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Social Capital and Natural Hazards Governance

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Summary and Keywords

The impact of disasters continues to grow in the early 21st century, as extreme weather events become more frequent and population density in vulnerable coastal and inland cities increases. Against this backdrop of risk, decision-makers persist in focusing primarily on structural measures to reduce losses centered on physical infrastructure such as berms, seawalls, retrofitted buildings, and levees. Yet a growing body of research emphasizes that strengthening social infrastructure, not just physical infrastructure, serves as a cost-effective way to improve the ability of communities to withstand and rebound from disasters. Three distinct kinds of social connections, including bonding, bridging, and linking social ties, support resilience through increasing the provision of emergency information, mutual aid, and collective action within communities to address natural hazards before, during, and after disaster events. Investing in social capital fosters community resilience that transcends natural hazards and positively affects collective governance and community health.

Social capital has a long history in social science research and scholarship, particularly in how it has grown within various disciplines. Broadly, the term describes how social ties generate norms of reciprocity and trust, allow collective action, build solidarity, and foster information and resource flows among people. From education to crime, social capital has been shown to have positive impacts on individual and community outcomes, and research in natural hazards has similarly shown positive outcomes for individual and community resilience. Social capital also can foster negative outcomes, including exclusionary practices, corruption, and increased inequality. Understanding which types of social capital are most useful for increasing resilience is important to move the natural hazards field forward.

Many questions about social capital and natural hazards remain, at best, partially answered. Do different types of social capital matter at different stages of disaster—e.g., mitigation, preparedness, response, and recovery? How do social capital's effects vary across cultural contexts and stratified groups? What measures of social capital are available to practitioners and scholars? What actions are available to decision-makers seeking to invest in the social infrastructure of communities vulnerable to natural hazards? Which programs and interventions have shown merit through field tests? What outcomes can decision-makers anticipate with these investments? Where can scholars find data sets on resilience and social capital? The current state of knowledge about social capital in disaster resilience provides guidance about supporting communities toward more resilience.

Keywords: social capital, natural hazards, disasters, climate change

Introduction

The impact of disasters continues to grow in the early 21st century, as extreme weather events become more frequent and population density in vulnerable coastal and inland cities increases. The number of people affected by disaster and the costs of disaster recovery continue to rise (EM-DAT, 2016), and modeling of anthropogenic climate change indicates that rising seas and higher temperatures will create more regular severe hurricanes and typhoons, as well as heat waves and potentially flooding. Disasters kill and displace more people than front-page-headline events such as terrorist attacks. The impact of these events will be magnified by the choices of residents, authorities, and developers, such as building habitations in vulnerable, highly dense areas like coastal and flood zones. Megacities remain at the forefront of these challenges, but small and medium-sized cities, such as Bangalore, India, have fewer available natural resources, rapidly growing populations, and less policy attention (Birkmann, Welle, Solecki, Shuaib, & Garschagen, 2016; Subramanian, 2017).

Natural hazards governance refers to a system that responds to a variety of technological and natural hazards and also plans for recovery after such incidents. Typically, the constellation of government agencies and institutions, systems for early warning, and other technical capacities makes up the natural hazards governance mechanisms that structure policies, legislation, and organizations (Thomalla et al., 2006; Briceño, 2015). Hence, standard natural hazards governance may involve laws governing setback distance from the ocean, specifying minimum build heights for homes in floodplains, and defining the roles of disaster institutions such as the U.S. Federal Emergency Management Agency (FEMA). The Stafford Act in the United States, for example, would be a critical piece of legislation in North America's natural hazards governance.

Over the past few years, scholars have seen an increase in the "legislation, policies, programs, and projects to address the increasing disaster risk threat to humanity" (Briceño, 2015, p. 1). At the same time, our knowledge about these systems has moved beyond standard top-down understanding of disaster management systems. Scholars and practitioners now look to community-based disaster risk reduction involving local governments and residents, often through informal and formal nongovernmental organizations (NGOs) and civil society organizations (CSOs) (Shaw & Izumi, 2016).

Against this backdrop of risk, decision-makers persist in focusing primarily on structural measures centered around physical infrastructure such as berms, seawalls, retrofitted buildings, and levees to reduce losses. Japan, for example, has continued to expend billions of dollars on seawalls to protect coastal communities against the threat of tsunami, despite little evidence that they have saved lives (Aldrich & Sawada, 2015). Further, across nations, decision-makers themselves fail to agree on precisely what defines the critical infrastructure within their countries (Kitagawa, Preston, & Chadderton, 2016). A growing body of research emphasizes that strengthening social infrastructure, not just physical infrastructure, serves as a cost-effective way to improve communities' ability to withstand and rebound from disasters (Aldrich & Meyer, 2015) and the effects of climate change (Aldrich, Page, & Paul, 2016).

