August 7). Inadequate monitoring led to tailings breach. https://www.timescolonist.com/opinion/letters/inadequate-monitoring-led-to-tailings-breach-4612275
[15] Mufson, S. (2010, November 10). Experts, rivals blast BP's practices. *Washington Post*, A, A04.

the existing practices when it comes to nuclear energy, which is expected given the strength of the German anti-nuclear movement. Overall, there was little confusion about the direction of blame in all three cases.

The incidence of frames emphasizing disaster's economic costs was approximately the same for all cases. The German framing actors, however, focused on the economic consequences of environmental damage and on post-Fukushima policies about twice as much as the Canadian and American framing actors (see Appendix 4, Table A-5). The environmental frames were not conflicting to a large extent in any of the cases. The predominant focus was on the scale of environmental damage, and the incidence of damage minimizing was small.

Although the incidence of the remaining frames is low, a closer look at them reveals several unexpected patterns. There was a surprising shortage of both industry frames and the linking of disasters to broader environmental themes to, for example, call for climate action or addressing environmental degradation. Similarly, there was no assignment of dramatic labels in any one of the cases, and the emphasis on dichotomies was rare. The case comparison also reveals that human interest frames and narratives meant to evoke emotions (specifically with respect to the environment and economy) had the highest incidence in the case with the smallest size of post-disaster protest. After Mount Polley, many human interest stories centered on the ordinary locals worried about their family, their homes, and their uncertain future.[16]

The post-disaster tone was mostly negative in all three cases (see Table 4-4). In the Mount Polley and Deepwater Horizon news coverage, the predominant tone was linked to lack of preparedness and uncertainty surrounding the disaster. The highest incidence of any

[16] Luymes, G. (2014, August 25). Mount Polley-area residents weigh in on mine spill. *Times Colonist.* https://www.timescolonist.com/bc-news/mount-polley-area-residents-weigh-in-on-mine-spill-4612911

negative tone type was uncertainty – 28% after the Fukushima disaster. In specific contexts, communication of unpreparedness and uncertainty may have implications for individuals' trust in government and political participation.

Table 4-4. Tone of news coverage (incidence in percent, rounded).

		Mount Polley	*Deepwater Horizon*	*Fukushima*
Negative		(N=183)	(N=99)	(N=206)
	Unsuccessful	10	12	18
	Unprepared	25	19	3
	Untrustworthy	18	6	9
	Obscure	9	7	12
	Uncertain	26	16	28
	Relatable	5	10	17
Neutral				
	Response	43	50	35
	Management	7	9	1
	Reliability	3	2	2
	Information	2	0	3
	Uncertainty	1	0	8
	Relatability	0	0	2
Positive				
	Successful	2	8	2
	Prepared	2	1	1
	Trustworthy	1	0	1
	Informative	3	3	5
	Certain	4	0	2
	Unrelatable	3	0	2

Note: N = number of articles analyzed. The percentages are based on the total number of sampled articles for each case. Most articles contained multiple types of tone.

4.3.3 Results: framing actors

Linking post-disaster frames to framing actors raises two questions. First, how well are specific actors covered in the news media? Second, of all statements that framing actors make in the news, which ones do they tend to use more often? Answering the first question allows for a comparison of the prominence of actors in the news coverage. It, however, does not reveal what frames each actor is more or less likely to use. Answering the second question does just that. Table 4.5 below provides an overview of the news coverage of specific framing

actors. The incidence of frames that these actors used in the disaster aftermath is in Appendix 4 (Table A-6).

Table 4-5. Percentage (rounded) of framing actors covered in the post-disaster news.

Framing Actor	**Mount Polley** (N=183)	**Deepwater Horizon** (N=99)	**Fukushima** (N=206)
Journalist	77	59	67
Activist	11	7	3
Government (total)	49	29	20
Local	18	0	2
Provincial/state	28	1	1
Federal	3	28	17
Company	5	28	5
Expert	28	24	7
Other	30	9	5

Note: N = number of articles analyzed. The percentages are based on the total number of sampled articles for each case. Most articles contained multiple framing actors.

Activists were featured very little in the post-disaster news coverage of Mount Polley, Deepwater Horizon, and Fukushima – 11%, 7%, and 3% of the time, respectively. This finding is in line with the literature on the protest paradigm, which is a pattern of media reporting characterized by the coverage in support of the status quo and the lack of coverage of "outsiders" (or those challenging the status quo) (Brown & Harlow, 2019). In the aftermath of the Mount Polley disaster, of all statements that activists made, most contained blame assignment (33%), followed by environmental frames (24%). After Deepwater Horizon most activist frames were environmental (45%) and against the industry (18%). Here, the complete lack of blame assignment frames in activist statements is surprising. After Fukushima, 56% of all activist statements in the news contained conflict frames (accusing), followed by anti-industry frames (22%) and environmental frames (11%). Activists did not use human interest and economy frames at all after Deepwater Horizon and Fukushima, only after Mount Polley (5% incidence for both frame types).

With respect to government frames, the results reflect diverse interests among different levels of government. In the case of Mount Polley, of all their statements in the news

media, local government assigned blame 21% of the time and focused on economy (15%) and environment (33%) – this reflects aboriginal groups' concerns about the impacts of the disaster on their communities. The provincial government denied blame in 27% of their statements. Of all framing actors, the provincial government was the most likely target of accusations by other actors, which is not surprising, given the localized impacts of the disaster. The federal government, while featured very little in the news, focused predominantly on blame assignment.

Similar dynamics between lower and higher levels of government is apparent in the Fukushima case. Most of the statements made by the local government in Germany focused on accusations, blame assignment, environment, and anti-industry narratives. The German federal government statements were more mixed, with most containing blame assignment, economy, and industry frames. The inter-governmental dynamics was not evident after the Deepwater Horizon spill – the US federal government assigned blame 26% of the time, while other levels of government were not represented in the coverage at all.

Statements from companies were also not well-covered in the post-disaster news. After Mount Polley and Fukushima, the companies were featured only 5% the time (compared to 28% after Deepwater Horizon). As expected, they focused mostly on blame and economy frames; yet, surprisingly, 20% of corporate frames after Fukushima and 50% after Mount Polley were environmental. At a closer look, however, these environmental frames were mostly the responsible company's reporting on the state of the environment after the disaster. In case of Mount Polley, the company sometimes appeared to minimize the perception of damage, for example through claiming the affected water was 'very close to drinking water.'[17]

[17] Moore, D. (2014). B.C. orders mine to plug toxic tailings release. *Global News.* https://globalnews.ca/news/1493713/b-c-orders-mine-to-plug-toxic-tailings-release/

The full results from the tone-actor analysis are available in Appendix 5. Activist tone was negative in all three cases. The tone of corporate frames tended to be positive except for two variables – information provision and uncertainty (i.e., companies used obscure and uncertain tone). After Mount Polley, the local government's tone was predominantly negative, which aligns with previous findings. The provincial government was mostly neutral or positive – exceptions are the use of negative tone when it comes to information provision and uncertainty. After both Deepwater Horizon and Fukushima, the federal government employed mostly negative tone. This points to the only significant difference in tone-actor dynamics across cases: the federal government's use of negative tone is linked to cases of medium- and large-size protests. I explore the implications of these results in the discussion section below.

4.4 Discussion and conclusion

The aim of this study was to expand our understanding of how different framing actors talk about environmental disasters in their aftermath. To this end, I conducted a content analysis of the news media coverage of three major environmental disasters: the Mount Polley mine leak, the Deepwater Horizon oil spill, and the Fukushima nuclear disaster. These disasters were followed by varying sizes of nonviolent public protest. The study's comparative design allows for an examination of potential (de)mobilizing frames in the context of environmental disasters.

The content analysis considered both the tone of coverage and different frames, including economic and environmental concerns, moral and emotional appeals, and industry positions. The findings challenge some prevailing views of environmental activist behaviour,

and specifically the use of environmental and emotional framing for protest mobilization. Specifically, the analysis offers four main takeaways.

First, environmental frames are likely not a significant factor behind the size of post-disaster protest, at least at the framing stage. While in some contexts environmental frames may motivate protest in issues like pollution or GMOs (Deng & Yang, 2013; Plows, 2008), they do not seem to be the deciding factor in motivating larger protests after environmental disasters. After Mount Polley, environmental frames were predominant in the news coverage, but the post-event protest was very small. This is surprising given that environmental damage is an easy focal point that could motivate emotional response and thus protest.

Even more obvious motivating frames are missing in the post-disaster media frames – framing actors are, for some reason, not linking environmental disasters to the bigger discourse of the environment and energy production or environmental protection in general. In countries like Canada, where environmental protection and energy production frequently clash in public discourse, the omission of such link from framing after industrial environmental disasters is puzzling. Thistlethwaite et al. (2019) found a similar lack of broader themes linked to flood disasters in Canada. My analysis reveals that this pattern holds across the US and German news coverage, as well.

Furthermore, the lack of dramatic labels and dichotomies in these three cases is in glaring contrast to public discourses surrounding climate change and environmental protection, and especially in the United States (Bolsen & Shapiro, 2018). Perhaps major environmental shocks like these disasters distract from the otherwise ongoing industry-environment discourses instead of serving as fuel or lightning rods. Such possibility forces us to reexamine disasters as catalysts that open windows of opportunity for political actors to push through their agendas.

Second, the case comparison reveals that some frames that in theory should be significant in protest mobilization – specifically narratives meant to evoke emotions – have a smaller presence in cases with medium or large protests. Like with environmental frames, the Mount Polley case with small post-disaster protest has the highest incidence of human interest frames. After Fukushima and Deepwater Horizon, other frames were much more common in the news. This suggests that although emotional frames may be important mobilizing factors in some contexts, they are neither emphasized nor seemingly necessary for larger protest after environmental disasters. Such finding challenges the long-standing assertion that emotional frames are a crucial element of protest mobilization and prompt further research to the conditions and contexts in which emotional frames may be an effective tool for protest.

Third, one possible explanation for the varying sizes of post-disaster protest, suggested in part by the tone-actor analysis, rests on the mobilizing potential of uncertainty. The incidence of the uncertain tone (as well as closely related obscure tone) is comparable between the Mount Polley case (small protest) and Fukushima case (large protest). This leads to two different conclusions: uncertainty is likely not the main protest mobilizing factor, or uncertainty has two opposing effects that likely manifest under different conditions. The latter alternative is theoretically more appealing as it aligns with extant research. While uncertainty has not been a frequently studied aspect of the protest mobilization process, the extant literature suggests that uncertainty has mixed effects on people's beliefs, attitudes, and willingness to act (Gustafson & Rice, 2020). Effects of uncertainty on protest may be case-specific and may be better assessed through, for example, experimental methods.

Fourth, while the relatively low incidence of activist frames in the post-disaster coverage may be explained through the protest paradigm (as described earlier), the lack of some types of frames in those that made it into the news is surprising. Activists did not use blame assignment in the Deepwater Horizon case, and human interest frames only after

Mount Polley. After Deepwater Horizon, most activist frames in the news were environmental. One explanation could be that these activists, assuming that their intent was to mobilize the public, preferred environmental frames to focus on the scale of the emergency, bring attention to the urgency and thus evoke some emotional response. Other explanations may be structural and specific to the American social, political, and economic conditions at the time.

Even in cases with larger protests, activist framing was sparse, which raises questions about the role of mobilization elites in protest. If a mobilizing frame is present in the news coverage, does it matter who its source is? Perhaps the alignment of government frames and protesters' attitudes – like in the cases of Deepwater Horizon and Fukushima – signals a possibility of success for protesters (with respect to the ability of protest to effect change). Policy change depends in part on a formulation of a clear policy solution, which gives hope that mitigation of similar future events is in human capacity (Crow et al., 2017; Thistlethwaite et al., 2019). The same may be true for public protest as the social movements literature suggests (e.g., Pinard, 2011). Expectation of success as a protest motivation is an established theoretical aspect of protest mobilization, but one that has not yet been closely examined empirically.

