



SOCIETAL DIMENSIONS OF EARTHQUAKES AND OTHER DISASTERS: FINDINGS IN SEARCH OF THEORY

Kathleen Tierney¹

ABSTRACT

Unlike physical scientists and engineers, social scientists tend not to specialize in particular types of disasters. For this reason, social scientific research findings on earthquake hazards and disasters cannot be assessed in isolation from research findings on other types of hazards and risks. Social scientific disciplines have been highly successful in developing and testing middle-range theories concerning hazards, disasters, and risk. However, advances have come at the expense of more comprehensive theorizing, hampering the development of an integrated theory of disaster vulnerability, impacts, and outcomes. Advances in vulnerability science and resilience studies have furthered the state of the art. The application of world system theory at a global scale and socio-political ecology theory at national, regional, and local scales can result in further advancement and integration across space, time, and hazard types.

Introduction

Unlike physical scientists and engineers, social scientists tend not to specialize in particular types of disasters. Instead, they focus more generally on societal factors associated with mitigating, preparing for, responding to, and recovering from a variety of potential and actual hazard-related events. In addition to ensuring that social scientists have more events to study, this approach also makes it possible to develop insights about hazard- and disaster-related behavior that are not hazard-specific. Findings derived from the study of particular types of hazards and disasters can also be tested across different kinds of events. For example, models developed from research on how the public responds to warning information for hurricanes and severe storms can be applied in research on public responses to earthquake aftershock warnings (Mileti and O'Brien 1992) and even to building occupants' behavior in response to a terrorist attack (Averill et al. 2005). Research conducted across hazard types indicates that the socioeconomic and experiential factors that predict household preparedness for earthquakes are essentially the same as those that predict preparedness for disasters more generally (Tierney, Lindell and Perry 2001). This is not to argue that hazard type does not matter. Hazard parameters such as familiarity, the possibility of warning, whether a hazard agent causes single or multiple impacts have been seen as important since the inception systematic social science research on disasters (see for example Dynes 1970). Rather, social scientists treat hazard parameters as one among many sets of factors that account for hazard-related human behavior.

¹ Professor, Dept. of Sociology and Institute of Behavioral Science, University of Colorado, Boulder, CO 80309-0482

What social scientists know about moral hazard, for example, applies equally to development in flood plains, hurricane-prone coastal zones, and areas of seismic risk. The extensive literature on risk perception and cognitive heuristics for low-probability/ high-consequence is relevant whether the peril in question is a major earthquake or a terrorist attack. High confidence can be placed in many social scientific findings on hazards and disasters precisely because they have been shown to be robust across a wide range of different hazards.

This long record of systematic social scientific research has generated and tested a variety of theoretical models of hazard- and disaster-related behavior. These models can best be characterized as middle-range theories (Merton 1949) or explanations of social phenomena that are more abstract than inductive generalizations from data and more concrete than general, or “grand” theory. Like other theories of the middle range, theories of disaster-related behavior are useful in various ways: they offer well-grounded explanations of a range of social and behavioral phenomena associated hazards and disasters, suggest areas for further investigation, and offer insights for practical application.

At the same time, current social science theories and concepts on key issues related to disasters are in many ways unsatisfactory. Social behavior is highly context-specific, but social science studies on earthquakes and other disasters place relatively little emphasis on the societal and historical context in which disasters occur. With certain notable exceptions, research on hazards and disasters is poorly linked to broader theoretical concerns within the disciplines in which studies are conducted. Even more problematic is that research on earthquakes and other disasters currently lacks an overarching or unifying theory of society that can lend both validity and relevance to disparate findings. In the sections that follow, I discuss ways that situation can be remedied.

Social Science Without Society? Trends in Social Science Research on Disasters

Early Research on the Sociobehavioral Aspects of Disasters

Social science research on earthquakes and other disasters originated in practical rather than theoretical concerns. Disaster research began in the early 1950s as a sociological sub-discipline that was funded by government agencies seeking answers to specific types of questions, such as whether populations experiencing nuclear attacks would panic or become demoralized in the face of an enemy (read Soviet) attack and whether those under attack would retain sufficient mental composure that they could work with government to reconstitute society.² The entities that initially provided funding for disaster research were also interested in whether sub-federal agencies such as state and local civil defense organizations and public safety agencies would be able to continue to function after a nuclear war and in related questions, such as whether personnel in such agencies could be counted on to remain at their posts under extreme duress. The general interest in this early work was on what might be termed “mass

² Early studies on disasters were funded by such defense-related agencies as the Office of Civil Defense, the Air Force Office of Scientific Research, the Army Chemical Medical Center, the Defense Civil Preparedness Agency, and the Advanced Research Projects Agency (later renamed the Defense Advanced Research Projects Agency—DARPA). E. L. Quarantelli (1987) was the first disaster scholar to detail this early history and to draw conclusions about the manner in which funding sources and their concerns influenced disaster research.

behavior” under conditions of extreme stress; put another way, the emphasis was on common or modal patterns of behavior and not on the reactions of different subgroups within the population, such as women and men, the elderly and children, and different social classes and racial and ethnic groups.

In addition to emphasizing common disaster responses, early disaster research was guided theoretically by structural functionalism or systems theory, which was the dominant theoretical perspective at the time. According to this theoretical approach, communities and societies can be characterized as systems that are organized around essential functions such as socialization, education, and providing for the economic well-being of members. Disaster agents like earthquakes, which originate in the environment, can impinge upon and disrupt these social systems, preventing them from performing all or some of their functions. Under such conditions, affected systems must adapt through various means. Disaster recovery occurs when disrupted systems are restored.

As I discuss elsewhere (Tierney 2007), traditional disaster research and the systems approach left significant lacunae in the social science knowledge base. For example, early research placed little emphasis on the ways in which particular groups within populations may have been differentially affected by disasters. In overcoming disaster myths such as the myth of panic, studies overemphasized the extent to which disasters result in the emergence of altruistic and therapeutic communities and under-emphasized both the disparate treatment of different community sub-groups in disasters and the deep-seated conflicts and power relationships disasters can expose. Equally important, because it characterized disaster as originating outside of the social order, in the environment, classic disaster research ignored the ways in which communities and societies themselves contribute to disaster losses.

Functionalism and systems theory came under sharp criticism during the 1960s decade, as social conflict theories that had been forced into the background during the anti-communist/anti-Marxist hysteria of the previous decade were once again viewed as offering important insights into the nature of the social order, and as grand theories proved to have limited utility for understanding social life. Interestingly, however, disaster research continued to embrace systems theory, at least implicitly, and it remained largely impervious to subsequent theoretical developments in the social sciences. Still, solid empirical findings concerning disaster-related behavior continued to accumulate. While functionalism eventually lost its currency within the field, no new theoretical consensus emerged. As a consequence, the current state of the art is something of a paradox, in that the field has generated multiple middle-range theories of hazard- and disaster-related social behavior *without a corresponding theory of society and social organization*. The discussion turns next to research developments that provide the key elements for such a theory.