Social capital serves as a key component of this social infrastructure, which serves alongside standard natural hazards governance mechanisms. Broadly, the term describes how social ties generate norms of reciprocity and trust, allow collective action, build solidarity, and foster information and resource flows among people (Portes, 1998). Social capital provides an umbrella and a theoretical tool for organizing much of what classical disaster studies show (Quarantelli, 2005)—the collective action, cooperation, and therapeutic community that arise following crisis events and that foster resilience for affected populations. In contrast to physical capital, social capital supports disaster resilience because “most importantly, of all the forms of capital, [social capital] is less damaged and less affected [by disaster]. Consequently, during the emergency period, it is the form of capital that serves as the primary base for a community response” (Dynes, 2005, p. 9). Further, social capital, unlike physical capital and financial capital, can be renewed and strengthened by use, rather than depleted.

Social capital has a long history in social science research and scholarship; thousands of peer-reviewed articles across various disciplines underscore its importance. From enhancing education to reducing crime, scholars have demonstrated that social capital has positive impacts on individual and community outcomes (Portes, 1998). Research in the field of natural hazards has similarly shown positive outcomes for individual and community resilience. Yet social capital also can foster negative outcomes, including exclusionary practices, corruption, increased inequality, and even violence directed toward out-groups. Understanding which types of social capital are most useful for increasing resilience is important to move the natural hazards field forward and develop community policies and programs that foster resilience. Beginning with the classics in social capital theory and moving to the frontier of disaster and resilience studies, this article illuminates the current state of knowledge in this area and addresses future research needs.

Social Capital in Natural Hazards Research

Social Capital

Social capital remains a central concept in sociology and political science that can be traced to the early 20th century. Core contributions to our general understanding of the concept come from Lyda Judson (L. J.) Hanifan, Pierre Bourdieu, James Coleman, and Robert Putnam. A century ago, Hanifan envisioned that social capital—“goodwill, fellowship, mutual sympathy, and social intercourse among a group of individuals and their families”—would grow from local institutions such as schools where both children and adults would work collectively (Hanifan, 1916, p. 130). Sociologists Bourdieu and Coleman then revived and energized social capital in the 1980s. Bourdieu identified social capital as one of four forms of capital, along with economic, cultural, and symbolic. He defined it as “the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition” (Bourdieu, 1985b, p. 248). In his theory, these four capitals are unequally distributed in society and interact to determine an individual’s trajectory within a specific social space (Bourdieu, 1985a). Much of his work emphasizes the credential-like nature of social ties, in that they can provide entrance to exclusive clubs or social circles.

Coleman (1988) similarly highlighted social capital as a resource that can be used to develop human capital. His definition offers six types of social capital, including obligations and expectations, informational potential, norms and effective sanctions, authority relations, and appropriable social organizations. Coleman looked closely at the ways that social ties enhanced productivity by, among other things, enhancing trust among potential economic partners. The work of both scholars emphasizes that social capital is a resource available to individuals through their interaction with other individuals within formal and informal social structures.

Following these primarily theoretical developments, Robert Putnam popularized the concept of social capital through a study of the historical development of economic regions within Italy (Putnam, 1993), and then through an article and book (Putnam, 1995, 2000) focusing on the decline of volunteerism and civic engagement in the United States. Putnam understood social capital as “the features of social organizations, such as networks, norms, and trust, that facilitate action and cooperation for mutual benefit” (1993, p. 35). His research focused on the ability and willingness of individuals within a group or community to work together toward shared goals and generate shared outcomes (Tolbert et al., 2002). Furthermore, his work is often noted for its negative view of modern society due to a monotonic decline of social capital over time (hence the book title, *Bowling Alone: The Collapse and Revival of American Community*).

One concept deeply connected to social capital since its inception has been trust (Fukuyama, 1997). When individuals in a network have accurate expectations about others’ behavior, and when they believe in the accuracy of the information provided to them by network members, they are better able to coordinate action across the network. As Coleman (1988) illustrated, diamond dealers who trust their buyers and suppliers need not resort to contracts, lawyers, or lawsuits to work out disputes. Instead, their dense social ties reduce the likelihood of cheating or renegeing on deals and make it easy to sanction members that have violated norms or laws (Olson, 1965).

Social capital occurs in different types of relationships, and scholars have identified three main types of social capital based on types of social ties: bonding, bridging, and linking (Putnam, 2000; Szreter & Woolcock, 2004). *Bonding social capital* identifies relations among close family and friends. These networks often show homophily, in which persons have similar racial, socioeconomic, cultural, demographic, and other characteristics. Hence, individuals who hold bonding ties may mirror each other strongly in terms of race, background, knowledge, and perspectives. These close relationships result in strong social support and in-group attitudes (Beggs, Haines, & Hurlbert, 1996), but they also may offer few new material resources, as may be needed during disasters.