There are two main limitations of my study. First, without additional data (e.g., from interviews) it is difficult to gauge framing actors' intentions and the effectiveness of specific frames on the target audience. Still, the study's comparative design allows for observations of actual behaviour after the framing of specific events appeared in the media (while keeping in mind that factors other than framing are crucial in protest mobilization). Second, my findings may be influenced by both my choice of analytical time period and my focus on print/online news sources. My analysis does not trace how specific frames and tone changed within the studied year from the onset of the disaster. Since frames change over time, this type of

temporal analysis could bring more insights into the (de)mobilizing potential of post-disaster frames. My focus on print/online media may have also influenced some of my findings. For example, Thomas et al. (2016) found that human interest frames are more common in television coverage of disasters – this may be one possible reason behind the shortage of human interest frames in the news coverage in my disaster cases.

While industrial environmental disasters may create a social dynamic that somewhat differs from other environmental emergencies, the generalizability of my findings can be evaluated in at least two ways. First, the role of environmental and emotional frames as well as uncertainty may be further examined in the context of protest after disasters from natural hazards and other contingencies. Second, the study's scope conditions may be altered or expanded to include instances of protest after industrial environmental disasters in non-democratic states or non-Western democracies.

Given the increasingly polarized and disillusioned public (at least in Western societies), the pervasive presence of uncertainty in political life, and the growing urgency of environmental problems, studying the mechanisms and outlets for public discontent is vital for well-functioning democracies. Understanding how and under what conditions major environmental disasters and other contingencies encourage or dampen protest mobilization opens opportunities for peaceful resolution of social conflict and easing of social discontent. Examining the use of framing after environmental disasters may shed more light on public interest in other environmental crises, including the loss of biodiversity and the impacts of climate change.

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5. Study 4: Protest under uncertainty: evidence from a survey experiment

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Appendix 1

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Appendix 2

Table A-2. Post-disaster frames in news coverage.

1. Responsibility frames
Assignment/Acceptance of blame
Q1a. Does the framing actor suggest that some level of government, corporation, individual or group is responsible for the disaster?
Q1b. Does the framing actor suggest that some other thing (without referring to a specific actor – e.g., a faulty design, mechanical problems) is responsible for the disaster?
Q1c. Does the framing actor suggest that some level of government has (or has had) the ability to alleviate the problem?
Q1d. Does the framing actor suggest that the pre-existing practices (governmental or corporate) are not working?
Q1e. Does the responsible actor accept responsibility for the disaster?

Denial of blame
Q1f. Does the framing actor employ excuses (i.e., deny responsibility)?
Q1g. Does the framing actor employ justifications (i.e., place the issue in a more favourable light)?
Q1h. Does the framing actor suggest the disaster was 'an act of God', a natural occurrence, or otherwise was impossible to predict?

2. Human interest frames
Q2a. Does the framing actor emphasize how individuals and groups are affected by the disaster?
Q2b. Does the framing actor discuss the personal or private lives of the impacted individuals?
Q2c. Does the framing actor employ adjectives, metaphors or anecdotes that generate feelings of fear, anger, empathy or sympathy?
Q2d. Does the framing actor refer to their own personal experience (e.g., their own families affected or potentially affected in the future) or the humankind?

3. Morality frames
Q3a. Does the framing actor imply (un)ethical or (im)moral actions on the part of themselves or others?
Q3b. Does the framing actor offer specific social prescriptions about how to behave either in the short term or long term? For example, does the framing actor urge others to help the affected people out of a sense of moral duty?
Q3c. Does the framing actor refer to morality, God, or other religious tenets?

4. Economic frames
Q4a. Does the framing actor refer to the economic costs of the disaster (in monetary or non-monetary terms, actual or potential) to individuals, groups, regions or the country, in the

immediate aftermath or in the future? (This includes the costs to the responsible company such as the cost of clean-up, various costs to taxpayers, or the company pledging funds for research linked to the disaster.)
Q4b. Does the framing actor refer to economic consequences that are explicitly linked to the environmental damage from the disaster (e.g., the cost of lost subsistence)?
Q4c. Does the framing actor mention economic consequences of pursuing or not pursuing a course of action such as specific policies related to the disaster?
Q4d. Does the framing actor employ adjectives, metaphors or anecdotes that generate feelings of fear or anger linked to the economic consequences of the disaster?

5. Conflict frames
Q5a. Does the story reflect disagreement between individuals, groups, different levels or parts of government or other actors?
Q5b. Does the framing actor criticize or accuse another?
Q5c. Does the framing actor refer to others as extremist or assign other dramatic labels?
Q5d. Does the framing actor refer to clear dichotomies such as jobs vs. conservation or economy vs. the environment? (These need not be related to the economy.)

6. Environmental frames
Q6a. Does the framing actor mention the current, ongoing or future environmental damage (and/or its consequences) caused by the disaster?
Q6b. Does the framing actor link the disaster damage to broader themes such as the deteriorating state of the environment or climate change?
Q6c. Does the framing actor employ adjectives, metaphors or anecdotes that generate feelings of fear or anger linked to the environment and loss of environmental values? (This could also include referring to extreme or never before seen damage, or using words such as emergency, catastrophe, etc.)
Q6d. Does the framing actor suggest the environmental damage, although present, is small, minimal, insignificant, contained or not as large as it seems?

7. Industry-specific frames
A. Pro-industry
Q7a. Does the framing actor refer to economic or environmental benefits of the industry or the industry's importance as a whole (e.g., the oil & gas industry, the mining industry, etc.)?
Q7b. Does the framing actor refer to stakeholder support for the industry?
Q7c. Does the framing actor refer to the reliability, safety and/or security of the specific energy?

B. Anti-industry
Q7d. Does the framing actor suggest economic, environmental, or health/safety risks of the industry independent of the disaster itself?
Q7e. Does the framing actor refer to a need for alternative energy or calls for the energy phase-out?
Q7f. Does the framing actor refer to previous (or potential future) accidents or disasters (similar or not) caused by that particular industry?
Q7g. Does the framing actor employ adjectives, metaphors or anecdotes that generate feelings of fear or anger linked to the particular industry?

C. Neutral/indifferent

Q7h. Does the framing actor suggest a balance when it comes to the advantages and disadvantages of that particular energy production?
Q7i. Does the framing actor suggest an inevitability of that particular energy production?
Q7j. Does the framing actor take an undecided or no position on the industry energy?
Q7k. Does the framing actor refer to a trade-off between the type of energy and other issues?

Table A-3. Tone of post-disaster news coverage.

a) Absent (0) – Unsuccessful (1) – Successful (2) – Neutral (3) – Unclear (4)
b) Absent (0) – Unprepared (1) – Prepared (2) – Neutral (3) – Unclear (4)
c) Absent (0) – Unreliable (1) – Reliable (2) – Neutral (3) – Unclear (4)
d) Absent (0) – Obscure (1) – Informative (2) – Neutral (3) – Unclear (4)
e) Absent (0) – Uncertain (1) – Certain (2) – Neutral (3) – Unclear (4)
f) Absent (0) – Relatable (1) – Unrelatable (2) – Neutral (3) – Unclear (4)

Table A-4. Coding instructions.

Coding Item	**Explanation**
V1. Story identification number	
V2. Source	Newspaper name and location
V3. Date	Story date: day, month, year
V4. Story uniqueness	If duplicate, mark as 'D' and include the duplicate story ID: e.g., D(146). If there are more than one duplicates of the same story, only use the ID number of the original/first story.
V5. Primary topic	1 = disaster aftermath 2 = disaster causes 3 = cleanup efforts/disaster response 4 = compensation 5 = protest 6 = other Note: If the story is fairly balanced in terms of different topics, more than one may be selected.
Disaster aftermath	Includes impacts on people and environment: victims' suffering (physical, emotional), economic damage (e.g., destruction of property, layoffs), environmental damage (destruction of natural environment)
Disaster causes	Discussion of what and/or who caused the event. Includes regulatory failures (i.e., ineffective pre-existing regulations, rules, laws, etc.)
Cleanup efforts/disaster response	Disaster response and/or cleanup efforts by government, corporation and/or communities. Includes discussions of cost and responsibility for cleanup.
Compensation	Lawsuits, fines, or any compensation requests (granted or not) linked to the disaster
Protest	Non-violent protest activities explicitly linked to the disaster (e.g., demonstration, petition, boycott, activist stunts). Must be

	explicitly stated that protest occurred. Simple a note of activist or public disagreement does not qualify.
Other	Anything else related to the disaster not captured by the other categories (e.g., discussion of new policies or other ways forward, political discussions triggered by the disaster, etc.).
V6. Attribution of Responsibility	Based on answers to questions in Table 1. Code as (1) if the answer is 'yes'. Code as (0) if the answer is 'no'.
V6a. Framing actor A (assignment of blame)	Subject assigning blame for the disaster. Code as (0) if V6 is absent. 1 = Journalist 2 = Activist 3 = Local government 4 = Provincial/state government 5 = Federal/national government 6 = Corporation 7 = Expert 8 = Other 9 = Unclear Note: Q1d refers to **pre**-existing practices in terms of regulations or established disaster preparedness/management practices, not to actors' response in the disaster aftermath.
V6b. Framing actor B (denial of blame)	Subject held accountable for the disaster. Code as (0) if V6 is absent. 1 = Journalist 2 = Activist 3 = Local government 4 = Provincial/state government 5 = Federal/national government 6 = Corporation 7 = Expert 8 = Other 9 = Unclear
V7. Human interest	Based on answers to questions in Table 1. Code as (1) if the answer is 'yes'. Code as (0) if the answer is 'no'. Note: Q2a refers to specific groups of people – code as (1) if article mentions a specific number of people in a specific area, but code as (0) if uses vague terms such as "thousands of people affected"
V7a. Framing actor	Subject using the human interest frame. Code as (0) if V7 is absent. If 'human interest' stories are presented by the journalist (e.g., if individuals are interviewed), code 'journalist' as the framing actor. Only include members of the public in 'other' (or other relevant category) if coding opinion pieces or interview transcripts. 1 = Journalist 2 = Activist 3 = Local government

	4 = Provincial/state government 5 = Federal/national government 6 = Corporation 7 = Expert 8 = Other 9 = Unclear
V8. Morality	Based on answers to questions in Table 1. Code as (1) if the answer is 'yes'. Code as (0) if the answer is 'no'.
V8a. Framing actor	Subject referring to morals/ethics within the disaster context. Code as (0) if V8 is absent. 1 = Journalist 2 = Activist 3 = Local government 4 = Provincial/state government 5 = Federal/national government 6 = Corporation 7 = Expert 8 = Other 9 = Unclear
V9. Economic consequences	Based on answers to questions in Table 1. Code as (1) if the answer is 'yes'. Code as (0) if the answer is 'no'.
V9a. Framing actor	Subject referring to economic consequences of the disaster. These include harm or negative externalities that are caused by the disaster or subsequent regulations that directly stem from the disaster. These also include harm or negative externalities to local, regional, or national economies that rely on the environment. 1 = Journalist 2 = Activist 3 = Local government 4 = Provincial/state government 5 = Federal/national government 6 = Corporation 7 = Expert 8 = Other 9 = Unclear
V10. Conflict	Based on answers to questions in Table 1. Code as (1) if the answer is 'yes'. Code as (0) if the answer is 'no'. Note: If Q5a is (1), there does not have to be an accusing and an accused actor. The story may simply reflect disagreements among different actors. Existence of public protest, for example, suggests conflict. In Q5b and Q5c, the conflict between specific actors must be explicitly stated.
V10a. Framing actor A (accusing)	Subject making accusations, assigning dramatic labels, or arguing in dichotomies. Code as (0) if V10 is absent. 1 = Journalist 2 = Activist

