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CATASTROPHE CHARACTERISTICS AND
THEIR IMPACT ON CRITICAL SUPPLY CHAINS:
PROBLEMATIZING MATERIAL CONVERGENCE
AND MANAGEMENT FOLLOWING
HURRICANE KATRINA

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**Catastrophe Characteristics and their Impact on Critical Supply Chains: Problematizing
Materiel Convergence and Management Following Hurricane Katrina¹**

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Catastrophe Characteristics and their Impact on Critical Supply Chains: Problematizing Materiel Convergence and Management Following Hurricane Katrina

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Abstract

The influx of supplies after disaster events helps to meet emergent needs of the impacted area and fill gaps in logistical plans. This same materiel convergence, however, can pose a challenging social problem as organizations must contend with difficulties in supply acquisition, reception, transport, storage, and distribution. In this paper, we use Hurricane Katrina, which impacted the Gulf Coast of the United States in 2005, as a case study to examine the ways in which catastrophic events generate unique conditions that impact how materiel convergence presents itself and must be managed. To examine this social problem, we use E.L. Quarantelli's (2006) six characteristics of catastrophe to explain how the magnitude and scope of the event generated social conditions that had bearing on the movement of critical supplies to, from and within the impacted zone. Data analysis of the materiel convergence and management problem revealed a seventh catastrophe characteristic not previously identified in the literature: mass and extended out-migration of people. Findings are based on qualitative interviews with key organizational actors involved in response efforts.

Introduction

The massive movement of personnel, information and materiel to a disaster site and locations associated with the event – otherwise known as convergence – is well documented in the sociological literature on disasters. It was discussed in S.H. Prince’s examination of the 1917 Halifax munitions ship explosion, commonly known as the first sociological study of a disaster (Scanlon 1991). Later, Fritz and Mathewson (1956) presented perhaps the earliest comprehensive treatment of the subject. Scholars such as Kendra and Wachtendorf (2003), Scanlon (1991), Wenger and James (1994), and Zakour and Gillespie (1998) have studied personal convergence, or the movement of people. Convergence of helpers to a disaster-impacted area, for example, can meet legitimate needs not otherwise addressed by the formal response (Kendra and Wachtendorf 2003; Stallings and Quarantelli 1985; and Wachtendorf & Kendra 2004). Yet this convergence behavior is often accompanied by a host of challenges including those related to coordination, communication, task assignment, and supply provision to these helpers (Barton 1970; Fritz and Mathewson 1956). In contrast, materiel convergence, or “...the actual movement of supplies and equipment...” (Fritz and Mathewson 1956 p. 4) is less understood. Indeed, Holguin-Veras et al. (2007) and Neal (1994) are among the few research publications dealing exclusively with materiel convergence. Their work, as well as that of the scholars who touch on materiel convergence in their treatment of personal convergence, suggests that the influx of supplies after disaster events helps to meet emergent needs of the impacted area and fill gaps in logistical plans. This same phenomenon, however, can present a challenging social problem as organizations must contend with supply acquisition, reception, transport, storage, and distribution. Lacking in the literature is a systematic study of the extent to which an

event's magnitude and scope impacts the manifestation of the materiel convergence and management problem. In this paper, we use Hurricane Katrina, which impacted the Gulf Coast of the United States in 2005, as a case study to examine the ways in which catastrophic events generate unique conditions that impact materiel convergence and how the problem must be managed.

Characterizing Catastrophe

For decades, scholars have pondered the question: "What is a disaster?" (For a review, see Perry 2006; Perry and Quarantelli 2005; Quarantelli 1998). Most definitions offer some variation of a non-routine event that exceeds a community's ability to cope, with many pointing to the occurrence of physical harm and social disruption as key features (e.g. Kreps 1998; Fritz 1961). Scholars disagree on such issues as the extent to which disasters are caused by outside agents or those internal to social systems and whether disasters are characterized by altruism or conflict. Indeed, even some who generally concede the non-routine element of disasters argue that periodic disasters are inevitable in our society given the way we structure our social systems, be it those who adopt a risk perspective (such as Perrow 1999), crisis perspective (such as Boin 2005) or social vulnerability perspective (such as Oliver-Smith 1998). Yet there is general agreement that disasters are qualitatively different from everyday emergencies, the latter characterized by fewer converging entities, greater respect for autonomy and freedom of action, stricter adherence to routine performance standards, and minimal interface between the public and private sector (Quarantelli 2006). Conceptually, the organizing principles and social behavior that emerge in disasters differ from everyday emergencies. Practically, disasters demand different responses.

In his prior characterizations of disasters, Quarantelli emphasized social elements, both in the ways that vulnerability is socially constructed by social system relationships and the notion of social change (Perry 2006). Disasters, he argued (Quarantelli 2000, p.682), have sudden onsets; seriously disrupt collective routines; lead to the adoption of unplanned actions; have unexpected life histories; and pose danger to valued social objects. Unlike disasters that exceed a community's ability to cope, catastrophes are high consequence events that generate more comprehensive and crippling impacts. Quarantelli (2006) identified six characteristics that distinguish catastrophes from disasters. In catastrophes:

- 1) most or all of the community built structure is heavily impacted....[and] the facilities and operational bases of most emergency organizations are themselves usually hit;
- 2) local officials are unable to undertake their usual work role, and this often extends into the recovery period;
- 3) help from nearby communities cannot be provided;
- 4) most, if not all, of the everyday community functions are sharply and concurrently interrupted;
- 5) the mass media system especially in recent times socially constructs catastrophes even more than they do disasters;
- and 6) because of the previous five processes, the political arena becomes even more important [than in disasters] (Quarantelli 2006).

