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CONCEPTUALIZING AND MEASURING ORGANIZATIONAL AND COMMUNITY RESILIENCE: LESSONS FROM THE EMERGENCY RESPONSE FOLLOWING THE SEPTEMBER 11, 2001 ATTACK ON THE WORLD TRADE CENTER

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Conceptualizing and Measuring Organizational and Community Resilience: Lessons from the Emergency Response Following the September 11, 2001 Attack on the World Trade Center

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Abstract

Resilience is a property of physical and social systems that enables them to reduce the probability of disaster-induced loss of functionality, respond appropriately when damage and disruption occur, and recover in a timely manner. Resilience can further be conceptualized as consisting of four dimensions: robustness, redundancy, resourcefulness, and rapidity. It can be further seen as consisting of technical, organizational, social, and economic elements. This analysis focuses on resourcefulness as an organizational and social phenomenon. In responding to the World Trade Center disaster, organizations exhibited considerable resourcefulness, as indicated by the capacity to manage convergence and emergence; by the network forms of organization that developed to cope with disaster-related problems; and by the ability to address response-related challenges through improvisation. Since resourcefulness can be viewed as both collective sensemaking and collective action, it is ultimately rooted in the same kinds of social conditions and processes that make those activities possible.

1. INTRODUCTION

While there has yet to be a definitive accounting of the human, economic, and social impacts of the September 11 terrorist attacks on the World Trade Center, that event was by any measure one of the most devastating and costly disasters in U. S. history. The death toll from the attacks is estimated at 2, 795 (CNN.com, 2002). An estimated 790 survivors were treated at area hospitals within 48 hours of the attack. Of that number, 139 were hospitalized, the majority because of smoke inhalation (Centers for Disease Control, 2002). This number does not include victims who sought treatment in settings other than hospitals, nor does it take into account other types of morbidity that may be found to have resulted from the attack. Estimates of direct and indirect losses resulting from the attacks continue to be developed. Based on its review of eight different economic impact studies, the U. S. General Accounting Office estimated that the September 11 attacks resulted in $83 billion dollars in direct and indirect economic losses in the New York City area alone, $16 billion of which will likely not be compensated by insurance or other forms of assistance (General Accounting Office, 2002). Already in a recession at the time of the 9-11 attacks, the U. S. economy suffered additional jolts as stock prices fell, people within the country and around the world curtailed their travel plans, and markets and consumers became increasingly concerned about the possible consequences of a war on terrorism. Airlines and tourism-related businesses were especially hard-hit. In the immediate aftermath of the attacks, there were significant ripple effects throughout the economy, as evidenced by September 11-related layoffs in various business sectors, especially the airline industry (Bureau of Labor Statistics, 2002). Despite these disruptions, the U. S. economy as a whole appears to have suffered no lasting negative effects as a result of the attacks.

To put the World Trade Center attack into context, there has been only one U. S. disaster that resulted in greater loss of life. That event was the Galveston Hurricane of 1900, which killed 6,000 (see review of death tolls from 20th century disasters in Noji, 1997). Prior to September 11, the most costly disaster events, in terms of direct losses suffered, were the 1994 Northridge earthquake (with an estimated $44 billion in direct losses), Hurricane Andrew ($30 billion), and the 1993 Midwest Floods ($19 billion). The largest U. S. disaster-related insured losses prior to September 11 were those associated with Hurricane Andrew—an estimated $15 billion, as compared with an estimated $37 billion for Trade Center-related losses. (Estimates for other disaster losses based on National Academy of Sciences, 1999).

The attack on the World Trade Center resulted in an unprecedented response on the part of public and private sector agencies, volunteer groups, and the general public. The size and complexity of the organized response to the Trade Center disaster were rooted both in the severity and in the multifaceted nature of the event itself. Simultaneously a disaster, a crime scene warranting intensive investigation, and a national security emergency, the Trade Center attack triggered what may well have been the largest post-disaster organizational mobilization in U. S history. All levels of government and thousands of organizations were involved in responding to the attacks and their immediate aftermath. Disaster-related tasks were performed by a broad spectrum of organizations and groups, ranging from designated first-responders, such as fire, police, emergency management, and emergency medical services agencies, to existing organizations that took on new disaster responsibilities, to volunteer organizations and emergent groups.