In contrast with bonding social capital, *bridging social capital*, also known as *weak ties*, connects those who may be quite different. These thinner ties may come from a shared institutional setting—a synagogue, church, or mosque; a workplace; a school; or a sports club—and bridge ethnic and cultural divides. While these relationships may involve fewer direct connections over time, they are quite useful during situations such as job hunting and ethnic conflict because they provide access to new information and different social networks. Granovetter (1983) demonstrated how people with a wider network of bridging ties can better uncover new job openings that may not be known within their close networks. Varshney (2001) illustrated how bridging ties between Hindus and Muslims in communities undergoing ethnic strife helped reduce violence.

While bonding and bridging ties tend to be horizontal (i.e., that is, between people with similar levels of authority and power), *linking social capital* connects community residents or citizens with persons in higher-level positions of authority or power (Woolcock & Narayan, 2000). Linking social capital can be seen as “norms of respect and networks of trusting relationships between people who are interacting across explicit, formal, or institutionalized power or authority gradients in society” (Szreter & Woolcock, 2004, p. 655). These might be ties between a fishing caste coastal resident and the government official known as the Collector in the Indian state of Tamil Nadu. Linking social capital also can be found between recovering coastal cities in Sendai, Japan, and the Cabinet in Japan’s capital, Tokyo (Aldrich, 2015). These kinds of ties allow individuals access to resources that they cannot find locally through either bonding or bridging ties.

As with all social science concepts, this branch of research has generated skepticism, especially of writers who emphasize only the positive benefits of social ties. Researchers have been quick to underscore the potential dark side of social capital, which can include xenophobia, exclusion, hoarding of resources, and even group violence (Levi, 1996; Berman, 1997; Aldrich, 2012). Strong ties can negatively affect organizations, as well as ethnic and racial minorities (Pillai, Hodgkinson, Kalyanaram, & Smitha, 2015). Powerful social ties can help racist and extremist organizations cement their prejudices and then act on them toward outsiders. Socially peripheral groups in Tamil Nadu, India, for example, often found themselves excluded from the roster of those designated to receive shelter and aid after the 2004 Indian Ocean tsunami (Aldrich, 2011). Certainly, social capital is no panacea, and like all concepts, it has both positive, negative, and neutral externalities. Nevertheless, social scientists in the field of natural hazards have shown the utility of social capital in their engagement with extreme weathers, disasters, and crises.

Grounding Social Capital in Natural Hazards Governance and Research

Natural hazards governance began with a focus on the role of official government institutions in responding to one-time hazards such as hurricanes, tsunamis, or earthquakes. Much of the initial work in the field recognized a civil defense–era approach that sought to mimic wartime structures, such as incident command systems and top-down hierarchical control systems (Tierney, 2007). Over time, however, both practitioners and scholars alike recognized that other actors beyond officially elected representatives and civil servants could play a role in protecting society from threats (Dynes, 1974).

Scholars within the field of natural hazards have begun to theorize and empirically investigate the role of social ties during and after crises and disaster. More than a decade ago, Adger (2003) discussed social capital as central to research on climate change response and adaptation. He recognized that “[f]rom civil society’s response to Hurricane Andrew to the networks of reciprocity and exchange in pastoralist economies, it has long been recognized that social capital is central to the lived experience of coping with risk” (p. 389). Nakagawa and Shaw (2004) then focused on social capital as an important factor in their comparative studies of the community recoveries following the Kobe and Gujarat earthquakes. They found that neighborhoods that had been more engaged and included in the process of recovery had better outcomes than similar ones with fewer connections. Dynes (2005), in a theoretical piece, argued that findings from previous disaster research might fit well under the umbrella of social capital, including those related to emergent organization, collective behavior, social support, improvisation, communication, and collaboration. Several scholars have developed conceptual frameworks for resilience that incorporate social capital (e.g., Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008; Cutter, Burton, & Emrich, 2010).

Since these initial studies, researchers have shown how deeper levels of social capital provide disaster-affected communities with a variety of critical factors. First, social ties help survivors make choices about evacuating, staying, and returning (Patterson, Weil, & Patel, 2010). Individuals may need to make very quick decisions about leaving areas under threat from tsunamis, tornadoes, or floods, and their network members can assist them. Church-based social capital in the Vietnamese community in New Orleans, for example, facilitated a 98% evacuation rate, which was much higher than other neighborhoods during Hurricane Katrina (Airriess, Chia-Chen, Leong, Li, & Keith, 2008). During the evacuations triggered by the Fukushima nuclear power plant meltdowns, individuals had to collect a single bag of possessions within 2 hours before leaving their homes for what may be forever (Iwasaki, Sawada, & Aldrich, 2017). In other cases, such as when Hurricane Sandy approached the northeastern United States, residents had to decide whether to evacuate or shelter in place and checked with family members about when to leave and where to go.

Next, social networks provide information, resources, and aid during times when normal service providers such as hotels, gas stations, grocery stores, and hospitals are closed (Aldrich, 2012). Some have labeled this type of assistance *mutual aid* or *informal insurance*. Neighbors, friends, and friends of friends may offer food, money, a place to stay, or informal child-care arrangements while standard institutions rebuild. Finally, social ties help overcome barriers to collective action, such as the need to create community crime patrols in crisis-affected communities when law enforcement cannot.