These characteristics do not form the basis of a dichotomous distinction between disasters and catastrophes. Rather, events are more or less catastrophic depending on the presence of each characteristic and extent to which each characteristic is apparent. If all characteristics are overwhelmingly present, surely the classification of a severe catastrophe would prove appropriate. An infectious disease outbreak, however, may not at all impact built structures (the first of Quarantelli's characteristics); yet this event may still demonstrate catastrophic impacts

through the presence of other characteristics. Two separate events may generate a lack of available assistance from nearby communities. For the community in the first event, *nearby* may constitute within a 50 mile radius. For the community in the second event, *nearby* may constitute within a 300 mile radius. The characteristics, therefore, provide a useful mechanism to conceptualize the degree to which an event is catastrophic for the impacted area.

While his characterizations, on the surface, emphasize the social over the physical elements, we argue that they in fact set the stage to consider the generation of a catastrophe (or a disaster, for that matter) as an event where physical conditions and resulting social impacts are tightly coupled. The magnitude and scope of the hazardous agent brings about a severely compromised physical environment (be it the landscape, the built environment, or even the air or water quality). At the same time, these physical conditions lead to compromised social conditions. The coupling, we argue is particularly relevant for catastrophic events. A lower level physical event could lead to severe negative social consequences depending on the social resiliency of the impacted community. Likewise, high levels of resiliency could mitigate the impact of a significant physical event, preventing a disaster situation. In contrast, the social characteristics of catastrophes are unlikely to occur without the presence of a physical event with a strong magnitude and broad scope. It would be incorrect to lay entire blame for the shortcomings materiel convergence management aftermath of Hurricane Katrina on the magnitude and scope of the event. Yet at the same time, ignoring these elements would lead to some false comparisons between Katrina and smaller-scaled disaster events. Indeed, after Hurricane Katrina, many of the organizational issues that shaped the response manifested from or were exacerbated by the physical context of the hurricane. For example, severity of the incoming storm led to the

mandatory evacuation of the area. This evacuation ultimately contributed to why many local officials were unable to fulfill their usual roles. The magnitude of the storm directly led to destruction of buildings, infrastructure, and response-related facilities. The far reaching scope of the hurricane impacted several states and thereby limited the extent to which nearby communities could provide assistance. Similarly, the magnitude and scope of this event were critical factors in determining the presence and flow of emergency supplies to the impacted region.

This paper explores how the characteristics of the post-Hurricane Katrina environment combined to generate an event that was catastrophic in nature. Moreover, these features led to specific challenges in the flow of emergency supplies following the event. That is, the types of problems associated with effective relief provision were a direct consequence of catastrophe characteristics.

Methods

In this paper, we use Hurricane Katrina as a case study to examine how the characteristics of catastrophic events generate unique conditions for the social problem of materiel convergence and the management of the emergency supply chain. Hurricane Katrina struck the Gulf Coast of the United States in fall 2005. Communities in Louisiana, Mississippi, and Alabama experienced direct impacts from the storm. Hundreds of thousands of evacuees fled to states around the country. In addition to the breach of New Orleans's 350 mile levee system, structures and infrastructure throughout the region were destroyed from flooding or wind damage.

The storm impacted almost 93,000 square miles across 138 parishes and counties. Over 1300 people lost their lives and the area suffered an estimated \$96 billion dollars in property damage (See Townsend 2006 for a fuller account of the impacts). Respondents from all government levels who were interviewed as part of our larger study on the emergency supply chains repeatedly referenced the catastrophic nature of Hurricane Katrina when explaining the complex resource challenges that communities experienced. Consequently, in this research we employed a combined inductive/deducted data analysis, using Quarantelli's (2006) six characteristics of catastrophe to determine: 1) each characteristic's presence in the Hurricane Katrina event; and 2) the impact of each characteristic on the movement of critical supplies to, from and within the impacted zone. Our data analysis ultimately revealed a seventh catastrophe characteristic not previously identified by Quarantelli (2006): the mass and extended out-migration of people.

Findings are based on an analysis of site observation notes, interview transcripts, and document material. Site observation and informal face-to-face interviews took place during a quick response trip to the region in September 2005. We then conducted face-to-face and telephone interviews with 36 key organizational actors involved in handling critical supplies during the Katrina response. Interviewees included actors from local, state, and federal agencies, the private sector, non-governmental aid organizations, and volunteer groups. On-site interviews were conducted during three trips (December 2005, January, 2006, and March 2006) to impacted areas in Louisiana and Mississippi, while telephone interviews were conducted throughout 2006.

Questions focused on topics such as the social dynamics of the supply chain process, procurement, challenges, and lessons learned. Interview-length ranged from 90-120 minutes, and

most were conducted by a joint team of social scientists and civil engineers. Document material consisted of government reports, newspapers, inventory logs, and maps.

We coded data by hand in three distinct phases. First, we highlighted and paraphrased passages pertinent to the broad research question – namely, exploring and understanding the supply chain process – and assigned descriptive open codes to this text. Second, descriptive codes were collapsed into general categories. A five to seven page outline of each transcript was produced for each transcript, resulting in fourteen categories, each with relevant subcategories. A review of the disaster research literature revealed an association between the categories and Quarantelli's (2006) characteristics of a catastrophe. In the third analysis phase, we constructed a table to organize data, where appropriate, under each of Quarantelli's characteristics. For each characteristic we returned to the data to note 1) the impact description; 2) the general consequence; and, finally, 3) the specific supply chain consequence. For example, one listing in Quarantelli's characteristic *damage to the built environment* included: 1) the impact description – a damaged road; 2) the general consequence – confusion about directions/detours; and, 3) the specific consequence to the supply chain – time delays in the movement and delivery of the critical supplies en route.

The table included two additional columns. The first accounted for data that fell outside of Quarantelli's categories. This data eventually led to the identification of a seventh catastrophe characteristic: the mass and extended out-migration of people, often well into the recovery period.

The second column helped organize consequences that overlapped multiple characteristics. For example, manpower shortages for logistics and supply chain operations resulted from not one but two catastrophe characteristics (local officials unable to take on their usual work roles as well as help from nearby communities cannot be provided). Manpower shortages then contributed to the occurrence of a third catastrophe characteristic (everyday community functions are sharply and concurrently interrupted).

