



# **Coping with Technological Disasters Appendix J:**

## **Curated Bibliography on Human Dimensions of Disasters**

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*Updated 2020*

This appendix provides an overview of relevant literature and web resources.

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# Introduction

There have been numerous developments and advancements in the study of human dimensions of technological disasters in recent decades. This appendix provides an overview of relevant literature and web resources. We present the information in three sections.

First, we provide an overview of recent literature on hazards and disasters in general and technological disasters in particular. The latter includes literature on natech disasters (natural hazard events causing technological failures and/or release of hazardous materials), climate change, and contaminated communities.

Next, we examine recent literature on oil spills with a focus on literature and resources related to the 2010 BP Deepwater Horizon oil spill (DHOS). We also present recent literature on post-DHOS policy and practice recommendations, as well as literature on the Exxon Valdez oil spill and the Selendang Ayu shipwreck and fuel spill.

The final section presents literature and resources related to mental health and disasters. In addition to examining summary literature on measures of mental health and factors associated with adverse mental health issues, we address mental health issues related to first responders—an area of particular concern in regards to healthcare and other frontline workers responding to the COVID-19 pandemic.

Each of the following three sections follows the same format. The sections begin with a narrative briefly explaining what is included in the sources of information being provided. Those explanations reference different combinations of the title, author, and publication year of the document being described. Each section includes a list of internet sources. Finally, at the end of each section there is a list of all the references discussed in the leading explanatory narrative.

# Literature on Human Dimensions of Technological Hazards & Disasters—2005-2020

A good starting point for a contemporary update on hazards and disasters in general is the second edition of the *Handbook of Disaster Research* (Rodriguez, Donner, and Trainor 2018). The book includes chapters related to definitions of disaster, resilience and disaster, terrorism, climate change and disaster, disaster vulnerability, gender and disaster, children and disaster, social media and disaster, as well as sections on research methods and disaster management. Tierney's 2019 book, *Disasters: A Sociological Approach* offers a more 'textbook-oriented' presentation of current thinking on disasters. Additionally, Tierney's 2014 book, *The Social Roots of Risk: Producing Disasters, Promoting Resilience* provides a solid perspective on how risks and disasters are woven into the fabric of societies and communities.

Vulnerability and resilience have become prominent features of hazard and disaster research and public policy. Cutter (2003, 2016a, 2016b) is a leading scholar in this area having created a Social Vulnerability Index (SoVI) that provides data on vulnerability and resilience at the census-block level throughout the U.S. (see Cutter, Ash, and Emrich 2014, Cutter, Boruff, and Shirley 2003). Miller, Johnson, and Dobson (2016) provide techniques for measuring vulnerability and resilience at the county/parish level of analysis. The National Academies of Sciences, Engineering, and Medicine (2019) has published the most recent and forward-thinking report on disaster resilience and the National Institute of Standards and Technology (2016) produced a community resilience planning guide. Both of these efforts use a community capitals framework to address issues of resilience (see Flora, Flora, and Gasteyer 2019).

Gill and Ritchie (2018) provide an overview of foundations and advancements in technological hazard and disaster scholarship. They provide a contextual history of the emergence of a differentiation between natural and human-caused hazard events and disasters and examines case studies such as the Buffalo Creek dam collapse and flood, toxic contamination at Love Canal, the nuclear accident at Three Mile Island, and the *Exxon Valdez* oil spill. They discuss natech hazards and disasters—natural hazard events causing technological failures and/or release of hazardous materials. The natech framework has been applied to Hurricane Katrina, an event that resulted in the release of more than 8 million gallons of oil and a toxic gumbo of floodwaters in New Orleans (Picou 2009). The 2011 Tohoku earthquake and tsunami that led to the Fukushima Daiichi nuclear disaster in Japan provides another example of a natech disaster (Perrow 2011). Slack and colleagues (2020) analyze Hurricane Harvey as a natech disaster in the Houston area.

An emerging area of scholarship is the relationship between climate change and hazards and disasters. Crutzen and Stoermer (2000) provide a foundational perspective for understanding the seriousness of the challenge of human-induced climate change. Following up on the IPCC Special Report on Global Warming, Djalante (2019) provides an update on climate change and disaster risk management with a focus on risks from coastal flooding, heat-related health impacts, sea level rise, and forest fires, as well as ways to strengthen risk management.