Particularly significant for purposes of this discussion, September 11 was a disaster that greatly exceeded the scope of prior planning in New York City. The city had engaged in considerable planning for both natural disasters, such as hurricanes, as well as for terrorist attacks, particularly those involving biological and chemical agents, but no prior

planning had anticipated an event like the one the New York faced on September 11: an attack that occurred without warning, caused death and injury on a massive scale, resulted in the collapse of two of the world's tallest skyscrapers, killed hundreds of emergency workers, and caused the collapse of the building housing the city's emergency operations center. In the initial hours, the city did not know how many people had been killed, lost, and injured, nor did it know whether more attacks were on the way. Prior planning had not addressed numerous issues that later emerged as pressing concerns, such as how to reconstitute emergency management capability after losing a command center, how to coordinate massive numbers of volunteers, and how to respond rapidly and effectively while maintaining needed levels of security. In the aftermath of the attack, responders operated in a rapidly-changing environment characterized by high levels of uncertainty and by challenges for which prior planning provided little guidance. Time pressures, the scale of the human and material convergence to the disaster site, and the loss of critical resources and personnel added additional complications.

Seen from this perspective, the attack on the World Trade Center constitutes an important case study that can lead to a better understanding of how organizations and communities achieve resilience in the face of near-catastrophic and catastrophic disaster events. By their very nature, all such events seriously challenge community and organizational response capabilities while presenting problems that cannot be adequately addressed through existing plans and procedures. Communities and organizations that cannot manage these events and their consequences in a resilient manner risk suffering even greater levels of loss than they would otherwise.

This analysis draws upon work in which the author has been involved as part of a team of investigators associated with the Multidisciplinary Center for Earthquake Engineering Research (MCEER), an engineering education and research center funded by the National Science Foundation and headquartered at the State University of New York at Buffalo. The objectives of this work are to define and conceptualize, identify dimensions of, and specify measures and empirical indicators of resilience. Still in their exploratory stages, these activities constitute an effort to bridge engineering and social science approaches to studying resilience, as well as to develop quantitative measures that are widely applicable across different systems and over time. (For a lengthier discussion on this work, see Bruneau, et al., 2002).

The sections that follow will (1) discuss the concept of resilience as formulated and operationalized in MCEER investigations; and (2) apply the concept to the World Trade Center disasters, with a specific focus on post-disaster response activities and on resourcefulness as an element in organizational and community resilience following that event.

2. THE CONCEPT OF RESILIENCE APPLIED TO THE STUDY OF DISASTERS

The term "resilience," a word that denotes both strength and flexibility, is commonly used in a wide range of disciplines, including environmental science, engineering, psychology, organizational studies, and economics. The term implies both the ability to adjust to "normal" or anticipated stresses and strains and to adapt to sudden shocks and extraordinary demands. In the context of hazards, the concept spans both pre-event measures that seek to prevent disaster-related damage and post-event strategies designed to cope with and minimize disaster impacts. Resilience has been defined as "the capacity to cope with unanticipated dangers after they have become manifest, learning to bounce back" (Wildavsky, 1991: 77) and as "the ability of a system to withstand stresses of 'environmental loading'... a fundamental quality found in individuals, groups, organizations, and systems as a whole (Horne and Orr, 1998: 31). Focusing on earthquake disasters and on post-event response activities, Comfort conceptualizes resilience as "the capacity to adapt existing resources and skills to new situations and operating conditions"(1999:21).