In our discussion below, we list below each of Quarantelli's catastrophe characteristics and then discuss specifically how each contributed to the particular social problem of materiel convergence and emergency supply chain management. The newly identified seventh characteristic treated in a similar manner. In our discussion, we address overlapping supply chain consequences under the catastrophe characteristic for which the data collected provided the strongest link. At the same time, however, we acknowledge that features noted under one characteristic may have direct relevance to other characteristics.

Findings

1. Quarantelli's First Characteristic: Most or all of the community built structure is heavily impacted....[and] the facilities and operational bases of most emergency organizations are themselves usually hit.

High winds, storm surge, and flooding generated by levee breaches in New Orleans led to significant damage to the built environment, including structures and infrastructure. A typical disaster generates less widespread physical damage and most emergency operational facilities escape largely unscathed (Quarantelli 2006). Hurricane Katrina, however, rendered many

homes, businesses, schools, hospitals, and emergency management facilities largely unusable. The region also experience widespread damage to transportation, power, and communication infrastructure (Townsend 2006).

Impact on Materiel Convergence and Emergency Supply Chains

Navigating the Impact Zone

In the event of a catastrophe, the level of damage to the built structure and the radius of the impacted zone are larger than in a typical disaster. With regard to Katrina, damage to local roads and bridges made difficult the moving of critical supplies to and within the impacted zone. As a consequence, greater time delays in getting critical supplies to locally affected populations ensued. Most truck drivers were not from nearby communities. Unfamiliar with the Metropolitan New Orleans, drivers often became confused about directions. Because of road and bridge damage, there was a need to create detours for incoming deliveries, which further confused drivers. As a result, many drivers became lost, putting some deliveries at a standstill during the immediate response. Dangerous conditions associated with the damage to the built environment led officials to often forbid both civilians and emergency responders from moving into or within the disaster zone without permits. Those delivering the both requested and spontaneously converging supplies were often unaware of the need for special entry permits, and the bureaucratic process of obtaining permits from organizations not always in communication with each other was reportedly time-consuming. Moreover, curfews were established in response to area power outages and damage levels. Delayed drivers who arrived after curfew were unable to unload their supplies, lengthening the time recipients had to wait for emergency goods.

Pre-Positioned Supply Damage

When a building is significantly damaged, its content may also be compromised. For example, we heard reports of pre-positioned supplies such as generators that were stored in warehouses within the impacted zone and were rendered useless due to flood damage to the structure. This damage to pre-positioned goods created an increased need for supplies to converge to the area. These much-needed converging supplies exacerbated problems associated with congestion, storage space, and the permitting and curfew issues noted above. Respondents noted that in New Orleans, damage to the paperwork and electronic files of pre-existing supply contracts impeded emergency responders from contacting desperately needed vendors, generated confusion and duplicate orders, and created challenges for ensuring a reimbursement-friendly paper trail that would have been present with easy access to the established contracts.

Identifying Alternative Space

Damage to the built structure generated the need to identify alternative space for stakeholders affected by Hurricane Katrina. For example, damage to pre-existing buildings that were intended to shelter victims of the storm necessitated the identification of alternative shelters for civilians. Respondents repeatedly identified these alternative spaces as “pop-up shelters,” alluding to their impromptu nature. Pop-up shelters were not pre-stocked with supplies, and it frequently took time to disseminate information about their location to of all actors in the supply chain distribution process.

Identification of alternative space was also an issue for converging emergency personnel. Some supplies sent to serve as alternative housing – in the form of large recreational vehicles and

trailers – were utilized as work (and likely housing) space for responders. Wind and water damage to pre-established warehouses forced the identification of alternative storage space for the large influx of material goods. Because the radius of the impact zone was so large, finding built structures for these purposes that were both undamaged yet still within reach of the impacted area proved difficult. Boats were occasionally used to store critical supplies; however, boats were also a critical resource needed for search and rescue activities and supply distribution. Helicopters – a far costlier transportation mode – were used to augment the search and rescue vehicle shortage.

Inadequate Communication

Aggravating the above factors was a lack of operable communication infrastructure. The lack of communication regarding infrastructure damage, rerouting, permitting, and curfews sometimes result in greater time delays in or failure to complete the supply chain. Similarly, victims and responders needed to communicate the impact to facilities and loss of supplies. Without communications systems, emergent needs such as requests for operable generators were not communicated. Considerable time delays in restoring power and providing other emergency relief services ensued. Efficiently managing the supply chain requires the ability to communicate information about emerging needs of the impacted community and including people who can best contribute to efficient response and relief. Inoperable communication infrastructure made difficult coordination of the supply chain process.

2. Quarantelli's Second Characteristic: Local officials are unable to undertake their usual work role.

Following catastrophes, the local personnel who are often so essential to the response to and recovery from community disruption events are themselves impacted in such a way that they are unable to contribute in usual ways. Outsiders are more relied upon following catastrophes. After Hurricane Katrina, where the ability of local officials to respond was often compromised, the role and challenges of utilizing outside assistance proved challenging in the supply chain process.

Impact on Materiel Convergence and Emergency Supply Chains

Overburden on the Local System

The catastrophic nature of the event precipitated several conditions that led to an overburden on the local system. First, it is important to remember that local officials in the Katrina impacted region were themselves victims of this event. Some – particularly non-essential personnel – evacuated with their families. Some organizations such as the New Orleans Police Department experienced high rates of absenteeism. Some officials were injured. Second, many respondents spoke of a lack of emergency officials embedded in local parishes to begin with. A shortage of manpower prior to a significant evacuation required existing and converging emergency workers to adopt, as one respondent termed it, an “all hands on deck” attitude and assume whatever roles were necessary to respond. Respondents stated that those officials who remained behind were sometimes overwhelmed with the response and were unable to balance on their own these emerging needs with their routine obligations. When local officials or responders were unable to offer their skills and knowledge in a timely manner the supply chain became overburdened. Fewer local officials were in place to determine and communicate need. Fewer local helpers had

sufficient local knowledge of the community's physical and social terrain. Fewer local officials were available to field outside inquiries, even when those inquiries promise support.