Urban Disasters and Social Inequality

The functionalist legacy of classic disaster research began to break down as a consequence of a growing body of research that highlighted disparities in disaster experiences and outcomes, particularly research on urban disasters. Beginning in the late 1970s and early 1980s, studies on topics such as evacuation and emergency sheltering brought to light behavioral

patterns that were in turn related to axes of inequality and diversity such as race, ethnicity, social class, and household composition. Other studies pointed to race and ethnicity as factors affecting disaster recovery processes and outcomes (Bolin and Bolton 1986) and looked at other dimensions of diversity, such as disability (Tierney, Petak and Hahn 1986), as factors affecting disaster vulnerability and victims' experiences. In the 1970s, studies on societal responses to the earthquake threat in Southern California (Turner, Nigg, and Heller Paz 1986) also emphasized the role of class, race, and gender and other social factors in predicting risk perception, preparedness, and other disaster-related behaviors. Other research pointed to the significance of axes of inequality and diversity for psychosocial and mental health outcomes following disasters (Norris et al. 2002a, 2002b).

Both disaster events and broader disciplinary trends brought about a further evolution of disaster scholarship in the 1990s. In many respects, the 1989 Loma Prieta earthquake was a watershed for disaster scholarship, for several reasons. Loma Prieta was a large earthquake that created significant impacts in many parts of the San Francisco Bay Region, affecting a highly diverse population residing in diverse communities ranging from the large cities of San Francisco and Oakland, to well-off enclaves, to smaller communities such as Santa Cruz and Watsonville, both of which were close to the earthquake's epicenter and heavily damaged. Additionally, because of the scope and severity of the earthquake's impacts, agencies such as NSF and USGS made special funding available for social science research in the affected region—funding that enabled social science researchers to conduct in-depth studies.

Loma Prieta vividly demonstrated the ways in which disasters affect large heterogeneous urban areas, as well as how disasters interact with ongoing problems such as homelessness and the lack of affordable housing in urban areas in ways that affect vulnerable groups. The communities that were damaged and disrupted in Loma Prieta were natural laboratories that enabled researchers to examine the influence of pre-disaster vulnerability, social diversity, and community context, both in terms of the distinctiveness of place as experienced by groups within the impact region and in terms of the importance of historical trends affecting people and places. For example, researchers documented the ways in which Loma Prieta affected Latino workers in Santa Cruz County and immigrants in general, as well as the ways in which the official disaster assistance system failed vulnerable populations in the aftermath of the disaster (Phillips 1993; 1998; Bolin and Stanford 1990).

Like Loma Prieta, Hurricane Andrew struck a highly diverse group of communities and brought to the fore issues of differential vulnerability associated with race, class, and ethnicity. Research on the hurricane also led to a more serious consideration of gender as a factor in differential disaster impacts and recovery. Gender issues were subsequently discussed extensively in *Hurricane Andrew: Ethnicity, Gender and the Sociology of Disaster* (Peacock, Morrow, and Gladwin 1997) and *The Gendered Terrain of Disasters: Through Women's Eyes* (Enarson and Morrow 1998).

The Northridge earthquake caused significant mortality, morbidity, property damage, and social dislocation in dozens of communities throughout the Greater Los Angeles region. Like Loma Prieta, Northridge stimulated federal agencies to increase funding for research in various disciplinary areas, including the social sciences. Research on the earthquake added additional

depth to a developing narrative on social disparities in disaster impacts, response, and recovery, as illustrated in research by sociologist Robert Bolin and his collaborators, including *The Northridge Earthquake: Vulnerability and Disaster* (Bolin and Stanford 1998). That study set out a theory of social vulnerability rooted in a political economy perspective that differed dramatically from the classic social science perspective on disasters. The substance of the book focused on the ways in which diverse communities and community residents, stricken by the same disaster, experienced that disaster differently, depending on the extent to which the communities were integrated into the larger-scale economic and power dynamics of the Southern California region. Bolin's work emphasized in a new way the importance of community, regional, and historical contexts for understanding disaster impacts, responses, and recovery.

The 1990s decade also saw the publication of *At Risk: Natural Hazards, People's Vulnerability, and Disasters* (Blaikie, Cannon, Davis, and Wisner 1994; Wisner, Blaikie, Cannon, and Davis 2004), a volume that signaled a paradigm shift from the concerns of classic disaster research to a more contextualized and process-oriented analysis of disasters and their impacts. *At Risk*, which incorporated theoretical insights articulated a decade earlier in the underappreciated volume *Interpretations of Calamity* (Hewitt 1983), characterized disasters as having their origins in social factors and processes such as poverty, livelihood loss, migration and settlement patterns, environmental degradation, political disenfranchisement, economic mismanagement, and lack of governmental capacity. According to the reasoning advanced in *At Risk*, pressures like those just mentioned, originating at global, regional, national, and local scales, build up over time, setting the stage for future disasters. Those pressures constitute the root causes of disasters, while the shocks that produce disastrous impacts are more appropriately seen as "triggering events." One implication of this formulation is that that disaster research must focus less on disaster events than on their broader and longer-term causes. *At Risk* provided a conceptual framework for the emerging field of vulnerability science, which is discussed below.

The second assessment of research on natural hazards, coordinated by Dennis Mileti of the University of Colorado during the 1990s (see Mileti, 1999 for a summary of assessment findings) centered mainly on the production of state-of-the-art summaries and syntheses of knowledge in areas such as hazards geography (Cutter 2001), land use planning (Burby 1998), hazard insurance (Kunreuther and Roth 1998), and disaster preparedness and response (Tierney, Lindell, and Perry 2001). However, as the title of the assessment's summary volume, *Disasters by Design*, indicates, Mileti also emphasized the idea that societies and communities "design" the disasters they will experience in the future through decisions they make (or fail to make) regarding the hazards they face. In choosing to ignore and downplay hazards, avoiding actions that could reduce their impacts, and denying the importance of loss-reduction measures, communities and societies set the stage for ever-larger future losses when triggering events occur, as they inevitably will.

Second assessment review and synthesis activities also focused specifically on gender as a neglected topic in disaster research. Under the auspices of the second assessment, Alice Fothergill developed comprehensive literature reviews on the role of gender across all phases of the hazards cycle, along with critiques of the ways in which the larger field ignored gender issues (Fothergill 1996; 1998). Fothergill later went on to write *Heads Above Water: Gender,*

Class and Family in the Grand Forks Flood (2004) and other publications on gender and disasters. Lori Peek, who specializes in the study of gender, age, ethnicity, and religion in disasters (see Peek 2008, Peek and Fothergill 2008) also contributed important analyses to the second assessment. Gender scholars from around the world have recently collaborated on the development of the Gender and Disasters Network, a resource for researchers and practitioners with an interest in gender issues, and several newer publications highlight gender as a significant factor in disaster victimization, disaster-related experiences, and recovery outcomes (Enarson, Fothergill, and Peak 2007; Phillips and Morrow 2008; Phillips, Thomas, Fothergill and Blinn-Pike 2010).