According to MCEER's formulation, resilience can be conceptualized as the capacity for both physical and social systems to withstand forces and demands generated by disaster events (e.g., earthquakes, hurricanes, human-induced events) and to adequately cope with such events through employing effective response and recovery strategies. Both the physical and the social aspects of resilience can be further conceptualized as consisting of the following properties:

1.) Robustness: the ability of elements, systems, and other units of analysis to withstand stresses and demands without suffering damage, degradation or loss of function;

2.) Redundancy: the extent to which elements, systems, or other units of analysis exist that meet functional requirements in the event of disruption, degradation, or loss of functionality of primary systems;

3.) Resourcefulness: the capacity to identify problems, establish priorities, and mobilize resources to avoid or cope with damage or disruption; the ability to apply human and material resources to meet priorities and achieve goals; and

4.) Rapidity: the capacity to meet priorities and achieve goals in a timely manner.

Resilience can also be characterized as encompassing four interrelated dimensions: technical, organizational, social, and economic. The technical dimension of resilience refers to the ability of physical systems (e.g., structures, lifelines, other engineered systems) to perform to desired levels when subject to disaster forces. The organizational dimension of resilience refers to the capacity of organizations (e.g., emergency management organizations, utilities, hospitals, governmental organizations) to make decisions and take actions to reduce disaster vulnerability and impacts. The social dimension of resilience consists of factors that lessen the negative social or community consequences of disasters, while economic resilience refers

to the capacity of firms and local, regional, and national economies to absorb, contain, or reduce both direct and indirect economic losses resulting from disasters.

More generally, resilience can be understood as the ability of one or more systems (e.g., physical, economic, or community systems) to: (1) reduce the probability of a major disaster-induced shock through effective mitigation measures; (2) cope with a disaster when it does occur by launching an effective response; (3) and recover quickly following disaster impact. Put another way, for whatever unit of analysis is considered, a resilient system exhibits reduced failure probabilities; reduced consequences from failures, in terms of lives lost, damage, and negative economic and social consequences; and reduced time to recover—with recovery defined as a return either to pre-disaster levels of performance or to levels that would have been achieved had the disaster event not occurred.

This analysis, which is still in a very preliminary stage, uses data on the emergency response following the September 11 attacks to further explore the organizational and social dimensions of resilience. The discussions that follow will first outline the methods used to collect data on emergency response activities in New York City following the September 11 attack and then move on to discuss aspects of the response that demonstrate resilience. No attempt is made to be comprehensive or definitive; rather, examples are chosen that can be considered indicative of resilience and that suggest further avenues for exploration.

3. DATA SOURCES

The data on which this analysis is based come from systematic observations carried out in the field in the aftermath of the Trade Center attack; original documents, including reports prepared by responding organizations; other documentary material, including newspaper reports, other journalistic records, and after-action reports; and informal interviews and public presentations. Beginning approximately two days after the September 11 attack, Disaster Research Center field workers were permitted access to a variety of organizations and settings in New York City. They were able to observe emergency response activities and attend meetings at the city's emergency operations center, command posts near Ground Zero, the federal disaster field office, volunteer, supply, and food-staging areas, family centers that were established to assist victims' families, respite centers that provided assistance to emergency workers, and other sites. In all, more than 750 person-hours were spent in the field in the three months following the attack, yielding extensive field notes as well as other materials that were collected from organizational contacts. Articles from major New York newspapers were collected for six months following the attack, as were articles from major periodicals, selected articles from newspapers around the world, and information from a wide range of government, charity, community and university-based Internet sites. DRC personnel also attended several conferences and community meetings for the purpose of obtaining relevant information on emergency response activities. Additionally, DRC was able to take advantage of volumes of written materials that have been produced on the World Trade Center disaster.

The discussions below, which are based on these data, constitute an effort to derive from the World Trade Center case more general insights on how resilience is achieved at the organizational and community levels in catastrophic and near-catastrophic disaster events. These discussions focus specifically on the "resourcefulness" dimension of resilience. The analysis centers on three sets of conditions and activities that contributed to resourcefulness: the ability to manage convergence and incorporate emergent groupings into the overall community response; the prominence of network forms of organization in the post-impact response period; and the capacity to respond in a flexible manner to unforeseen demands.