Hayes, Blashki, Wiseman, Burke, and Reifels (2018) provide an overview of the current and projected climate change risks and impacts to mental health and provide recommendations for priority actions to address the mental health consequences of climate change. Islam and Kieu

(2020) examine issues of food insecurity associated with climate change. Berry, Bowen, and Kjellstrom (2010) identify pathways climate change can affect mental health and propose an explanatory framework to guide public health policy, practice and research. Berry and colleagues (2018) outline current thinking about climate change and mental health and discuss crucial limitations in modern epidemiology. They advocate a systems approach, complemented by a new style of research thinking and leadership. Cunsolo and Ellis (2018) argue that grief is a natural and legitimate response to ecological loss, and one that may become more common as climate impacts worsen.

Most of the prominent work on contaminated communities in the U.S. focuses on Flint, Michigan, and the lead contamination of its water supply and infrastructure (ATSDR 2016; Flint Water Advisory Task Force 2016; Pauli 2020). This ongoing crisis has yielded research from an environmental justice perspective (Butler, Scammell, and Benson 2016; Lee et al 2016; Mohai 2016, 2018; Morekel and Terzano 2019). Healy and Bernstein (2016) cover interventions to address mental health impacts of the crisis. Another case involves the 2008 TVA coal ash spill in Tennessee (Ritchie, Little, and Campbell 2018). Ritchie, Gill, and Long (2019) found that a high levels of community involvement were associated with higher levels of avoidance behaviors (i.e., psychosocial stress). These counter-intuitive findings related to community involvement and chronic stress-response avoidance behaviors can inform community mental health needs following technological disasters.

## Internet Resources

Several websites provide useful information on hazards, risks, and disasters in general. They include the following:

Natural Hazards Center, University of Colorado:

<https://hazards.colorado.edu/>

Disaster Research Center, University of Delaware

<https://www.drc.udel.edu/>

Federal Emergency Management Agency (FEMA)

<https://www.fema.gov/whole-community>

Hazard Reduction and Recovery Center, Texas A&M University

<https://hrrc.arch.tamu.edu/>

Hazards & Vulnerability Research Center

<http://artsandsciences.sc.edu/geog/hvri/front-page>

Coastal Resilience Research Center, University of North Carolina

<https://coastalresiliencecenter.unc.edu/>

Center for Hazards Assessment, Response & Technology, University of New Orleans

<https://www.uno.edu/chart>

National Center for Disaster Preparedness, Columbia University

<https://ncdp.columbia.edu/>

National Institute for Environmental Health Sciences

<https://www.niehs.nih.gov/research/clinical/studies/gulf/index.cfm>

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# Literature on Human Dimensions of Oil Spills—2005-2020

The 2010 BP Deepwater Horizon oil spill (DHOS) is the focus of the majority of studies in this category. As noted by Ritchie, Gill, and Picou (2011), there are striking similarities in human impacts of the DHOS and the Exxon Valdez oil spill (EVOS). However, there are also unique aspects of DHOS largely driven by complexities created by easy geographic access, health concerns, a larger population, involvement of multiple federal, state, and local jurisdictions, and the impacts of recent disasters such as Hurricane Katrina. Among the many books published in the wake of the DHOS, Freudenburg and Gramling (2011) offer a compelling “narrative of failures, missteps, and bad decisions, explaining why this oil spill was a disaster waiting to happen.”

The BP disaster provided an opportunity to develop and apply a peer listener training program across highly impacted communities in areas of the Gulf of Mexico long affected by oil industry operations (Nicholls et al. 2015, Picou 2011). This program evolved beyond the response phase of disaster management to include recovery from the DHOS and preparedness for a broad array of hazard events endemic to the region.

As expected from previous natural and technological disaster research, the immediate aftermath of the blowout and spill produced psychosocial stress and caused mental health problems throughout the region. Siegal (2010) and Gratten and colleagues (2011) describe emerging psychosocial problems being experienced by residents along affected coastal areas. In their study of residents in southeastern Louisiana, Osofsky and colleagues (2011) found that “disruption to participant lives, work, family, and social engagement” had the greatest effect on mental health in terms of increased symptoms of anxiety, depression, and posttraumatic stress. In addition, they noted cumulative adverse mental health impacts among those who had also experienced Hurricane Katrina in 2005.