Emerging Perspectives: Social Conflict, Vulnerability, and Resilience

As noted above, classic social science research on disasters led to an accumulation of evidence that countered inaccurate beliefs about how disaster victims behave, such as the myth that people panic under disaster conditions. Other myths that were debunked in early research included myths about disaster-induced mental illness and anti-social behavior, such as looting. As I discuss elsewhere (Tierney, 2007), early research resulted in the development of a “good news about disaster”³ narrative that shaped subsequent disaster scholarship and had the unintended consequence of closing off systematic explorations of conflict in disaster situations. The “good news” trope notwithstanding, researchers continued to document numerous cases of conflict and unequal treatment of various groups that occurred within the context of disasters. For example, research on the Great Kanto earthquake has provided details on pogroms carried out against Koreans living in Japan, and also against socialist and anarchist groups—mass killings that began on the day the earthquake struck. Studies suggest that Japanese officials themselves were responsible for inciting and organizing the pogroms (Weiner 1989; 1994; Allen 1996; Ryang 2003). In *Rising Tide* (1997), John M. Barry describes in detail the ways in which African Americans in parts of the impact region were virtually enslaved in sandbagging operations and forcibly prevented from leaving flooded areas so that their labor could continue to be exploited after the flood. Writing on the 1906 San Francisco earthquake, Philip Fradkin presents evidence documenting extensive inter-class and inter-group conflict, including vigilante violence against poor residents; the looting of Chinatown by better-off San Franciscans; and discrimination against Chinese and Chinese-American victims (Fradkin 2005). Conflicts developed following Loma Prieta as well, as community-based organizations charged FEMA with discrimination against non-English-speaking and low-income victims of the earthquake (Bolin and Stanford 1993), and Chicanos in Santa Cruz County protested their treatment at the hands of government agencies (Simile 1995).

In 2005, Hurricane Katrina put to rest for all time the “good news” theme that had been so prominent in earlier disaster scholarship. Katrina showed unequivocally that while social bonds remain robust and compelling altruistic norms do indeed emerge in disasters, disasters do not eradicate pre-existing inter-group conflicts and may in some cases exacerbate them. Katrina provides strong evidence for the longstanding notion that inequities that are inherent in the social

³ This expression is taken from the title of an article by sociologist Verta Taylor, which appeared in *Psychology Today* Vol. 93, 1977. The “good news” was that disasters bring families closer together and can result in an increased sense of well-being among victims.

order are most evident when it is disrupted, as indicated by death tolls, patterns of damage, and differential treatment of the victims of disaster, including involuntary evacuation, destruction of affordable housing in the aftermath of the storm, and even outright murder of African American residents.⁴ Katrina was a wake-up call not only for the public but also for disaster scholars. Never again would disaster be characterized as the “great equalizer” that invariably leads to the emergence of “therapeutic communities.” Rather, Katrina became in the words of Shirley Laska (2008) “the mother of all Rorhschachs,” into which scholars can gaze over time in order to fully understand how disaster provides information about the fabric of society. By calling attention to the ways in which persistent inequities structure disaster impacts, experiences, and outcomes, research on Katrina set the agenda for subsequent social science research on disasters and prepared the field for the challenge of studying events like the 2010 Haiti and Chile earthquakes.

The past ten to fifteen years have also witnessed the development of vulnerability science as a guiding perspective in disaster research. Central to vulnerability science is the notion that disasters are produced as a consequence of the structural features and dynamics of societies and groups of societies, and that it is these phenomena that must be described, analyzed, and explained by hazards and disaster scholars. Vulnerability science has been influenced by at least four different but interrelated research traditions. The best known to disaster researchers is hazards geography, which since early work by White, Kates, and Burton, has focused on factors that contribute to the “hazardousness of place” (Burton, Kates, and White 1993; Kasperson, Kasperson, and Turner 1995; Cutter 1996; 2003). A second tradition, which is less well known among hazards scholars, is pioneering research on food insecurity, as exemplified in the work of Amartya Sen (1982), which identified differences in “entitlements” as causal factors in famine. Entitlement-oriented scholarship focuses on axes of diversity and inequality, such as social class and gender, as well as on social institutions, as factors that contribute to vulnerability. Related research on the disaster-development nexus also influenced vulnerability science by showing that disaster losses are related to the position of societies and communities within larger global and national political and economic systems (Cuny 1983; Varley 1994; Pelling 2003). Finally, and perhaps least acknowledged by the disaster research community, vulnerability science draws insights from research on the political economy of the environment and of the world system, which is discussed below.

Another notable trend is the extent to which research on earthquakes and other disasters been influenced by scholarship on resilience. In the earthquake area, the topic became a major focus for research conducted by investigators from the Multidisciplinary Center for Earthquake Engineering Research (MCEER). Initial MCEER work drew to some degree on broader theoretical and research traditions in the study of resilience. MCEER investigators were responsible for the first article on earthquake resilience to appear in *Earthquake Spectra* (Bruneau et al. 2003). That article, co-authored by a broad multidisciplinary team, defined resilience as (Bruneau et al. 2003: 735)

...the ability of social units (e.g., organizations, communities) to mitigate hazards,

⁴ On the last-mentioned point, see “Charges Filed in Katrina Inquiry,” New York Times, Feb. 24, 2010. This story focuses on murders allegedly committed by police officers and on an alleged police force conspiracy to cover up the murders.

contain the effects of disasters when they occur, and carry out recovery activities in ways that minimize social disruption and mitigate the effects of future earthquakes.

Resilience was further conceptualized as having four dimensions: *robustness, redundancy, resourcefulness, and rapidity*. MCEER has made resilience definition, measurement, and enhancement a core element in its work, and MCEER-affiliated researchers have gone on to make significant contributions to the resilience literature in various fields, including earthquake engineering, economics, and urban planning and regional science (Chang and Shinozuka 2004; Miles and Chang 2006; Tierney and Bruneau 2007; Rose 2004; 2007; McDaniels et al. 2008). Many other definitions of disaster resilience exist (for an idea of the diversity of perspectives on resilience, see Norris et al. 2008), but the central idea of the MCEER conceptualization, which sees resilience as consisting of both inherent resistance, or robustness, and the ability to adapt and adjust following disaster-induced disruption, is consistent with the general multi-disciplinary consensus.