Much work in the disaster field has specified how the categories of social capital—bonding, bridging, and linking—affect disaster and resilience outcomes. Bonding social capital, for example, provides affected residents with immediate assistance, strategic support (Hawkins & Maurer, 2010), and emotional, administrative, and resource assistance in the midst of a crisis (Beggs, Haines, & Hurlbert, 1996). Islam and Walkerden (2014) found that deeper reservoirs of bonding social capital among coastal Bangladesh residents provided immediate resources, including food sharing, alternative income opportunities, and temporary migration options. Further, these ties remained strong through response and long-term recovery to Cyclone Sidr. Strong ties with neighbors and friends helped reduce anxiety and depression among Fukushima evacuees who evacuated from their homes because of radioactive contamination (Iwasaki, Sawada, & Aldrich, 2017). But bonding social capital—which many have described as helping people get by, but not get ahead—may not be sufficient for holistic recovery.

Bridging social ties help individuals and groups connect to resources and ideas outside their inner circle or immediate neighborhood. These ties also offer promise for community revitalization and long-term community survival (Hawkins & Maurer, 2010). Elliot, Haney, and Sams-Abiodun (2010), for example, found that access to bridging social capital outside local neighborhoods decreased the negative impacts of Hurricane Katrina and increased the speed of recovery compared to residents who had mostly strong bonding capital that was place-based in affected neighborhoods. For children who left New Orleans due to the destruction caused by Hurricane Katrina, schools served as a source of bridging community (Krajden, 2010). Similarly, for single mothers in urban environments, day-care centers provided nodes through which they increased ties not only to other mothers, but also to relevant institutions that could facilitate child-rearing (Small, 2009).

Linking social capital ties provide access to resources, nonlocal donations, and funding provided by governments and humanitarian aid institutions (IFRCRC, 2011). Nakagawa and Shaw (2004) found that linking social capital was important in connecting local disaster survivors to government officials for response and recovery assistance. Socially vulnerable populations, such as poor, low-caste persons in India, that have linking social capital have been shown to receive more response and recovery aid than low-caste persons without such ties (Aldrich, 2012). Hawkins and Maurer (2010) argued that linking social capital is perhaps more important than bonding or bridging, showing how it provided access to resources for Hurricane Katrina evacuees at the time of their need. Islam and Walkerden (2014) similarly argued that while bonding and bridging social capital can address immediate needs, survivors need linking social capital during continued recovery efforts as financial and physical resources available through bonding and bridging ties are depleted. When local governments in the Tohoku region of Japan struggled to find sufficient personnel and resources to begin recovery after the March 11 (3/11) tsunami, those prefectures with stronger bridging and linking ties reached out to decision-makers in the central government, foreign NGOs, and civil society organizations to accelerate their revitalization (Bisri, 2013).

The Current State of Social Capital in Natural Hazards Governance

The sociological and political studies that propelled social capital into mainstream social science have become classics. Currently, scholars are pursuing specialized investigations in their studies of social capital and natural hazards resilience and governance. Research includes assessments of social capital in relation to mobility,

migration, and repopulation; social vulnerability (especially race and class); activities across the disaster life cycle; and interaction between social capital and governance type.

Mobility/Migration/Repopulation

Social networks remain important to immigrants and migrants alike (Haug, 2008; Portes, 2010). Social capital, including connection, trust, and increased potential for collective action, increase disaster survivors' likelihood of following official mandates, relocating from hazardous areas as disasters draw closer, and finding shelter and resources in new locations. Such connections also help residents support community-level recovery plans after the disaster has passed. For example, social ties influence the likelihood of accepting (or turning down) a flood buyout offer from authorities (Vries & Fraser, 2012) and influence decisions about relocating from a tsunami-affected coastal house to a safer housing location (Joshi & Aoki, 2014).

Social capital also has been shown to increase repopulation and regeneration of damaged housing in disaster-affected areas. Preevent community participation (such as voting rates) and postevent emergent group recovery activity correlate to faster population return after disasters in Japan (Aldrich, 2012). Neighborhoods in New Orleans with strong civic engagement have faster repopulation after Hurricane Katrina, even when controlling for damage and individual resources (such as income) (Rackin & Weil, 2015). Further, civic engagement and organizations focused on blight reduction supported neighborhood revitalization following Hurricane Katrina (Weil, 2012). Given recent policy challenges faced by Greece and Spain over issues of migration and immigration, as well as broader policy debates within many developed nations across the world about the topic, there is much left to investigate in this area.

