Sea change? Sensemaking, Firm Reactions, and Community Resilience Following Climate Disasters

Boe-Lillegraven, S.N.; Georgallis, P.; Kolk, A.

Publication date
2023

Published in
Journal of Management Studies

Citation for published version (APA):
Sea change?
Sensemaking, Firm Reactions, and Community Resilience Following Climate Disasters

Siri Boe-Lillegraven¹*,
s.n.boe-lillegraven@uva.nl

Panikos Georgallis²,
p.georgallis@uva.nl

Ans Kolk³,
akolk@uva.nl

¹, ², ³ Amsterdam Business School,
University of Amsterdam,
Plantage Muidergracht 12,
1018-TV Amsterdam,
The Netherlands

*corr. author

(Paper accepted at Journal of Management Studies)

Suggested citation:

Acknowledgements: We thank editor Christopher Wickert for the invaluable expert guidance we received as we refined the paper towards publication, and three reviewers for their commitment and challenging but constructive remarks. We are also grateful to J.W. Stoelhorst and seminar participants at the Strategy and International Business section of Amsterdam Business School for their sparring and support. Additionally, the paper has benefitted from being presented at the GRONEN Research Conference 2020 and the EGOS conference sub-themes on “Shaping Desirable Futures” (2023) and “System Change, Not Climate Change” (2021). A prior version of this article was runner-up for the Academy of Management OMT Division’s 2021 Responsible Research Award.
Communities around the world face increasing risks of climate disasters such as floods, hurricanes, and droughts. What drives firms’ heterogeneous responses to a climate disaster, and what could be the consequences for community resilience? To address these questions, we theorize how different aspects of sensemaking (sense of place, time, certitude, and loss) affect firm responses. Then, aided by an elaborate thought experiment—a narrative scenario of a future flood hitting the Dutch coast—we theorize how heterogeneity in firms’ initial responses can trigger sensemaking-sensegiving cycles that spiral a community toward reconstruction or unplanned retreat. Our article advances understanding of firms’ heterogenous disaster responses, the drivers of community resilience, and uncovers potential tensions between organizational and community resilience. We also contribute to sensemaking theory by relaxing the popular assumption that sensegiving requires deliberation. Finally, our article showcases how narrative scenarios of future events can expand the methodological toolkit of organization theory and points to new opportunities for future interdisciplinary work.

Keywords: Climate change; disasters; resilience; narrative; scenarios; sensemaking
Weather forecasts of an upcoming storm for the Sunday evening of February 1st 2043 were met with near indifference by citizens of the Randstad, the largest Dutch metropolitan area. For all they knew, this would be just another of the six to eight large storms hitting the country every year. They tied up the garden trampolines, called in the cats, and went to sleep.

What was coming, however, was no ordinary storm. Overnight, an unusual combination of a high spring tide and extreme northwesterly winds worked up the waves to break through the storm surge barriers of the Delta Works, widely known as the Dutch ‘sea wall’. By the next day at noon, the unthinkable had happened: Dike ring 14 was taking in water. Soon after, parts of Amsterdam and Rotterdam became unreachable by foot or bike. Public transport stopped functioning. Reports of families drowning in their cars, while trying to flee, reached the public, before internet and phone coverage disappeared. Gas and electricity outages followed.

By midnight, the Randstad was darker than ever before, but nobody was sleeping. The sound of water seeping into buildings, rising through the streets, was interrupted only by cries for help and radio reports broadcasted by those owning battery-operated devices. “Relocate to higher ground”, the radio voice said. “Put a heavy bag in the toilet to block the sewage”. Finally: “Hang a white sheet from the window and wait. Escape is not safe”.

For the first time in ninety years, the brutal forces of nature had taken the Dutch completely by surprise. In the calm after the storm, however, the pursuit of recovery would begin. As city authorities were grappling with the momentous task of economic revival, the role of firms appeared critical. Managers of businesses, big and small, found themselves faced with the same dilemma as the one that defined people’s immediate reactions to the flood: Should we stay, or should we leave?

How would firms eventually react? And how might their reactions impact the fate of the flooding cities?

The above account is fictional, but the possibility of a disastrous flood hitting the Dutch coast is not. Ever since the North Sea Flood devastated the province of Zeeland in 1953, authorities have tried to prepare for similar low-probability but high impact events (Deltacommissie, 2008). In light of rising sea levels and proliferation of extreme weather linked to climate change (Hansen et al., 2016; IPCC, 2018), environmental researchers have discussed how the next ‘100-year flood’ may unfold (Olsthoorn et al., 2008). The case of the Netherlands is hardly a unique example. Communities around the world are increasingly exposed to catastrophic climate-induced natural disasters (from now on: climate disasters) including floods, hurricanes, superstorms, heat waves, draughts, and associated fires (Hansen et al., 2016; IPCC, 2018). Given firms’ prominent role in economic and social life, it is important to understand what drives firms’ post-disaster reactions and how these reactions relate to community-level recovery.
Literature on resilience, a concept defining systems’, communities’, organizations’, and individuals’ ability to withstand and recover from disasters and other forms of adversity (Rao and Greve, 2018; Linnenluecke et al., 2012; Williams et al., 2017), provides a starting point for taking stock of firms’ disaster responses and linking them to communities. Resilience research has highlighted activities such as post-disaster venture creation (Linnenluecke and McKnight, 2017; Williams and Shepherd, 2016) or corporate giving (Ballesteros et al., 2017) as important for community recovery, and established that firms differ in their willingness and ability to offer support (Ballesteros et al., 2017). Even though studies have shown that some firms opt for relocating after a disaster rather than remaining in the disaster-hit location (Feldman et al., 2022; LeSage et al., 2011), however, the exact drivers of such disaster responses are undertheorized in resilience research (Linnenluecke, 2017). That is, while recent work examined why some firms are more resilient than others (e.g. Conz et al., 2023; DesJardine et al., 2019), variance in the actions firms take to withstand and recover from disasters received less attention. Explaining such variance is critical, for two reasons: First, whether firms stay or relocate influences availability of products and services in the disaster-hit community, which can save lives and livelihoods. Second, firms’ disaster responses may influence one another and shape community resilience (McKnight and Linnenluecke, 2019); inadequate attention to such inter-firm dynamics may lead to incomplete and incorrect predictions of the societal consequences of firms’ actions.

Despite climate disaster risks being well recognized (IPCC, 2018), determining exactly when and where a climate disaster will take place is unrealistic. Especially floods are marked by surprises and unanticipated system failures (Dilling et al., 2015; Katsman et al., 2011), with people’s general level of preparedness being deterred by cognitive biases and a lack of experience from similar events (Irons, 2005; Watkins and Bazerman, 2003). Climate disasters are therefore associated with extreme uncertainty, making it “difficult, if not impossible for managers to know ex ante which strategic response will lead firms to […] recover in the aftermath of the shock” (Wenzel et al., 2021). Taking this into account, we rely
on sensemaking—the process by which individuals and groups interpret novel or ambiguous situations (Stigliani and Ravasi, 2012; Weick, 1995)—to theorize firms’ disaster responses. This approach ensures attention to emotion-driven decisions and interpretations, common under extreme uncertainty (Maitlis and Sonenshein, 2010; Williams et al., 2017; Weick, 1993). Furthermore, it is sensitive to businesses’ unique orientations and histories that may shape varying judgments of similar circumstances (Williams and Shepherd, 2016). Not least, although extant research on disaster sensemaking accounts for dynamics within firms more than it does across them (Bundy et al., 2017; Häggren et al., 2018), the theory’s emphasis on meaning-making as a collective process offers the opportunity to specify how sensemaking pathways may develop and interact across firms to shape community-level outcomes.

Our theorizing addresses the following questions: What drives firms’ heterogeneous responses to a climate disaster, and what could be the consequences for community resilience? After introducing literature relevant for our work, we first explain how firms’ sensemaking leads them to ‘freeze’, ‘fight’ or ‘flee’ (Wester, 2011) after a climate disaster. Then, inspired by narrative scenarios from environmental science and policy (Rounsevell and Metzger, 2010; IPCC, 2000), we utilize an elaborate thought experiment to contextualize our framework and aid its further development. Concretely, we use disciplined imagination (Weick, 1989) to create a rich “dystopian” scenario (Hoffman and Jennings, 2021) of a flood hitting the Dutch coast. This helps us advance theory on inter-firm patterns of sensemaking and sensegiving—the latter denoting the activity of influencing others’ meaning-making (Gioia and Chittipeddi, 1991; Maitlis, 2005)—that can steer a community’s development into contrasting directions.

The paper offers new explanations for variation in firms’ disaster responses, specifies firms’ impact on community-level outcomes, and illuminates potential tensions between firm and community resilience. Furthermore, it directs renewed attention to temporality and cross-level dynamics of post-disaster sensemaking and expands the notion of sensegiving by explicating how firms might engage in it without intentionality (Gioia and Chittipeddi, 1991;
Maitlis, 2005). Not least, heeding recent calls for new methodologies and thought experiments in organization theory (Cornelissen et al., 2021; Jarzabkowski et al., 2021; Kornberger and Mantere, 2020), the paper showcases how narrative scenarios can aid theory development on issues of high societal importance (Wickert et al., 2021); not only by crafting utopian visions (Gümüşay and Reinecke, 2022) but also by imagining dystopian crises. More broadly, we take a step forward in addressing the ‘third mandate’ of organization theory: to analyze the impact of organizations on society (Mair and Seelos, 2021).

**BACKGROUND**

**Disaster resilience**

A small but growing body of work has attended to interrelations between firm and community resilience, highlighting firms’ resource allocations as one socio-economic factor explaining why some communities are more vulnerable to climate change than others (Thomas et al., 2019). Concretely, firms benefit communities’ abilities to withstand disasters through disaster preparation or post-disaster improvisation (Linnenluecke et al., 2012); the latter including provision of fast and effective aid (Ballesteros et al., 2017; Williams and Shepherd, 2016). Additionally, whether firms stay open after climate disasters impacts access to services (Feldman et al., 2022), which influences community revival. Historically, however, research on community- and firm resilience has progressed through separate streams with limited attention to interrelations (Linnenluecke, 2017), leaving much room for theoretical elaboration.