The need to conceptualize, measure, and enhance resilience at the macro (societal), meso (institutional, community, organizational) and micro (household and individual) levels now constitutes a major focus in the study of hazards and disasters. Agencies such as NOAA, DHS, and NSF have made significant investments in research on a variety of dimensions of resilience, and the concept has proved to be a major force in generating important research insights. In many respects, resilience is a concept that spans and unifies many disciplines, making it possible for the study of hazards and disasters to glean numerous insights from other fields. This is not to say that there is a unified body of knowledge on the concepts of resilience and vulnerability. Studies on these two bodies of knowledge indicate that a separation remains between ecological and mathematical research on the concepts, on the one hand, and studies in the fields of geography, natural hazards, and climate change, on the other (Janssen, Schoon, Ke, and Borner 2006). Both vulnerability science and resilience research are multifaceted fields of inquiry that have yet to be integrated.

Regardless of disciplinary differences, the literature is clear on the point that resilience is not merely the obverse of vulnerability. The concept of vulnerability refers to the societally-created *potential* for loss. Entities can be vulnerable to the impacts of an event—death, injury, illness, financial loss, dislocation—and they can also be vulnerable to negative outcomes following an event, such as poor recovery outcomes and lasting health and mental health problems. Resilience refers to inherent and acquired capacities to resist damage and disruption and to adapt to and compensate for loss and disruption. Entities can vary in their levels of vulnerability and also in their levels of resilience. Based on extensive research, it is possible to make general statements about both vulnerability and resilience; for example, compared with better-off members of society, people who are living in poverty are more vulnerable to disaster impacts and are generally less resilient, in that they generally have fewer options and coping resources for bouncing back when they suffer losses (Fothergill and Peek 2004). However, it is important to note that both vulnerability and resilience are attributes of particular social units (societies, communities, organizations, etc.) situated in particular social and historical contexts, facing particular perils. One needs only to look at the remarkable resilience demonstrated by the Haitian people in the wake of the earthquake catastrophe to understand this fundamental point.

Hazards theory and research has begun to focus on social capital as a key factor in disaster resilience. Studies emphasize the importance of concepts such as bonding and bridging capital, as well as horizontal (within group) and vertical (from groups to centers of power) integration in strengthening the capacity to cope with disasters (National Research Council 2006; see also Dynes 2006; Koh and Cadigan 2007; Nakagawa and Shaw 2004). Disaster researchers could go further and could borrow from environmental and development research that sees various kinds of capital—social, but also political, physical, financial, and material—as contributing to the capacity for adaptation to environmental change (Ritchie and Gill 2007). Access to any and all of these forms of capital enhances resilience, while deficiencies increase vulnerability.

Regarding the concept of disaster vulnerability and the forces that shape vulnerability, geographer and risk researcher Roger Kaspersen observed nearly a decade ago that (2001: 1):

A key research issue in seeking to understand vulnerability is the need to better grasp the causal structures (or maps) of current patterns of vulnerability and how these causal structures that shape immediate attributes of risk and vulnerability are embedded in the basic processes of society, economy, and polity. As yet we have few searching explanations, much less modeling efforts, of these causal “maps.”

This statement remains true to some degree, and identifying the causal chains that produce disaster remains a significant challenge for social science research on earthquakes and other hazards. However, as I discuss below, at least the general outlines of what must be included in causal maps are now better understood.

Disasters and Society: Advancing the State of the Art

Research on earthquakes and other disasters has been event-driven for a variety of reasons. From its inception, social science disaster research has maintained an emphasis on conducting quick-response studies in the aftermath of disasters. This kind of research has been and remains important, because it provides a way of collecting otherwise perishable data on key disaster-related topics. Because of the importance of post-disaster research, agencies such as NSF and USGS have often developed funding initiatives in the aftermath of particular disasters, including the 1964 Alaska, 1971 San Fernando, 1989 Loma Prieta, 1994 Northridge, and 1995 Kobe earthquakes, as well as the 2004 Indian Ocean earthquakes and tsunamis, and most recently the 2010 Haiti catastrophe. Significant research advances have been made following these events, and also following disasters such as the September 11, 2001 terrorist attacks and numerous other disasters, including Hurricanes Andrew and Katrina. The fact that so much is currently known about the human and social dimensions of disasters can be traced directly to investments in research on a wide range of disaster events. (For more detailed discussions on the importance of post-disaster social science research and NEHRP research in general see National Research Council 2006.)

However, even as the knowledge base has expanded, the task of developing a general

theory of disaster causation, vulnerability and victimization remains unfinished. This is due in part to the field's limited focus on processes associated with the production of societal and population vulnerability to disasters. In an effort to indicate how to improve the state of the art, I turn next to a discussion of those processes.

***Disasters and the Political Economy of the World System:
Global Vulnerability Production***

Earlier I noted that vulnerability science is partially an outgrowth of development studies and investigations into the consequences of world-system dynamics. In the social sciences, outdated concepts such as “development” and “underdevelopment” have been supplanted by a more nuanced understanding of the structural features and processes associated with the modern world system. The world system has several characteristics that are relevant for disaster theory: an economy based on capitalism; political and economic policies guided by neo-liberalism, as manifested in a belief in “free markets,” privatization, and the worldwide regulation of economic activity through institutions like the International Monetary Fund and the World Bank; operation on a global scale; and marked inequality between dominant economic and political actors (such as the G-12 nations) and less-powerful nations, sometimes termed “peripheral” and “semi-peripheral” entities within the world system. The political economy of the world system (PEWS) also has a historical dimension, in that the status and well-being of countries and regions are best understood by taking into account the positions they have held in the world system over time and their distinctive historic roles in world-system politics and economics. (For representative work in the PEWS area, see Wallerstein 1986; Arrighi 1999; Chase-Dunn 2001; for an interesting application of world system theory to the international disaster relief process, see Letukas and Barnshaw 2008).

PEWS scholarship highlights a number of processes that are common across the entities (nation states, region) that comprise the world system. The first is intensified exploitation of natural resources, which generates wastes, such as toxic materials, that are then exported to “environmental sinks,” such as less-economically-well-off regions and nations. Better-off entities in the world system reap the benefits of economic development, while poorer and less powerful ones are forced to contend with environmental hazards that put their populations at risk. Another trend is the tendency for corporate actors to move hazardous forms of production from the core states in the world system to peripheral and semi-peripheral ones, where labor is less expensive and regulation is less stringent. Technological and environmental disasters are one consequence of this process; the 1984 Bhopal disaster is a case in point.

Deforestation and the loss of other ecosystem services are also common in less-well-off nations in the world system. Forests are clear cut for agricultural purposes, wood is harvested to meet worldwide demand, and impoverished populations use wood to generate heat. Deforestation leads in turn to soil degradation and erosion, setting the stage for intensified flooding, landslides, and debris flows. Wetlands destruction is another common pattern that erodes protection against high winds, storm surges, and tsunamis.