Race, Income, and Gender

The role played by social networks during and after disaster may strongly connect with social stratification in a society, such as by socioeconomic status, gender, or race and ethnicity. Disaster scholarship clearly indicates that social stratification affects all aspects of the disaster experience and refers to this issue as "social vulnerability" (Wisner, Blaikie, Cannon, & Davis, 2004; Phillips, Thomas, Fothergill, & Blinn-Pike, 2010). It is also known that the amount and types of social capital vary based on stratification in society, and that marginalized groups may use and have access to different types of social capital than majority groups (Stack, 1975). The degree to which different ethnic, economic, and racial groups (among other demographics) access reservoirs of social capital required for disaster resilience remains largely unexplored.

Following the 2004 Indian Ocean tsunami, some coastal villages in India recovered at rates noticeably faster than others. Researchers found that across six different hamlets, communities with higher levels of linking and bonding social capital fared better than those with only bonding social capital (Aldrich, 2012). These communities with higher levels of bonding and linking social capital were capable of rebuilding homes that had been destroyed in the tsunami, as well as create new jobs and on-site training. However, the *uur panchayats*—traditional community leaders—tasked with distributing aid did so at the exclusion of widows, Dalits, Muslims, and other groups living on the cultural and ethnic periphery in these hamlets. In this case, higher levels of social capital facilitated faster recovery, but also at the expense of those marginalized groups.

An exploration of morbidity during the July 1995 heat wave in Chicago, when more than 700 people died, provides some evidence for interaction of social capital, race, and disaster impacts. Persons who died in the heat wave were more likely to be African-American men who were living alone. Klinenberg (2002) explored the depopulated and declining neighborhood of North Lawndale, a Black community, and the more vibrant community of Little Village, a Hispanic community, to show how trust and social connections helped save lives, especially among elderly, isolated persons without air conditioning in their homes. While popular conceptions argued that African Americans and Latinos died at different rates because of "family values," in reality the social geography of perceived safety, known neighbors, access to "third places" that had air conditioning, and connections with strong, centralized Catholic churches encouraged people to leave their vulnerable homes to seek shelter elsewhere and fostered neighbors to check on fragile elderly in their buildings.

Hurricane Katrina also affect racial groups differently, due in part to differences in access to social capital. Network capacities of the primarily African-American community of the Lower 9th Ward in New Orleans dissipated at a different rate than those of the mostly white neighborhood of Lakeview (Elliott, Haney, & Abiodun, 2010). Residents of the Lower 9th Ward had mostly local, neighborhood-based social networks, which provided strong support for daily life among low-income residents of the city. When the neighborhood was totally destroyed during Hurricane Katrina, this bonding social capital was severely damaged as well. In contrast, white, more affluent residents of Lakeview had ties outside the city and state to draw upon for social support in the days, weeks, and months following the storm.

Other studies have shown how institutional social capital—that is, the ties generated by connections to an organization—can help otherwise vulnerable groups acquire information, resources, and access (Ganapati, 2012). One study of childcare centers in New York demonstrated the ways that single mothers who connected to the organizations received information on nutrition, access to services such as housing support, and opportunities to develop new skills, such as scholarships (Small, 2009). Accessing existing networks or new networks that connect survivors to institutional resources while displaced from a disaster are especially crucial to vulnerable populations such as single mothers (Tobin-Gurley, Peek, & Loomis, 2010). At the community level, stronger ties between neighbors and local institutions can help reduce crime and disorder, which often concentrate in neighborhoods with higher levels of minority groups (Sampson, 2001).

Phases of Disaster

Social capital provides access to various resources across the phases of a disaster—from mitigation and preparedness to response and recovery. Further, while observers may assume that social network strength remains unchanged over a crisis, different types of social capital (bonding, bridging, or linking) increase and decrease as the resource needs of survivors change across disaster phases (Misra, Goswami, Mondal, & Jana, 2017). For example, social capital has been shown to both encourage and discourage mitigation and preparedness tasks that reduce the impacts. Social ties can support the spread of mitigation and preparedness knowledge, as well as support social norms within a group that promote preparedness behaviors. For example, social ties aided Maasai pastoralists in making decisions that mitigate the effects of drought (Miller, Leslie, & McCabe, 2014). Family and friends often help each other with mitigation and preparedness activities, such as installing hurricane shutters or moving. Bridging social capital, specifically, has been shown as increasing individual disaster preparedness, while social capital via participation or association with community groups increases awareness of community responsibilities and roles during a disaster (Brunie, 2009, 2010). Having community organizations that are local and focused on mitigation and preparedness can increase preparedness among residents (Mimaki, Takeuchi, & Shaw, 2009).

At the same time, social capital may cause individuals to undertake risky behaviors, refuse to leave hazardous areas, or fail to evacuate in the face of threats. Horney, MacDonald, Van Willigen, Berke, and Kaufman (2010) found that group membership reduced evacuation likelihood, as people often stayed behind to help others. Anecdotal evidence about the evacuation from the 3/11 disasters in Tohoku, Japan, indicated that more connected individuals may have stayed longer in the inundation zone

in an attempt to help others with less mobility. Wolf, Adger, Lorenzoni, Abrahamson, and Raine (2010) concluded that elderly persons who relied on social capital for information about heat waves may feel less need to prepare individually for an event.