4. RESILIENCE ILLUSTRATED: CONVERGENCE, EMERGENCE, NETWORKS, AND FLEXIBLE MODES OF ADAPTATION

4.1 Managing Convergence and Emergence.

Major disasters are occasions that are invariably marked by large-scale convergence, or the movement of people, goods, and other resources into the disaster-stricken area. One of the earliest patterns identified in research on disasters (see Fritz and Mathewson, 1957), convergence occurs in virtually all major disasters. Major disasters also constitute occasions for the formation and mobilization of emergent groups. As their name suggests, these groups, which did not exist prior to the disaster, "emerge" and begin to function because their members see themselves as able to meet needs that are not being addressed by the formal emergency response system. Both convergence and emergence are linked to disaster severity; other things being equal, the greater the devastation and social disruption caused by a disaster event, the more people and goods will mobilize to the affected area, and the greater the likelihood that new groups will form to assist with the response.

Immediately following the Trade Center attacks, convergence and emergence began to occur on a very large scale. With respect to human convergence, those who converged included on- and off-duty emergency workers from New York City; other emergency workers, first from the nearby region and later from across the country; governmental personnel; business employees; and community residents and volunteers wishing to offer every conceivable kind of assistance. Equipment, goods, and supplies poured into the city from around the U. S. and later from around the world. This convergence was followed by an unprecedented outpouring of charitable giving. Numerous new groupings were formed, first at Ground Zero, and then later at other assistance sites around the city, such as the center that was established to provide assistance to the families of victims.

Characteristics of the setting and of the disaster event itself facilitated convergence. While there was enormous devastation at Ground Zero, millions of people in the impact region were unaffected by the attacks and available to provide assistance. Similarly, tens of thousands of

emergency workers and governmental employees were instantly available to offer aid. Initially, emergency communications called for all available personnel to mobilize. Additionally, large numbers of first responders and other personnel "self-dispatched" to the Ground Zero site, and many workers who were explicitly ordered not to respond ignored those orders. The sheer density of the population in the Greater New York City region virtually ensured that convergence would take place on a massive scale, and undamaged transportation systems provided relatively easy access to the city. Because the attacks took place during the regular morning news broadcast and because the story of the hijacked flights dominated all news coverage in the entire country, information about the attack was disseminated extremely rapidly within the population. The visual drama and the immensely tragic and disturbing nature of the attacks made the September 11 disaster an event of enormous cultural significance and triggered an extraordinary outpouring of emotions on the part of the general population. Characterized almost immediately as both a disaster and an "act of war," the Trade Center attack generated feelings of both altruistism and patriotism among the populace. These factors, combined with the unique characteristics of New York City as an urban center, all contributed to mass convergence and stimulated the formation of emergent groups.

Convergence and emergence can enhance community and organizational resilience by addressing the need for disaster-related skills and material resources. At the same time, it has long been observed that these patterns can create problems if not managed effectively. Too many workers, vehicles, and convergent volunteers at the scene of a disaster can create congestion and interfere with response activities, and the need to manage converging resources puts additional strain on emergency response systems. In many cases, the people and goods that converge into disaster areas were never requested and are not needed. Similarly, the presence of many emergent groups at the scene of a disaster requires additional coordination. Often such groups are seen as challenging official response agencies, as performing services that are unnecessary or duplicative, or as carrying out their activities in inappropriate ways. (For more discussions on convergence, emergence, and volunteer behavior in disasters, see Tierney, Lindell, and Perry, 2001.)

Problems like these did develop in New York City following the Trade Center attacks. Even given the magnitude of the disaster, a large proportion of the people, equipment, and supplies that poured into the area were not needed, and in some cases mass convergence made situations more difficult and dangerous, rather than less. However, by and large the emergency management system was able to cope effectively and manage convergent personnel and resources. A variety of mechanisms evolved for this purpose. First, measures were put in place to ensure spatial separation between convergent resources and the disaster site. For example, the Jacob Javits Convention Center in Manhattan was used as a site for volunteers and a storage place for some supplies. A network of warehouses, staging areas, and storage caches were set up to better manage and account for converging resources.