	3 = Local government 4 = Provincial/state government 5 = Federal/national government 6 = Corporation 7 = Expert 8 = Other 9 = Unclear
V10b. Framing actor B (accused)	Actor subjected to accusations and/or dramatic labels. Code as (0) if V10 is absent. 1 = Journalist 2 = Activist 3 = Local government 4 = Provincial/state government 5 = Federal/national government 6 = Corporation 7 = Expert 8 = Other 9 = Unclear
V11. Environmental damage	Based on answers to questions in Table 1. Code as (1) if the answer is 'yes'. Code as (0) if the answer is 'no'.
V11a. Framing actor	Subject referring to environmental damage (immediate and/or future harm) from the disaster. This includes public health issues (e.g., pollution of drinking water). Environment refers to natural resources, wildlife, air, land, water, and landmarks. 1 = Journalist 2 = Activist 3 = Local government 4 = Provincial/state government 5 = Federal/national government 6 = Corporation 7 = Expert 8 = Other 9 = Unclear
V12. Industry-specific	Based on answers to questions in Table 1. Code as (1) if the answer is 'yes'. Code as (0) if the answer is 'no'.
V12a. Pro-industry	Subject defending and/or supporting the industry linked to the disaster. Code as (0) if V12 is absent. 1 = Journalist 2 = Activist 3 = Local government 4 = Provincial/state government 5 = Federal/national government 6 = Corporation 7 = Expert 8 = Other 9 = Unclear

V12b. Anti-industry	Subject opposing the industry linked to the disaster. Code as (0) if V12 is absent. 1 = Journalist 2 = Activist 3 = Local government 4 = Provincial/state government 5 = Federal/national government 6 = Corporation 7 = Expert 8 = Other 9 = Unclear
V12c. Indifferent/neutral	Subject referring to the industry linked to the disaster in a neutral/indifferent tone. Code as (0) if V12 is absent. 1 = Journalist 2 = Activist 3 = Local government 4 = Provincial/state government 5 = Federal/national government 6 = Corporation 7 = Expert 8 = Other 9 = Unclear
V13. Tone: disaster management	Tone of coverage regarding the government's or corporation's handling of the disaster, including government's course of action towards the responsible corporation. If the tone is present, the story should convey the sense of the situation being handled well or not well – for example, through emphasizing that proper procedures were (not) followed/established after the disaster, or through referring to the speed of response (where fast=successful; slow=unsuccessful). Code as 'neutral' if the tone is apparent in the story and is fairly balanced (i.e., no positive or negative tone prevailing) – e.g., if the story mentions someone following some procedures, but does not clearly state whether those procedures were good or bad. 0 = Tone absent 1 = Unsuccessful 2 = Successful 3 = Neutral 4 = Unclear
V13a. Framing actor	Subject using the tone. Code as (0) if V13 is absent. 1 = Journalist 2 = Activist 3 = Local government 4 = Provincial/state government 5 = Federal/national government 6 = Corporation 7 = Expert 8 = Other

	9 = Unclear
V14. Tone: disaster preparedness	Tone of coverage regarding disaster preparedness – government's, corporation's or community's. If the tone is present, the story should convey the sense of the relevant actor(s) being prepared for the disaster (or similar disasters) – for example, through emphasizing that pre-existing regulations/procedures were (not) adequate. This tone is specifically about referring to relevant pre-existing regulations or procedures. If, for example, the framing actor refers to weak regulations, the tone conveys lack of preparedness. Code as 'neutral' if the tone is apparent in the story and is fairly balanced (i.e., no positive or negative tone prevailing). 0 = Tone absent 1 = Unprepared 2 = Prepared 3 = Neutral 4 = Unclear
V14a. Framing actor	Subject using the tone. Code as (0) if V15 is absent. 1 = Journalist 2 = Activist 3 = Local government 4 = Provincial/state government 5 = Federal/national government 6 = Corporation 7 = Expert 8 = Other 9 = Unclear
V15. Tone: actor reliability	Tone of coverage regarding government and/or corporate actors' trustworthiness and dependability. This could be either general or with reference to the specific disaster. For example, the framing actor expressing lack of confidence in existing procedures suggests lack of reliability/trust. Accusations of cover-ups also convey the unreliable tone. Code as 'neutral' if the tone is apparent in the story and is fairly balanced (i.e., no positive or negative tone prevailing). 0 = Tone absent 1 = Unreliable 2 = Reliable 3 = Neutral 4 = Unclear
V15a. Framing actor	Subject using the tone. Code as (0) if V16 is absent. 1 = Journalist 2 = Activist 3 = Local government 4 = Provincial/state government 5 = Federal/national government 6 = Corporation 7 = Expert

	8 = Other 9 = Unclear
V16. Tone: information provision	Tone of coverage regarding the provision of information on the disaster. Refers to specific actors' willingness (or lack of it) to disclose information on the disaster. For example, code as 'obscure' if an actor argues the information should not be public. Code as 'neutral' if the tone is apparent in the story and is fairly balanced (i.e., no positive or negative tone prevailing). 0 = Tone absent 1 = Obscure 2 = Informative 3 = Neutral 4 = Unclear
V16a. Framing actor	Subject using the tone. Code as (0) if V17 is absent. 1 = Journalist 2 = Activist 3 = Local government 4 = Provincial/state government 5 = Federal/national government 6 = Corporation 7 = Expert 8 = Other 9 = Unclear
V17. Tone: uncertainty	Tone of coverage regarding the certainty/uncertainty surrounding the disaster. The uncertain tone can be conveyed through open acknowledgment of uncertainty (e.g., through explicitly referring to the uncertain nature of the disaster, whether in terms of causes or damages or other aspects) or through specific words such as 'potentially', 'probably', 'likely', etc. Only code the tone as 'certain' if certainty is explicitly stated (e.g., through the use of words such as 'certain', 'sure', etc., or through expressing high confidence in disaster causes, damages, etc.). Code as 'neutral' if the story/framing actor presents both certain and uncertain aspects of the disaster. 0 = Tone absent 1 = Uncertain 2 = Certain 3 = Neutral 4 = Unclear
V17a. Framing actor	Subject using the tone. Code as (0) if V18 is absent. 1 = Journalist 2 = Activist 3 = Local government 4 = Provincial/state government 5 = Federal/national government 6 = Corporation 7 = Expert 8 = Other

	9 = Unclear
V18. Tone: relatability	Tone of coverage regarding the relatability of the disaster to the target audience, including the affected population or the public in general. Relatable tone can be conveyed through using comparable examples or human interest frames or referring to similar disasters potentially occurring in the future. Code as 'neutral' if the story/framing actor presents both relatable and unrelatable aspects of the disaster. 0 = Tone absent 1 = Relatable 2 = Unrelatable 3 = Neutral/balanced 4 = Unclear
V18a. Framing actor	Subject using the tone. Code as (0) if V19 is absent. 1 = Journalist 2 = Activist 3 = Local government 4 = Provincial/state government 5 = Federal/national government 6 = Corporation 7 = Expert 8 = Other 9 = Unclear

Notes:

If more than one frame/actor is present in a story, multiple values per variable are allowed.

When coding actors:

- If the story does not refer to a specific actor, code the journalist as the framing actor.
- Corporation refers to the company responsible for the disaster.
- 'Activist' may include religious groups.
- Local government includes First Nations representatives if in reference to the chief or some governing body. Code any other First Nations organizations as 'activist'.
- 'Expert' includes commissions of experts assembled to investigate the disaster cause. 'Expert' could be identified as such by the journalist or self-identified (e.g., in opinion pieces).
- 'Other' includes industry groups, international organizations (e.g., IAEA), and members of the public (e.g., in opinion pieces) (except when interviews with the public are used as human interest frames by the journalist).

Appendix 3

1. Case descriptions

Mount Polley

The Mount Polley mining disaster was a tailings pond spill on 4 August 2014 in British Columbia, Canada. The spilled mine waste – between fifteen and twenty-four million cubic meters – polluted the nearby natural environment. It was the largest mining environmental disaster in Canadian history and one of the worst in the world.[18] The open pit copper and gold mine is owned by a Canadian company, Imperial Metals, who claimed responsibility and later was found at fault by an independent, government-ordered expert panel. Poor practices (specifically, an inadequately designed dam for the tailings pond) were determined as the cause of the disaster more than five months after the event.[19] No casualties were reported, but the environmental damage was large, primarily due to the spilled mine waste clogging the salmon-bearing habitat. Some nonviolent protests followed the Mount Polley disaster. These occurred in Vancouver about a week after the event. The protests were mostly aimed at the mining company and were small in terms of the number of participants.[20]

The Mount Polley disaster was widely publicized in the Canadian press coverage. The Canadian media system is dominated by several major newspapers with similar agendas and little difference in the reporting of regional media networks. Local newspapers, however, remain important.[21] The Canadian news media has had a strong influence on environmental issues in both public discourse and policy.[22]

Environmental issues have been part of the Canadian public discourse, policy, and media agenda for decades. At first dramatic events like prominent oil spills shaped Canadian environmental consciousness. Environmental issues' salience then decreased until the early 1990s with renewed international and federal policy attention.[23] There is a well-established environmental movement in Canada that enjoys broad public support.[24] In recent years, among the prominent issues on Canada's environmental agenda are natural resource extraction, species and biodiversity protection, indigenous resource management, and responses to climate change, all intertwined in a wider discourse of the trade-offs between the

[18] Lee, A. (2014, 14 August). Cleaning up after Canada's largest tailings pond leak. *Maclean's*. http://www.macleans.ca/news/canada/cleaning-up-after-canadas-largest-tailings-pond-leak/; Meissner, D. (2016, 4 August). Mount Polley mine disaster hits 2-year mark, fallout still causes divisions. *CBC News*. http://www.cbc.ca/news/canada/british-columbia/mount-polley-anniversary-1.3706850

[19] Hunter, J., & Humer, M. (2015, 30 January). Design failure caused Mount Polley tailings breach, expert panel concludes. *The Globe and Mail*. http://www.theglobeandmail.com/news/ british-columbia/design-failure-caused-mount-polley-tailings-breach-expert-panel-concludes/article22719967/; Linnitt. C. (2015, 18 December). No fines, no charges laid for Mount Polley mine disaster. Desmog Canada. http://www.desmog.ca/2015/12/18/no-fines-no-charges-laid-mount-polley-mine-disaster.

[20] Richmond, J. (2014, 12 August). Protesters slam Imperial Metals over Mount Polley. Mining.com. http://www.mining.com/protesters-slam-imperial-metals-over-mount-polley/

[21] Soroka, S. (2002). *Agenda-setting dynamics in Canada;* Hallin, D., & Mancini, P. (2004). *Comparing media systems. Three models of media and politics*. Cambridge University Press, p.25.

[22] Soroka, S. (2002). Issue attributes and agenda-setting by media, the public, and policy-makers in Canada. *International Journal of Public Opinion Research,* 14(3), 264–85; Soroka, S. (2002). *Agenda-setting dynamics in Canada*. UBC Press.

[23] Soroka, S. (2002). *Agenda-setting dynamics in Canada*.