Notably, in a disaster’s aftermath, some firms may stay to rebuild while others end up permanently leaving the local community to continue activities elsewhere (Feldman et al., 2022; LeSage et al., 2011) in order to withstand and recover from damages. The firm-specific drivers of such heterogenous responses have received little attention among resilience scholars (Linnenluecke, 2017; McKnight and Linnenluecke, 2019). Some firms may relocate to remain resilient, but their absence can deter community recovery. Such tensions between firms’ and communities’ resilience are also largely unexplored (McKnight and Linnenluecke,
Overall, the process through which firms’ interactions shape community developments after disasters is poorly understood – especially considering firms whose core business is outside emergency response (Williams and Shepherd, 2016).

Sensemaking

We employ a sensemaking perspective to address these shortcomings, for three main reasons. First, disasters are often challenging to respond to as they provide very weak signals before they hit; especially sudden events such as climate disasters are difficult to anticipate in advance (Dilling et al., 2015; Thomas et al., 2019; Williams et al., 2017). With its emphasis on emotion-driven decisions and interpretation-driven meaning-making, sensemaking offers theoretical leverage to flesh out how firms reactively make sense of surprising and ambiguous events (Maitlis and Sonenshein, 2010; Weick, 1993). Second, sensemaking acknowledges that judgment can be influenced by businesses’ unique orientations and histories (Williams and Shepherd, 2016), which aids explaining why responses differ. Third, sensemaking depicts meaning-making as a collective process (Weick et al., 2005); this can help flesh out how firms’ initial disaster reactions might influence—or become influenced by—other firms’ reactions. This can, in turn, inform how firms’ responses interact to impact communities’ disaster resilience.

Concurrent with early sensemaking scholars’ interest in accidents and emergency response (e.g. Weick, 1988; 1990; 1993), a key insight from extant sensemaking theory is that actors’ initial capacities, interpretations, and commitments impact how a crisis event unfolds (Maitlis and Sonenshein, 2010). Recently, scholars have called for more attention not only to initial dramatic events but to potential gradual transformations of meaning and action after disasters (Dwyer et al., 2023; Roulet and Bothello, 2022). Altogether, sensemaking studies of disasters and adversity more generally have established sensemaking as critical for organizational resilience (Maitlis and Sonenshein, 2010). Yet, theories of disaster sensemaking tends to focus predominantly on dynamics within single groups or firms (Bundy et al., 2017; Hällgren et al., 2018) rather than how inter-firm dynamics—including firms’
potentially differing sensemaking pathways—may impact community level outcomes. In addition, much theorizing of post-disaster sensemaking generated explanations but few predictions. Utilizing sensemaking to anticipate firms’ disaster reactions and their effects on communities could inform disaster resilience research and help overcome the general lack of attention in organization theory to societal consequences of firms’ conduct (Barley, 2016; Hinings and Greenwood, 2002).

**ANTICIPATING FIRMS’ RESPONSES**

In this section, we argue that sensemaking of a disaster is a key determinant of a firm’s ability to constructively cope with it. We should acknowledge, however, that we engage in conceptual bracketing when we refer to sensemaking pertaining to a firm, or organizational sensemaking more broadly (Maitlis, 2005). In practice, sensemaking will be influenced by multiple actors engaging in meaning-making ‘inside’ a given firm, and by the meaning actors external to a firm ascribe to the events unfolding (Weick et al., 2005). Especially managers can promote or hinder the sense others make, due to their assigned leader roles and experience (Gioia and Chittipeddi, 1991). Out of consideration for parsimony, we refer to a firm’s sensemaking; not to imply uniformity but to suggest that a predominant orientation will emerge so that the firm moves in one direction or another. By contrast, a situation whereby too many or no plausible accounts of the situation persist within an organization (Cristofaro, 2021) represents a collapse of sensemaking (Weick, 1993).

The notion that sensemaking can stall or collapse (Weick, 1993) suggests that firms’ disaster response repertoires include inaction. Inaction does not imply no effort, but reflects actors’ persistent struggles to (re)configure their experiences informed by different cues and assumptions (Christianson and Barton, 2020; Hernes and Obstfeld, 2022). Importantly, firms’ sensemaking will differ. Even within the same community, firms’ unique histories, positions, and priorities may lead their focal actors to notice and interpret different issues (Maitlis, 2005). For instance, firms with pre-existing relations with authorities may incorporate them differently into their response systems (Boyer, 2019), which conditions both their sensitivity
to and interpretation of information from these authorities after a disaster.

Overall, we suggest that firms’ sensemaking of disasters can produce three differing reactions. Some firms may ‘freeze’, reflecting the complex, confusing, and potentially shocking circumstances under which managers have to process information and make decisions. Other firms may stay put and start ‘fighting back’, aiming for a fast recovery by re-establishing or continuing operations. Finally, firms might opt to ‘flee’ the area and continue operations elsewhere.

The freeze reaction can be a temporary response masking ongoing sensemaking towards a negotiated agreement that, once established, will lead to fighting or fleeing. At other times, it can persevere; as actors’ sensemaking capabilities exceed their limits (Farjoun and Starbuck, 2007; Weick, 1993), firms can fail to act even “in spite of clear dysfunctional consequences” (King, 2000, p. 180). Fighting and fleeing firms may adjust their responses over time, if the associated underlying drivers change. Below, we outline sensemaking as an important response driver, focusing specifically on four aspects of sensemaking that become salient following a sudden climate disaster: firms’ sense of place, time, certitude, and loss.

**Sense of place**
Sense of place refers to perceptions of firms’ identification with and embeddedness within a community. It can be informed by a firm’s history, identity (Dinger et al., 2020), and the location of its assets, suppliers, employees, customers, and other key stakeholders (Ballesteros et al., 2017). Like elements of organizational identity, it is made salient to decision-makers by critical precipitating events (Georgallis and Lee, 2020), severe crises (Dinger et al., 2020), or other defining “fork-in-the-road” choices (King and Whetten, 2008). Sense of place thus conditions how managers attend to affected parties in the community and their perceived responsibility toward them. For example, after the 9/11 terrorist attack in New York, firms headquartered in the city provided greater philanthropic contributions (Crampton and Patten, 2008). We pertain that firms’ sense of place following a climate disaster can vary markedly and thus help explain firms’ differing reactions.
Consider first firms with a strong sense of place. This can include firms with a long history in the community who predominantly employ and serve local stakeholders, such as family owned businesses catering to residents or local establishments (Bingham et al., 2011). A strong sense of place may also apply to corporations and conglomerates with wide-reaching supply- and delivery chains that maintain headquarters or other core facilities in a community (Marquis et al., 2007), as decision-makers in such firms are accustomed to taking the locale into account. Firms with a strong sense of place are more strongly dispositioned to stay after a disaster, as they consider the fate of the company and the community as intertwined and may develop a feeling of ‘shared fate’ (Hiatt and Park, 2022). For instance, after hurricane Katrina, strong place attachment and feelings of shared fate motivated entrepreneurs to stay in New Orleans (Grube and Storr, 2018). Overall, we expect a strong sense of place to motivate a fight response more than other responses.

Moreover, research on voluntary organizations and ad-hoc emergency groups responding to disasters has stressed the need for collective action and heterogeneous contributions by various stakeholders (Dutta, 2017; Hälgren et al., 2018; McKnight and Linnenluecke, 2016). Because the means necessary for recovery are unlikely to be held by a single organization, the capacity to connect various stakeholders becomes crucial. Non-profits or ad-hoc emergency groups often take on a brokering role (Rao and Greve, 2018; Williams and Shepherd, 2016), but some firms may also be well-positioned for it (Ballesteros et al., 2017). We expect a strong sense of place to be predictive of such a role, because local knowledge, social capital, and ties to community stakeholders are necessary to coordinate collective responses, access heterogeneous resources, and facilitate recovery (Dinger et al., 2020; Dutta, 2017; Shepherd and Williams, 2014). Thus, sense of place can influence not only firms’ willingness to fight for rebuilding the community, but also their ability to do so. This reinforces the earlier argument that firms are more likely to stay and fight rather than flee or freeze when they have a strong sense of place.

Consider, by contrast, firms associated with a weak sense of place. This includes
firms less embedded within the local community and with a less pronounced local identity, such as corporations and conglomerates with geographically dispersed operations or smaller firms that do not depend on local customers or employees and own few local assets (Wasileski et al., 2011). While other outcomes are possible, we associate a weak sense of place with stronger tendency of firms to flee as a reaction to a climate disaster; this as their identity is less tied to the community and they perceive lower responsibility for local stakeholders. For some firms already operating in many markets, a flee reaction could involve a relatively rapid reallocation of activities to an unharmed location where the firm is already partially based (Baraniuk, 2020). For smaller and less geographically dispersed firms with a loose attachment to local stakeholders and networks, fleeing could involve a more dramatic move of operations to quickly reestablish business elsewhere (Scarinci, 2016).

**Sense of time**
Temporal thinking is incorporated into everyday practices and impacts firms’ dealings with complex issues such as climate change (Orlikowski and Yates, 2002; Slawinski and Bansal, 2015). Sudden climate disasters constitute departures from the status quo, threatening the coherence of actors’ representations of past, present, and future, which triggers temporal realignment to update the firm’s strategic direction (Kaplan and Orlikowski, 2013; Bansal et al., 2022). Due to the resource-constraining circumstances of a disaster, we expect decision-makers to rely on established ways of conducting temporal work rather than reinvent it. Consistent with Hernes and Obstfeld (2022), we suggest that the extent to which actors emphasize past experience versus projections that break with this experience tends to vary. We denote a firm’s sense of time as its relative emphasis put on the past, present, or future as a basis for strategically relevant actions, such as where the firm reestablishes its course after a major disaster.