Pressures generated by the PEWS also lead to intensified rates of urbanization, as rural residents are drawn to cities in search of work opportunities. This worldwide pattern is

especially marked in poorer societies and those undergoing rapid industrialization and incorporation into the economy of the world system. Large-scale migration and pressures toward urbanization result in lax controls on land use and building codes and practices, the growth of informal settlements, and further environmental degradation. Under such pressures, governments increasingly fall behind in their ability to provide for the needs of ever-expanding urban populations.

Within the global system, multi-national corporations have the flexibility to move their operations geographically in a continual effort to exploit low-wage pools of labor. Labor booms in some communities and societies can be followed by severe economic difficulties, as corporate employers abandon them in search of workers who will work for even less. Responding to the dynamics of the PEWS, the fortunes of nations and regions rise and fall depending on their strategic and geopolitical importance. At a given point in time, a particular nation may enjoy favored status because labor is cheap, because it possesses strategic minerals or other needed resources, or because of its significance for military or trade activities.

Structural adjustment programs (SAPs), overseen by institutions such as the World Bank and the International Monetary Fund, have become hallmarks of the PEWS. Ostensibly initiated as a means of ameliorating poverty, such programs have had mixed effects. Although SAPs have differential effects across societies and also across time, research shows that in many cases SAPs actually result in increased poverty and greater income inequality. The high levels of foreign debt that accompany SAPs also mean that countries find it difficult to invest in infrastructure improvements, health care, education, and other resilience-enhancing measures.

These features of the PEWS constitute the social forces that produce disasters—forces that should receive more attention than they currently command in the social scientific study of earthquakes and other disasters. The focus on vulnerability and resilience constitutes a major advance in research on earthquakes and other disasters, but analyses must go still further to identify the global and societal roots of vulnerability and resilience.

How would such research proceed? In the aftermath of the Haitian earthquake catastrophe, commentators have pointed to various conditions that made Haitian society extremely vulnerable both to earthquakes and to other disasters: widespread poverty, unemployment, illiteracy, and chronic hunger and health problems within the population; the lack of earthquake resistance in the built environment; the country's tragic history of dictatorship, internal violence, and government corruption; its teeming urban slums and other informal settlements; and deforestation that leaves the nation vulnerable to heavy rains and hurricanes.

These descriptions are accurate, but they leave open questions about the origins of these conditions. Additionally, by giving the impression that Haiti is somehow uniquely vulnerable to disasters, such characterizations overlook the extent to which the conditions that exist in Haiti (albeit in an extreme form) also exist in many nations throughout the world—and for the same reasons. A more complete causal map of the Haitian catastrophe would take into account such factors as its long history of indebtedness, first to France and more recently to international financial institutions through SAPs; its strategic importance to the U.S., first in the 20th century as the gateway to the Panama Canal and now as a bulwark against political regimes in Cuba and

Venezuela that are opposed by the U.S.; the strategic reasons why more powerful states in the world system propped up Haiti's dictatorial and kleptocratic rulers; the pattern of continual outside intervention in its internal affairs; the forces that led to the undermining of Haiti's agricultural sector⁵, which led in turn to large-scale migration to the capital; the expansion of informal settlements in urban areas; mass deforestation caused mainly by the people's need for charcoal; and its export-oriented economy based increasingly on low-wage production and assembly operations, such as the production of t-shirts and baseballs. As the second-oldest nation in the Western hemisphere, Haiti has a long and troubled history, and the roots of the 2010 catastrophe are found in that history.

Few social scientists analyze disasters in this way. One exception is anthropologist Anthony Oliver-Smith, whose research on the 1970 Peruvian earthquake analyzed that catastrophe in historical context. In that case, Spanish dominance undermined the resilience of local populations and increased their vulnerability to earthquakes. Before the conquest, the peoples of the region lived in decentralized settlements, partly as a way of adapting to the earthquake hazard. Spanish rule led to much more centralized settlement patterns, and the Spanish also built structures using European architectural designs, rather than construction methods that were indigenous to the region. Oliver-Smith refers to the Peruvian catastrophe as a "five hundred year earthquake" to emphasize how these and other historical patterns contributed over time to the buildup of risk in the region (Oliver-Smith 1992; 1994).

The lessons for social science research are clear. Much of what happens to increase vulnerability and reduce resilience in individual countries is a function of broad global processes such as rapid urbanization and environmental degradation. For example, the continuing growth of megacities in vulnerable locations is a worldwide phenomenon (Pelling 2003). At the same time, outcomes from these processes are also influenced by historical, social, and cultural factors that vary across nations. Additionally, nations and populations—some more than others—still retain the capacity to overcome trends that increase vulnerability and to become resilient in the face of hazards. With this global perspective as a backdrop, I now turn to discussing needed research on earthquakes and other disasters in a more local context.

Local Ecologies and Vulnerability Production

While taking into account global and historical factors that produce vulnerability, it is also important not to lose sight of the fact that local-level factors have a major influence on disaster production. As shown so vividly in Katrina and in Haiti, disaster severity is a function of the intersection of locational, population, built environment, and ecosystem vulnerability. The social science perspective known as socio-political ecology (SPE) provides an overarching frame through which to analyze interactions among these different vulnerability factors. SPE is concerned with how places and spaces develop and change over time as a function of competing political and economic interests. Key research concerns include economic and political forces that influence decisions regarding development, land use, and environmental amenities and

⁵ For example former president Clinton, the U. S. Special Envoy for Haiti recovery, has personally apologized for his role in the destruction of rice production in Haiti. Rice growers were driven out of business by U.S. policies that facilitated the dumping onto Haiti of rice, which came primarily from Arkansas.

ecosystem services; historic and contemporary patterns of social inequality and inter-group relations that characterize at-risk communities; and factors that affect the capacity of governmental entities to engage in effective loss-reduction activity across the hazards cycle (Peacock, Morrow, and Gladwin 1997; see also Enarson, Fothergill, and Peek 2007).

Like the PEWS perspective, SPE recognizes that the vulnerability of particular regions, communities, and groups is the consequence of distinctive local conditions, but that broader-scale forces are also at work that produce similar results across local communities, and also across different types of hazards. Put another way, local vulnerability conditions and individual disasters are unique in many respects, but owing to the influence of macro-scale political, social, cultural, and economic factors, they also have a good deal in common.

Focusing on the U.S. and recent disasters, it is possible to see both sets of factors at work. Cutter and Emrich (2006) characterize the vulnerability of New Orleans residents to Hurricane Katrina as resulting from a set of circumstances that is both unique to that city and emblematic of broader societal trends: African American migration to cities, which was followed by white flight; the movement of jobs out of cities and overseas; and the absence of effective policies to address the needs of low-income city dwellers. Other researchers also focus on the interplay of macro- and local-level forces in both the production and reduction of disasters. In her work on housing issues in earthquakes, Mary Comerio (1998) points to the need for a coherent and effective urban housing policy. Mike Davis (1998) discusses how growth in Los Angeles was promoted by boosters who consistently downplayed natural hazards in the region. Research by Alesch and Petak (1986) describes how seismic safety legislation was enacted in that city over the strong opposition of landlords after struggles that lasted for many years.

