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THESIS

THE ROLE OF THE PRIVATE SECTOR IN THE NATIONAL RESPONSE SYSTEM

by

Robert E. McKenna

December 2013

Thesis Co-Advisors:

Robert Bach
Kathleen Kiernan

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**THE ROLE OF THE PRIVATE SECTOR
IN THE NATIONAL RESPONSE SYSTEM**

Robert E. McKenna
Captain, United States Coast Guard, Chesapeake, VA
B.S., United States Coast Guard Academy, 1989
MBA, University of Maryland, 1995

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requirements for the degree of

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September 2013**

Author: Robert E. McKenna

Approved by: Robert Bach
Thesis Co-Advisor

Kathleen Kiernan
Thesis Co-Advisor

Mohammed Hafez
Chair, Department of National Security Affairs

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ABSTRACT

As indicated by the 9/11 Commission, the private sector accounts for approximately 85% of the critical infrastructure in the United States and accounts for approximately 80% of the gross domestic product. The private sector clearly is the engine that drives U.S. economic vitality, and as such, it is critical that it maintains business continuity in the face of a disaster. Moreover, it is equally important to the private sector that communities affected by a disaster recover as quickly as possible to enable it to conduct normal day-to-day business once again, which drives the bottom-line for most companies. The impact of disasters on economic vitality is readily available in numerous studies. It was estimated that the worldwide economic losses incurred during 2004 due to natural disasters was over \$145 billion, or more than twice as much as in 2003. Moreover, disasters such as Hurricane Katrina have highlighted the inadequacies of the national response system when faced with catastrophic disasters and the further inability to incorporate willing participation and resources properly from the private sector.

The purpose of this thesis is to demonstrate how response and relief operations at the federal, state and local level can be further improved by providing a better implementation of a network-based methodology for the private sector to participate in the national response framework.

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LIST OF ACRONYMS AND ABBREVIATIONS

BEA	Business Executive Association
BENS	Business Executives for National Security
BEOC	Business Emergency Operations Center
CEO	Chief Executive Officer
CIP	Critical Infrastructure Protection
COTP	Captain of the Port
DHS	Department of Homeland Security
DoS	Denial of Service
EO	Executive Order
EOC	Emergency Operations Center
ESF	Emergency Support Functions
FEMA	Federal Emergency Management Agency
GAO	Government Accountability Office
GOHSEP	Governor's Office of Homeland Security and Emergency Preparedness
JFO	Joint Field Office LABEOC Louisiana Business Emergency Operations Center
LABEOC	Louisiana BEOC
MSC	Maritime Security Committee
MTSA	Maritime Transportation Security Act
NBEOC	National Business Emergency Operations Center
NRCC	National Response Coordination Center
NCS	National Communications System
NGO	Non-governmental Organization
NHC	National Hurricane Center
NIMS	National Incident Management System
NIPP	National Infrastructure Protection Plan
NOAA	National Oceanic & Atmospheric Administration
NPS	Naval Postgraduate School
NRF	National Response Framework
NWS	National Weather Service

PSCSA	Private Sector Coordination Support Annex
RRCC	Regional Response Coordination Center
SITREP	Situation Report
SOC	Self-organized Criticality
USC	United States Code
USCG	United States Coast Guard

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I. INTRODUCTION

A. PROBLEM STATEMENT

The nation's disaster response system is a multi-scaled and overlapping network of public, private, tribal, and non-governmental organizations that contribute in one form or another to responding to incidents. The National Response Framework (NRF) is the guiding document that establishes national level policy and procedures and outlines how all layers of this system are supposed to work together. The NRF guides agencies on conducting all-hazards responses based on scalable, flexible, and adaptable structures. The intention of the document is to provide the foundation for authorities, best practices, and the organizational structures to support responses to terrorist attacks and natural disasters (Department of Homeland Security, 2008a, p. 2).