[24] McKenzie, J. (2002). *Environmental politics in Canada: Managing the commons into the twenty-first century*. Oxford University Press; Stoddart, M., & MacDonald, L. (2011). Keep it wild, keep it local: Comparing news media and the Internet as sites for environmental movement activism for Jumbo Pass, British Columbia. *Canadian Journal of Sociology*, *36*(4), 313–335.

economy and the environment.[25] The relationship between the environment and mining in particular is a thorny and complicated issue in British Columbia, with economic interests, local environmental concerns, and indigenous lands management continuously at odds in the public discourse.[26]

Deepwater Horizon

The Deepwater Horizon disaster was an oil spill that followed an explosion of an offshore drilling rig off the coast of Louisiana in the Gulf of Mexico. The rig exploded on 20 April 2010, and the subsequent damage to a subsurface wellhead set off a leak that continued until August when the well was sealed permanently. With approximately 600 thousand tonnes of oil leaked into the Gulf, the Deepwater Horizon disaster made history as the largest accidental oil spill in the world. The explosion resulted in death of eleven platform workers and injuries of several others.[27] Environmental damage was immense – almost 1,300 km of coastal habitat, including wetlands and beaches, were oiled, severely affecting seabirds, marine mammals, fish, and corals.[28] The company that had contracted to use the drilling rig, the British Petroleum (BP), assumed responsibility for the disaster.[29] Nonviolent protests – demonstrations, petitions and boycotts – against BP erupted across the United States and Britain.[30] Yet, despite heavy medialization, the protests that occurred after the Deepwater Horizon spill were only middling in size.[31]

Like Mount Polley, the Deepwater Horizon disaster received widespread media attention, including international coverage. The US media landscape is highly commercialized, with private media organizations dominating the broadcasting system.[32] In the American newspaper market, local papers are important (much like in Canada) albeit with some recent decline in the salience of local news.[33]

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[25] Harrison, K. (1996). *Passing the buck. Federalism and Canadian environmental policy.* UBC Press; Harrison, K. (2012). A tale of two taxes: The fate of environmental tax reform in Canada. *Review of Policy Research,* 29(3), 383–407; Maclean, K., Robinson, C., & Natcher, D. (2014). Consensus building or constructive conflict? Aboriginal discursive strategies to enhance participation in natural resource management in Australia and Canada. *Society and Natural Resources, 28*, 197–211; Dauvergne, P., & Neville, K. Mindbombs of right and wrong: Cycles of contention in the activist campaign to stop Canada's seal hunt. *Environmental Politics, 20*(20), 192–209.

[26] Mehta, S., & Shore, W. (2021, 29 May). Mining reform needed to prevent costly conflicts, advocates say. *The Discourse.* https://thediscourse.ca/west-shore/mining-reform-bc-highlands

[27] Hoffman, A., & Devereaux Jennings, P. (2010). The BP oil spill as a cultural anomaly? Institutional context, conflict and change. *Ross School of Business Working Paper Working Paper* No. 1151, 1–36.

[28] Freudenburg, W., & Gramling, R. (2011). *Blowout in the Gulf. The BP oil spill disaster and the future of energy in America.* MIT Press.

[29] Kerr, R., Kintisch, E., Stokstad, E., & Schenkman, L. (2010). Will Deepwater Horizon set a new standard for catastrophe? *Science*, *328*(5979), 674–75.

[30] Jonsson, P. (2010, 12 June). Worldwide BP protest day vilifies BP for Gulf oil spill. *Christian Science Monitor*. http://www.csmonitor.com/USA/2010/0612/Worldwide-BP-Protest-Day-vilifies-BP-for-Gulf-oil-spill

[31] Klaus, K. (2010, 31 May). Memorial Day protest of BP held at Clearwater Station. *Tampa Bay Times*. http://www.tbo.com/news/florida/memorial-day-protest-of-bp-held-at-clearwater-station-38905; Wheaton, S. (2010, 2 June). Protesters gather at BP gas stations. *The New York Times*. http://www.nytimes.com/2010/06/03/us/ 03boycott.html; Schmidt, J. (2014). Framing environmental crises: Correlating action to outcomes for the 1969 Santa Barbara and 2010 Deepwater Horizon oil spills. Master's Thesis, University of Northern British Columbia.

[32] Strömbäck, J., & Dimitrova, D. (2006). Political and media systems matter. A comparison of election news coverage in Sweden and the United States. *Press/Politics, 11*(4),131–47; Hallin, D., & Mancini, P. (2004). *Comparing media systems,* pp.75 and 236.

[33] Hayes, D., & Lawless, J. (2017). The decline of local news and its effects: New evidence from longitudinal data. *The Journal of Politics*, *80*(1).

Similar to the Canadian experience, dramatic attention-grabbing events helped forge American environmental consciousness,[34] and the environmental movement is well established with broad support.[35] Environmental issues have been on the American public, media, and policy agenda since 1960s but experienced a similar cycle of increased/decreased salience as in Canada.[36] While public environmental attitudes are linked to concerns over economic growth, most Americans generally support environmental protection.[37] There is political polarization on specific environmental issues in the United States and especially climate change and support for environmental spending more generally.[38] Closely linked to the environment-economy trade-offs is the issue of energy development and environmental protection, with Americans wavering in their support between the two.[39] Since later 2000s, however, most Americans prefer shifting energy production away from fossil fuels and towards alternative energy sources, prioritizing environmental protection.

Fukushima

The Fukushima disaster was a meltdown of the Fukushima Daiichi nuclear power plant located in the Fukushima Prefecture, Japan. The disaster was triggered by an earthquake and tsunami on 11 March 2011, with the epicenter about 100 km off the coast of Japan. The nuclear power plant was operated by Tokyo Electric Power Company. Plant operators managed to stop the release of radioactive material from the failed reactors in December 2011, nine months after the meltdown began. No deaths were recorded due to radiation exposure, but twenty people died due to explosions and during evacuation.[40] Environmental impacts of the disaster were devastating – radioactive material contaminated the mainland and flowed into Japan's coastal estuary systems and the Pacific Ocean.

Although the Fukushima disaster affected countries across the world, public responses in two of them were in an especially stark contrast: post-disaster protest mobilization in Germany versus that in Japan. In Germany, over a hundred thousand people took to streets days after the disaster, calling for a national nuclear phase-out.[41] In Japan, the protests began a month after the disaster; they were amateur and short-lived and constrained to Tokyo (with up to about 60,000 people gathering there).[42]

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[34] See, for example, Leiserowitz, A., Kates, R., & Parris, T. (2006). Sustainability values, attitudes, and behaviors: A review of multinational and global trends. *Annual Review of Environment and Resources, 31*, 413–44.

[35] Dunlap, R. (2000). Americans have positive image of the environmental movement. *Gallup Poll Monthly,* No.415 (April), pp.19–25.

[36] Dunlap, R. (1991). Trends in public opinion toward environmental issues: 1965 – 1990. *Society and Natural Resources,* 4, 285–312; Dunlap, R. (2002, September/October). An enduring concern: Light stays green for environmental protection. *Public Perspective*, 10–14.

[37] Dunlap, R. (2002). An enduring Ccncern.

[38] Dunlap, R., Xiao C., & McCright, A. (2021). Politics and environment in America: Partisan and ideological cleavages in public support for environmentalism. *Environmental Politics*, *10*(4), 23–48; McCright, A., & Dunlap, R. (2011). The politicization of climate change and polarization in the American public's views of global warming, 2001–2010. *The Sociological Quarterly, 52*(2), 155–94; Kima, S., & Urpelainen, J. (2018). Environmental public opinion in U.S. states, 1973–2012. *Environmental Politics*, *27*(1), 89–114.

[39] Bergquist, P., Konisky, D, & Kotcher, J. (2020). Energy policy and public opinion: Patterns, trends and future directions. *Progress in Energy,* 2.

[40] Elliott, D. (2013). *Fukushima: impacts and implications*. Palgrave Macmillan, p.8.

[41] Hasegawa, K. (2014). The Fukushima nuclear accident and Japan's civil society: Context, reactions, and policy impacts. *International Sociology, 29*(4), p. 291.

[42] Elliott, p. 18; Hasegawa, p. 292; The Economist. (2014, 3 August). Japan's anti-nuclear movement. Where's the protest? *The Economist.* http://www.economist.com/blogs/banyan/2014/08/japan-s-anti-nuclear-movement

Like in other parts of the world, the Fukushima disaster was heavily medialized in Germany. The German media system is characterized by high newspaper circulation and a strong role of political parties and organized civil society in the media.[43] Due to Germany's federal political system, the news media system is decentralized, with broadcasting being the responsibility of each federated state. The political differences in these federated states are then reflected in both public and private broadcasting.[44] Local and regional newspapers thus have a lot of weight in the German public discourse.[45]

Nuclear risks have long been part of the German news coverage, with both anti- and pro-nuclear voices given space for alarming and reassuring statements.[46] The anti-nuclear movement in Germany has been well established since the 1970s and it has been successful at exerting policy pressure ever since, slowing the German development of nuclear power. German Green party at the federal level has made nuclear phase out one of its main goals. The public opinion on nuclear power in Germany was favourable in the mid-1970s but declined after the Three Mile Island and Chernobyl nuclear disasters despite the media coverage of the impacts being relatively benign.[47]

Public opinion on nuclear power and environmental awareness are intertwined. The pattern of increasing and decreasing salience of environmental concerns in Germany mirrors that in the USA and Canada.[48] In the 2000s and before the Fukushima disaster, the German environmental consciousness had grown and environmental protection gained salience in light of the worries about climate change and sustainability. According to the 2010 German Environmental Awareness Study, almost two-thirds of surveyed individuals wished to see a stronger political action towards environmental protection.[49] The same survey found that while most of the respondents supported a shift to renewable resources, there was a growing skepticism about German reliance on nuclear energy. After the Fukushima disaster, there was a downward shift in public opinion not only in Germany but globally.[50]

2. Sampled newspapers for content analysis

Case	**Newspaper**	
Mount Polley	Main Canadian press	*Globe and Mail, Toronto Star, Montreal Gazette, Halifax Chronicle, Calgary Herald, Vancouver Sun, Winnipeg Free Press, La Presse*
	Major provincial newspapers	*Prince George Citizen, the Province, the Times Colonist*
Deepwater Horizon	Main US press	*USA Today, the New York Times, the Wall Street Journal, Los Angeles Times, New York Post, Chicago Tribune, the Washington Post, Newsday, Daily News,*

[43] Hallin, D., & Mancini, P. (2004). *Comparing media systems*, p.71.
[44] Hallin, D., & Mancini, P. (2004). *Comparing media systems*, p. 167.
[45] Kleinsteuber, H., & Thomass, B. (2007). German media landscape. In G. Terzis (Ed.), *European media governance. National and regional dimensions* (pp. 111-124). University of Chicago Press.
[46] Dunwoody, S., & Peters, H. (1992). Mass media coverage of technological and environmental risks: A survey of research in the United States and Germany. *Public Understanding of Science*, 1, 199–230.
[47] Wiliarty, S. (2013). Nuclear power in Germany and France. *Polity*, *45*(2), 281–96; Arlt, D., & Wolling, J. (2015). Fukushima effects in Germany? Changes in media coverage and public opinion on nuclear power. *Public Understanding of Science*, *25*(7), 1–16.
[48] Hartmann, J., & Preisendörfer, P. (2021). Development and structure of environmental worries in Germany 1984–2019. *Zeitschrift für Soziologie*, https://doi.org/10.1515/zfsoz-2021-0022
[49] Available at https://www.umweltbundesamt.de/publikationen/umweltbewusstsein-in-deutschland-2010
[50] Arlt, D., & Wolling, J. (2015). Fukushima effects in Germany?

		am New York, San Francisco Chronicle, the St. Louis Post-Dispatch
	Largest newspapers (by circulation) in the affected states	*the Dallas Morning News, Houston Chronicle, the Birmingham News, Baton Rouge Advocate, Tampa Bay Times/St. Petersburg Times, Tampa Tribune, the Clarion-Ledger, and Star-News (Northern Carolina)*
Fukushima	Main German press	*Welt, Frankfurter Rundschau, die Tageszeitung*
	Major regional and local newspapers	*Berliner Zeitung, Kölnische Rundschau, Kölner Stadt-Anzeiger, Stuttgarter Nachrichten, Spiegel, Rheinische Post, Mitteldeutsche Zeitung*
	Other regional and local newspapers	*Kölner Express, Berliner Kurier, Bürstädter Zeitung, Idsteiner Zeitung, Lampertheimer Zeitung, Main-Spitze, Aachener Zeitung, Aachener Nachrichten, Wiesbadener Kurier, Der Tagesspiegel, Börsen-Zeitung, General-Anzeiger, Wormser Zeitung, VDI nachrichten, Nürnberger Zeitung*
	Global news in German	*Agence France Presse - German*

Appendix 4

Table A-5. Percentage (rounded) of each framing variable.