Helper Convergence and Coordination

When local officials are unable to fulfill their roles, leadership may be assumed by community outsiders. Emergency response workers converging from outside the local area are often unfamiliar with the layout of the impact zone and may lack adequate knowledge of local norms – both inside and outside the walls of responding organizations. These challenges were apparent after Katrina, where many outside responders came to assume tasks normally undertaken by local responders or officials. Respondents described how individuals were operating from “different battle books” or had different conceptions of appropriate procedures and regulations, some of which eventually impacted reimbursement eligibility. At other times these differences in approaches led to friction between external helpers and local responders or community members. Other interviewees reported difficulty contacting those who would have normally communicate specific needs in the local area. Time delays ensued as outside helpers navigated a newly emerging social system. Disasters involve a multi-organizational response that best operates when communication and coordination are optimized (McEntire and Drabek 2002). When organizational actors experienced difficulty integrating into the response system – which often included a dynamic network of local, state, federal, and international agencies – that coordination was challenged.

Outside organizations much contend with their own logistical considerations. That is, these converging personnel will generate their own resource needs including clothes, food, supplies,

equipment and shelter. Some organizations stipulated that their personnel must arrive with enough supplies to meet their own needs, yet others did not. Even compiling necessary goods took time and sometimes delayed travel to the impacted region.

Determining helpers with required skills from those well-meaning convergers without necessary skills presents additional challenges to many response tasks, including supply chain flow (Kendra and Wachtendorf 2003). This challenge was true for both requested helpers and those who spontaneously arrive at various sites. For example, while some FEMA auxiliary staff members were skilled in logistics, others were less so or were trained in computer systems different from those currently in use. Inexperienced helpers assuming logistics positions were forced to learn new tasks and responsibilities in the midst of responding to a catastrophe. One organization received a computer tracking system to inventory supplies but was unable to implement it because no one was adequately trained. Those auxiliary personnel experienced in logistics expressed dismay that the federal response did not require regular training, familiarity with updated manuals, and standardized forms. Interviewees noted that instead of having a corps of permanent, professional employees to assume these roles, an increased reliance on smaller, mostly private contracting entities aggravated this problem.

Some organizations, of course, had a history of coordination with external entities prior to the event. For example, as Katrina approached the Gulf Coast, a donations representative in Florida contacted a state emergency management colleague in Mississippi in an effort to anticipate what donations and delivery mechanism would be appropriate. Upon request, the donations representative arrived before landfall to begin organizing volunteer and donations activities.

Agreements between the two states – both within FEMA Region IV – also facilitated supply chain flow. In Louisiana, the state Volunteer Organizations Active in Disasters (VOAD) consortium is routinely active prior to landfall and worked to help ensure that state non-profit groups coordinated. Many respondents highlighted successful working relationships between the state and VOAD agencies during the response. Organizations coming from greater distances and with no prior working relationships in place, on the other hand, often experienced more difficulty navigating the response network.

3. Quarantelli's Third Characteristic: Help from nearby communities cannot be provided.

In an event of catastrophic magnitude, not only are most of a particular community's residents impacted but so too are neighboring jurisdictions. Thus, the event has a regional character.

Immediately following Katrina, there was significant need for assistance from non-local agencies farther away from the impacted region. For example, one particularly heavy hit parish noted that the Canadian mounted police were the first relief organizations to arrive at the scene. In addition to the insider-outsider issue noted in the previous section, assistance provided from outside the region is less likely to fall under pre-established mutual aid agreements and more likely to take added time to arrive. In catastrophes, nearby communities cannot contribute to response and relief activities. Instead they compete for what becomes an extremely unreliable and unpredictable supply of information, people and goods.

Impact on Materiel Convergence and Emergency Supply Chains

Extended Travel Time for Resources

Unable to rely heavily on neighboring but equally devastated communities for assistance, Gulf Coast communities drew upon the many resources that came from outside of the impacted region. As a consequence, time necessary to transport goods – be it by air, rail, road or sea – was greater than had more items been available from adjacent jurisdictions. By comparison, while the September 11th 2001 World Trade Center disaster resulted in high casualty rates, generated devastating structural loss to a concentrated area of Manhattan, and drew upon resources originating from across the country, New York City was very quickly able to redirect resources within the city, call on mutual aid agreements with organizations in other New York communities, New Jersey, and Connecticut, and utilize spontaneously delivered supplies (including those delivered that day by an improvised water transport). While the supplies may eventually arrive – and perhaps exceed actual need – communities that experience catastrophes like Katrina are more likely to suffer an extended gap between the initial impact and the time goods arrive.

Less Likely to have Pre-Established Mutual Aid Agreements

Although communities vary in the extent to which they establish pre-disaster mutual aid agreements with neighboring jurisdictions, respondents indicated that the regional impact of Katrina left impacted communities more likely to rely on assistance from organizations where no such agreements were in place. With such large volumes of outside assistance pouring into the area, coordination of resources remained a key problem for emergency responders, sometimes in contrasting way. For example, many organizations took steps to ensure that goods were accounted for and that proper protocol was followed despite the fact that the organization had incorporated new personnel. Outsiders to the organization did not have signature authority to

make key supply decisions in the midst of the early response. While such steps likely served to reduce the number of procedural errors made, the high demand on the limited number of individuals with such authority reportedly generated delays through the review process. At the same time, we heard reports of duplicate orders that were unnecessarily filled without such oversight.