Consider, first, past-oriented firms who predominantly emphasize the past in their routines and decision-making practices. Some such firms may operate in environments or control niches where competition is driven by other factors than adaptability and innovation.
Thus, their need for improvisation has historically been low while the viability of elaborate planning has been high (Crossan et al., 2005). Since managers and other organization members have grown accustomed to upholding stability (Tripsas and Gavetti, 2000), a disaster will require a considerable shift in thinking for which extant routines provide little support. Their first attempts to respond may therefore result in a ‘freeze mode’ where decision-makers struggle to align the new situation with prior plans and activities, thus also struggling to make sense of what happened and settle on a clear course of action.

Some firms, by contrast, can stay in motion by improvising responses (Crossan et al., 2005; Weick, 1995). This ability appears contingent on actors’ flexible use of the past in light of the present (Hatch and Schultz, 2017) and is stifled by elaborate plans depicting the future as a linear progression (Crossan et al., 2005). A core predictor of business continuity after disasters may thus involve giving prevalence to the present; that is, addressing the unfolding issues by flexibly and selectively drawing on routines. In this way, present-oriented firms act mainly on the basis of real-time information (Crossan et al., 2005). This was seen, for example, in mental health workers who ensured continuity after Hurricane Katrina by focusing on pressing everyday challenges (Feldman et al, 2022). In the context of a large-scale disaster, we expect present-orientation to direct attention to the pressing needs at hand, such that managers will begin fighting back to regain momentum and postpone deliberation about the city’s or their firms’ vulnerabilities. By coordinating their futures just enough to keep going (Tavory and Eliasoph, 2013, p. 936), they will reestablish operations by means of incremental rather than radical changes, supporting an emergent view of the disaster as an obstacle that needs to be immediately overcome.

Some firms engage relatively more in prospective sensemaking (Sandberg and Tsoukas, 2020). Such firms are accustomed to scenarios decoupled from the present (Hilbolling et al., 2022, p. 156) and can continuously navigate and update multiple visions of the future (Rohrbeck and Schwarz, 2013). Their managers’ interpretation frameworks are kept in flux (Harries et al., 2018) and they consider the needs of the present in light of already
embodied alternative future visions (Slawinski and Bansal, 2015). Even when surprised by disasters, thus, such future oriented firms may quickly adjust their outlook and revise assumptions. Benefiting from past discussions, workshops, scenarios, roadmaps, and contingency plans (Slawinski et al., 2017), they may more easily view the disaster as a signal of change. Thus, more often than for present-oriented firms, future oriented firms will question recovery by reconstruction and consider fleeing to safer grounds – either because they can afford to acknowledge (Weick, 2006) that cutting losses supports longer-term survival or because their updated future outlook supports construing fleeing as productive even in the short term (Slawinski and Bansal, 2015).

**Sense of certitude**

In the aftermath of a disaster, firms need to interpret the novel situation and assess cues of the chances of community recovery. Managerial beliefs about recovery prospects will be shaped not only by the scope of the disaster, but also by attributes that vary across firms; this includes knowledge, capabilities, and trust in authorities. Thus, firms’ ‘sense of certitude’, their interpretation of the potential for community recovery, will vary markedly. Concretely, firms’ access to knowledge and tools relevant for rebuilding (Ballesteros et al., 2017) may, together with information obtained via their different webs of stakeholders, shape decision-makers’ confidence in the firms’ abilities to contribute to community recovery (Van Valkengoed and Steg, 2019) and thereby their perceived control (Hahn et al., 2014) over this outcome. Additionally, firms’ prior exposure to and level of trust in authorities will shape assumptions about those authorities' rebuilding abilities as well (Van Valkengoed and Steg, 2019). As elaborated below, we expect a low versus high sense of certitude to predict fleeing and fighting.

Consider, first, when managers experience a low sense of certitude, such as when they have little trust in or knowledge of authorities’ abilities to respond effectively. In such cases, their firms will be prone to withholding resources that could have been spent on fighting back (i.e. they will “retain their tools”, see Weick, 1996, p. 306), and opt for physically relocating
the firm and its valuable assets. Even when the firm possesses assets relevant for rebuilding initiatives, it will likely not commit if the effort is perceived to be in vain (Gebrehiwot and Van der Veen, 2015; Terpstra and Lindell, 2012) and if control over how events will unfold is construed as lying outside the firm (Crilly, 2017; Smart and Vertinsky, 1984). Thus, a low sense of certitude may more likely trigger the firm to flee than to take any alternative action path.

Consider, by contrast, firms where decision-makers exhibit a high sense of certitude. This may include firms relatively more accustomed to following the lead of authorities, for instance due to priorly established working relations, or firms that control means that can alleviate damages. Due to trust in the government’s ability to overcome negative consequences of the disaster and/or because they are confident that their own efforts can bear fruit, firms with a high sense of certitude are more likely than comparable firms with a low sense of certitude to stay put and—with the means they have available—fight for recovery.

**Sense of loss**

A catastrophic event can physically damage firms and societies, but can also lead to losses stemming from the disaster’s disruption of routines (Majchrzak et al., 2007; Weick, 1988). Scholars have long recognized that loss, or an impending threat of loss, can influence firms’ actions (Staw et al., 1981). Intense stress or fear stemming from losses can lead to rigidity in managerial perceptions and cognitions, which reduces decision-making flexibility and reinforces orientations to familiar and oftentimes outdated responses to new circumstances (Bundy et al., 2017; Kahn et al., 2013). Notably, disasters may spur emotional responses also in the absence of immediate or threatening losses. For example, a firm’s decision-makers can find meaning and purpose through offering services to stakeholders who suffered losses. The associated desire to care for and help others—be it with or without accompanying opportunities to profit—will influence their firm’s response as well (McKnight and Linnenluecke, 2016). Based on the above insights, we conceive of sense of loss from the disaster as ranging from suffering severe material or human losses, to merely having been
exposed to others’ losses. Furthermore, we consider that some firms might become well positioned to help other actors alleviate losses. Notably, for firms with several geographical locations, the perceived severity of losses will depend in part on the assets harmed in the disaster location relative to the size of the firm’s total assets.

First, consider firms directly and severely impacted by disaster. For example, staff members and/or their families may have been injured or killed, and production facilities, office buildings, or employees’ homes destroyed or damaged. The intuition would be that such firms would remove themselves from the vulnerable area to pursue opportunities elsewhere (Linnenluecke et al., 2011; Pinkse and Gasbarro, 2019). However, evidence from studies of reactions to dramatic events points to a less rational behavioral pattern. Rather than recognizing losses as foregone and focusing on new sources of profit (Perrow, 1970), actors within the firm are impacted by intense negative emotions such as anger, sadness, or even shock (Maitlis and Sonenshein, 2010), which constrains sensemaking and limits constructive action (Herbane et al., 2004; Slawinski et al., 2017; Weick, 1988). We thus expect that a strong sense of loss will lead to a rigid, freeze-like response whereby the firm is prevented from effectively making sense of and improving its current situation.

Second, consider firms less directly impacted that observe an impending threat of loss from disaster due to negative impacts on the firm’s supply chain or market disruption. The fact that losses have not yet occurred is likely to produce less intense emotions, compared to when a firm has already suffered direct losses (Harries et al., 2018; Maitlis and Sonenshein, 2010), and will motivate actions to avoid future losses. Hence, we expect that firms unharmed by a disaster, but that are facing threat of loss caused by the disaster’s wider consequences, will search for constructive solutions that can help avoid losses and sustain current operations (Herbane et al., 2004; McKnight and Linnenluecke, 2016). In other words, they are more likely to stay put and fight to maintain their current position.

Third, consider firms unharmed by a disaster who may even see the potential to benefit from its aftermath – to fulfil profit-based motives or because the disaster actualizes
their socially oriented mission (Ballesteros et al., 2017). Such firms may include suppliers of food and basic commodities, or businesses offering disaster-relief services and (re)construction-related technical expertise. Unharmed firms with pre-existing reputational problems may also be able to partly or fully benefit from a disaster by engaging in philanthropy, which can improve stakeholders’ social evaluations of the firm (Crampton and Patten, 2008). Decision-makers in these firms are likely to experience a low sense of loss and may even experience moderately positive emotions stemming from their strong sense of agency and potential gains from participating in disaster relief. Thus, while the severely-harmed firms might freeze and eventually flee, firms whose decision-makers have a low sense of loss are likely to stay (i.e. fight) and help rebuild the community.

—Figure 1—

Thus far, we advanced how different aspects of sensemaking condition firms’ disaster responses (see summary in Figure 1). We expect the effects of sense of place, time, certitude, and loss to be intertwined. That is, all aspects should be considered together to anticipate the direction of a given firm’s reaction. Some aspects might pull the firm into opposing directions while others reinforce each-other. Importantly, the more actions taken based on sensemaking in a given direction, the more evidence will be produced to support it (Weick, 2006), and the more counterevidence will be required for a firm to shift its response. Furthermore, a firm’s sensemaking will not only indicate the initial path forward for that firm (Weick, 1988), but may also result in actions giving sense to other firms. A study of Hurricane Katrina’s impact on the city of New Orleans, for example, suggested that businesses’ (re)location decisions are interdependent (LeSage et al., 2011). Yet, little theorizing exists about how firms’ disaster reactions affect other firms, and how such collective interactions may ‘trickle up’ to shape community resilience. In what follows, we use an elaborate thought experiment—a narrative scenario (Rounsevell and Metzger, 2010; Shepherd et al., 2018)—to show our theory in context and aid its further development by accounting for such temporal and cross-level dynamics.
**SCENARIO DEVELOPMENT**

Organizational scholars have been encouraged to embrace methods of inquiry relying on ‘disciplined imagination’ (Weick, 1989)—including scenarios, counterfactual reasoning or, more generally, thought experiments—as such methods can “provide crucial devices triggering transformations in thought and practice” (Kornberger and Mantere, 2020, p.1; Cornelissen and Durand, 2014; Gümüsay and Reinecke, 2022). Thought experiments are common in science. Plato’s description of the utopian city-state in the Republic, Darwin’s ‘imaginary illustrations’ about the Origin of Species, Adam Smith’s pin factory in the Wealth of Nations, and Einstein’s ‘falling elevator’ example all left a mark on their respective disciplines (Rounsevell and Metzger, 2010; Kornberger and Mantere, 2020; Zalta et al., 2005). Max Weber is frequently cited as the first to recommend thought experiments for social research (Ragin, 2009, p.151), and scenarios in particular have been used by influential thinkers such as Herbert Simon (see Kornberger and Mantere, 2020).