Frame		Percentage		
		Mount Polley (N=183)	*Deepwater Horizon* (N=99)	*Fukushima* (N=206)
Responsibility	Some actor is responsible for the disaster.	25	37	2
	Some other thing is responsible.	15	10	3
	Government can alleviate the problem.	7	1	1
	The existing practices are not working.	23	15	11
	Accepting responsibility.	1	5	2
	Employing excuses.	7	11	1
	Employing justifications.	1	0	0
	Disaster was 'an act of God', a natural occurrence, or impossible to predict.	1	1	0
Human interest	Focus on affected individuals or groups.	12	6	11
	Focus on personal or private lives of the impacted individuals.	4	1	3
	Adjectives, metaphors or anecdotes that generate feelings of fear, anger, empathy or sympathy.	9	1	8
	Focus on own personal experience or the humankind.	1	0	2
Morality	Focus on unethical or immoral actions.	4	3	3
	Social prescriptions.	2	2	0
	References to morality or religious tenets.	0	0	1
Economy	Economic costs of the disaster.	24	30	27
	Economic consequences of the environmental damage.	5	5	12
	Economic consequences of pursuing/not pursuing a course of action.	2	4	8
	Adjectives, metaphors or anecdotes that generate feelings of fear or anger linked to the economic consequences of disaster.	6	3	1
Conflict	Disagreement among actors.	8	11	7
	Actor criticizes or accuses another.	6	6	9
	Assignment of dramatic labels.	0	0	0
	Dichotomies.	3	2	1
Environment	Environmental damage from disaster.	64	29	37
	Disaster linked to broader themes.	0	3	1
	Adjectives, metaphors or anecdotes that generate feelings of fear or anger linked to the environment.	26	17	8
	Environmental damage is minimal.	14	4	2
Industry	Benefits of the industry.	4	0	2
	Stakeholder support for the industry.	0	1	2
	Reliability or safety of the energy.	2	0	3
	Risks of the industry independent of the disaster.	3	8	3
	Need for alternative energy.	0	3	13

Other disasters caused by the industry.	2	1	3
Adjectives, metaphors or anecdotes that generate feelings of fear or anger linked to the industry.	2	3	4
Balanced view of the energy production.	0	0	2
Inevitability of the energy production.	1	0	2
Undecided or no position on the industry.	7	5	2
Trade-off between the energy and other issues.	0	0	2

Note: N = number of articles analyzed. The percentages are based on the total number of sampled articles for each case.

Table A-6. Frames that framing actors made in the news (in percent, rounded).

	Journalist	**Activist**	**Loc. gov**	**Prov./ state gov**	**Fed. gov**	**Company**	**Expert**	**Other**
Mount Polley	(N=140)	(N=21)	(N=33)	(N=52)	(N=6)	(N=10)	(N=52)	(N=55)
Blame assign.	11	33	21	6	50	20	62	22
Blame denial	0	0	0	27	0	0	0	4
Human interest	12	5	9	0	0	0	2	5
Morality	2	5	6	2	0	0	0	5
Economy	19	5	15	10	17	20	4	13
Conflict (accusing)	0	10	9	8	17	0	6	6
Conflict (accused)	0	0	0	23	17	20	0	0
Environ.	49	24	33	42	17	50	25	35
Pro-industry	1	0	0	4	0	10	0	4
Anti-industry	1	5	6	0	0	0	0	4
Neutral	6	14	0	2	0	0	2	4
Deepwater Horizon	(N=91)	(N=11)	(N=0)	(N=1)	(N=43)	(N=43)	(N=36)	(N=14)
Blame assign.	19	0	0	0	26	16	31	21
Blame denial	0	0	0	0	0	28	0	0
Human interest	7	0	0	0	0	0	0	0
Morality	1	9	0	0	2	0	0	0
Economy	27	0	0	0	7	14	17	21

Conflict (accusing)	1	9	0	0	2	7	6	0
Conflict (accused)	0	0	0	0	7	12	0	0
Environ.	24	45	0	0	14	2	14	29
Pro-industry	0	0	0	0	0	0	0	7
Anti-industry	1	18	0	0	7	0	8	7
Neutral	4	0	0	0	7	0	0	0
Fukushima	(N=203)	(N=9)	(N=5)	(N=3)	(N=51)	(N=15)	(N=22)	(N=15)
Blame assign.	9	11	20	0	12	20	23	27
Blame denial	0	0	0	0	0	7	0	0
Human interest	12	0	0	0	0	0	5	0
Morality	2	0	0	0	0	0	14	0
Economy	26	0	0	0	18	7	14	7
Conflict (accusing)	3	56	40	0	8	0	9	13
Conflict (accused)	0	0	0	0	27	33	0	7
Environ.	37	11	20	0	6	20	5	7
Pro-industry	1	0	0	0	8	0	18	0
Anti-industry	7	22	20	100	18	7	0	40
Neutral	2	0	0	0	4	7	14	0

Note: N = number of frames attributed to specific framing actor in each case.

Appendix 5

Tone variables: 1= response, 2= preparedness, 3=dependability, 4=information, 5=uncertainty, 6=relatability

Figure A-1. Tone and framing actors: journalist, Mount Polley.

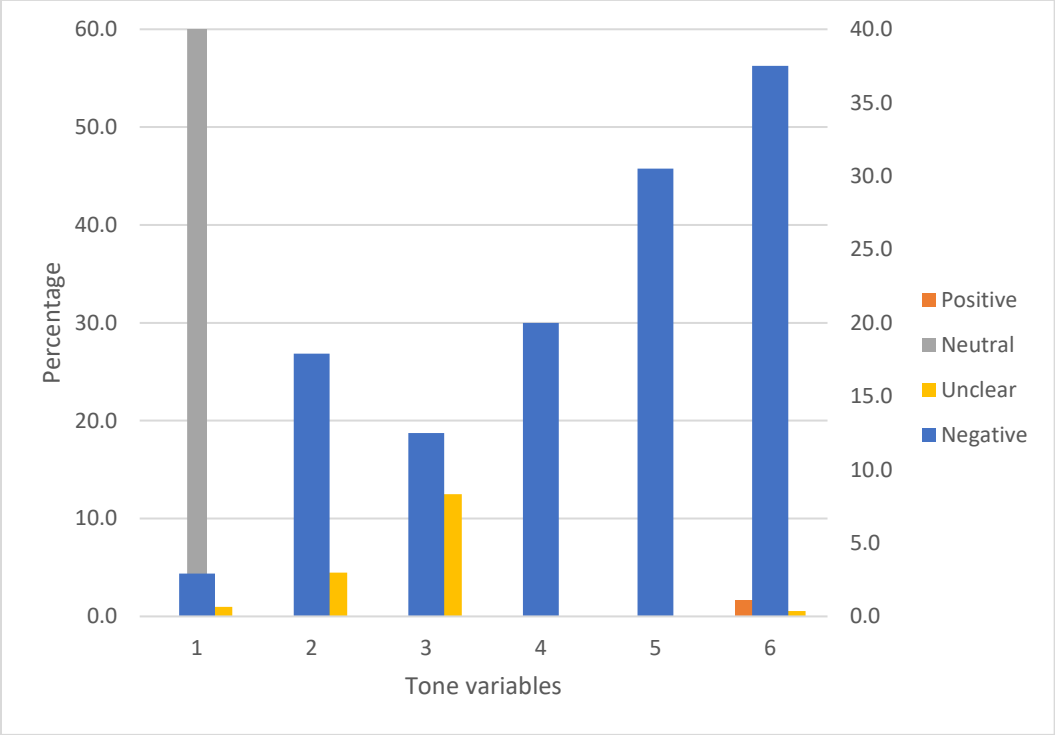

Figure A-2. Tone and framing actors: activist, Mount Polley.

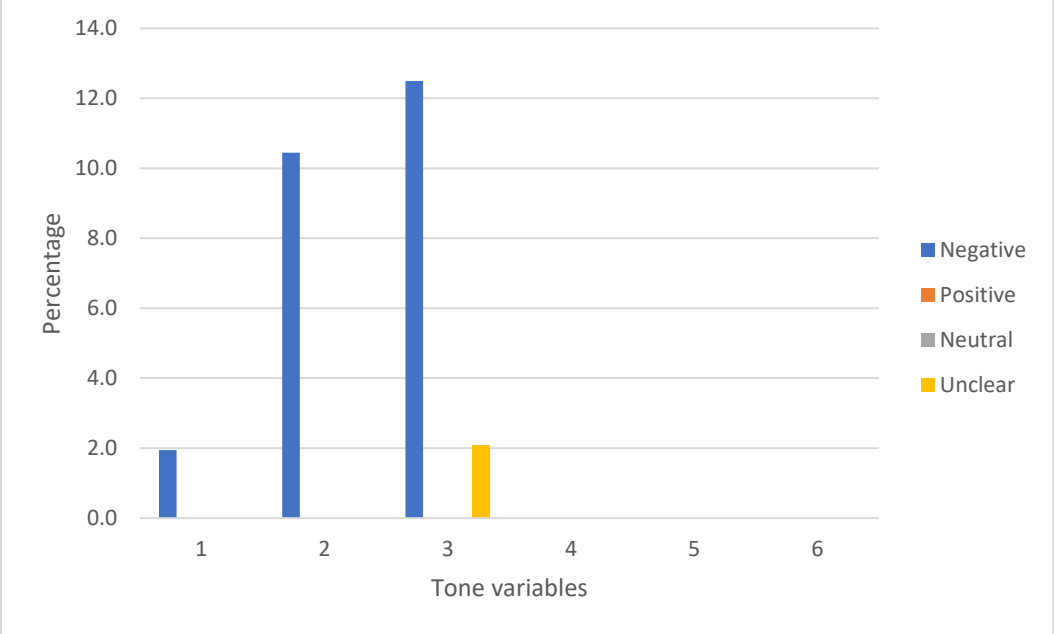

Figure A-3. Tone and framing actors: local government, Mount Polley.

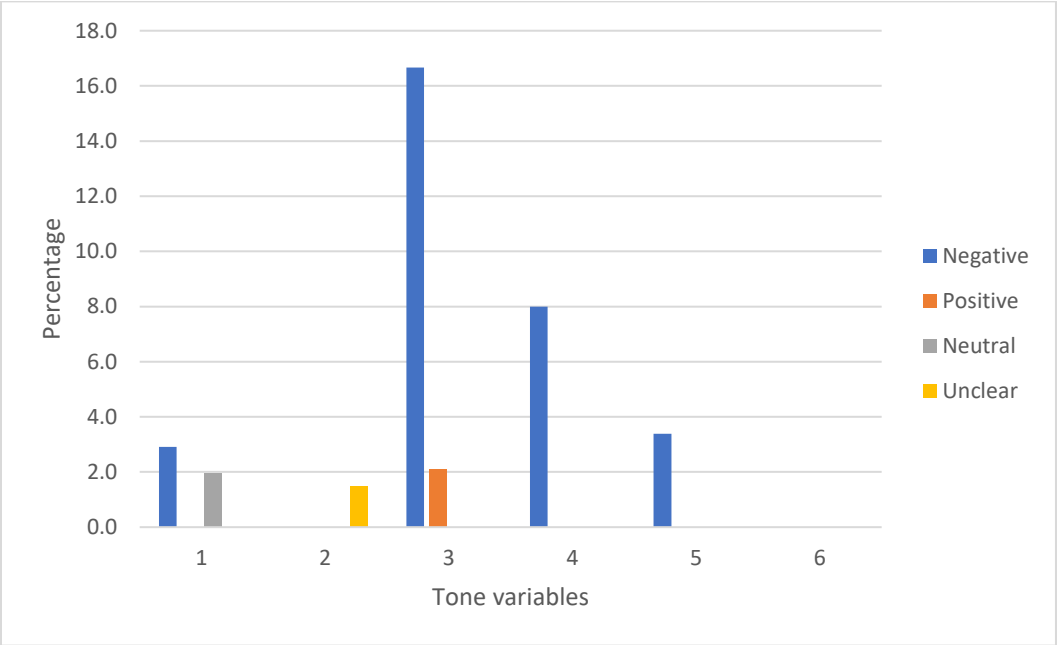

Figure A-4. Tone and framing actors: provincial government, Mount Polley.