The Public Policy Research Laboratory at Louisiana State University conducted a Community Oil Spill Study (COSS). The COSS consisted of five waves of cross-sectional trend data beginning in June 2010, with following waves in October 2010, April 2011, April 2012, and April 2013 (Cope et al. 2020). Households located in Lafourche Parish, Plaquemines Parish, Terrebonne Parish, and the community of Grand Isle were randomly selected to participate in the study. The dataset includes measures of community sentiment; social ties; mental and physical health; blame and distrust; financial situation; employment in industries affected by the oil spill; and demographic variables. Lee and Blanchard (2012) published from the first wave of the COSS and found that community attachment is associated with higher levels of psychosocial stress, suggesting that strong attachments in renewable resource communities initially lead to greater disruption during a technological disaster. From June 2010 to October 2010, levels of psychosocial stress significantly increased, particularly among fishers, and high levels of community attachment continued to be a predictor of greater stress (Cope, Slack, Blanchard, and Lee 2013). An analysis of COSS data through 2013 focused on issues of recreancy and blame (Cope, Slack, Blanchard, and Lee 2016). They found that respondents viewed BP and the Federal government with high levels of blame and distrust at first, but these views diminished over time. Blame and trust in state government increased over time. Feelings of blame and distrust are highest among fishing households. Cope and Slack (2017) examined

the relationship between ‘emplaced social vulnerability’ and mental health impacts by combining COSS and US Census Bureau data. Adverse mental health impacts were more likely to increase over time in areas that have high levels of community sentiment and natural resource employment, the latter providing new insights into vulnerability as a multidimensional concept shaped by social attributes that characterize people and places. Parks, Drakeford, Cope, and Slack (2018) examined social disruption by analyzing the degree to which residents of spill affected communities were prevented from undertaking routine behaviors over time. Those with ties to the fishing industry reported significantly higher levels of disruption across all waves, but disruption among all groups steadily decreased from 2010 to 2013. Findings also show that community sentiment promotes resilience by buffering social disruption. Most recently, Cope, Slack, Jackson, and Parks (2020) employed systemic and corrosive community frameworks to examine community sentiment over four waves of data. They found that compared to 2010, community sentiment became significantly greater over time. Understanding community sentiment has potential to contribute to advancing overall community resilience to technological disasters.

Analysis of EVOS and DHOS revealed similarly high levels of psychological stress for survivors of both disasters. A research team from Oklahoma State University, the University of Colorado’s Natural Hazard Center, and the University of South Alabama collected three waves of telephone survey data in coastal Alabama. Conducted in September 2010, the first wave focused on south Mobile County—Alabama’s ‘Seafood Capital’. A 2011 survey expanded to include south Baldwin County—Alabama’s beach and tourism destination. A 2013 survey of residents from both areas focused on compensation and litigation processes. The first two waves collected psychosocial stress data comparable to that obtained from a random sample of residents of Cordova, Alaska, after the Exxon Valdez disaster. Gill, Ritchie, and Picou (2012) compared the social and mental health impacts of the EVOS and DHOS drawing on data collected five months after each respective event. Using the Impact of Event Scale (IES) in surveys of both samples, analysis revealed similarly high levels of initial psychosocial stress for survivors of both disasters. Among the Alabama sample, the strongest predictors of stress were family health concerns, commercial ties to renewable resources, concern about economic future, economic loss, and exposure to the oil. Gill and colleagues (2014) compared survey results from Cordova residents collected 18 months after the Exxon spill with those of residents in the Alabama coastal counties of south Baldwin and south Mobile one year after the BP disaster. For residents of coastal Alabama, the strongest predictors of psychosocial stress were exposure to oil, ties to renewable resources, concerns about economic future, worries about air quality, and safety issues regarding seafood harvests in oiled areas. Ritchie, Gill, and Long (2018) examined secondary trauma associated with processes intended to provide compensation and economic relief from technological disasters and the extent to which protracted compensation processes exacerbate adverse psychosocial impacts and hinder community recovery. Specifically they examined involvement with claims, settlement, and litigation activities; vulnerability and exposure to the spill; ties to resources; resource loss and gain; perceptions of risk and recreancy; and intrusive stress and avoidance behaviors as measured by the impact of event scale. Analysis revealed that the strongest contributors to intrusive stress were being part of the compensation process; resource loss; concerns about air quality; and income. Beliefs that the compensation process was as distressing as the oil spill significantly contributed to intrusive stress and avoidance behaviors.