Narrative scenarios, or scenario storylines, constitute a special category of thought experiments (Aligica, 2005) that are “internally consistent and challenging descriptions of possible futures” (Chermack and Lynham, 2002, p.370). Known to encourage processual thinking and settlement around a given ordering of events (Vaara et al., 2016), development of such scenarios rests upon a rich philosophical and methodological tradition and has been used to foster disciplined imagination within environmental science and policy studies (IPCC, 2000; Rounsevell and Metzger, 2010) as well as in future studies and corporate foresight (Slaughter and Hines, 2020; Rohrbeck et al., 2015).

Like other thought experiments used in management research—for instance spotlight counterfactuals (Cornelissen and Durand, 2014) and fictional narratives of past events (Roulet and Bothello, 2022)—scenarios are not meant to test theory but to aid theory development and extension (Kornberger and Mantere, 2020). Narrative scenarios, thus, are judged on creativity, relevance, credibility, and internal coherence (Chermack and Lynham, 2002). They depend as much on disciplined imagination (Weick, 1989) as on empirical
understanding of context. While surprising plot lines and chance elements ensure a compelling read, narrative scenario development benefits from systematic engagement with data, leading to ‘thick’ contextual descriptions that rigorously target a fictional but realistic world-as-it-could-be (Aligica, 2005; Rounsevell and Metzger, 2010). Contrary to forecasts, scenarios are not focused on the probable but describe plausible events as input for theorizing “what does not (yet) exist” (Gümüşay and Reinecke, 2022, p. 236).

Scenarios have three main benefits that render scenario development appropriate for applying and further developing our theory. The first relies on scenarios’ creative function; their potential to decompose complexity and illustrate ideas in a salient and compelling manner. Humans relate more easily to stimulating and causally coherent narratives, and scenarios can instill a deeper appreciation of a theoretical framework by making visible and concrete what is otherwise complex and abstract (Aligica 2005). The second benefit relates to scenarios’ epistemic value, which allows for ‘mentally experimenting’ with parameters of interest while holding constant factors that complicate theory development. This is not always feasible when studying real-life cases, as researchers lack control over naturally occurring events (e.g. one cannot ‘produce’ a disaster hitting two communities that are almost identical on many relevant attributes but differ on theoretically relevant ones). Third, scenarios can reveal consequences and dynamics that might otherwise be overlooked. These ‘plausible dynamics’ trigger reflexivity and fuel new theorizing in ways that traditional methods do not (cf. Chermack and Lynham, 2002; Kornberger and Mantere, 2020).

Case and procedure

We developed a dystopian but plausible scenario (Bradfield et al., 2005; Spaniol and Rowland, 2019) of the 2043 Grand Dike Collapse across the Dutch coast. This illustrated our proposed theory and aided further mental experimentation to uncover unforeseen nuances within, and implications of, the emergent framework (Aligica 2005). We followed an iterative approach (e.g. Ramirez et al., 2015) where one main disaster scenario was developed and further enriched (see Appendix A) and where the initial framework was refined as the
scenario development progressed.

**Problem formulation.** Our main goals were to (a) illuminate firms’ sensemaking and reactions within a specific and highly relevant community context, so as to (b) derive potential effects of firms on community-level developments that would aid further theorizing. To ensure a reasonable scope, we focused on the four aspects of sensemaking as key predictors. Viewing disruption as a crisis unfolding over time (Roulet and Bothello, 2022), we then developed accounts of how sensemaking would shape firms’ reactions and community developments over time.

**Case selection and background.** When disaster protection systems are well-developed, high trust in those systems may leave firms ‘relaxed’ and unprepared. This is especially so when the last major disaster happened a long time ago, as the need to prioritize flood preparation is less salient. Given such circumstances, post-disaster sensemaking will likely drive firms’ disaster responses more than pre-disaster anticipation. The Netherlands presents such a revelatory setting. Despite the country being well-known for superior water management (Deltacommissaris, 2019; Deltacommissie, 2008), defense system upgrades are hard to ‘sell’ politically as few citizens have experienced severe floods (Olsthoorn et al., 2008). Should a major flood occur, it remains uncertain whether the momentum will be used to rebuild and strengthen storm surge barriers, or if the disaster will spur unplanned retreat.

Our main scenario fleshes out sub-scenarios for the country’s two largest cities, Amsterdam and Rotterdam. These are major economic centers, but their economies rely on companies that may be differentially impacted and react differently due to their varying sensemaking. In light of this, we exploited a key advantage of thought experiments that was articulated above: the potential to ‘mentally experiment’ with parameters of interest (e.g. firms’ idiosyncratic characteristics and post-disaster circumstances that may shape sensemaking) while holding constant factors that complicate theory development (e.g. national culture, disaster preparedness).

**Procedure, data sources and assumptions.** Our scenario was informed by the 1953 North
Sea Flood that took the lives of 1836 people in the Netherlands and brought massive damage to infrastructure, homes and livestock. As our focal region is more densely populated and economically developed, we assumed a similar future event to exceed the previous catastrophe in terms of damages. The secondary sources informing us about this disaster and different ‘near misses’ (e.g. the flooding of the Waal, Maas and Rhine in 1995) included academic articles, video interviews with experts and eye witnesses, and public documents on flood prevention and crisis management. We consulted critical articles in newspapers and professional journals for triangulation purposes. Recent floods elsewhere helped verify the scenario’s plausibility and inspired quotes to make the storyline realistic. Appendix B provides examples of how storyline content links to sources, Appendix C gives a more comprehensive source overview, and Appendix D explains the scenario setting.

To flesh out reactions of firms, we considered context-specific information (e.g. firms doing business in the area) and used our freeze-fight-flee framework. For some firms, our judgment was unequivocal in the direction of fight or flee. Other times, the rich scenario details spurred discussion of how the different aspects of sensemaking would interact to shape the firm’s response over time. This fueled imagination of how firms would consider other firms’ responses, and how their own reactions could impact other firms. Consider, for example, a firm with a high sense of place (predicting fight), a predominant orientation towards the future (predicting flee), a high sense of certitude (predicting fight), and a strong sense of loss (predicting freeze). Our resulting prediction was a temporary freeze-like response followed by a relatively rapid shift towards foregrounding fighting over fleeing. As part of its fighting efforts, furthermore, we envisioned that the firm might mobilize or inspire other firms in its network and/or surroundings to do the same.

We exemplified distinct community-level outcomes—one dystopian and one more utopian sub-scenario embedded within the dystopian-like main disaster scenario—for Amsterdam and Rotterdam. We envisioned plausible interactions between firms in these communities, which suggested that responses would remain diverse over time but that
dominant effects could emerge. We assumed a relatively active role of governmental actors with respect to evacuating citizens and a more reactive role in addressing business needs.

We begin our narrative with the main disaster scenario and end with exemplifying differing response dynamics for Rotterdam and Amsterdam. After summarizing key insights, we flesh out the remaining theorizing on sensemaking across and beyond firms. The narrative includes annotations that are accessible through Appendix B.

THE GRAND DIKE COLLAPSE: A PROSPECTIVE HISTORICAL ACCOUNT
The Dutch are said to be among the best sleepers in the world, with a nightly average of 8.2 hours\(^1\). On the Sunday evening of February 1\(^{st}\) 2043, heavy rainfall and strong wind gusts made people living in the Randstad, one of Europe’s largest economic areas, opt for a particularly early night. Commuters and working parents had already rescheduled meetings for the next day; trains tended to get delayed and schools encouraged early pick-ups on such occasions\(^2\). Some—such as those employed in road maintenance or logistics management—anticipated a hectic morning due to blown-over trees and suspended deliveries. For most people, nevertheless, the weather represented nothing more than an ordinary hassle; just another of the six to eight large storms hitting the country every year\(^3\). They tied up the garden trampolines, called in the cats, and went to sleep\(^4\).

This time, however, the Dutch were caught by surprise. Overnight, the unusual combination of a high spring tide and an extreme northwestern storm had worked up the waves to break through the storm surge barriers of the Delta Works\(^5\). Even worse, due to a series of unfortunate events, alarms were only sounded in the morning, and many citizens mistook them for the usual alarm rehearsal taking place on the first Monday of every month\(^6\).

By noon, even the most stoic individuals were in panic. Dike ring 14, protecting central areas of the Randstad, took in water at several locations\(^7\). Parts of Amsterdam and Rotterdam became unreachable by foot or bike. Metro stations closed up. Public transport came to a halt. Tap water turned reddish, then dark brown. Internet and phone coverage disappeared. Gas and electricity outages followed\(^8\). Eyewitnesses reported “a wall of water” rushing in. Satellite images confirmed that entire buildings had been knocked down\(^9\).

Hundreds of thousands of people struggled to determine how to stay safe. Some took off by car, only to get stuck on flooded roads with nowhere to go. Others waited for help at home\(^10\). Most large companies and commercial buildings locked up shop, and rushed employees and customers out while a few stayed behind to place sandbags at the door—if they had any—and lift filing cabinets onto desks\(^11\). Staff in hotels, cafés, and locally owned shops got caught up in seemingly endless calamities\(^12\). Farmers opened all gates to help save their cattle, but most saw them drown in the thousands\(^13\).