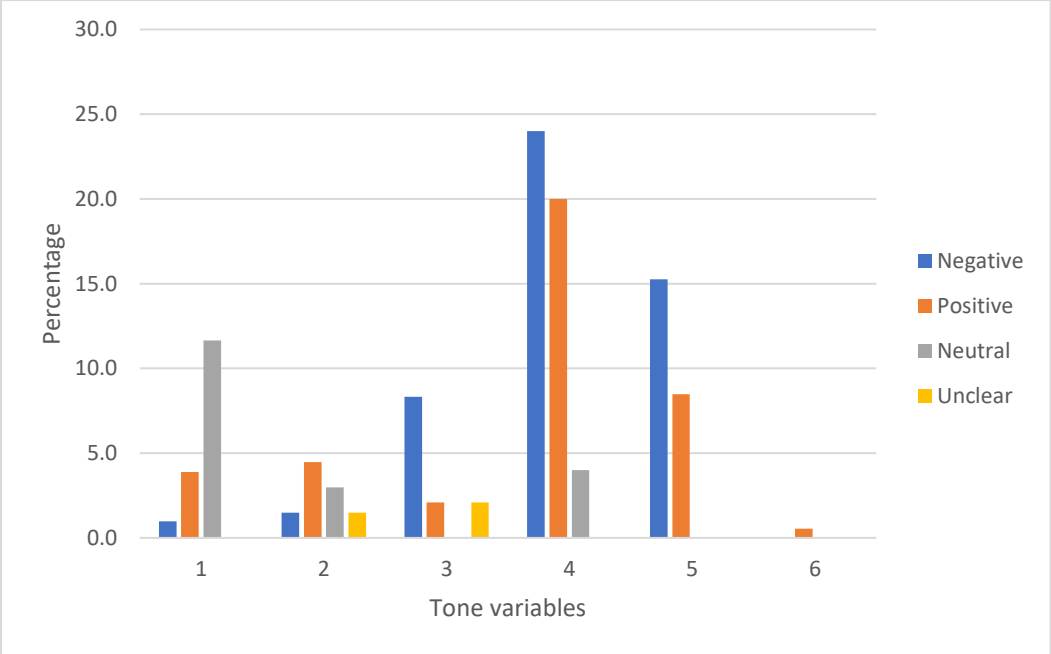

Figure A-5. Tone and framing actors: federal government, Mount Polley.

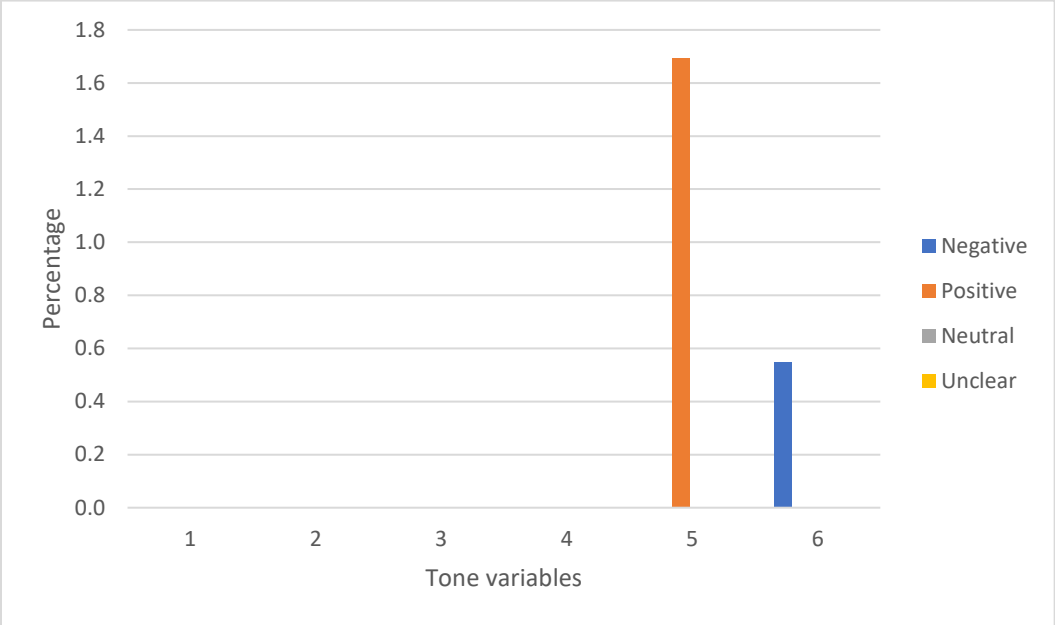

Figure A-6. Tone and framing actors: company, Mount Polley.

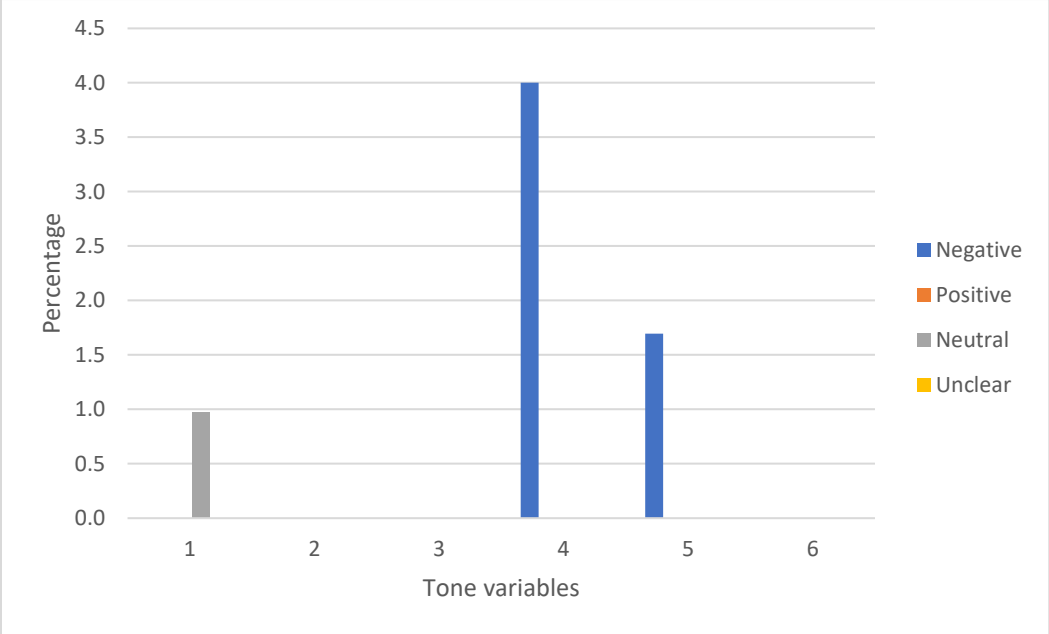

Figure A-7. Tone and framing actors: expert, Mount Polley.

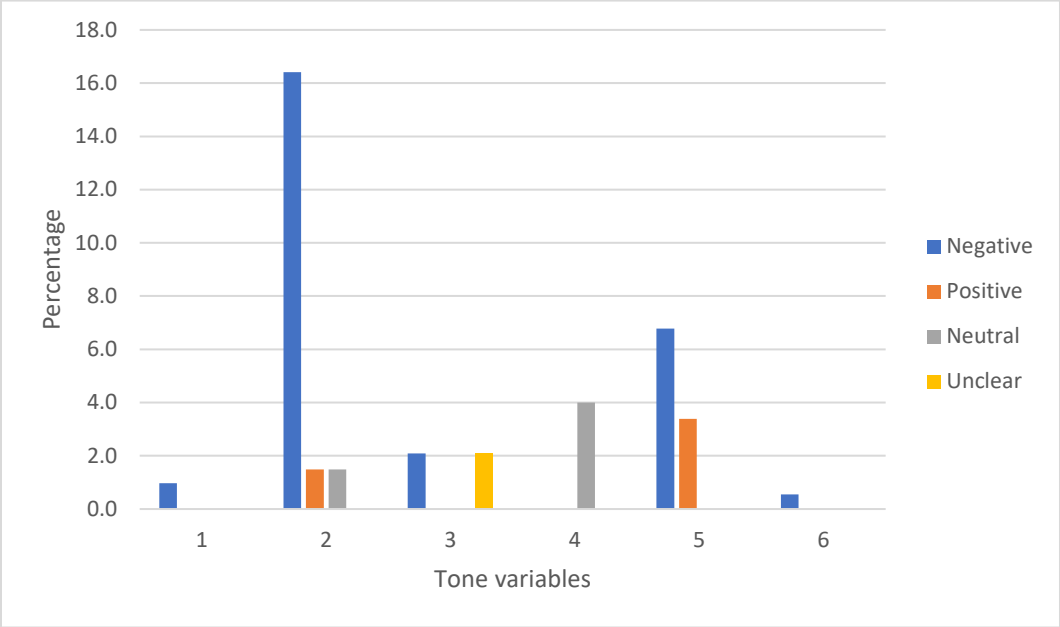

Figure A-8. Tone and framing actors: other, Mount Polley.

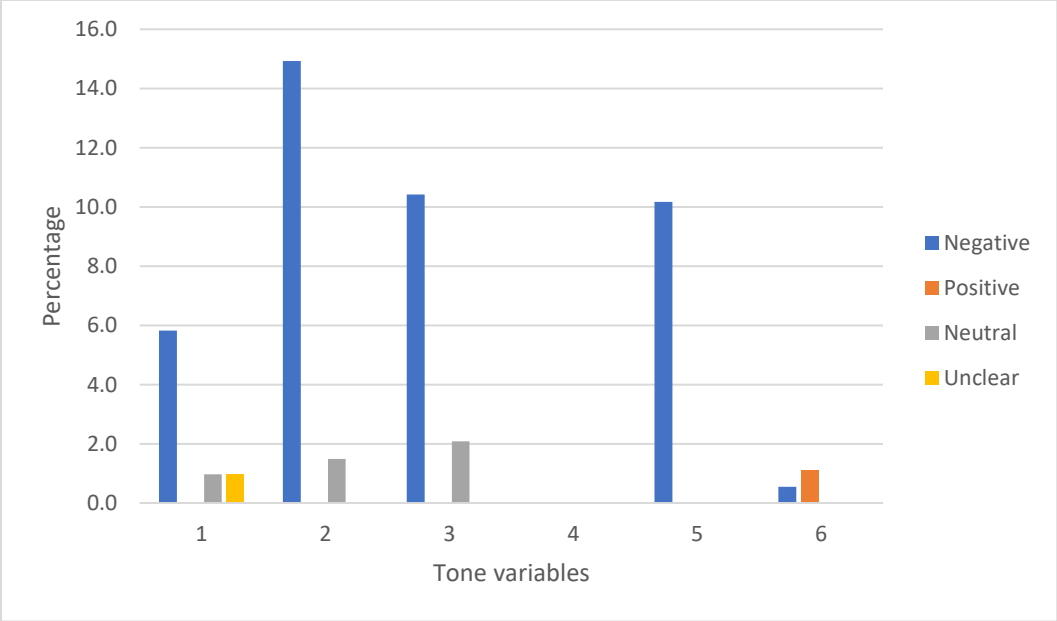

Figure A-9. Tone and framing actors: journalist, Deepwater Horizon.