In order to expedite operations in an environment where personnel are in short supply, organizations sometimes opted to take short-cuts in the supply chain process. For example, materiel inventories were not always compiled. Instead, transport vehicles sometimes went directly to distribution areas rather than stopping at supply warehouses or related facilities. Consequently, the origin, exact quantity, and type of goods were not always documented. In other cases, inventories were not conducted in a consistent or standardized manner. Sometimes goods were itemized while other times palettes were counted. This flexibility was seen as an important step in ensuring that quick turn-around of supplies. What emerges as a concern is not necessarily the less-rigid protocol but the interpretation of inventories as precisely reflecting the success or short-comings of the system.

Competition for Resources

With a large swath of the region impacted by the hurricane, neighboring communities were often not only unable to provide assistance but also in direct competition for resources. First, the regional impact increased demand while simultaneously diminished a potential source of supplies. Those nearby parishes or counties whose governments, businesses, and citizenry could otherwise have been called on for support were themselves seeking assistance. Second, the impact can, as we saw in Katrina, lead to a situation where communities or organizations play a

heavy hand in diverting much-needed goods from others and to their own suffering constituency. Interview respondents, media accounts, and official reports repeatedly noted that trucks had been commandeered by communities through which they had passed. One sheriff in Mississippi admitted to commandeering FEMA trucks of ice from a nearby storage area to meet the needs of residents:

The ice trucks had been sitting idle at Camp Shelby, a National Guard base just south of Hattiesburg, before the sheriff ordered them sent to the towns of Petal and Brooklyn on Sept. 4. McGee has said his deputies detained a National Guard soldier who tried to interfere. (St. Petersburg Times, 2006).

This appropriation of goods was not an isolated incident. We heard reports from interview respondents of other communities stopping trucks en route to other areas and demanding that the trucks be unloaded to meet the needs of their own community's members. While these are all instances of those in need appropriating necessary – sometimes life saving – goods, other communities experienced delays in receiving those items. In another controversial case, New Orleans residents were reportedly turned away at a bridge crossing by Gretna, Mississippi officers. Where some of the 200 evacuees charged racism in the action, the police chief cited lack of resources as the cause:

"We had no preparations," he said. "You know, we're a small city on the west bank of the river. We had people being told to come over here, that we were going to have buses, we

were going to have food, we were going to have water, and we were going to have shelter. And we had none.” (CNN.com 2005a)

Moreover, the lack of sophisticated tracking systems and integrated distribution protocol during the crisis sometimes led to a situation where those individuals sending the goods truly thought the trucks had arrived at their intended locations rather than being diverted to nearby communities in need. As a result, no subsequent shipment was sent to the initial destination.

4. Quarantelli’s Fourth Characteristic: Most, if not all of the everyday community functions are sharply and concurrently interrupted.

With catastrophic events come the closing of places of work, worship, healthcare provision, recreation, and education. Extensive damage to transportation and lifeline systems generate disruption to electricity, water, telecommunications, Internet service, and mail service, and routine commerce. Whereas a disaster may bring some temporary disruption to some community functions, catastrophes involve widespread and longer-lasting disruption to response activities more generally and the distribution systems more specifically.

Impact on Materiel Convergence and Emergency Supply Chains

Impact to Response Activities

In most disasters, response workers can typically rely on many of the community functions that operate during routine periods. Following Hurricane Katrina, however, this was not always the case. Housing, for example, was extremely scarce and response workers were often forced to find lodging in untraditional locations like abandoned schools and office spaces. Unlike disaster

events where helpers may be able to rely on local hotels and restaurants, Katrina required that goods such as cots, blankets, and food be delivered to support the response operation.

Interviewees reported siphoning gasoline from vacant cars and deserted gas stations. Search and rescue operators purchased private boats. Food was appropriated from local retail stores as commercial activity had ceased in many areas. Improvised communication systems became necessary. For example, we heard accounts of response workers communicating over short distances using walkie-talkies normally intended for children. Signs on the major traffic routes were used in Mississippi to communicate to truck drivers the location of a newly established logistics staging area. Hand written requests for supplies were sent with helicopter pilots. In short, an inability to rely on such a wide range of routine community functions hampered and complicated the response activity and heightened the need for certain supplies.

Impacts to Distribution Systems

The magnitude and scope of the event altered supply chain distribution systems that would otherwise have worked to facilitate material flow during a disaster. The experience of food banks that routinely provide assistance to low income residents illustrates how community disruption during catastrophe can significantly alter distribution systems. Local food banks, faith-based organizations, and other non-profits in the Gulf Coast region normally served as points of food distribution for the national organization Second Harvest. The majority of organizations within this local network were themselves impacted by the hurricane, however, and many staff evacuated the area. Interviews revealed that not only were many of these local organizations then unable to assist clientele who remained in the area, they were also unable to serve as distribution points after Katrina hit. Some personnel were unable to reenter the area as they were not

credentialed. Others promoted emergent points of distribution by walking or driving around neighborhoods, a less efficient information dissemination strategy than if routine communication systems had remained intact. With a strained supply flow, however, the ability generate an environment in which the routine organizations could operate took significant time. Second Harvest took creative steps to contend with the situation, such as what they termed “virtual food banking.” The warehouse phase of the supply chain was eliminated and goods were sometimes sent directly to their member agencies. In other words, the sheer scale of the event demanded that the warehouse component of the supply chain sometimes be eliminated. The features on which distributions systems rely are frequently compromised following a catastrophe, demanding innovative or improvised strategies more so than disaster events. Moreover, it may be more likely that improvisations will require adaptive or creative solutions on a system level rather than minor improvisations or improvisations that reproduce a pre-event system that would no longer prove appropriate given the post-catastrophe environment (see Wachtendorf, 2004 for a discussion of improvisation types).