Social capital is most often studied during disaster response and recovery, with results acknowledging the importance of local social networks in providing immediate aid and support to survivors (Tierney, 2014). Bonding social capital in the form of family are most important to securing life and personal safety during disaster impacts and response (Casagrande, McIlvaine-Newsad, & Jones, 2015), such that family is central to many individuals' expectations of support (Meyer, 2017). Research continues to show that beyond immediate needs, bridging social capital and ties outside one's local environment helps in providing information, evacuation shelter, childcare, and emotional support (Aldrich & Meyer, 2015). Procopio and Procopio (2007) found that interactions over the Internet during the response period fostered weak bridging ties that provided social support to individuals following Hurricane Katrina. Furthermore, social capital among community organizations and emergency management facilitates more effective disaster response (Kapucu, 2007; Oh, Okada, & Comfort, 2014). Preevent coordination between agencies and early incorporation of local networks into formal response activities facilitated communication and streamlined responses (Kapucu, 2006; Reimer, Kulig, Edge, Lightfoot, & Townshend, 2013).

Social capital of all types has positive effects on recovery for individuals and communities. Social networks that provide emotional support can reduce the likelihood of mental health concerns, such as posttraumatic stress syndrome (Adeola & Picou, 2014; Wind & Komproe, 2012; Ganapati, 2012). For example, research in England following a flood modeled the mechanisms for social support and coping behaviors that result in improved mental health (Wind, Fordham, & Komproe, 2011). Yet, individuals can have too much social capital and be burdened with caring for too many other persons. These persons may see an initial decline in mental health that then rebounds later in recovery (Weil et al., 2012). Furthermore, trust and community membership increases the likelihood that people will participate in collective action (Jicha, Thompson, Fulkerson, & May, 2011). Dense, bonding networks of organizational leaders predisaster increase their and their organizations' recovery speed, since building new relationships and trust takes time (Doerfel, Chewning, & Lai, 2013; Doerfel & Haseki, 2015; Doerfel, Lai, & Chewning, 2010). Social capital in the form of local organizations that are able to avoid corruption following disaster can promote faster recovery, incorporate resilience into their missions, and support overall economic recovery (Barone & Mocetti, 2014; Vallance & Carlton, 2015).

Social Capital Interacting With Governance Type

Social capital mitigates the negative effects of disasters, but disasters themselves can alter social capital levels. Social capital that fosters resilience often occurs at the local level, and thus governance from national and international operations that does not utilize local practitioners and existing groups can erode local resilience by negatively affecting social capital (Zanotti, 2010). Top-down structures that reduce the agency of disaster survivors to determine their own and their community's recovery trajectories suppress collective action that fosters resilience (Alipour et al., 2015; Imilan, Fuster, & Vergara, 2015; Larenas, Salgado, & Fuster, 2015).

One example of top-down policies that damage social capital postdisaster comes from rapid, often random relocation of vulnerable populations. Rather than seeking to keep families, friends, and neighborhoods—and therefore social networks—together, disaster managers may instead stress quick placement into housing. This policy, however well intended, damages social ties (Hikichi et al., 2017). Similarly, linking social capital between survivors and NGOs provides invaluable lifelines during disaster response, but corruption may increase relief dependency among community members, as previously noted in Bangladesh. Further, NGO desire to capitalize on the high financial returns available for response activities may overlook mitigation and preparedness efforts (Islam & Walkerden, 2015).

In natural disasters, there is some evidence that the event can increase social capital, at least during the initial response period. For example, trust may increase, linking social capital may increase and remain following recovery, and nonprofits and community organizations may gain assets and capacities that further support collective action (Pena, Zahran, Underwood, & Weiler, 2014; Toya & Skidmore, 2014). Esnard and Sapat (2016) showed how linking social capital in the Haitian diaspora connected local community practitioners to transnational advocacy groups, faith-based networks, and professional networks outside the country that provided vital advice and support. This linked support from the Haitian diaspora specifically connected with locals on the ground catalyzed social capital rather than eroding the existing local capacity as other efforts did (Zanotti, 2010).

While many have argued that disasters tend to increase social cohesion and trust (Solnit, 2009), in fact the influence of a crisis depends strongly on predisaster conditions and the impact of the event itself (Fleming, Chong, & Bejarano, 2014). One quantitative study of the 2010 Chilean earthquake showed interaction between governance type, trust, and postdisaster social capital. In neighborhoods and societies with already low levels of social capital, the disaster built little additional trust (Dussaillant & Guzman, 2014). Similarly, studies of the Chilean and El Salvador earthquakes demonstrated that predisaster state capacity influenced postdisaster interpersonal trust (Carlin, Love, & Zechmeister, 2014). Other research on the Chilean disaster showed that the government failed to prioritize the needs and visions of local citizens during the postdisaster reconstruction process, missing a chance to improve their health and livelihood situations (Imilan, Fuster, & Vergara, 2015).