Second, considerable time and effort were invested in establishing security perimeters and later credentialing systems to ensure that only authorized personnel had access to the Ground Zero site and to important facilities, such as the city's reconstituted emergency operations center at Pier 92 and the disaster field office, which was established at a neighboring pier. Credentialing systems, which were initially improvised, became increasingly sophisticated over time. Credentials and security are always important in disaster operations, but because of the nature of the event, such concerns were even greater in the Trade Center disaster.

Third, while it was difficult at first, over a period of a few days, the city, through the Mayor's Office of Emergency Management, was able to put in place authorization systems that ensured that workers, supplies, and equipment (including materials that had been donated) were not mobilized unless explicitly requested by agency personnel who had the authority to make such requests. While the need for formal systems of authorization seems obvious in retrospect, such measures were in fact difficult to institute and enforce following the attacks on the Trade Center, particularly given the massive scale of convergence and the emotions that motivated people to get involved in the emergency response. Indeed, even with such systems in place, individuals and groups continued to show an amazing amount of ingenuity in circumventing and subverting procedures in order to provide goods and services they believed were needed.

4.2 Networks, Decentralization, and Resilience. DRC is in the process of coding data on the World Trade Center disaster response in order to better describe both what organizations took part in the response and how those organizations interacted with one another during the emergency period. Based on various data sources, and focusing only on the first ten days following the attacks, more than five hundred organizations have been identified to date. Results from quantitative analyses of interorganizational relations will not be available until later in 2003. However, based on initial descriptive material, several features of the interorganizational arrangements that developed in response to the Trade Center attacks warrant discussion. One such feature is the prominence of network forms of organization during the emergency response period. In this context, a network organizational form consists of organizational actors that "pursue repeated, enduring exchange relations with one another and, at the same time, lack a legitimate organizational authority to arbitrate and resolve disputes that may arise during the exchange" (Podolny and Page, 1998: 59).

While many response-related activities were carried out in accordance with prior planning, a large proportion of the collaborative activities that were undertaken by groupings of organizations developed on an emergent basis, driven mainly by immediate emergency-related needs, as defined by those organizations and by the intergovernmental

response system more generally. For example, network arrangements emerged and evolved among marine transport organizations that worked together to evacuate people from lower Manhattan following the attacks; organizations that carried out various tasks associated with search and rescue; existing and emergent groups that conducted building inspections in the Lower Manhattan impact area; organizations that took responsibility for debris removal and disposal and site stabilization at the Ground Zero site; organizations and groups that provided mapping and geospatial information to responding agencies; organizations that banded together to provide assistance to the families of victims; and agencies and organizations concerned with a wide variety of health and safety issues in the aftermath of September 11. While in some cases network ties were later authorized officially (e.g., through contracts) many other network ties were based on informal relationships and agreements. Networks generally consisted of a mix of public and private and official and volunteer organizations, and their composition changed over time as new needs were identified.

Although technically subject to a wide variety of rules and authorities, the networks that emerged to handle response-related demands operated in a relatively decentralized fashion, especially in the immediate aftermath of the attacks. In contrast with more hierarchically-arranged groupings, response networks were loosely-coupled and operated in a semi-autonomous manner. This is not to imply that systems of coordination were lacking. Such systems were present. The city's emergency operations center was organized into functional work groups composed of organizations that were responsible for related and complementary tasks—for example, law enforcement, transportation, utilities, and human needs. However, the organizations that were present in the EOC were each only "nodes" in larger and more diverse organizational groupings, and they did not actually direct the activities of network actors.