Another line of research on the BP disaster focuses on the physical and mental health of children and families. Abramson and colleagues (2010) conducted a telephone survey of 1,203 adult residents of Louisiana and Mississippi who live within approximately ten miles of the Gulf Coast. The survey focused on exposure, effects on children, post-event decision-making, and trust in health information. Among their findings: four out of ten had experienced some direct exposure to the oil spill; more than 33% of parents reported that their children had experienced either physical symptoms or mental health distress due to spill; 20% lost income; and 25% believed they would have to relocate. Those earning less than \$25,000 annual household income were most likely to experience these adverse oil spill impacts. Osofsky and colleagues (2014) evaluated pre-oil spill and post-oil spill measures of posttraumatic stress disorder symptoms from a sample of 1,577 youth (aged 3-18 years). Spill-related stressors were associated with PTSD symptoms and youth who had also experienced Hurricane Katrina had the most elevated post-oil spill PTSD symptoms. A second study by Osofsky and colleagues employed a multi-wave longitudinal design to follow 4,619 youth who were evaluated for PTSD symptoms, hurricane exposure, and oil spill exposure/stress at four time points over a period of 4 years. Over this time-period, 52% displayed stable to low symptoms; 20% showed steep declines after initial symptoms; 18% exhibited increasing symptoms; and 9% showed stable to high symptoms. Analysis revealed effects of oil spill stress and hurricane exposure on symptom levels and trajectories of exposed youth. Rung and colleagues (2017) investigated relationships between social ties and depression related to the DHOS. D'Andrea, and Kesava (2013) reported results of health studies of clean-up workers.

Other studies of long-term human health impacts of the BP DHOS include the WaTCH study (Peters et al 2017; Rung et al 2016) and research conducted by Kwok and colleagues (2019) and Lichtveld and colleagues (2016). Eklund and colleagues (2019) summarized results on health studies funded by The Gulf of Mexico Research Initiative (GoMRI)—established in 2010 to support research on the disaster and recovery. Primary findings from more than 32 peer-reviewed papers published between 2011 and May 2019 focus on dispersants and human health concerns, harmful algal blooms and associated human pathogens, and vulnerabilities of individuals and communities reliant on renewable resources.

There are other noteworthy BP DHOS research publications. Colten, Hay, and Giancarlo (2012) examine “inherent resilience” practices used by renewable resource communities along Louisiana’s coast to cope with oil spills. They compare local inherent resilience to formal government and corporate resilience plans to increase understanding of different forms of inherent resilience capacity; community capabilities and practices to survive with minimal external assistance; and the degree of integration of inherent resilience into formal contingency plans. Safford, Ulrich and Hamilton (2012) study long-standing questions about energy exploration and its social and environmental implications highlighted by the BP disaster, particularly social impacts and dissatisfaction with government and industry responses. Analysis of survey data revealed that direct personal impacts and compensation strongly influenced evaluations of responding organizations, as did age, place of residence, levels of confidence in television news and BP as sources of information. Walker, Pavia, Bostrom, Leschine, and Starbird (2015) examined persistent risk communication problems around oil spill response and dispersant use, with a focus on the BP DHOS. They identified institutional and operational factors that inhibit communities and stakeholder group engagement during oil spill preparedness and response, the removal of which would advance

risk management. They suggest five risk management practices to improve risk communications during oil spill preparedness and response activities. Sandifer and Walker (2018) review literature on disasters, resilience, and disaster-associated stress in the post-DHOS era. They provide recommendations for improving post-disaster mental and physical health programs, collecting pre- and post-disaster health-related data, and creating community engagement opportunities to strengthen public health preparedness and responses (see also Bostrom et al 2015).

There have been some recent publications on the Exxon Valdez disaster. In a 2009 chapter, Palinkas provides a concise overview of psychosocial research conducted by Impact Assessment, Inc., Picou and colleagues, and the Valdez Counseling Center. Palinkas (2012) draws upon research conducted after the EVOS to develop a conceptual framework for understanding and responding to psychosocial impacts of oil spills. The framework incorporates corrosive community, risk and resilience, cognitive activation concepts with biopsychosocial impacts (see also Palinkas 2015). Hobfoll (2012) elaborates how COR (conservation of resources) theory contributes to this conceptual framework (see also Osofsky, Osofsky, and Hansel 2012). Gill, Ritchie, and Picou (2016) provide an overview of 24 years of social science research on sociocultural and psychosocial impacts of the Exxon Valdez oil spill (EVOS) on the community of Cordova, Alaska. They document theories and methods used and developed throughout their study to examine: event-related psychosocial stress; litigation impacts; resource loss; and beliefs about recreancy. Their findings documented acute and chronic psychosocial stress within the community and identified involvement in litigation, resource loss, and perceptions of recreancy as significant contributors to high levels of stress (see also Ritchie 2012; Ritchie Gill and Farnham 2014).