Political and economic forces operating at multiple scales are key drivers of risk production. Decades ago, sociologists Harvey Molotch (1976; see also Logan and Molotch 1987) developed the concept of the “growth machine” to describe the ways in which political and economic interests collaborate to make development and growth high priorities for local communities. Although there are of course exceptions, generally speaking these interests work to avoid or weaken land-use and construction regulations. Development attracts migrants, and migration in turn drives more-intensive development. Research documents how these mutually-reinforcing patterns lead to risk buildup. Studies by Roger Pielke, Jr. and his colleagues demonstrate, for example, that losses from hurricanes and earthquakes are attributable more to intensified development than to event frequency or severity (Pielke et al. 2008; Vranes and Pielke 2009). At the same time, other studies show that in cases where states are able to enact legislation enabling stronger land-use and development controls, insured losses decrease (Burby 2005).

Recent research by William Freudenburg and his collaborators (Freudenburg et al. 2008; 2009) documents how political and economic pressures helped to cause the Katrina catastrophe. Development decisions were motivated by a pervasive spirit of “rent seeking,” or continual efforts toward more intensive and profitable forms of development—objectives that are frequently achieved through political maneuvering. Other scholarship emphasizes the role of “JARring actions” (Kousky and Zeckhauser 2005), or decisions made by political and economic interests that “jeopardize assets that are remote.” Such assets include ecosystems, forests, barrier

islands, marshes, open spaces, and other environmental amenities that so frequently play a role in mitigating the impacts of natural hazards. In Louisiana, oil drilling and shipping companies were among the entities that undertook JARring actions that over time undermined the resilience of the natural and built environment in the face of hurricanes.

SPE theory also recognizes that local ecological systems simultaneously provide benefits (often of a substantial nature) to some groups while disadvantaging others. Both in the U.S. and around the world, income inequities are very large, and cities are increasingly becoming places inhabited by the very wealthy and the very poor. Racial, ethnic, and immigrant groups occupy distinctive niches within urban ecologies—positions that are again shaped both by broader historical processes and by unique local conditions. Groups are differentially vulnerable—and differentially resilient—as a result of those conditions. Similarly, the vulnerabilities and disaster-related experiences of men and women are also shaped by social and cultural forces such as historic patterns of gender relations, legal rights granted on the basis of gender, inequities in the gendered division of labor, and religious traditions. As noted earlier, gender issues in disasters have increasingly become a focus in social science research. Recent events such as the Indian Ocean earthquake and tsunamis have highlighted the vulnerability of women and girls and implicated factors like those just discussed in that vulnerability (Ariyabandu 2006, Pincha 2008).

Conclusions

This paper began by highlighting a paradox concerning social science research on earthquakes and other disasters: that while a great deal has been learned about the social dimensions of hazards and disasters, and while well-validated theories of the middle range abound, research has proceeded without linkages to more general theories concerning the way societies operate. More specifically, research has drawn attention to the ways in which societies, communities, businesses, groups, households, and individuals can be vulnerable to disasters, but has placed considerably less emphasis on how vulnerability develops in the first place. Research has also led to significant advances in the understanding of disaster resilience, but again without investigating the social processes that increase or undermine resilience. While it would be a major mistake to understate all that has been accomplished, research is more likely to progress and lead to new insights when it is guided by more general theories and more robust concepts. Overarching paradigms make it possible to better understand social forces that produce effects across time and space and to see more clearly the factors that lead to risk buildup and greater losses for disasters in general, as opposed to individual disasters or types of disasters.

I have provided an overview of two such frameworks: the political economy of the world system and the socio-political ecology approach. Both perspectives are currently used in the study of disasters, but on an intermittent and often implicit basis. Both have the advantage of advancing theoretical and conceptual thinking in the field of disaster research, but they also show great potential for linking that field with a number of closely-related areas of research, including environmental studies, development studies, and research on perils such as climate change that are currently receiving too little attention in the social sciences. They also have the advantage of providing an integrating platform for hazards and disaster research in a variety of social science disciplines, including sociology, urban studies, geography, political science,

economics and urban planning and regional science. This kind of integration represents the new frontier in social research on hazards and disasters.

References

- Alesch, D.J. and Petak, W.J., 1986. The Politics and Economics of Earthquake Hazard Mitigation: Unreinforced Masonry Buildings in Southern California. Boulder, CO, University of Colorado, Institute of Behavioral Science, Natural Hazards Center.
- Allen, J. M., 1996. The price of identity: the 1923 Kanto earthquake and its aftermath. *Korean Studies* 20, 64-93.
- Ariyabandu, M. M., 2006. Gender issues in recovery from the December 2004 Indian Ocean tsunami: the case of Sri Lanka. *Earthquake Spectra* 22: S759-775.
- Arrighi, G., 1999. Globalization and historical macrosociology. In J. Abu-Lughod (ed.) *Sociology for the Twenty-First Century: Continuities and Cutting Edges*. Chicago: University of Chicago Press.
- Averill, J. D., D. S. Mileti, R. D. Peacock, E. D. Kuligowski, N. Groner, G. Proulx, P. A. Reneke, and H. E. Nelson, 2005. *Federal Building and Fire Safety Investigation of the World Trade Center Disaster: Occupant Behavior, Egress, and Emergency Communications*. Gaithersburg, MD: National Institute of Standards and Technology. NIST NCSTAR 1-7.
- Barry, J. M., 1997. *Rising Tide: The Great Mississippi Flood of 1927 and How It Changed America*. New York, Simon and Schuster.
- Blaikie, P., T. Cannon, I. Davis, and B. Wisner, 1994. *At Risk: Natural Hazards, People's Vulnerability, and Disasters*. London, Routledge.
- Bolin, R. C., with L. Stanford, 1998. *The Northridge Earthquake: Vulnerability and Disaster*. London: Routledge.
- Bolin, R. C. and P. Bolton, 1986. *Race, Religion, and Ethnicity in Disaster Recovery*. Boulder, CO, University of Colorado, Institute of Behavioral Science, Natural Hazards Center.
- Bolin, R. C. and L. Stanford, 1993. Emergency sheltering and housing of earthquake victims: The case of Santa Cruz County. Pp. B43-B50 in P. A. Bolton (ed.) *The Loma Prieta, California, Earthquake of October 17, 1989—Public Response*. Washington, D. C., U. S. Geological Survey.
- Bruneau, M., S. E. Chang, R. T. Eguchi, G. C. Lee, T. D. O'Rourke, A. M. Reinhorn, M. Shinozuka, K. Tierney, W. A. Wallace, and D. von Winterfeldt, 2003. A framework to quantitatively assess and enhance the seismic resilience of communities." *Earthquake Spectra* 19, 733-752.