Resumption of Community Functions

The problem of recovery is circular in a catastrophe as the resumption of community functions is needed to support the emergency supply chain, yet the emergency supply chain is necessary for functions to resume. On the one hand, without the operability of routine community functions following Katrina, the emergency supply chain was hampered. Without local vendors, supplies needed to be transported from greater distances. Without electricity, storage of perishable items closest to those who needed it most proved challenging. Without telecommunications, communicating information about supply chain needs and operations was difficult. Without the

presence of hospitals, employment opportunities, schools, and other key social activities, local community residents who could help with restoration activities extended their period of evacuation. Without local community-based organizations, many distribution points and systems were no longer options for the response – as noted above. On the other hand, without a smoothly flowing supply chain, resumption of community functions was difficult as these resources were needed to begin the recovery process. Without essential supplies, it is difficult for operations to resume or continue as normal.

5. Quarantelli’s Fifth Characteristic: The mass media constructs catastrophes even more than they do disasters.

According to Quarantelli (2006), the social construction of catastrophic events outside of the local area is more likely than in disaster situations and has specific implications. Disasters attract substantial local media attention and often attract some level of national or international coverage. Yet catastrophic events are more likely to receive the sustained world-wide attention of the kind witnessed after Hurricane Katrina. Because many local venues are inoperable after a large-scale catastrophe, coverage by media external to the impact area may exceed that of local media coverage.

Impact on Materiel Convergence and Emergency Supply Chains

Wagging the Dog

The response organizations members we interviewed recognized that the media can be an important mechanism to encourage public support and provision of supplies. In a disaster, local officials and public information officers are often able to channel messages to the public through the media, articulating what goods are needed and appropriate avenues of donating those goods.

Moreover, the organizationally- and geographically-contained impact of a disaster better enable officials to determine actual resource need (though misunderstandings still occur).

During a catastrophe, in contrast, there is greater impact to the built environment (including transportation and communication systems), a wider impact scope, and added response burdens on government officials. Consequently, the media may initially serve as the primary information source for both officials and the general public. Because the media's role is focused on information-gathering, as opposed to information-gathering coupled with other activities, media outlets sometimes determine key response needs or issues before government officials during these complex events. Following Hurricane Katrina, for example, the New Orleans local newspaper Times-Picayune reported on the thousands of people stranded at the convention center. The Federal Emergency Management Agency only learned about the resource needs at this facility the following day after Director of Homeland Security Michael Chertoff was questioned on the matter on National Public Radio.

Intense world-wide media coverage can generate an increasingly swelling supply of goods donated by the public and private sector. Some of these unsolicited resources are very much needed and supplement gaps in formal supply chains. In other cases, unsolicited supplies can create additional management burdens on the response, such as the need to sort perishable and low priority goods from high priority items or the storage of unanticipated goods. Contending with unsolicited donations is challenging in any disaster (Kendra and Wachtendorf 2003; Scanlon 1991; Neal 1994; Fritz and Mathewson 1956). Catastrophic events that garner sustained attention, however, experience this influx on a much larger scale. Respondents repeatedly

reference “the second disaster” as a way of characterizing unsolicited donations. For example, we heard frequent accounts of how unsolicited unsorted clothing, perishable food items, or furniture more likely needed in early recovery did not meet immediate response needs. These unsolicited donations required storage capacity and the attention of personnel, which diverted attention from higher priority tasks and occupied space needed for higher priority goods. While public relations officers can often help in mitigating misunderstandings regarding resource needs, even these officials can contribute to convergence challenges. We heard one report of a public relations officer from a non-profit organization – also a victim of the hurricane – projecting personal needs in calls for community assistance. As a result, an emphasis was placed on requesting clothing that indeed could not be adequately processed at that time. Respondents noted that once the message is generated to the public through the media, it is very difficult to correct the message.

As vital a role the media plays in disseminating information on emerging needs, it is important to remember the media may not have access to all the information necessary to convey the overall need of the impacted areas. If information dissemination from official sources is lacking (either because personnel demands inhibit swift communication or because the information officials do have remains incomplete), the media may frame response needs with a limited perspective. That is, they may call for donations where supplies are already in the pipeline. They may indicate donations are needed without providing clear guidance on how best to integrate those resources into the emergency supply chain. They may direct resources to some areas while ignoring other areas that are in greater need.

Said another way, the mass media plays a pivotal role in the framing emergency supply needs as well as directing the flows of supplies, or, as one respondent colorfully described it, the media “really wags the dog sometimes.” The wide and rapid reach of the media can quickly generate a flow of supplies that can be difficult to circumvent. According to one Hurricane Katrina respondent, the media initially ignored several heavily impacted areas, arguing that donators from outside the region may not even have heard of New Orleans’s 3rd Ward. This finding, that media serves as a critical force that pushes donation supply chains to particular areas at the exclusion of others, is consistent with research on other events such as the 2004 Indian Ocean tsunami and the 2008 China earthquake (Letukas 2008; Wachtendorf 2008; Wachtendorf et al. 2006). In another example, one official described how some media negatively framed a state-level decision to direct excess clothing donations to Goodwill, a non-profit organization that sells used items and uses most of its revenue to fund education and job service training for disadvantaged populations. This decision was framed, however, allowing donated goods to be sold for profit. Again, in a vacuum of information generated from other sources, the media framing of response activities can impact how the public assesses the impact of their donations and the effectiveness of those groups that direct those supplies.

6. Quarantelli’s Sixth Characteristic: Because of the previous five processes, the political arena becomes even more important.

According to Quarantelli, the political arena of a catastrophic event “is a radically different situation [compared to disasters] when the nation government and the very top officials becomes directly involved” (Quarantelli 2006). More levels of government and numbers of jurisdictions become involved or a requested to act in catastrophic events than in disasters. In conjunction

with characteristic 5, public officials increasingly use the media to frame the degree to which their units have successfully responded to catastrophic events. The political stakes are raised when the impacts are more severe.