Another noteworthy event drawing the attention of researchers was the 2004 Selendang Ayu shipwreck and fuel oil spill off Unalaska Island in Alaska's Aleutian chain (Kurtz 2008). Ritchie and Gill (2008) examined risk perceptions within the community and how social and cultural processes mediated these risks. Risks from the shipwreck and oil spill were contextualized within the existing high-risk nature of the community and contemporary events such as the 2004 Indian Ocean tsunami. Results identifies threats to the seafood industry, Alaska Native subsistence culture, and ontological security as the most salient risks and the general perception was that it is only a matter of time before another, more damaging accident occurs.

## Internet Resources

Several websites provide useful information on oil spills, particularly those related to the BP Deepwater Horizon oil spill. They include the following:

Mississippi Alabama Sea Grant Consortium

<http://masgc.org/about>

<http://masgc.org/news/article/being-human-understanding-our-anxieties-responses-in-the-face-of-disasters>

<http://masgc.org/news/article/team-reads-writes-travels-to-answer-your-oil-spill-questions>

<http://masgc.org/news/article/healthy-and-resilient-communities-lessons-learned-from-the-deepwater-horizo>

<http://masgc.org/publications/category/resilience-indices>

[http://masgc.org/assets/uploads/publications/865/oil\\_spill\\_outreach\\_one-pager\\_final\\_2.pdf](http://masgc.org/assets/uploads/publications/865/oil_spill_outreach_one-pager_final_2.pdf)

National Academies of Sciences, Engineering, and Medicine Gulf Research Program

<https://www.nationalacademies.org/gulf/gulf-research-program>

Consortium for Resilient Gulf Communities

<http://www.resilientgulf.org/resilience-resources/health-literature-review-searchable-database/>

The Lowlander Center

<https://www.lowlandercenter.org/>

Gulf of Mexico Research Initiative

<https://gulfresearchinitiative.org/>

Louisiana State University Community Oil Spill Survey

<https://www.sciencedirect.com/science/article/pii/S2352340920302845>

<https://www.lsu.edu/fweil/Surveys/HealthandResilience-OilSpill2010-11.pdf>

<https://www.sciencedirect.com/science/article/pii/S2352340920302845>

<https://www.lsu.edu/research/news/2020/0421-deepwaterhorizonlessons.php>

Coastal Response Research Center and Center for Spills and Environmental Hazards, U of New Hampshire

<https://crrc.unh.edu/>

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# Literature on Mental Health and Psychosocial Stress—2005-2020

Literature reviewed in this section focuses on scholarship that summarizes research on various measurements of psychosocial stress, as well as research identifying factors associated with these adverse impacts.

Meta-analysis scholarship conducted on measurements of PTSD include articles by Bradley and colleagues (2005), Boals and Hathaway (2010), and Neria and Galea (2008). Bromet and colleagues (2017) have published a more recent meta-analysis of PTSD and disasters. Norris and colleagues (2008) situate mental health within community resilience and offer strategies for improving disaster preparedness. Marsella (2010) reminds us of cultural differences in applying metrics of PTSD.

Scholarship on factors associated with mental health outcomes includes those focused on gender (Boe et al. 2010; Bowler et al. 2017; Chung et al. 2008), social support (Kaniasty et al. 2011), and cumulative/long-term impacts (Liddell et al. 2019; Garfin et al. 2018).

Although not situated in the U.S., there is a rich body of scholarship on a 2000 fireworks disaster in Enschede, Netherlands (van der Velden, Yzermans, and Grievink 2008). Research includes documentation of physical and mental health shortly after the disaster (van Kamp et al. 2005) as well as data from longitudinal studies of persistence of adverse mental health impacts and factors that underlie them (van den berg et al. 2012; van der Velden et al. 2013).

Another important publication from the Enschede disaster research focuses on mental and physical health reactions of firefighters (van der Veldon et al. 2006). This relates to a growing body of literature on mental health issues of first responders such as police officers, firefighters, emergency medical technicians, trauma medical care professionals, and mental health counselors. Umeda and colleagues (2020) examined research papers, agency reports, the manuals of aid organizations, and educational materials. Extracted actions to potentially protect and improve the mental health of disaster responders include: during the pre-activity phase, enabling responders to anticipate stressful situations at a disaster site and preparing them to monitor their stress level; during the activity phase, engaging in preventive measures against on-site stress; using external professional support when the level of stress is excessive; and after the disaster response, getting back to routines, sharing of experiences, and long-term follow-up. Likewise, Guilaran and colleagues (2018) provide evidence for the importance of social support in ameliorating adverse psychological effects among disaster responders (see also Hyman 2004).

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