By midnight, the Randstad was darker than ever before, but nobody was sleeping. The sound of water, seeping into basements, kitchens, and living rooms, was interrupted by loud voices crying for help; from inside houses or commercial buildings, up on rooftops, or on overfilled house boats\(^14\). Those owning battery-operated radios took turns broadcasting
authorities’ “Tips for staying”. “Tips for leaving” were no longer aired, as devastating reports of entire families having drowned in their cars had already reached the public. “Put a heavy bag in the toilets to keep out sewage”, the radio voice said; “If your house is lower than two floors, relocate to another building”. In the absence of immediate rescue, people were told to help their neighbors, and to ration food and water. Finally: “Hang a white sheet from your window and wait for help. Escape is not safe”.

Freeze, fight, or flee? Firms’ initial reactions
Thanks to a remarkable emergency response led by the authorities, the number of casualties was lower than feared. The harm to the Randstad economy, however, was numbing.

Managers of businesses, big and small, struggled to make sense of the dilemma: Should we stay, or should we leave?

Most firms had been ill-prepared, with no pre-made plans involving disruptive events of such magnitude. A consulting firm headquartered in Amsterdam, for instance, lost multiple members of staff, including its CEO. Remote work by employees outside of town ensured business continuity in the short term, but strategic decision-making was obstructed. Also in Rotterdam, many streets became uninhabitable, leaving shop owners and restaurateurs with more questions than answers. Amsterdam businesses within tourism and hospitality cancelled their offerings and postponed any long-term planning.

Hotels in undamaged locations offered temporary housing – at first in a highly improvised manner and eventually in collaboration with municipalities. A large Dutch grocery chain, whose employees volunteered to ship water and food supplies into flooded areas, was also among the early responders. Thanks to pre-existing community ties and long experience handling logistics, shipment routes were established utilizing boats and ferries operated by public transport organizations in both cities.

In many cases, however, interdependencies between actors reinforced a stalemate. Financial service providers waited to hear from office facility landlords, who waited to hear from insurers, who waited to hear from authorities, who waited to hear from experts. Manufacturers waited for retail customers to get back on their feet. Retailers waited for facilities to be rebuilt and for customers to move back into their homes. Thus, many firms stayed in a freeze mode, struggling to stake out a clear course of action.

A tale of two cities: Firms’ reactions and community recovery
Reports of the Grand Dike Collapse shocked the world, as it became obvious that the ‘old normal’ would never fully return. But for many, the most unanticipated outcome was the astonishingly diverse development of the country’s two largest cities.

Rotterdam. Albeit businesses within retail and hospitality struggled to regain their footing, multiple companies in Rotterdam stood out due to their coordinated action. Many firms from the construction, maritime logistics, and shipbuilding sectors had only lost materials ordered for ongoing projects while most machines and equipment were safely stored offsite. They were quick to put their skills and assets to use. Helped by local consulting firms that had already built a business case around city resilience, other stakeholders interested in protecting the identity of Rotterdam as a modern port city were mobilized. As many of them had worked with—or for—the local government in the past, accessing trustworthy information about the authorities’ recovery plans was relatively easy. A pattern
emerged, whereby companies controlling tools, infrastructure, or knowledge relevant for rebuilding and flood prevention led the movement to fight back, even when surrounded by chaos. Many of them already had a strong identification with the city, which was further triggered also in other firms as they were encouraged to join and take action.

There were also counter-movements. One internet technology firm had close to 100 of its expat employees abandon their flooded rental homes and move out of the country within days. Most of these homes, however, were in Amsterdam and not Rotterdam, as were the company’s biggest and now empty offices. Rotterdam’s start-up businesses without local assets and identities to speak of packed their servers and furniture after giving landlords their notice. Some went back to their founders’ garages with staff working remotely, and several discussed co-locating in the higher-lying ‘brainport’ city of Eindhoven.

Thanks to another spiral of actions picking up speed among the firms remaining, the majority of business leaders started talking about rebuilding. Local construction and logistics companies had successfully incited a movement inspiring firms from other sectors to participate. Restaurants, barber shops, and boutique hotels that had temporarily closed, gradually reopened. As more businesses resurfaced after observing the turn of events, the city became livable again, further reinforcing beliefs that Rotterdam could bounce back. Young couples and families that had fled in panic returned, reassured by employers’ commitment to their resettlement. Professionals from elsewhere started flowing in as well.

For Rotterdam, the flooding became a wake-up call that helped it position itself as the indisputable industrial center of the Randstad. Not only did it spur increased commitment and investment into maintaining a secure and open port, but rebuilding helped firms develop novel expertise on water resilience. These positive and self-reinforcing dynamics triggered more firms to stay put and help—each in their own way—to recover the economy. The success story of how local firms, the Rotterdam Port, the Rotterdam municipality, citizens, and the Dutch Government rebuilt the city was much welcomed and lauded by other vulnerable coastal cities around the world.

Amsterdam. Agricultural and food processing companies at the city’s outskirts had a long history in the area, but had operated in the same way for decades. Their owners were in shock from the damages and called to authorities for financial support. Yet, a few companies had already picked up hydroponic farming and adjusted to raw ingredient traceability; these could more easily envision fighting back by expanding activities less reliant on the flooded land.

Also the city’s wealthy commercial property owners signaled an interest in staying to rebuild, fearing severe losses. Technical experts embedded within their community volunteered to estimate costs, but few of those committed to rebuilding possessed the tools and skills to actually start. Some Rotterdam-based construction companies offered their services, but mobilizing effective collaborative networks with these unknown actors was difficult for the Amsterdammers. Notably, after being evacuated, many students left their now uninhabitable apartments unattended to, and many internationals fled to their own countries. The resulting accumulation of unpaid rent considerably worsened property owners’ losses and dampened their fighting spirit.

Most financial service providers, who anyway addressed clients online and had few local assets requiring protection, relocated to The Hague where the damages were less
severe and rebuilding progressed faster. As they watched neighboring businesses leave, many more of Amsterdam’s technology and finance companies followed suit. Several firms facilitated employee relocation to The Hague, which prevented some international staff from leaving the country. Corporations in the apparel, chemical, and packaging industries had once chosen Amsterdam as a hub for HR, IT, or supply-chain related functions, but their board members were used to adjusting the course. After all, the associated brands were independent from specific Dutch cities or the Netherlands as such, as were their investors.

Many citizens followed companies to new locations in pursuit of social and economic stability. Smaller shop owners had fewer options, but were discouraged when the early attempts to fight back stranded. Already before the minimal insurance payouts, many identified new locations or permanently shut down. Eventually, this triggered actions from the authorities, who closed deals to buy and tear down hundreds of flood-prone buildings and made offers on hundreds more. As the city’s resilience administrator expressed it: “It’s not easy to walk away from your neighborhood. But it’s also not easy to live with the risk of this happening again.”

Eventual commitments did help restore some historical buildings and streets. Through what became known as ‘New Venice’, a project launched by the city government and property owners supported by World Heritage funds, Amsterdam’s tourist appeal was somewhat revived. Visitors could now explore the Museum of the Grand Dike Collapse, or board a “Flood Tour” to the spooksteden (ghost towns): abandoned neighborhoods set aside to absorb excess water from future spring tides and storms. But by and large, the post-flood dynamics altered the very make-up of the city. Once a hub for financial and technology sector multinationals, Amsterdam saw much of its economy wiped out within months, to never fully recover.

Scenario assessment

The application of our framework to the Grand Dike Collapse scenario showcases how firms’ reactions to a climate disaster may vary considerably, due to differences in their sensemaking. As evident from the narrative and illustrated in Table I, firms in both cities froze, fought, and fled. Yet, anticipating the interplay of firms’ reactions and their ongoing sensemaking helped illuminate differing emergent dynamics that eventually shaped recovery paths also at the city level.

As different communities include businesses who vary in their sense of place, time, certitude, and loss, reactions can vary across these locations even if disaster damages are comparable. Many of Rotterdam’s construction, shipbuilding, and maritime logistics firms may develop a strong sense of certitude, due to their own reconstruction capabilities. Having
worked together with government on public-private partnerships before, their confidence in rebuilding will be comparatively higher than for firms from dominant industries in Amsterdam whose main value lies in immaterial rather than material assets (e.g. financial services and consulting) and branding rather than construction (e.g. apparel companies). Also, most construction companies are used to organize work in a manner where specific circumstances at hand (i.e. the weather, jobs to be done at different sites) dictate what gets priority, which orients many of these firms relatively more to the present.

As acknowledged in the narrative, having few material assets harmed may contribute to a low sense of loss and an interest in fighting back, which sends signals to other firms. However, the lack of an impending sense of loss may inspire firms to flee, and this tendency will be stronger in Amsterdam, where many financial service providers and internet technology firms can flexibly shift work across locations. A larger portion of those operating in Amsterdam are multinationals once drawn to the city as an international hub; the combination of a relatively mobile workforce, ownership of relatively few local assets, and often no historical roots in the community gives such firms a weak sense of place and reinforces their tendency to flee. Furthermore, their fleeing propensity is supported by established routines for adjusting strategy to an ever-changing sense of the future. By contrast, routines and capabilities of many Rotterdam-based firms will condition them to focus on gains from fighting. Their engineers, technical consultants, and technicians are predominately present-oriented in their temporal work and will prioritize ‘grabbing their tools’ (Weick, 1996) to address immediate challenges induced by the disaster. A large portion of these firms, therefore, will likely stay and fight. Naturally, some multinational firms might have developed closer community ties over the years and some construction firms might have all their customers abroad; sensemaking by these companies might differ compared to other industry peers, but may also become influenced by peers’ more dominant paths of action.

Overall, even though sensemaking depends on the situation at hand (Rouleau and Balogun, 2011; Hernes, 2008), considering firms’ characteristics may help anticipate
sensemaking and plausible disaster responses in advance. Furthermore, interorganizational
dynamics can create cascading effects that eventually lead to one city thriving and the other
not fully recovering. We return to this stylized observation in the discussion, after explicating
the mechanisms by which firms’ sensemaking and reactions ‘trickle up’ to the community
level (Roulet and Bothello, 2022).