Impact on Materiel Convergence and Emergency Supply Chains

Laying Blame and Revealing Systemic Shortcomings

The potential and real costs to human life can prove severe when emergency supply chains are disrupted in a catastrophe. In the days following Katrina, we saw television news segments become a forum not only for assignment of blame but statements of direct linkages between lack of resource support and cost to human life. Moreover, shortcomings in the organizational structures and societal context emerged in the political discourse related to supply provision.

Public officials at all levels were quick to reach out to the media in this regard. Following Katrina, the five characteristics above contributed to an environment where different government levels routinely blamed one another for inadequacies in supply distribution. Local officials questioned the speed at which the federal government acted, while federal government officials sympathized but resisted shouldering all of the blame. One respondent interviewed faulted the media for perpetuating finger-pointing rumors. Specifically, he stated that the rumors suggested that federal agencies were blaming local jurisdictions for not requesting help. The National Response Plan clearly outlined that local jurisdictions are responsible for sustaining themselves for 48-72 hours, yet could the need for higher-level assistance have been better predicted and organized? Was the mayor of New Orleans at fault for not finding drivers and utilizing buses to transport local citizens without vehicles out of the area? Was the governor of Louisiana at fault for not pre-staging sufficient resources? Were Homeland Security Director Chertoff, Federal

Emergency Management Agency Director Brown, and President Bush at fault for not opening the flood-gates of resources even more quickly? The political implications of how blame is socially constructed given the severity of impact, the complexity of the needs, and the mass media involvement were heightened in a catastrophic event.

Officials made statements that attempted to directly link the actions of other government levels to a lack of resource support and cost to human life. For example, New Orleans officials lodged harsh criticism through the media against local, state, and federal entities:

New Orleans emergency operations chief Terry Ebbert blames the inadequate response on the Federal Emergency Management Agency. "This is not a FEMA operation. I haven't seen a single FEMA guy," he says. "We can send massive amounts of aid to tsunami victims, but we can't bail out the city of New Orleans.

“Mayor Ray Nagin criticized Jefferson parish for closing the door to exhausted refugees who trudged over the Crescent City Connection to escape the ruined city and reach high ground on the West Bank. ‘We were taking people from St. Bernard parish. If we had a bottle of water, we shared it. Then we were going to let people cross the bridge, they were met with frigging dogs and guns at the parish line,’ said Nagin during an aerial tour of the city.” (The Times Picayune 2005)

"You mean to tell me that a place where you probably have thousands of people that have died and thousands more that are dying every day, that we can't figure out a way to authorize the resources that we need? Come on man," he said...."I've talked directly with

the president," he said. "I've talked to the head of the homeland security. I've talked to everybody under the sun....I keep hearing that it's coming. This is coming, that is coming. And my answer to that today is BS, where is the beef? Because there is no beef in this city....I don't know whether it's the governor's problem, or it's the president's problem, but somebody needs to get ... on a plane and sit down, the two of them, and figure this out right now." (CNN.com 2005b)

Meanwhile, over two years after Katrina, remarks federal and state officials were still attributing blame to each other for the slow response in materiel assistance:

"It makes a significant difference when you have somebody in the statehouse willing to take the lead," [President George W.] Bush said, according to the Associated Press. (Moller 2007)

In a statement forwarded by her press office, Blanco noted that it took federal forces nearly a week to arrive in Louisiana after the storm. "I was the only game in town, leading for nearly a week without the president's help," [then Louisiana Governor Kathleen] Blanco said. (Moller 2007).

According to Quarantelli (2006), federal presence usually consists of little more than a symbolic role and financial assistance, even large disaster. In catastrophes, however, organizational weakness and underlying systems contributing to vulnerability are more often revealed, and this is particularly so at the federal level when direct involvement may prove more necessary or where a greater level of participation is seen. Following Katrina, the lack of disaster management experience of many top FEMA officials and the relatively new subordinate role of FEMA within

the Department of Homeland Security were repeatedly cited as factors contributing to the inadequate provision of resources. So too, however, were local parish politics noted as playing a pivotal role in preparedness and response decisions regarding supplies. Race and class contributors to vulnerability and slow provision of supplies surfaced in discussion about the event, both amongst interviewees as well as in public statements made by officials. "Public inquiries and testimonies took place, before entities such as the United States Congress, regarding challenges related to resource provision. While these political dimensions are not absent from more common disaster events, as Quarantelli (2006) states the involvement of national and top officials is more pervasive in catastrophic events. The attribution of responsibility and blame for resource provision in this catastrophe became a focal point in the political area and discourse.

7. Newly Identified Seventh Characteristic: Mass and extended out-migration of residents.

Our research identified a category not previously noted by Quarantelli (2006). The events of Hurricane Katrina suggest that mass and extended out-migration constitute a seventh important catastrophe characteristic. The more catastrophic an event, the greater and more extended the migration may be. Based on more than 40,000 postings on Internet safe-lists by Hurricane Katrina survivors, ePodunk generated a map depicting those survivors evacuated from their hometowns to towns and cities across the nation (see Figure 1). This sample, while sizeable, is not a complete picture, nor is it intended to reflect the numbers of people moving to a city. Houston, for example, experienced a much greater influx than Seattle. However, the map (Edmondson 2007) does provide a graphic representation of the nationwide impact of such a huge migration of more than 1 million people dispersed throughout the country. The three

hardest hit counties in Mississippi experienced a population decline of approximately 40,000 people after the storm, although many had returned in the years since (Jervis 2008). New Orleans alone experienced a near complete evacuation of its population prior to the storm. Approximately 100,000 people remained in the city and were evacuated in the days following the storm. Some 28% of the population did not return to the city even three years after the event (Jervis 2008). Houston accepted tens of thousands of evacuees, and United States Census statistics indicate that the population of Baton Rouge grew by nearly 100,000 after the event (United States Census Bureau 2006). Not only does the mass out-migration add to the challenges expressed in Quarantelli's second characteristic – as many local officials and employees who would otherwise routinely staff organizations were among the evacuees – but the movement of people also generates competing demands for emergency resources and further complicates the flow of goods as demands shifted in particular geographic areas.