With regards to the private sector specifically, the NRF discusses the need to have a close partnership between the government and the private sector to identify and eliminate the vulnerabilities of the private sector (Department of Homeland Security, 2003, p. 12). In addition, an entire division exists within the Department of Homeland Security (DHS) dedicated specifically to critical infrastructure protection (CIP). The NRF also discusses the need to have private sector elements respond to incidents at their own facilities and to be able to link up with local government incident managers to develop response plans (NRF, 2010, p. 32). Moreover, a great deal of work, research has been done, and organizational effort to incorporate volunteer agencies, such as the Red Cross, into disaster relief (Simo & Bies, 2007, pp. 67, 125–142).

Some good examples of the value and benefit “for-profit” companies have provided during disaster relief scenarios can be cited. For instance, Wal-Mart is able to predict the types of goods they should have in their stores in areas prone to hurricanes. In addition, Wal-Mart also reassigns personnel throughout the

country to backfill employees in impacted areas, indicative of both their continuity of operations priorities, as well as their capacity to support large-scale disasters (U.S. Government Accountability Office, 2006c, p. 5).

As indicated by a Government Accountability Office (GAO) report on the relief efforts during Hurricane Katrina, while thousands of lives were saved, many federal, state, local government, and private sector organizations were unable to meet the overwhelming demands imposed by the catastrophic impacts of the hurricane (U.S. Government Accountability Office, 2006a, pp. 6–10). Crisis management and large-scale disaster relief demand that all available assets be engaged to meet the demands of the relief effort. The disaster preparedness community needs better policy and partnerships to enable the private sector to have a larger role in relief efforts from the earliest stages of the preparedness cycle.

Hurricane Katrina, and more recently, the relief efforts in Haiti, clearly demonstrated the significant role the private sector could play in providing logistical expertise and critical resources to responders, as well as assisting with providing care for relief victims. However, the current policies in place do not offer a formal and repeatable process for the role the private sector can play in disaster response preparation and operations.

B. RESEARCH QUESTION

How can the private sector, specifically “for-profit” organizations, be better leveraged and serve a more integrated role in the disaster preparedness process at the federal, state, and local levels?

C. LITERATURE REVIEW

Disaster preparedness transverses all aspects of U.S. society, from the individual to the broadest expanses of the U.S. federal government. Throughout this spectrum, a great deal of literature outlines the roles and responsibilities of the various players in the disaster preparedness world of work. This review

focuses on existing governmental policy and doctrine specifically centered on the role of the private sector in disaster preparedness. In addition, it examines the private sector's role in business continuity and how that fits in the disaster preparedness cycle.

1. Governmental Policy and Doctrine

The role and importance the private sector plays in U.S. national readiness posture, either as the engine for this nation's economic vitality, or within homeland security or national defense, is not a new concept and is well supported by literature. In fact, at least dating back to the Cuban Missile Crisis, private industry has been viewed as having a critical role in U.S. national security. The problems encountered within the telecommunications sector that hampered the direct negotiations between President Kennedy and Premier Khrushchev resulted in the creation of the National Communications System (NCS) in 1963 (Lewis, 2006, p. 30). The NCS was created to "provide necessary communications for the Federal Government under all conditions" (Department of Homeland Security, n.d.).

Private industry's role in the evolution of homeland security has mostly grown out the Cuban Missile Crisis experience, especially as it applies to maintaining critical infrastructure. President Reagan issued Executive Order 12656, which began to qualify further the federal government's role in identifying private facilities and resources essential to national defense and the vitality of the economy (The White House, 1988). Further, this order also directed interagency activities to integrate preparedness and response strategies, as well as the ability to assess the effects of disruptions due to disaster or attack. It is clear from this action that President Reagan and the rest of government was not only acknowledging the importance of the private sector with regard to its ability to provide resources to an incident but also the need for business activity to resume in the wake of a disaster to minimize the impact on the economic vitality of the nation.