Loosely-coupled networks like those that emerged in the aftermath of the 9-11 attacks have many advantages, including flexibility, adaptability, and the capacity to continue functioning despite shocks and environmental turbulence. Network forms of organization are also thought to enhance interorganizational learning, both through their ability to disseminate information rapidly among constituent organizations and through fostering an ability to recognize novelty and support innovation (Podolny and Page, 1998). These network properties were a source of organizational resourcefulness and resilience in the Trade Center disaster.

4.3. Improvisation and Creativity as Indicators of Resilience. The capacity to improvise and respond in creative ways to the problems that presented themselves in the wake of the September 11 attacks was another key contributor to organizational resourcefulness and resilience. Disasters are occasions that invariably call for improvisation and creativity; an event that can be managed through established procedures and that does not require affected organizations to search for new information and solutions is by definition not a disaster. By their very nature, catastrophic and near-catastrophic events are more likely than other types of disasters to require novel ways of meeting disaster-related demands. The September 11 disaster was that kind of event; completely unexpected, severe, highly complex, and demanding, it presented challenges that could not be adequately handled either through existing organizational repertoires or through existing emergency plans.

Numerous examples of improvisational and creative activity have been documented in the World Trade Center disaster. For example, prior to 9-11, New York City had no procedures for conducting post-disaster safety inspections of buildings. After the attacks, a group of volunteer engineers worked with city building officials to inspect damaged structures in and around the Ground Zero area. They used ATC-20, a rapid-damage-screening protocol that had originally been developed by California engineers for carrying out building safety inspections following earthquakes. This form of improvisation illustrates what Weick (1993), following Levi-Strauss (1966), refers to as *bricolage*, a key element in the collective sensemaking that must take place in order for organizations to respond to environmental turbulence. The *bricoleur* is a type of handyman who gets things done through developing solutions based on materials and resources that are "at hand." Geographic information systems, computer modeling, remote sensing, and other new technologies were used in novel and unplanned ways to deal with response-related problems (for a discussion of remote-sensing tools used at Ground Zero, see Huyck and Adams, 2002). Emergency management software that had been obtained but never used was put in place after the disaster response was under way to help the city track resources, and outside experts were brought in to assist with those activities. Working with other agencies, again without prior planning, the Mayor's Office of Emergency Management completely reconstituted its emergency operations center following the destruction of its state-of-the art facility at 7 World Trade Center. In this last-mentioned example, resourcefulness compensated for shortcomings in redundancy; when 7 World Trade Center was lost, the city had no alternative site from which to direct its emergency operations.

The development of task-centered interorganizational networks, discussed above, can itself be seen as a novel solution to the enormous challenges this disaster presented. New networks emerged precisely because the organizations involved recognized that the scope of the disaster exceeded that of previous planning. The creative element in the response involved a recognition that prior preparedness activities—whether centered on natural disasters, on the one hand, or terrorism and bioterrorism, on the other—were simply inadequate to address the 9-11 event in its complexity. Tools for rapid post-earthquake screening and the services of structural engineers were employed because the September 11 event resembled an earthquake in terms of its impacts. At the same time, however, Ground Zero was also a crime scene, necessitating extensive involvement on

the part of law enforcement organizations, as well as a potential source of health- and safety-related threats, creating an important role for health-care-sector organizations. Extraordinarily complex by any standard, 9-11 required an equally complex interorganizational response and the development of new action repertoires. The ability to recognize these distinctive requirements and to deviate both from plans and past practice when necessary while retaining organizational repertoires and arrangements as appropriate was itself a major contributor to organizational and community resilience. Lengthier discussions related to the points made here, along with more detailed descriptions of processes such as organizational innovation can be found in Kendra and Wachtendorf, 2001; Kendra and Wachtendorf, 2002a; 2002b; and Tierney, 2002.