Ritchie and Gill (2007) sought to capture the two-way interactions between social capital, with a focus on technological disasters. Social capital theory, they argued, describes not only how disaster impacts are moderated by preevent social capital, but also how certain types of events can erode or build social capital in a community. For example, technological disasters have been shown to generate "corrosive community," where social ties fray, trust declines, and collective trauma ensues after the event. Even up to decades after a technological disaster, such as the *Exxon Valdez* oil spill in Alaska, evidence of loss of trust, disruption in associational membership, weakened social networks, and increased violations of norms of reciprocity can be found (Ritchie, 2012).

Public Policies and Programs Connecting Social Capital to Resilience

With research indicating the importance of social capital to resilience, practitioners have begun implementing social capital and community-building activities into adaptation and recovery programs. For example, social capital has been integrated into temporary housing siting and formats (Spokane, Mori, & Martinez, 2013) and used in programming to increase the well-being of displaced residents (Takahashi et al., 2015). Asset-based mapping and development of community response teams have been used in various communities to increase social capital and resilience (Freitag, Abramson, Chalana, & Dixon, 2014; Lionel, 2015; O'Sullivan, Corneil, Kuziemsy, & Toal-Sullivan, 2015). As social capital programming becomes more common in disaster resilience agencies, evaluation of the effectiveness of such activities is needed (Ritchie & MacDonald, 2010).

A number of NGOs and local governments engage in programs that build and maintain social ties. BoCo Strong) formed following large-scale flooding in 2013 in Boulder, Colorado. This group focuses on building relationships such as knowing neighbors and promoting informal first responders, connecting nonprofits across the county, and building linking social capital by engaging policymakers and community members. Working groups, collaborations, and educational programs are integrated into emergency management to sustain and strengthen social capital. Similarly, the Neighborhood Empowerment Network (NEN) in San Francisco supports neighborhoods that create community cohesion and disaster preparedness and resilience activities and products. Among their tools is the NeighborFest event, where communities receive funds

to hold a block party, which increases predisaster cooperation and helps clarify leadership and activism in the neighborhood. The Wellington Regional Emergency Management Organization (WREMO) in New Zealand has preidentified “Community Emergency Hubs,” which are resident-led spaces for survivors to meet, discuss, collaborate, and organize during a disaster.

The Red Cross in Australia published a Roundtable Report for its first responders, focusing on how to map out and use social capital precrisis and postcrisis. This initial report underscores the importance of social capital both before and after disaster, and recognizes the need for clear and straightforward measurements, referencing survey questions designed to measure social capital published by the Australian Bureau of Statistics (2004). While the report boasts of the importance of social capital in disaster preparedness and resilience, it is also evident that large organizations, like the Red Cross, are still investigating which activities promote connections and social ties, what role the norms of reciprocity play following a disaster, and which activities promote the generation of trust.

The Red Cross, as well as other organizations, should consider looking to programs like the Ibasho Café in Tohoku, Japan. The Ibasho Café was designed to build social capital, reconnect the elderly with society and each other, and to learn from their collective experience. The Ibasho Café has created what are known as *third places*—that is, the public, informal, and inclusive spaces that serve the function of bringing the community together (Oldenburg, 1999). The Ibasho Café has created a space for community bonding to take place around activities that are elder-led, but designed for all ages. A study of participants and nonparticipants found that those who were regular patrons felt that they could make their community a better place to live (Kiyota, Yasuhiro, Arnold, & Aldrich, 2015). Among the patrons surveyed, those who attended more frequently expressed a deeper sense of community bonding and had stronger ties in their neighborhood (Aldrich & Kiyota, 2017).

Following the 2011 Tōhoku earthquake and tsunami, and subsequent level 7 meltdowns of three nuclear reactors at the Fukushima Daiichi Nuclear Power Plant complex, it was a strong sense of community and social ties, akin to those generated at the Ibasho Café, that served to mitigate the psychological distress experienced by individuals in the town of Futaba in Fukushima, located only 4 miles (6.7 km) from the Daiichi Nuclear Power Plant. These findings suggest that social networks play a key role in an individual’s ability to cope with and recover from a traumatic event, and that disaster managers and decision-makers should make every effort to (a) assist community efforts to strengthen community ties (Tatsuki & Hayashi, 2002), and (b) keep communities intact in postdisaster arrangements (Iwasaki, Sawada, & Aldrich, 2017). The City Club of Portland, Oregon, has sought to do just that.