**TOWARDS A THEORY LINKING FIRMS’ SENSEMAKING TO COMMUNITY
DISASTER RESILIENCE**

Disasters and other crises have often been treated as singular jolts rather than discontinuities
with—over time—profound macro level impacts (Roulet and Bothello, 2022). Our thought
experiment sensitized us to sensemaking and firm responses beyond the disaster’s immediate
aftermath, as firms’ interactions may foster diverging community developments over time.
Explaining this theoretically requires attention to sensemaking and sensegiving dynamics.

**Sensegiving and firms’ responses**

A firm’s sense of place, time, certitude, and loss following a disaster will inform its initial
response. As this response is enacted, the firm is not only staking out its own path, but can
influence other firms through sensegiving.

**Sensegiving with deliberation.** Sensegiving is typically seen as a purposeful attempt to
influence others’ sensemaking and meaning construction (Gioia and Chittipeddi, 1991;
Maitlis, 2005). Firms who quickly stake out a path will engage in more deliberate sensegiving
than those that have yet to “act their way into sense”, due to having more resources freed up
(Weick, 2009, p. 130). Decision-makers in firms that stay open or reopen in the disaster-hit
community will likely prioritize sensegiving to other firms in the community because fighting
requires comparatively more convincing of, and collaboration with, other actors in the
community than fleeing. A fighting firm depends on other firms (e.g. suppliers, buyers), and
these interdependencies motivate them to promote economic recovery. Three elements are
likely particularly salient in such efforts:

First, staying firms will benefit from communicating a stronger sense of certitude, as
their success will largely depend on others actors’ beliefs in economy recovery. Second, rebuilding the economy is a collective action project (Demiroz and Hu, 2014) requiring suppliers to continue delivering, customers to visit, employees to move back, and so on. Thus, fighting firms are motivated to—through their actions and rhetoric—contribute to a feeling of shared fate. This can be achieved by triggering a stronger sense of place among other actors, which motivates fighting. Third, as firms join the rebuilding movement, they become more sensitized to the gains of staying—and to the presence of and upside of alleviating threatening losses—which might circumvent initial impulses to relocate.

**Sensegiving without deliberation.** Despite the common depiction of sensegiving as an intentional act, evidence indicates that sense can also be given unintentionally. For example, in the much-studied Mann Gulch fire, the commander and ranger worried about the fire being a death trap and sent the crew towards a river. Having a quick meal while the rest marched instilled the false sense that the fire was not that serious; a conviction reinforced by a smokejumper’s priority to make photos and the commander’s early labeling of the fire as likely to end by 10 AM (Weick, 1993). Similarly, we argue that firms’ actions can give sense to other actors who observe them, even when those firms are not actively trying to give sense to others. Especially in the face of uncertainty, other firms’ doings can constitute a strong cue (Haveman, 1993; Rao et al., 2001) that influences the sense made by others.

Firms are not equally receptive to all signals; detecting non-deliberate sensegiving may require actively searching for cues. Overall, we expect decision-makers in firms not yet committed to a clear fight- or flee response to be more receptive to signals. Cues from firms sharing the same location, business model, or industry (LeSage et al., 2011), or cues from large and otherwise prominent firms, are more easily detected and might be given more weight than others.

The impact of unintended sensegiving by earlier-moving firms will depend on the initial sense of the later-moving firms. To illustrate: A strong sense of place implies seeing the fates of the company and the community as intertwined, and leads managers to attribute
greater salience to other actors in the community, including firms. An initial hunch to stay and fight will be reinforced or weakened depending on whether few or many other firms have started rebuilding the economy. Sense of certitude will be reduced when a firm’s decision-makers observe that multiple businesses, for example from the same street or industry, have left. Furthermore, as firms with a strong sense of loss are debilitated from responding early, observing that others stay inert (i.e. remain frozen) may reinforce panic and prolong inaction.

**Sensemaking-sensegiving cycles and community resilience**

Two additional conceptual moves are needed to account for cross-level dynamics and firms’ influence on community resilience. One entails acknowledging that firms’ recovery efforts may be in tension with community revival. Some firms may stay open, or make efforts to reopen, while others flee. These choices may all contribute to firm resilience, but fleeing could negatively impact community resilience. Indeed, recent work left open the possibility of tensions between firm and community resilience (Clément and Rivera, 2017).

The second conceptual move constitutes relaxing the assumption (implicit above) that firms’ disaster responses occur in two stages, with fleeing or fighting firms acting first and others (who initially froze) following next. While this assumption helps us illustrate intentional and unintentional sensegiving, in reality there are infinite combinations of actors’ recovery paths. A parsimonious middle ground explanation, taking temporal dynamics seriously, rests on the idea that firms react to other firms or shape other firms’ reactions in cycles of sensemaking and sensegiving (Gioia and Chittipeddi, 1991). During any given period, a firm’s decision-makers make sense of the situation in light of a number of factors, including what other firms did prior to that period. As firms look to other firms to make decisions, a self-reinforcing dynamic arises with firms’ responses collectively shaping the community’s capacity to bounce back (see Figure 2).

---Figure 2---

Critically, the scenario illustrates that “initial responses do more than set the tone; they determine the trajectory of the crisis” (Weick, 1988, p. 309). Our emergent theory
suggests that this observation holds true beyond single organizations’ crisis responses, and also applies to community outcomes spurred by organizational responses. Overall, we posit that sensemaking-sensegiving cycles (Gioia and Chittipeddi, 1991) constitute a key mechanism to explain the link between firms’ disaster responses and community resilience.

**DISCUSSION**

We developed a novel framework explaining key drivers of firms’ heterogenous responses to climate disasters and theorized how firms’ sensemaking-driven interactions can shape community resilience. An imagined dystopian account of a large-scale flood aided our theory development and gave way to insights generalizable beyond this specific context.

First, our work offers new explanations for variation in firms’ disaster responses. Resilience scholars have rarely investigated the sources of this heterogeneity (Linnenluecke, 2017), and have recently called for more research on why “firms are influenced differently” by disasters (McKnight and Linnenluecke, 2019, p. 835). Avoiding the simplification that firms will exhibit one unified response, our article addresses these oversights by advancing theory on how firms respond differently to the same climate disaster (e.g. freeze, fight, flee) due to heterogeneity in their sensemaking (sense of place, time, certitude, and loss). Our work thus expands research on disaster resilience beyond activities focused on aid and emergency response entrepreneurship (Ballesteros et al., 2017; Tilcsik and Marquis, 2013; Williams and Shepherd, 2016) to better understand firms’ propensities to continue their operations or relocate. Additionally, using the notion of sensegiving, we develop theory to explain how firms’ initial reactions may shift or become sustained, illustrating how the persistence of some heterogeneity can be explained by firms’ differing receptibility to the sense of others.

Second, we expand disaster resilience literature by theorizing the link between firm reactions and community resilience. Prior work highlighted firms’ resource allocations as one factor explaining communities’ differing climate vulnerabilities (Thomas et al., 2019) but explanations for how firms’ post-disaster reactions may interact to influence community recovery were missing (McKnight and Linnenluecke, 2019). Business actions and societal
outcomes are known to be closely interconnected (Bansal et al., 2021); we theorize a specific process through which firms’ initial reactions may generate community-level consequences in addition to impacting single firms’ decisions. Enriching recent (Hernes and Obstfeld, 2022) and early (Weick, 1979) theorizing of how sensemaking explains continuity and change, we suggest that firms whose sensemaking spirals them early into a clear course of action (i.e. fight or flee) can influence other firms towards community rebuilding or retreat. Firms may flee or fight to remain resilient, but flee responses are unlikely to contribute to community resilience. As such, we pinpoint potential tensions between the resilience of firms and communities, offering the sobering message that, in their efforts to recover, firms may trigger consequences that may bring about a community’s demise. We hope this observation will redirect research away from a focus on how firms’ attributes and responses shape their own resilience towards more explicit examination of how alternative response pathways by firms come to shape community resilience over time.

Third, our work advances research on sensemaking. While we expect fighting firms to dedicate most effort into influencing other firms’ meaning-making, we relax the typical assumption that sensegiving is intentional (Gioia and Chittipeddi, 1991; Maitlis, 2005) to explicate that all firms, including fleeing and freezing firms, can unintentionally give sense to and impact disaster responses of others. Overall, we add to literature that examines post-crisis’ sensemaking beyond organizations’ relatively immediate reactions (Dwyer et al, 2023; Roulet and Bothello, 2022) by addressing “how different forms of organizational sensemaking and their outcomes relate to one another over time” (Maitlis 2005, p. 45). Thus, we also heed recent calls for attention to feedback effects in the study of organizational and community resilience (Williams et al., 2021).

Finally, we offer a methodological contribution towards a sea change in the toolkit considered relevant for organization research. New and unconventional methods are required to study societal problems (Jarzabkowski, et al., 2021) and to theorize cross-level effects (Roulet and Bothello, 2022). We showcase how narrative scenarios can aid theory
development through disciplined exploration of events ‘located’ in the future. Specifically, a systematically-developed prospective event can be confronted with insights deduced from past events and extant literature to inform new theory. Starting the scholarly inquiry in a not-yet-realized future (Augustine et al., 2019) reorients attention from trying to explain why undesirable events happened to anticipating developments beyond mere extrapolations of the present (Gümüşay and Reinecke, 2022). This helps illustrate plausible dynamics that, as part of treating the imagined future as an ‘as-if’ reality (Savage et al., 2018), stimulate reflexivity and theory development (Shepherd et al., 2018). Overall, our work responds to calls for management scholars to engage with ‘possible futures’ (Gümüşay and Reinecke, 2022; Jennings and Hoffman, 2021) and displays narrative scenarios as relevant for producing novel theoretical insights on problems of high societal importance.

**Limitations and future research**

Narrative scenarios illustrate and help develop theory, but scenario development does not constitute theory testing. Thus, questions about our work’s predictive validity should not be laid to rest. We invite both historical research and real-time ethnographic work to test, refine, and expand our theory. Using our assumptions as input for agent-based simulations could also yield novel insights.