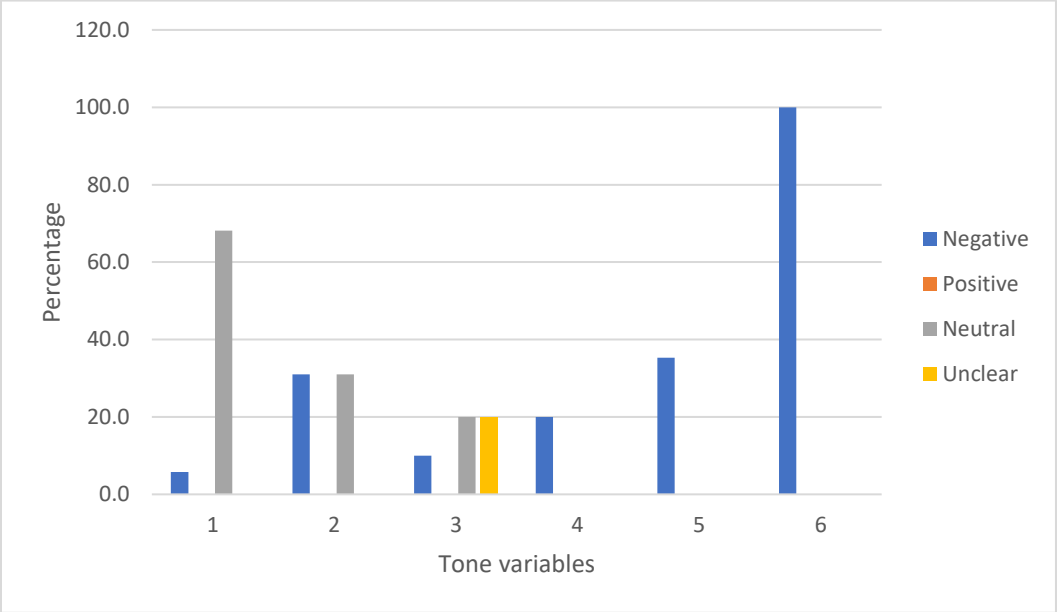

Figure A-10. Tone and framing actors: activist, Deepwater Horizon.

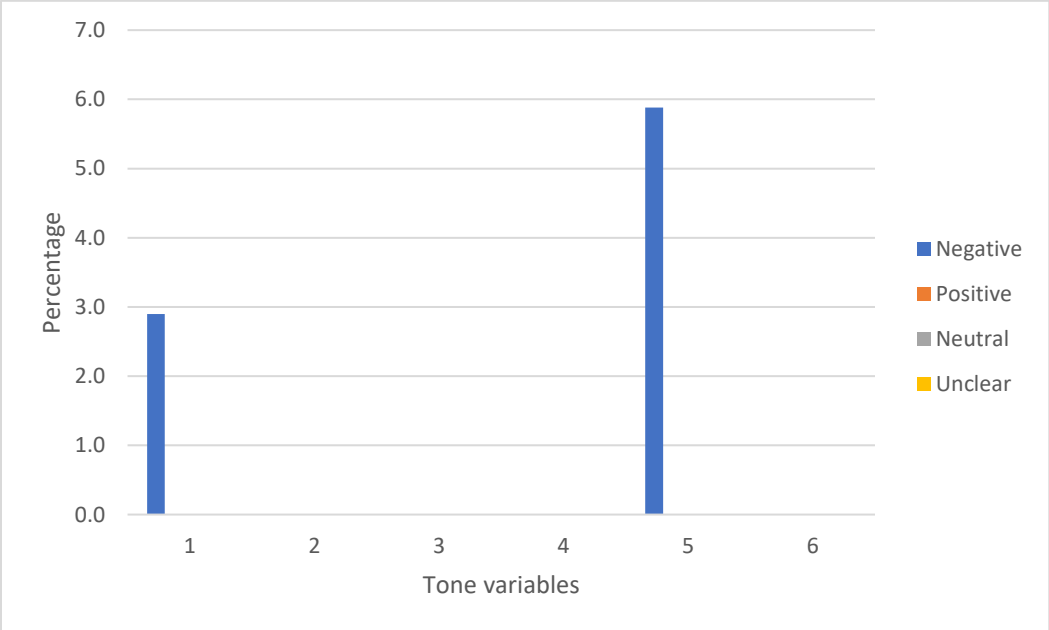

Figure A-11. Tone and framing actors: federal government, Deepwater Horizon.

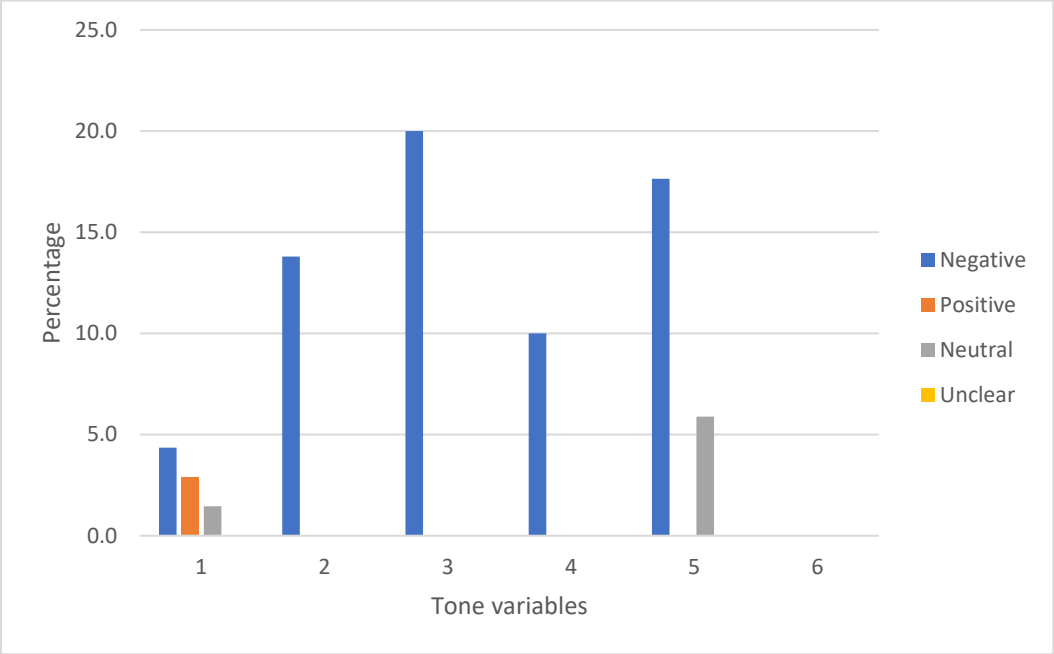

Figure A-12. Tone and framing actors: company, Deepwater Horizon.

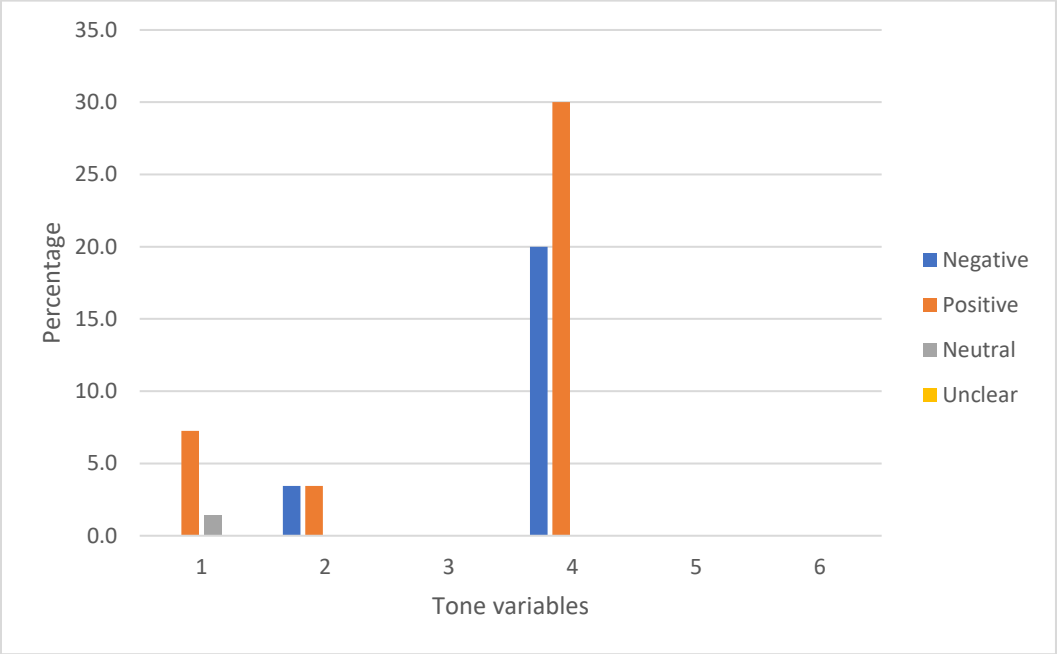

Figure A-13. Tone and framing actors: expert, Deepwater Horizon.

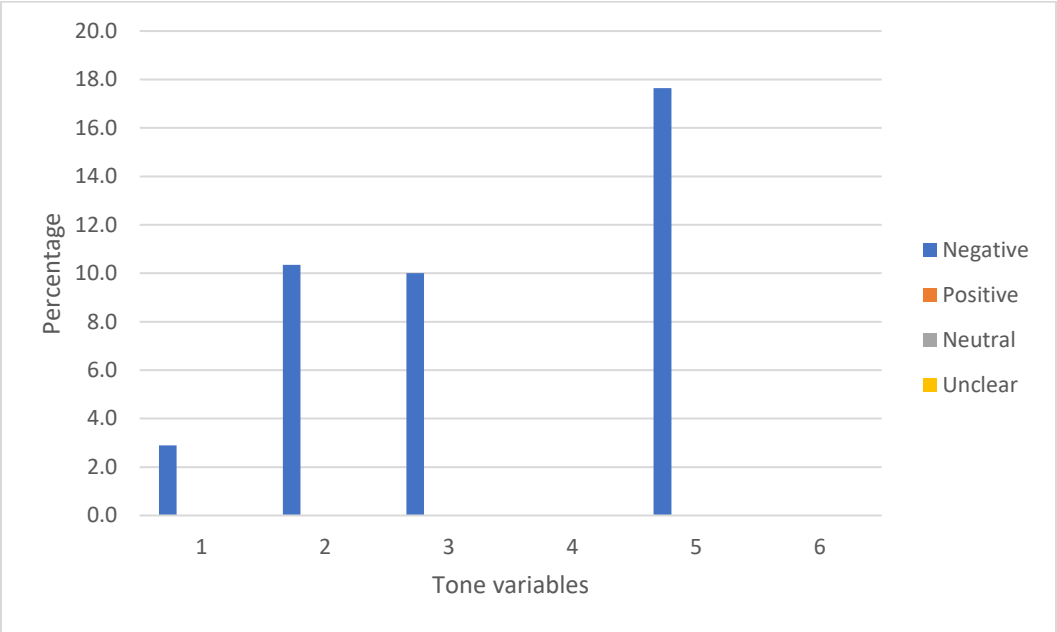

Figure A-14. Tone and framing actors: other, Deepwater Horizon.