Portland is among a number of cities on the West Coast of the United States and Canada that face the same threat: the impending social and physical upheaval of established communities as a result of a 9.0 megathrust earthquake that will take place in the Cascadia Subduction Zone (often referred to as *CSZ*). The last significant earthquake that took place in the CSZ was in 1700, making the West Coast well overdue for another event of the same or greater magnitude, and the City Club of Portland has decided to do something about it. In a recent report (City Club of Portland, 2017), they promote improvement in both the physical and social infrastructure in Portland. They recognize that strengthening community ties is critical to improving social infrastructure, and pursuant to this point, they suggest by promoting public awareness of risks, citizen engagement and strategic planning, strengthened social ties in the community will be a natural by-product of this predisaster engagement, promoting neighborhoods that are both strategically informed for natural hazards and socially intertwined.

Gaps in the Research

Despite progress in the field in critical areas of policy and theory, there is much work to do. Four main gaps remain for future researchers to investigate gaps between individual- and community-level studies, the interaction between social media and social networks, data-set availability and measurement concerns, and integration with other disciplines.

Social capital in natural hazards research faces similar difficulties in integrating individual- and community-level analyses and frameworks as social capital research in general. Individual studies of social networks and participation in civic activities are often devoid of community context or how individual networks and collaborations coalesce into overall community resilience. In other cases, population-based studies (of aggregates of individuals) are substituted for community processes (Patterson et al., 2010), which may not account for how social capital operates. Recent studies on mental health and social capital are beginning to develop mechanisms that describe the multilevel aspects of social capital for disaster survivors’ resilience (Wind & Komproue, 2012). Future research needs to clarify at what level social capital is being studied and how that relates specifically to individual and community resilience.

Social capital also is only recently becoming integrative across disciplines beyond social science. Some firms, such as the engineering company Arup, have begun working through a framework of resilience engineering that incorporates approaches and data from outside engineering. Engineering students have similarly taken this cross-disciplinary approach to resilience seriously. Khalili (2017), for example, used qualitative and quantitative data from floods in New South Wales to map out social resilience indicators. Several philanthropic organizations and think tanks have started to move the agenda forward in the field of integrative resilience (Acosta, Chandra, & Madrigano, 2017).

The number of articles about the use of social media such as Twitter and Facebook for information and warning distribution or situational awareness for first responders or aid providers is increasing (de Albuquerque, Herfort, Brenning, & Zipf, 2015; Moyer, 2017; Takahashi et al., 2015). Yet studies of the potential or actual prospects for social media use in building, maintaining, and deploying social capital for resilience during crisis has been understudied. Numerous new platforms exist that could build or alter social capital, such as NextDoor, Facebook, Twitter, and Snapchat.

Research using data from the social media platform NextDoor has already shown that social media use and disaster responses from communities strongly correlates with the ground levels of civic engagement and activities (Page, 2017); however, future research is needed to further identify the role of social media in resilience.

A final gap in the field of social capital and natural hazards is data availability. Secondary data sets are important for comparisons across locations, testing of hypotheses at the community level, and allowing longitudinal assessment of social capital predisaster and postdisaster. Yet these data may have only one or two indicators for social capital (e.g., voter turnout, voluntary and horizontal association participation, per-capita religious adherents, etc.); be collected rarely; have geographic resolutions too large to understand neighborhood social capital; be incomplete; or require integration of data from multiple sources in order to understand social capital. For example, Cutter et al. (2010) used six different national level data sets to operationalize social capital for their Baseline Resilience Indicator for Communities (BRIC) at the county level. Survey data, such as collected by the Social Capital Assessment Tool (SOCAT) from the World Bank, are able to capture perceptions of social capital and social network details (World Bank, n.d.). But these surveys are time-consuming, expensive, and often only implemented postdisaster, thus eliminating the ability to assess change in social capital prevent as well as postevent. Scholars have the capacity to move to shore up these gaps and increase the knowledge in these critical areas.

Toward the Future

The field of social capital within natural hazards governance has made tremendous progress since its inception in the early 2000s. Rather than imagining that the core capacity for responding to disasters and crises comes from legislation, political institutions, and elected officials, experts and practitioners recognize the powerful role played by residents, communities, and formal and informal organizations. Qualitative and quantitative data continue to show that social ties—especially bonding, bridging, and linking connections—matter at all stages of disaster. Scholars have pushed forward our knowledge of social ties and mobility, socioeconomic characteristics, the phases of disaster, interaction with governance, and public policies.

A variety of NGO and state-based practitioners in the disaster space, including BoCo Strong, NEN, and WREMO, have explicitly incorporated social capital into their plans and frameworks. Despite some progress, work remains in the areas of interdisciplinary frameworks, data availability, paucity of research into social media, and individual-community bridging approaches. As philanthropic organizations and think tanks such as the RAND Corporation, 100 Resilient Cities, and the Robert Wood Johnson Foundation help advance the agenda, scholars should recognize the gaps in the field and develop a research agenda to clear them. In an area when threats from global climate change, rising sea levels, extreme weather, and humanmade disasters will only increase, communities need social capital as a known and researched part of their toolkit for building resilience.

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