As is the case for any theory, our work relied on simplifications out of consideration for scope and parsimony. In terms of scope, our theoretical assumptions are consistent with cases of high-impact low-probability events, such as climate disasters or other related crises typically characterized by surprise and extreme uncertainty (Dilling et al., 2015; Wenzel et al., 2021). Other theoretical perspectives may be appropriate to study responses to climate events that are more common or largely anticipated, whereby organizations can cope by simply following established routines and pre-existing plans.

Future studies could further investigate how sense of place, time, certitude, and loss are intertwined, or consider configurations of sensemaking and contextual attributes that we
left unaddressed. One opportunity would be to compare decision-makers’ emotion-driven reactions to disasters with ‘colder’ judgments and calculations to learn more about the relative influence of intuitive reactions versus sober financial reasoning on firms’ post-disaster conduct. In addition, decision-makers’ degrees of abstraction about the future and perceptions of being closely connected to a community could be tied to alternative theoretical lenses such as construal level theory (Trope and Liberman, 2010) to enrich our predictions. Future work could also expand on sensemaking theory’s anticipatory potential. As we have alluded to, a firm’s sense of place can be inferred—at least to some extent—from its history at a location, its mission and vision, or the whereabouts of its customers and suppliers. A firm’s sense of time can be partly anticipated by examining its orientation to long-term planning and innovation, and by considering rates of change in its industry or strategic group. Sense of certitude and loss can be anticipated by considering relations with authorities and assets in disaster-prone locations. Future research can explicitly theorize about connections between these or other observable firm indicators of post-disaster sensemaking.

Another fruitful extension of our theory would be to further consider how firms interact with private citizens, public and non-profit organizations, and ad hoc emergency groups to shape community resilience. Studies could also examine how public authorities direct or react to firms’ disaster responses. Furthermore, future work can zoom out to the country level to focus on inter-community dynamics, or explore what happens when only a small subset of firms are harmed. On this, we encourage dialogue with the science and policy literature on societal adaptation to climate change, which has often paid limited attention to firms or depicted them as one unified group acting based on fully rational cost-benefit calculations (Nicholls et al., 2008; Olsthoorn et al., 2008). Interdisciplinary work could also more explicitly consider when a community’s rebuilding versus unplanned retreat is more or less beneficial. Overall, as research on how firms’ actions mediate societal adaptation is in its
infancy (Thomas et al., 2019), our study can help bridge organizational research with climate science and policy literature.

**Implications for policy and practice**

Policymakers and forward-looking businesses are informed by research on the likelihood and economic consequences of catastrophic events (e.g. Anthoff et al., 2010; Nicholls et al., 2008), but business- and policy scenarios must be infused with more accurate depictions of firms’ reactions to disasters. Scenarios rooted in sensemaking can help policymakers prevent certain reactions before they happen or, alternatively, influence societal dynamics after a major climate disaster has occurred.

Consider, for example, proactive interventions by municipal authorities informed by our framework. Their swift pre-planned responses can potentially sway firms’ sense of certitude by instilling them with confidence in the government’s abilities and commitment. Moreover, keeping the public and firms informed about contingency plans is paramount, as inaction and lack of information create doubt that can be interpreted as lack of planning (cf. Maitlis and Sonenshein, 2010) or may lead to helplessness (Shepherd and Williams, 2014). Like sense of certitude, sense of loss is highly situated and challenging to address in advance. Yet, losses can be perceived differently depending on circumstances partially controlled by policy makers. For instance, recovery plans and communication efforts that include provisions for how losses are covered can reduce firms’ sense of loss, and rhetoric shifting people’s minds from incurred to impending losses can make a difference between firms freezing or fighting.

Government rhetoric can also be used to shape firms’ responses driven by sense of time. Despite not having anticipated the timing and magnitude of a given disaster, future-oriented firms can more easily project in the wake of it and thus be more susceptible to unplanned retreat. Authorities can link recovery rhetoric (e.g. ‘the city will bounce back to
what it was’) with future-proof resilience rhetoric (e.g. ‘the city’s defenses will be strengthened’) to sway such firms to stay. In addition, important events such as natural disasters increase the salience of local identity (Dinger et al., 2020; Tilesik and Marquis, 2013). Thus, authorities can strive to increase the salience of the community’s identity to induce (more) firms to fight, contributing to rebuilding. Lastly, public authorities may also consider directly aiding prominent firms (e.g. reputable, large employers) to recover, as these can give sense to and shape the behavior of other firms.

Conclusion

By explicitly studying societal outcomes, management and organization scholars will be better positioned to help tackle some of the world’s greatest challenges. Our study provides new insights into how firms’ sensemaking can shape firm reactions and community resilience following climate disasters. We hope our theorizing and narrative scenario will inspire more research on this important topic and incite policymakers to more carefully consider firm heterogeneity in climate adaptation plans.

REFERENCES


Stigliani, I., and Ravasi, D. (2012). Organizing thoughts and connecting brains: Material practices and the transition from individual to group-level prospective


Williams, T., Gruber, D., Sutcliffe, K., Shepherd, D., and Zhao, E. (2017). Organizational response to adversity: Fusing crisis management and resilience research
Academy of Management Annals, 11, 733-769.
FIGURE 1 – Sensemaking and firms’ reactions to disasters: Key predictors

A firm’s reaction to a climate disaster can be explained by sensemaking pertaining to...

- **Place**
  - Strong
  - Weak

- **Time**
  - Future
  - Past

- **Certitude**
  - High
  - Low

- **Loss**
  - High
  - Low

...which predicts the firm’s tendency to either...

- **Freeze**
  - Predominantly past-oriented temporal work delays adjustment to novel conditions.
  - Strong sense of loss hampers action.

- **Fight**
  - Strong sense of place motivates staying to rebuild.
  - Predominantly present-oriented temporal work motivates fighting back by addressing challenges ‘here and now’.
  - High sense of certitude in community recovery motivates fighting.
  - Weak (or looming) sense of loss motivates fighting to avoid future losses or to realize gains from rebuilding.

- **Flee**
  - Weak sense of place reduces likelihood of staying to rebuild.
  - Predominantly future-oriented temporal work increases the possibility of cutting losses and pursuing recovery elsewhere.
  - Low sense of certitude in the chances of rebuilding the city motivates escape.
FIGURE 2 – Self-reinforcing dynamics following firm’s initial responses to a disaster

Thick arrow represents theory that explains firm responses (initial framework)

Thin arrow represents emergent theory on how firm interdependencies come to shape community resilience (developed abductively aided by the scenario).

Dashed arrows represent other important dynamics revealed by the scenario or that represent potential contingencies that are outside the scope of our core theory.
### TABLE I – Sensemaking and firm responses to a climate disaster

<table>
<thead>
<tr>
<th>Aspects of firms’ sensemaking</th>
<th>Response</th>
<th>Illustrative examples illuminated through the disaster scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sense of place</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strong community identification and embeddedness</td>
<td>Fight</td>
<td>● A large Dutch grocery store chain quickly shipped water and food supplies into flooded areas. This <strong>fight</strong> response was enabled by strong pre-existing community ties, motivating employees to volunteer and enabling setting up shipment routes with authorities.</td>
</tr>
<tr>
<td>Weak community identification and embeddedness</td>
<td>Flee</td>
<td>● International companies within financial services, technology, and data management had chosen the Netherlands for tax reasons, were led by non-Dutch nationals, and relied on many non-Dutch employees that had taken refuge in their home countries. Their weaker community identification made them more prone to <strong>flee</strong> and relocate their headquarters.</td>
</tr>
<tr>
<td>Sense of time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emphasis on the past as input for strategic actions</td>
<td>Freeze</td>
<td>● Agricultural and food processing companies had used the same routines for decades and struggled to realign the past with the novel post-disaster conditions. Decision-makers in these firms went into a <strong>freeze</strong>.</td>
</tr>
<tr>
<td>Emphasis on the present as input for strategic actions</td>
<td>Fight</td>
<td>● Some agricultural firms had already felt competitive pressures related to hydroponic farming and raw ingredient traceability. Because of their experience in adjusting to ongoing changes in their surroundings, they found it easier to <strong>fight</strong> back and stake out a new course.</td>
</tr>
<tr>
<td>Emphasis on the future as input for strategic actions</td>
<td>Flee</td>
<td>● Technology companies who had routinely produced longer-term forecasts and contingency plans updated their future outlook as a basis for post-disaster action. Many decided to stomach the costs of relocation, seeing <strong>fleeing</strong> as relatively undramatic.</td>
</tr>
<tr>
<td>Sense of certitude</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chances of rebuild perceived as certain</td>
<td>Fight</td>
<td>● Rotterdam-based construction and logistics firms had strong ties with the authorities, having worked with them on public-private mega-projects around the port. Combined with their own reconstruction-related capabilities, this fostered a strong sense of certitude that the city could be rebuilt and motivated <strong>fighting</strong>.</td>
</tr>
<tr>
<td>Chances of rebuild perceived as uncertain</td>
<td>Flee</td>
<td>● Firms with few capabilities relevant for disaster-specific aid searched for new locations to continue business elsewhere (i.e. <strong>flee</strong>); their doubt in authorities and low feeling of agency demotivated them from trying again where their current losses had occurred.</td>
</tr>
<tr>
<td>Sense of loss</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Great losses incurred</td>
<td>Freeze</td>
<td>● Many restaurants, hair salons, bakeries, and other businesses that were centrally located, suffered losses obstructing their business for months. The shock of these losses put many into a temporary <strong>freeze</strong> mode.</td>
</tr>
<tr>
<td>Few losses incurred, serious threat of losses anticipated</td>
<td>Fight</td>
<td>● Some firms that experienced less severe damage to their assets, but who risked great additional losses due to their locations becoming unavailable or clients facing bankruptcy, initially tried to <strong>fight</strong> to get their livelihoods back.</td>
</tr>
<tr>
<td>Few losses incurred, future gains anticipated</td>
<td>Fight</td>
<td>● Some firms that suffered few losses, and who controlled assets and capabilities relevant for rebuilding, were quick to join the <strong>fight</strong> to build back better as well.</td>
</tr>
</tbody>
</table>
APPENDIX A – Overview of scenario development procedure