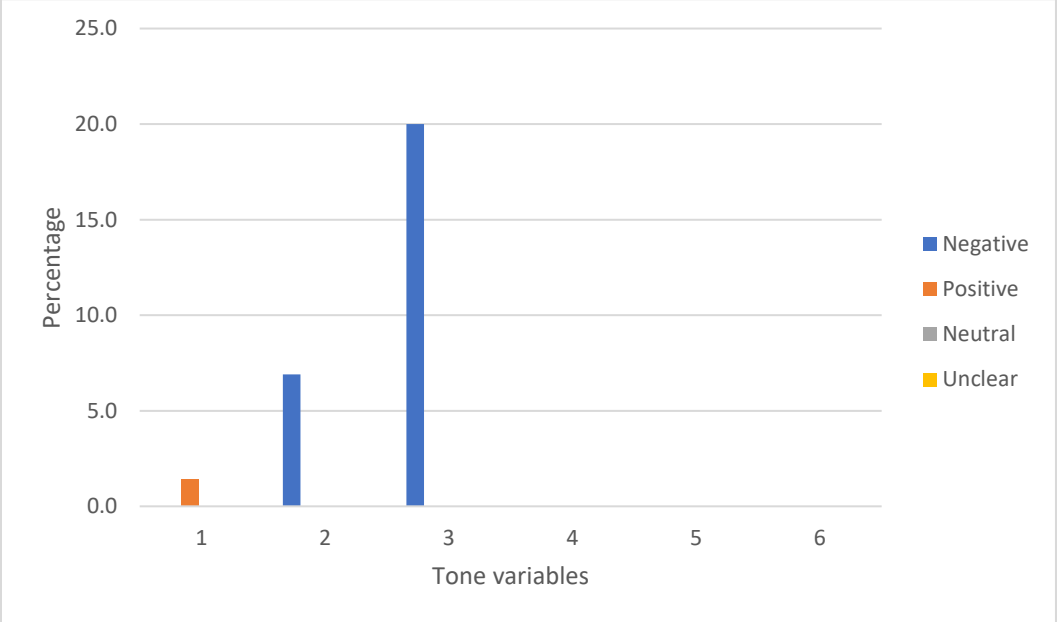

Figure A-15. Tone and framing actors: journalist, Fukushima.

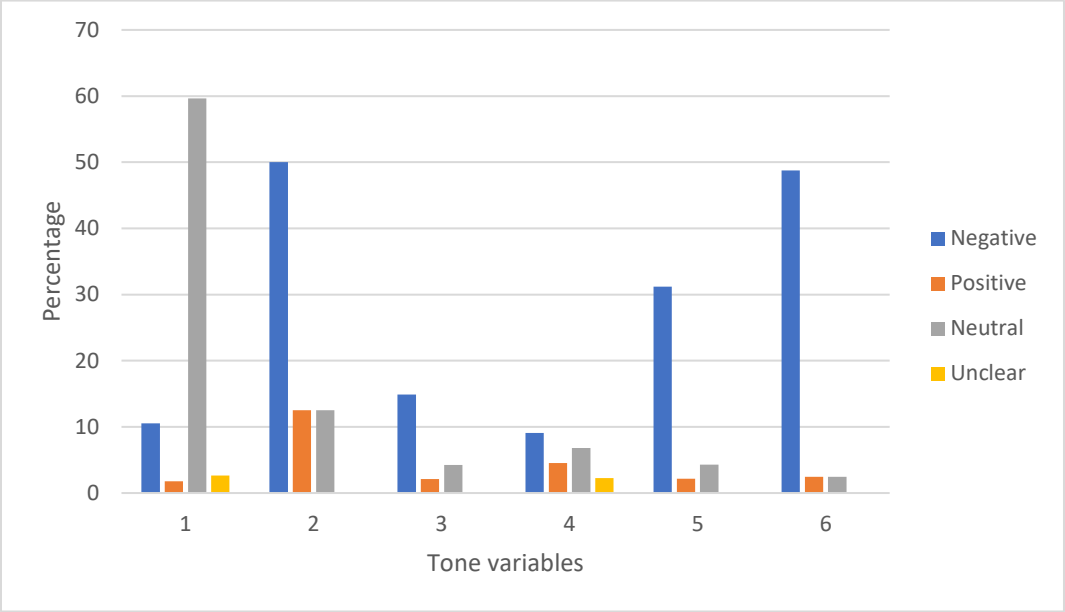

Figure A-16. Tone and framing actors: activist, Fukushima.

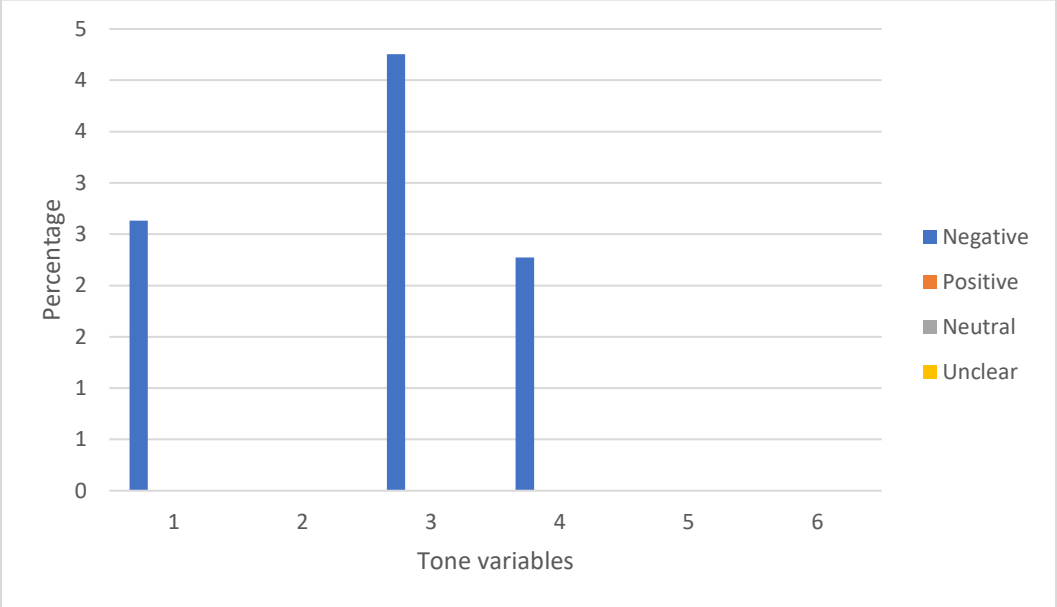

Figure A-17. Tone and framing actors: federal government, Fukushima.

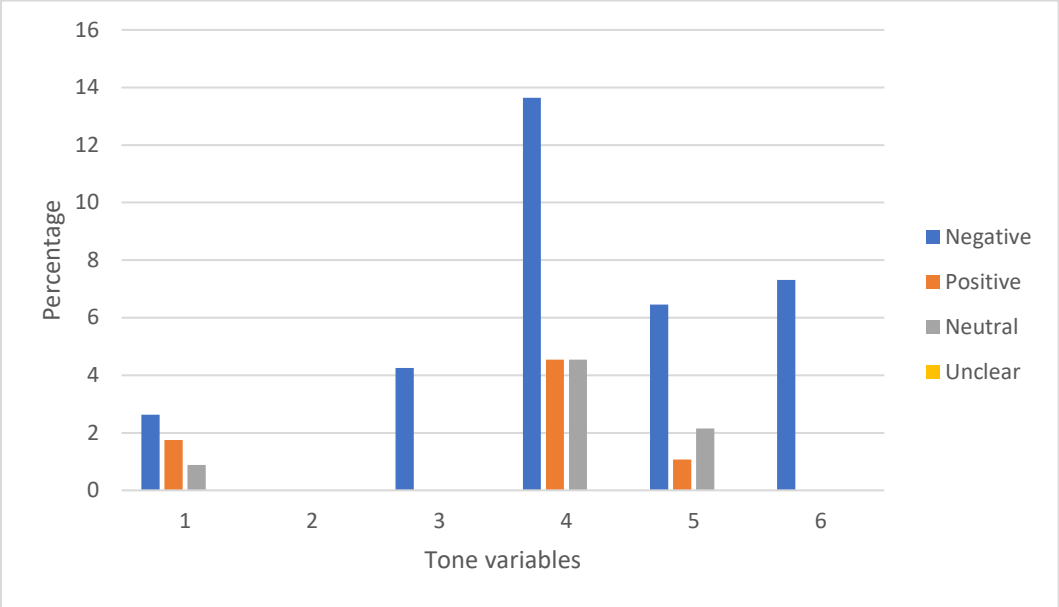

Figure A-18. Tone and framing actors: company, Fukushima.

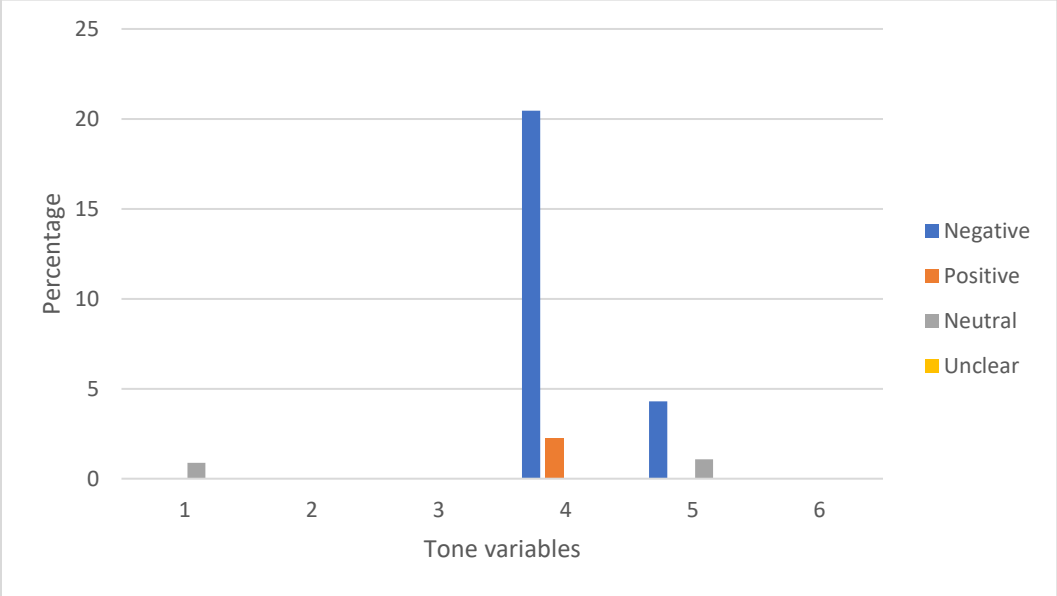

Figure A-19. Tone and framing actors: expert, Fukushima.

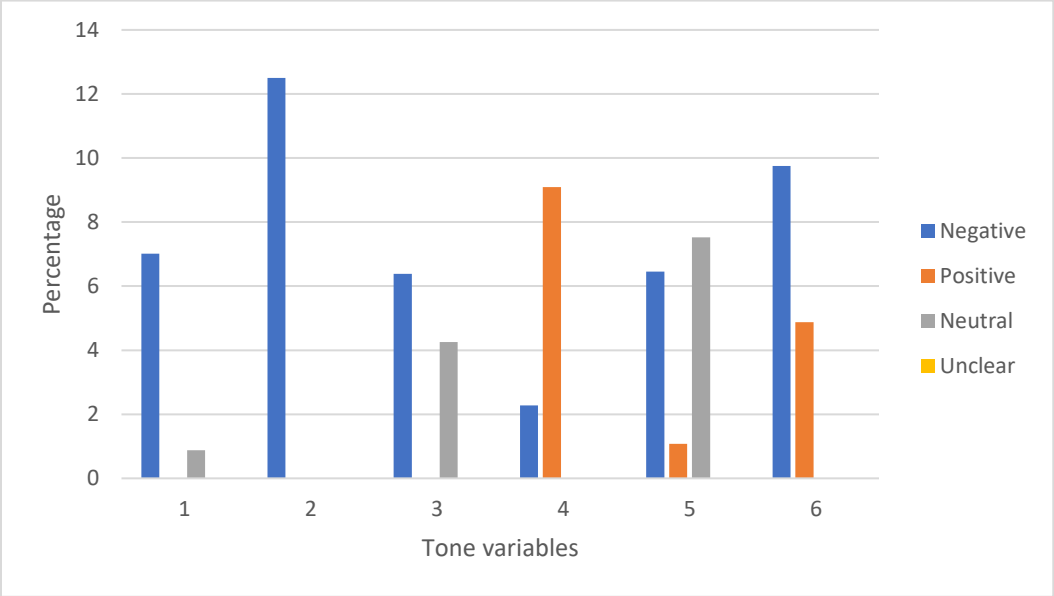

Figure A-20. Tone and framing actors: other, Fukushima.