The movement of evacuees outside the physically impacted region increased the sites included in the disaster response milieu (Kendra & Wachtendorf 2003). That is, convergence of materiel resources were not only required or directed toward the disaster zone, but also to sites within cities providing a safe haven for evacuees. A rapid population increase in host communities changed the demand on their existing supply of goods and services. These host-cities, then, needed to compete with the impacted region for resources.

While formal supplies were often initially directed warehouses proximate to but not immediately in the disaster zone, other supplies, particularly from informal sources, were more often than not still directed toward the impact site, even when many of victims had since fled to other areas. As

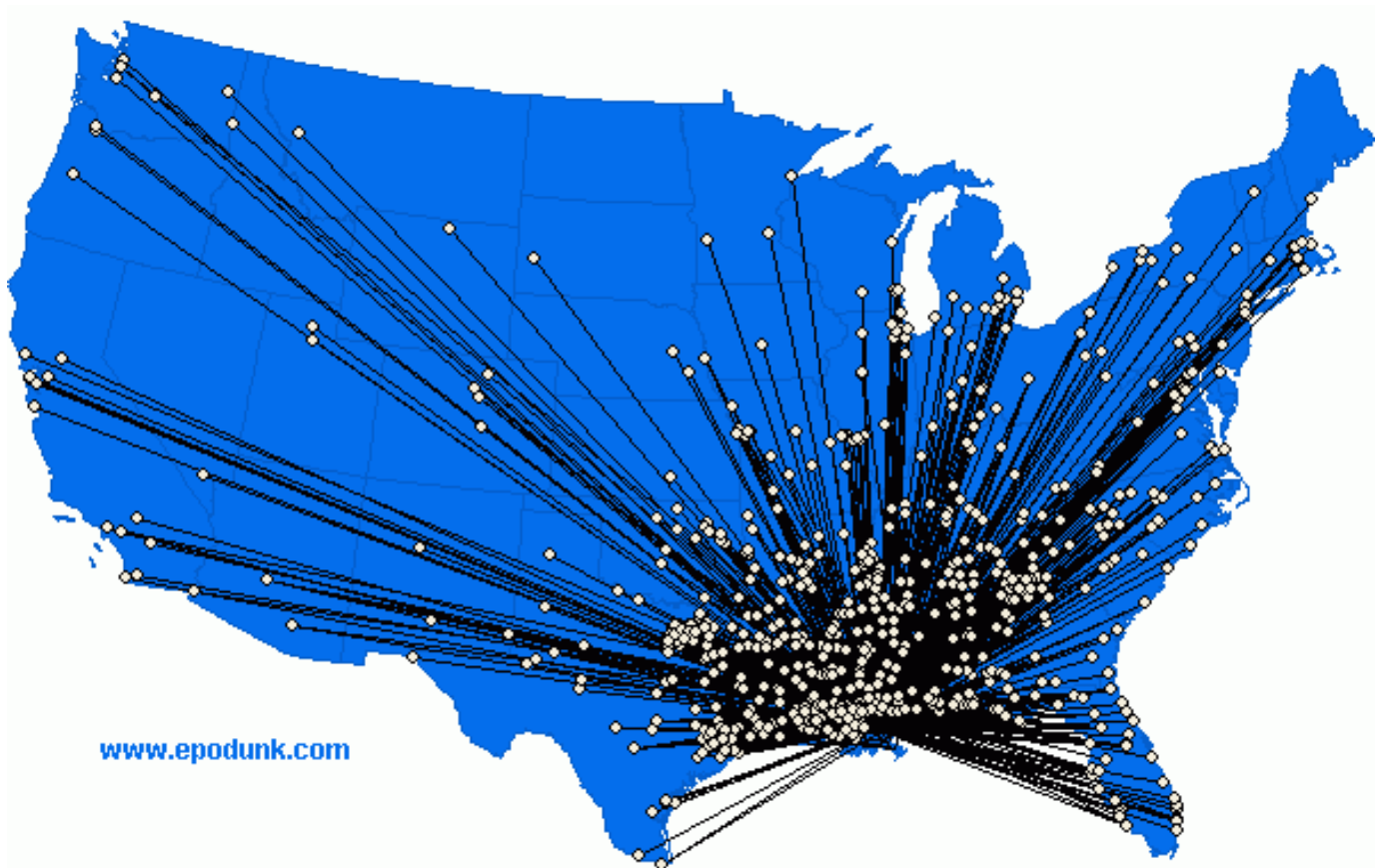
the geographic dispersing of victims occurred, so too did the dispersing of need for some critical supplies such as shelter, food, and medicine. By the time requests had been processed for particular supplies, needs sometimes shifted due to the movement of victims. Redirecting such resources adds time to the supply chain flow, particularly when transportation infrastructure is impaired.

Conclusions

The interplay of the hazard environment with the dynamic social systems within communities contributes to the risk those communities face (Wisner et al. 2003). One approach to reducing risk, consequently, is to take action to mitigate the hazard itself. A second approach is to take action to bolster community resilience through adjustments to the organizational and systemic features of those communities. A tandem approach, addressing physical and social conditions, is ideal. The findings we present here focus on the social conditions, but within the catastrophic physical nature of the event. The magnitude and scope of Hurricane Katrina facilitated the emergence of social conditions consistent with the characteristics of catastrophe, including those identified by Quarantelli (2006) as well as the characteristic newly-identified in this study. Each characteristic generated unique – compared with what occurs during more common disaster scenarios – challenges for those responders attempting to meet emergent resource needs and manage the supply chain. Contending with materiel convergence and coordinating the supply chains following Hurricane Katrina, therefore, was directly linked to the catastrophic nature of the event. Conceptualizing distinctions between disasters and catastrophes becomes, then, more

than an academic exercise. Instead, the social problem demands solutions that carefully consider these differences in the implementation of practice.

Figure 1.



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