- Burby, R. J. (ed.), 1998. *Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities*. Washington, D. C., Joseph Henry Press.
- Burby, R. J., 2005. Have state comprehensive planning mandates reduced insured losses from natural disasters? *Natural Hazards Review* 6, 67-81.
- Burton, I., R. W. Kates, and G. F. White, 1003. *The Environment as Hazard*, 2nd ed. New York, Guildford Press.
- Chang, S. E. and M. Shinozuka, 2004. Measuring improvements in the disaster resilience of communities. *Earthquake Spectra* 20, 739-755.
- Chang, S. E., C. Pasion, K. Tatebe, and R. Ahmand, 2008. *Linking Lifeline Infrastructure Performance and Community Disaster Resilience: Models and Multi-Stakeholder Processes*. Buffalo, State University of New York, Multidisciplinary Center for Earthquake Engineering Research.
- Chase-Dunn, C., 2001. World-systems theorizing. Pp. 589-612 in J. Turner (ed.) *Handbook of Sociological Theory*. New York: Springer.
- Comerio, M. C., 1998. *Disaster Hits Home: New Policy for Urban Disaster Recovery*. Berkeley, Ca, University of California Press.
- Cuny, F. C., 1983. *Disasters and Development*. New York, Oxford University Press.
- Cutter, S., 1996. Vulnerability to environmental hazards. *Progress in Human Geography*. 20:529-539
- Cutter, S. (ed.), 2001. *American Hazardscapes: The Regionalization of Hazards and Disasters*. Washington D. C., Joseph Henry Press.
- Cutter, S., 2003. The vulnerability of science and the science of vulnerability. *Annals of the Association of American Geographers* 93, 1-12.
- Cutter, S., 2006. Moral hazard, social catastrophe: The changing face of vulnerability along the hurricane coasts. *Annals of the American Academy of Political and Social Science* 604, 102-112.
- Davis, M., 1998. *Ecology of Fear: Los Angeles and the Imagination of Disaster*. New York: Metropolitan.
- Dynes, R. R., 1970. *Organized Behavior in Disaster*. Lexington, MA, Heath Lexington Books.
- Dynes, R. R., 2006. Social capital: Dealing with community emergencies. *Homeland Security Affairs* 2, 1-26.

- Enarson, E. and B. H. Morrow (eds.), *The Gendered Terrain of Disaster*. Westport, CT, Praeger.
- Enarson, E., A. Fothergill, and L. Peek, 2007. Gender and disaster: Foundations and directions. Pp. 130-146 in H. Rodriguez, E. L. Quarantelli, and R. R. Dynes (eds.) *Handbook of Disaster Research*. New York: Springer.
- Fothergill, A. 1996. Gender, risk, and disaster. *International Journal of Mass Emergencies and Disasters* 14, 33-56.
- Fothergill, A. 1998. The neglect of gender in disaster work: An overview of the literature. Pp. 11-25 in E. Enarson and B. H. Morrow (eds.) *The Gendered Terrain of Disaster*. Westport, CT, Praeger.
- Fothergill, A., 2004. *Heads Above Water: Gender, Class and Family in the Grand Forks Flood*. Ithaca, NY, SUNY Press.
- Fothergill, Alice and Lori Peek. 2004. "Poverty and Disasters in the United States: A Review of Recent Sociological Findings." *Natural Hazards* 32(1): 89-110.
- Fradkin, P., 2005. *The Great Earthquake and Firestorms of 1906: How San Francisco Nearly Destroyed Itself*. Berkeley, CA, University of California Press.
- Freudenburg, W. R., R. Gramling, S. Laska, and K. Erikson., 2008. *Catastrophe in the Making: The Engineering of Katrina and the Disasters of Tomorrow*. Island Press.
- Freudenburg, W. R., R. Gramling, S. Laska, and K. Erikson, 2009. Organizing hazards, engineering disasters: Improving the recognition of political-economic factors in the creation of disasters. *Social Forces* 87, 1015-1038.
- Hewitt, K., (ed.), 1983. *Interpretations of Calamity: From the Viewpoint of Human Ecology*. Boston, Allen and Unwin.
- Hines. R., 2007. Natural disaster and gender inequality: The 2004 tsunami and the case of India. *Race, Gender, and Class* 14: 60-68.
- Janssen, M.A., M. L. Schoon, W. Ke, and K. Börner, 2006. Scholarly networks on resilience, vulnerability and adaptation within the human dimensions of global environmental change. *Global Environmental Change* 16, 240-252.
- Koh, H. and R. Cadigan, 2007. Disasters and social capital. In I. Kawachi, S. V. Subramanian, and D. Kim (eds.) *Social Capital and Health*. New York, Springer.
- Kousky, C. and R. Zeckhauser, 2005. JARring actions that fuel the floods. Pp. 59-73 in R. J. Daniels, D. F. Kettl, and H. Kunreuther (eds.) *On Risk and Disaster: Lessons from Hurricane Katrina*. Philadelphia: University of Pennsylvania Press.

- Kunreuther, H. and R. J. Roth, Sr. (eds.), 1998. *Paying the Price: The Status and Role of Insurance Against Natural Disasters in the United States*. Washington, D. C., Joseph Henry Press.
- Kasperson, R., 2001. Vulnerability and global environmental change. Update: Newsletter of the International Human Dimensions Programme on Global Environmental Change, 2, 1-2.
- Kasperson, J. X., R. E. Kasperson, and B. L. Turner (eds.), 1995. *Regions at risk: Comparisons of Threatened Environments*. Tokyo, United Nations University Press.
- Laska, S., 2008. The 'mother of all rorschachs': Katrina recovery in New Orleans. *Sociological Inquiry* 78, 580-591.
- Letukas, L and J. Barnshaw, 2008. A World-system approach to post-catastrophe international relief. *Social Forces* 87, 1063-1084.
- Logan, J. R. and H. L. Molotch, 1987. *Urban Fortunes: The Political Economy of Place*. Berkeley, CA, University of California Press.
- McDaniels, T., S. Chang, D. Carole, J. Mikawoz, and H. Longstaff, 2008. Fostering resilience to extreme events within infrastructure systems: Characterizing decision contexts for mitigation and adaptation. *Global Environmental Change* 18: 310-318.
- Merton, R. K., 1949. *Social Theory and Social Structure*. New York, Free Press.
- Miles, S. and S. E. Chang, 2006. Modeling community recovery from earthquakes. *Earthquake Spectra* 22, 439-458.
- Mileti, D. S., 1999. *Disasters by Design: A Reassessment of Natural Hazards in the United States*. Washington, D. C., Joseph Henry Press.
- Mileti, D. S. and P. O'Brien, 1992. Warnings during disaster: Normalizing communicated risk, *Social Problems* 39, 40-57.
- Molotch, H., 1976. The city as a growth machine: Toward a political economy of place. *American Journal of Sociology* 82, 309-332.
- Nakagawa, Y. and R. Shaw, 2004. Social capital: A missing link to disaster recovery. *International Journal of Mass Emergencies and Disasters* 22. 5-34.
- Norris, F., M. Friedman, P. Watson, C. Byrne, E. Diaz, and K. Kaniasty, 2002a. 60,000 disaster victims speak: Part I, an empirical review of the empirical literature, 1981-2001. *Psychiatry* 65, 207-239.
- Norris, F., M. Friedman, and P. Watson, 2002b. 60,000 disaster victims speak: Part II, summary and implications of the disaster mental health research. *Psychiatry* 65: 240-260.