5. DISCUSSION AND CONCLUSIONS

Both MCEER formulations and DRC studies on the World Trade Center disaster have focused on identifying factors that contribute to organizational and community resilience in major disaster situations. The communitywide response to the World Trade Center disaster was a resilient one, owing in large measure to the resourcefulness that characterized response activities. A resourceful response was possible in this case due to the fact that the scope of impact was confined to a relatively small geographic area. The Greater New York City area is extremely rich in human and material resources, and the attacks left the overwhelming majority of those resources intact and available. This is in contrast with other types of disasters that produce damage over a wide area and destroy or damage critical response resources.

To be employed effectively, however, converging resources had to be managed. After a difficult period, the agencies coordinating the emergency response were able to accomplish that task through measures that geographically separated converging resources from the disaster site, instituted controls over access to the site, and put in place systems of accountability.

Equally important, loosely-coupled network forms of organization developed that enabled constituent organizations and groups to focus on specific aspects of the emergency response (e.g., building inspection, debris removal, health and safety). These collaborative networks were diverse and responsive to local conditions and emerging problems. The structural features of these networks, including their ability to incorporate new organizational actors as required, enabled response agencies to adapt to a continually-evolving environment. The severity, scope, and unprecedented nature of the disaster fostered a collective search for ways of coping with the unexpected, in turn generating a wide array of improvisational and innovative activities.

The response to the Trade Center disaster was resilient not merely because sufficient resources were available to handle problems as they arose, but more significantly because the entities responsible for managing response activities were able to develop a common vision of what needed to be done in various task areas, evolve organizational structures capable of addressing those needs, and identify (and in some cases create) specialized resources, tools, and techniques to meet needs as they emerged.

Seen in broader terms, resourcefulness as exhibited in the World Trade Center disaster can be viewed as a form of "collective sensemaking." As discussed by Weick (1995), sensemaking involves responses to uncertainty and surprise in which individuals, groups, and organizations actively define situations and craft strategies for dealing with them. To expand on this idea:

> [s]ensemaking is an effort to tie beliefs and actions more closely together as when arguments lead to consensus on action, clarified expectations pave the way for confirming actions, committed actions uncover acceptable justifications for their occurrence, or bold actions simplify the world and make it clearer what is going on and what it means (Weick, 1995: 135)

Especially germane for this discussion is Weick's characterization of sensemaking as "enactive of sensible environments" and as inherently social. The concept of "enactment" refers to the fact that, rather than passively "reacting" to external environments, organizations can also "enact" or actively create their environments. Following the Trade Center attack, many organizations enacted environments and created arenas for action, often in a very entrepreneurial fashion. For example, Langewiesche (2002) discusses in detail how New York City's Department of Design and Construction acted rapidly on the day of the attacks to define for itself a central role in the management of activities at the Ground Zero site—a role for which the agency had no prior authority. In similar ways, responding organizations actively reached out to other organizations and groups that were thought to possess needed resources and expertise, even when mechanisms to formalize their participation in response activities were not in place. Emergent networks and enacted environments were themselves the products of social activity aimed at making collective sense of an event that was far outside the bounds of prior collective understandings. "Sensemaking work" consisted of interlinked processes of collective definition and collective action—and in many instances actions preceded definitions, rather than the other way around.

The notion that resourcefulness has its basis in collective sensemaking leads logically to questions about factors that contribute to sensemaking within organizations and in particular within networks of organizations. Although such an analysis is beyond the scope of this discussion, efforts to identify conditions that facilitate sensemaking should start with the work of Weick (1995), who has looked in depth at constituent elements in sensemaking that include shared cognitive frames, the ability to recognize and act on cues, ideologies, organizational vocabularies, paradigms, theories of coping, and tradition.

Recognizing the link between resourcefulness and the

mobilization of networks of collective actors also leads to a consideration of the social bases of collective action. Studies on collective action (see in particular Tarrow, 1994) have identified sets of facilitating factors, including cognitive and ideological frames, pre-existing social and organizational networks, and opportunities for mobilization that are present in the environment in which such actions are launched, such as political opportunity structures. Such studies, which have generally focused on social movements, also have clear applicability for the study of resourcefulness and resilience in organizational and community systems following disasters.

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