PROBLEM FORMULATION
- Rising sea levels and climate change pose increasing risks for firms and communities
- Firm sensemaking and reactions may shape post-disaster development

CASE SELECTION
- Long time since prior disaster
- Vibrant economic centers below sea level
- Extant plans pay little attention to firms

SCENARIO DEVELOPMENT
- Focus on low-probability, high impact flood
- Informed by historical data on prior disaster, accounts from the literature and recent climate change adaptation discourse

PROBLEM ENRICHMENT
- Two cities facing similar risks, but are composed of firms with different profiles
- Firms will not react in isolation; accounting for inter-firm dynamics is important

SCENARIO ENRICHMENT
- Elaboration of firms’ reactions by confronting scenario with initial framework
- Developing emergent interactions across cities
- Final discussions and write-up of narrative

ASSESSMENT OF INSIGHTS
- Cities are impacted differently due to different firm reactions and associated interactions
- Firms may drive post-disaster development into different directions
## APPENDIX B – Examples of how specific sources informed the scenario

<table>
<thead>
<tr>
<th>Aspect of storyline</th>
<th>Examples of information that informed the content</th>
<th>Example(s) of source(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting the scene by introducing the habitual way of dealing with large storms characteristic for the scenario context (1-4)</td>
<td>We used publicly available sources (e.g. about sleeping habits of the Dutch and expectations regarding number of large storms occurring yearly by the time of the imagined disaster) and observations made while living in the country (e.g. schools' reactions to weather alerts, neighbors' routines for tying up their trampolines).</td>
<td>KNMI (2020). Uitleg over KNMI waarschuwingen (Explanation of KNMI weather alerts). KNMI.nl. Accessible via <a href="https://www.knmi.nl/kennis-en-datacentrum/uitleg/knmi-waarschuwingen">https://www.knmi.nl/kennis-en-datacentrum/uitleg/knmi-waarschuwingen</a> (last accessed August 2022). Walch, O. J., Cochran, A., &amp; Forger, D. B. (2016). <em>A global quantification of “normal” sleep schedules using smartphone data</em>. Science Advances, 2(5), doi: 10.1126/sciadv.1501705</td>
</tr>
<tr>
<td>Explaining how and why people were caught by surprise (6, 8, 9)</td>
<td>We drew on information that we became aware of by living in the area (e.g. alarm rehearsals every first Monday of the month) and from earlier accounts of floods. Our write-up of the failings to properly warn the public and other low preparedness was inspired by eye witness reports from 1953 and from more recent floods (e.g. phone and internet outages, “a wall of water”), in addition to academic articles about flood preparedness.</td>
<td>Olthoorn, X., van der Werff, P., Bouwer, L. M., &amp; Huitema, D. (2008). <em>Neo-Atlantis: The Netherlands under a 5-m sea level rise</em>. Climatic Change, 91(1-2), 103-122. Watersnoodmuseum (2022). Verhalen over het water (Stories about water). Watersnoodmuseum.nl. Accessible via <a href="https://watersnoodmuseum.nl/verhalen">https://watersnoodmuseum.nl/verhalen</a> (last accessed August 2022)</td>
</tr>
<tr>
<td>Exemplifying specific reactions of firms (11-13, 21-23)</td>
<td>In addition to our framework, we drew on reports of damages from the 1953 flood (e.g. farm owners losing their cattle, the ruining of farmland) and evidence from other major floods (e.g. some businesses improvising to prevent damages and helping citizens, and the emergence of self-reinforcing mechanisms among businesses in the same location). Country-specific company data and trends were extrapolated to envision within-country mobility of economic activity (e.g. some businesses moving to the technology-focused ‘brainport’ of Eindhoven).</td>
<td>van den Berg, L., &amp; Otgaar, A. H. (2012). Brainport Eindhoven: A proactive approach towards innovation and sustainability. In European Cities and Global Competitiveness (pp. 171-201). Edward Elgar Publishing. van Ginkel, R. (1993). <em>Het water en de herinnering. De Zeeuwse watersnoodramp 1953-1993</em>. Meulenhoff Boekerij.</td>
</tr>
</tbody>
</table>
### APPENDIX C – Overview of sources used for the development of the narrative scenario

<table>
<thead>
<tr>
<th>Data types</th>
<th>Amount, location, examples</th>
<th>Use in scenario development</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interviews</strong> with eyewitnesses and experts about the 1953 disaster and the risk of future floods</td>
<td>15 videos. Examples: • 5 eyewitness interviews • 10 other videos focused on the 1953 disaster and/or more generally on future possible floods. All interviews and videos were publicly available from sources: <a href="http://www.overstroomik.nl">www.overstroomik.nl</a> (last accessed in August 2020) and <a href="https://watersnoodmuseum.nl/verhalen">https://watersnoodmuseum.nl/verhalen</a> (last accessed in August 2022)</td>
<td>Provided insight into lived experiences of a similar flood disaster as our selected extreme scenario. Informed the write-up of the final narrative.</td>
</tr>
<tr>
<td><strong>National and municipal websites</strong> focused on informing the public about flood prevention and recovery (including the 1953 disaster)</td>
<td>8 websites. Examples: Crisis.nl. Information from the Dutch government in the event of disasters, emergencies and emergencies. Accessible at <a href="https://crisis.nl">https://crisis.nl</a> (last accessed in August 2022) Helpdesk Water. Website designed to answer questions from people professionally involved in water policy, water management and water safety related issues in the Netherlands. Accessible at <a href="https://www.helpdeskwater.nl/secundaire-navigatie/english/">https://www.helpdeskwater.nl/secundaire-navigatie/english/</a> (last accessed in August 2022) Overstroomik.nl (public awareness website designed by authorities to increase awareness about flood risk). Accessible at <a href="https://overstroomik.nl/">https://overstroomik.nl/</a> (last accessed in August 2020)</td>
<td>Enriched our understanding of likely first-reactions in the event of a sudden large-scale flood. Helped us to add more realistic details to the write-up of the final narrative.</td>
</tr>
<tr>
<td><strong>Reports, articles and databases</strong> about the economies and businesses of Amsterdam and Rotterdam</td>
<td>Approximately 15. Examples:</td>
<td>Helped verify, further understand and articulate core differences between the two cities selected for our scenario and connect those differences to our initial theoretical framework.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Naturalistic observations</strong></th>
<th></th>
<th>Served to validate assumptions about the general (low) level of awareness among many business actors concerning flood risk, and enriched our understanding of how a potential disaster could unfold.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Extended period of time spent in the Randstad region in the Netherlands, including vulnerable areas in the focal cities.</td>
<td>• Visits to relevant part of the Delta Works, such as the dams and locks in Rotterdam and in the province of Zeeland.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Notes from joint meetings</strong></th>
<th>Approximately 25 double spaced pages of text</th>
<th>Captured emerging insights from discussing the topic of flood prevention, and eventually: from discussing and revising the chosen main scenario.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximately 10 pages of drawings</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Commentaries and feature articles</strong> about the risk of future floods in the Netherlands</th>
<th>Approximately 25. Examples:</th>
<th>Enriched and validated the chosen scenario and its relevance.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Case studies</strong> of prior disasters in various locations (based on academic articles and Notes)</th>
<th>Approximately 15. Examples:</th>
<th>Enriched and validated the chosen scenario, including its revelatory potential and the plausible reactions of firms.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain</td>
<td>Example</td>
<td>Source</td>
</tr>
<tr>
<td>--------</td>
<td>---------</td>
<td>--------</td>
</tr>
</tbody>
</table>
APPENDIX D – A dystopian climate disaster scenario from the Netherlands

- Depending on the estimate, between 1/3 and 1/4 of the Netherlands lies below sea level, with the lowest point being 22 feet (6.7 meters). This makes the country highly vulnerable to flooding.
- The Randstad is the central economic area of the Netherlands and includes, among others, the cities of Amsterdam, Rotterdam, The Hague and Utrecht. The so-called Dike Ring 14 protects the area from flooding.
- A breach of Dike ring 14 is currently considered highly unlikely but potentially devastating. According to public reports and experts, a breach is plausible under rare circumstances such as an extremely strong northwestern storm and high water levels.
- In 1953, the North Sea Flood hit the Netherlands under conditions of a strong northwestern storm and high spring tide. Since then, massive investments have been made into the Delta Works – the now world-famous system of sluices, dams, dikes, locks, levees and storm surge barriers protecting the country from the sea.
- Since the 1970s, a change of mentality in flood protection has taken place in the Netherlands: from fighting the water to living with the water. Continued investment in flood protection is considered technically feasible and economically desirable, although debates continue about the allocation of funds to flood-prone versus higher-lying areas.
- Climate change will require continued investment into the Delta Works. At the same time, climate change can make it more demanding to estimate the probabilities of disasters (for instance, due to an increase in extreme weather conditions in combination with sea level rise due to warming of the oceans).
- The potential impact of a dike breach is very large: It has been estimated that around three million people can be affected and that almost the whole of Randstad can become flooded if Dike Ring 14 breaches. Damage recovery has been estimated to take several years.

The map shows the Netherlands. The darker colored areas on the map are areas considered most prone to flooding in a low-probability but high impact flood scenario. The Randstad region, which includes Amsterdam and Rotterdam (marked on the map), largely overlaps with the flood defense mechanism called Dike ring 14. In the event of a defense system collapse, it has been estimated that the water can rise up to 8 meters in parts of these cities.

Illustration source: Authors’ elaboration based on data from Risicokaart.nl, Rijkswaterstat, and https://commons.wikimedia.org/wiki/File:Netherlands_location_map.svg. For content sources, see Appendix C.