- Norris, F. H., S. P. Stevens, B. Pfefferbaum, K. F. Wyche, and R. L. Pfefferbaum, 2008. Resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American Journal of Community Psychology* 41, 127-150.
- Oliver-Smith, A., 1992. *The Martyred City: Death and Rebirth in the Peruvian Andes*, 2nd ed. Prospect Heights, IL, Waveland Press.
- Oliver-Smith, A., 1994. Peru's five hundred year earthquake: Vulnerability in historical context. Pp. 3-48 in A. Varley (ed.) *Disasters, Development, and Environment*. London, Wiley.
- Peacock, W. G., B. H. Morrow, and H. Gladwin (eds.), 1997. *Hurricane Andrew: Ethnicity, Gender and the Sociology of Disasters*. London, Routledge.
- Peek, L. and A. Fothergill, 2008. "Displacement, Gender, and the Challenges of Parenting after Hurricane Katrina." *National Women's Studies Association Journal* 20, 69-105.
- Peek, L., 2008. "Children and Disasters: Understanding Vulnerability, Developing Capacities, and Promoting Resilience – An Introduction." *Children, Youth and Environments* 18(1), 1-29.
- Pelling, M., 2003. *Natural Disasters and Development in a Globalizing World*. London, Routledge.
- Pielke, R. A., Jr., J. Gratz, C. W. Landsea, D. Collins, M. A. Saunders, and Rade Musulin, 2008. Normalized hurricane damage in the United States: 1900-2005. *Natural Hazards Review* 9, 29-42.
- Pincha, C., 2008. *Indian Ocean Tsunami Through the Gender Lens: Insights from Tamil Nadu, India*. Mumbai, Earthworm Books for Oxfam America.
- Phillips, B. D., 1993. Cultural diversity in disasters: Sheltering, housing, and long term recovery. *International Journal of Mass Emergencies and Disasters* 11: 99-110.
- Phillips, B. D., 1998. Sheltering and housing of low-income and minority groups in Santa Cruz County after the Loma Prieta earthquake. Pp. 17-28 in J. M. Nigg (ed.) *The Loma Prieta, California, Earthquake of October 17, 1989—Recovery, Mitigation, and Reconstruction*. Washington, D.C., U. S. Geological Survey. Professional paper 1553-D.
- Phillips, B. D. and B. H. Morrow, 2008. *Women and Disasters: From Theory to Practice*. XLibris Publications.
- Rose, A., 2004. Defining and measuring economic resilience to disasters. *Disaster Prevention and Management* 13, 307-314.
- Rose, A., 2007. Economic resilience to disasters: multidisciplinary origins and contextual dimensions. *Environmental Hazards: Human and Social Dimensions* 7, 1-16.

- Quarantelli, E. L., 1987. Disaster studies: An analysis of the social historical factors affecting the development of research in the area, *International Journal of Mass Emergencies and Disasters* 5, 285-310.
- Ritchie, L. A. and D. A. Gill, 2007. Social capital theory as an integrating framework for technological disaster research. *Sociological Spectrum* 27, 1-26.
- Ryang, S., 2003. The Great Kanto earthquake and the massacre of Koreans in 1923: Notes on Japan's modern national sovereignty. *Anthropology Quarterly* 76, 731-748.
- Simile, C. 1995. *Disaster Settings and Mobilization for Contentious Collective Action: Case Studies of Hurricane Hugo and the Loma Prieta Earthquake*. Doctoral dissertation. Newark, DE, University of Delaware, Dept. of Sociology.
- Sen, A, 1982. *Poverty and Famine: An Essay on Entitlements and Deprivation*. Oxford, Clarendon Press.
- Phillips, B. D., D. S. K. Thomas, A. Fothergill, and L. Blinn-Pike (eds.), 2010. *Social Vulnerability to Disasters*. Boca Raton, FLA, CRC Press.
- Tierney, K. J., 2007. From the margins to the mainstream? Disaster research at the crossroads. *Annual Review of Sociology* 33, 503-525.
- Tierney, K. and M. Bruneau, 2007. Conceptualizing and measuring resilience: A key to disaster loss reduction. *TR News* 250, 14-15,17.
- Tierney, K. J., M. K. Lindell, and R. W. Perry, 2001. *Facing the Unexpected: Disaster Preparedness and Response in the United States*. Washington, DC: Joseph Henry Press.
- Tierney, K. J., W. J. Petak, and H. Hahn, 1986. *Disabled Persons and Earthquake Hazards*. Boulder, CO, University of Colorado, Institute of Behavioral Science, Natural Hazards Center.
- Turner, R. H., J. M. Nigg, and D. Heller Paz, 1986. *Waiting for Disaster: Earthquake Watch in California*. Berkeley, University of California Press.
- Varley, A. (ed.), 1994. *Disasters, Development, and Environment*. London: Wiley.
- Vranes, K. and R. A. Pielke, Jr., 2009. Normalized earthquake damage and fatalities in the United States: 1900-2005. *Natural Hazards Review* 10, 84-101.
- Wachtendorf, T., J. M. Kendra, H. Rodriguez, and J. Trainor, 2006. "The social impacts and consequences of the December 2004 Indian Ocean tsunamis: Observations from India and Sri Lanka. *Earthquake Spectra*, 2, S3: 693-714.

Wallerstein, I., 1986. Societal development, or development of the world system? *International Sociology* 1, 3-17.

Weiner, M., 1989. *The Origins of the Korean Community in Japan, 1910-1923*. Atlantic Highlands, NJ, Humanities.

Wisner, B., Blaikie, P., T. Cannon, and I. Davis, 2004. *At Risk: Natural Hazards, People's Vulnerability, and Disasters 2nd Ed.*. London, Routledge.

Acknowledgments

Partial support for producing this paper was provided by National Science Foundation grant no. CMMI 0734304. The ideas expressed here are mine; they do not reflect the positions of the funding agency.