This view was further explored and formalized under President Clinton after he issued Executive Order EO-13010 in 1996. This order established the Presidential Commission on Critical Infrastructure Protection, which generated the first definition of critical infrastructure. The Executive Order states, “Certain national infrastructures are so vital that their incapacity or destruction would have a debilitating impact on the defense or economic security of the United States. These critical infrastructures include telecommunications, electrical power systems, gas and oil storage and transportation, banking and finance, transportation, water supply systems, emergency services (including medical, police, fire, and rescue), and continuity of government” (The White House, 1996). The post-9/11 governmental policy continues to build upon this framework and has further linked the federal government and private industry under the umbrella of homeland security.

The 9/11 Commission Report clearly established the link between the private sector and national preparedness and provided a series of measures to improve the preparedness posture of the private sector. The report states, “The private sector controls 85% of the critical infrastructure in the nation...Homeland security and national preparedness therefore begins with the private sector” (*The 9/11 Commission Report*, 2004, p. 398). The Commission Report further, and quite eloquently, articulates the rationale for the private sector to be involved in the preparedness cycle: “Private sector preparedness is not a luxury; it is a cost of doing business in the post-9/11 world. It is ignored at a tremendous potential cost in lives, money, and national security” (*The 9/11 Commission Report*, 2004, p. 398). The National Strategies for Homeland Security and the National Response Framework (NRF), from this aforementioned framework, have further devised strategies to define the policies for implementing the private sector’s role in homeland security.

The NRF is the comprehensive document that addresses roles, responsibilities, activities, and interdependencies for partners involved in response and short-term recovery actions to disasters and emergencies

(Department of Homeland Security, 2010b, p. 1). The NRF places significant emphasis on the need for engaged partnerships, as well as the need for an unity of effort through unified command as it specifically relates to the private sector (Department of Homeland Security, 2008a, pp. 9–10, 48). In addition, the Private Sector Coordination Support Annex (PSCSA) provides the most comprehensive discussion of the role that the private sector can fulfill in national preparedness. However, it falls short in terms of defining the exact role of the private sector when it comes to interacting with the response community. For instance, the private sector is encouraged to participate in sector coordinating councils, “as the principal entity for coordinating with the government on a wide range of critical infrastructure protection activities and issues” (Department of Homeland Security, 2008b, p. PRV-5). It further describes the councils as “self-organized and self-regulated;” however, it does not detail where and when the councils should engage the preparedness system. Moreover, the available policy documents, most notably the PSCSA, simply indicate that the private sector for-profit organizations should assign liaisons at the joint field office level or work with the state, local, and tribal authorities to integrate in the preparedness process (Department of Homeland Security, 2008b, p. PRV-7).

The lack of firm policy in the arena of outlining the private sector role in the preparedness process seems to be an area of weaknesses that if improved, could help better leverage the capabilities and capacities of the private sector.

2. Private Sector

As emphasized by the 9/11 Commission, the private sector accounts for approximately 85% of the critical infrastructure in the United States and accounts for approximately 80% of the gross domestic product (Department of Commerce, Bureau of Economic Analysis, 2007, p. 9). The private sector clearly is the engine that drives U.S. economic vitality, and as such, it is critical that it maintains business continuity in the face of a disaster. Moreover, it is equally important to the private sector that communities affected by a disaster recover as

quickly as possible to enable them to normal day-to-day business once again conduct, which drives the bottom-line for most companies. A great deal of literature is available that examines the impact of disasters on the overall economy, business continuity, and the role the private sector in disaster preparedness.

The impact of disasters on economic vitality is readily available in numerous studies. It was estimated that the worldwide economic losses incurred during 2004 due to natural disasters was over \$145 billion or over twice as much as in 2003 (Hochrainer, 2007, p. 31). Moreover, as depicted in Figure 1, a number of studies suggest natural disasters are increasing in quantity and are having an increasing impact on the worldwide economies due to a number of factors including the location of the disaster, large population growth, low use of mitigation and preventative measures, and limited available resources to respond to events among others (Miller & Keipi, 2005, p. 3).

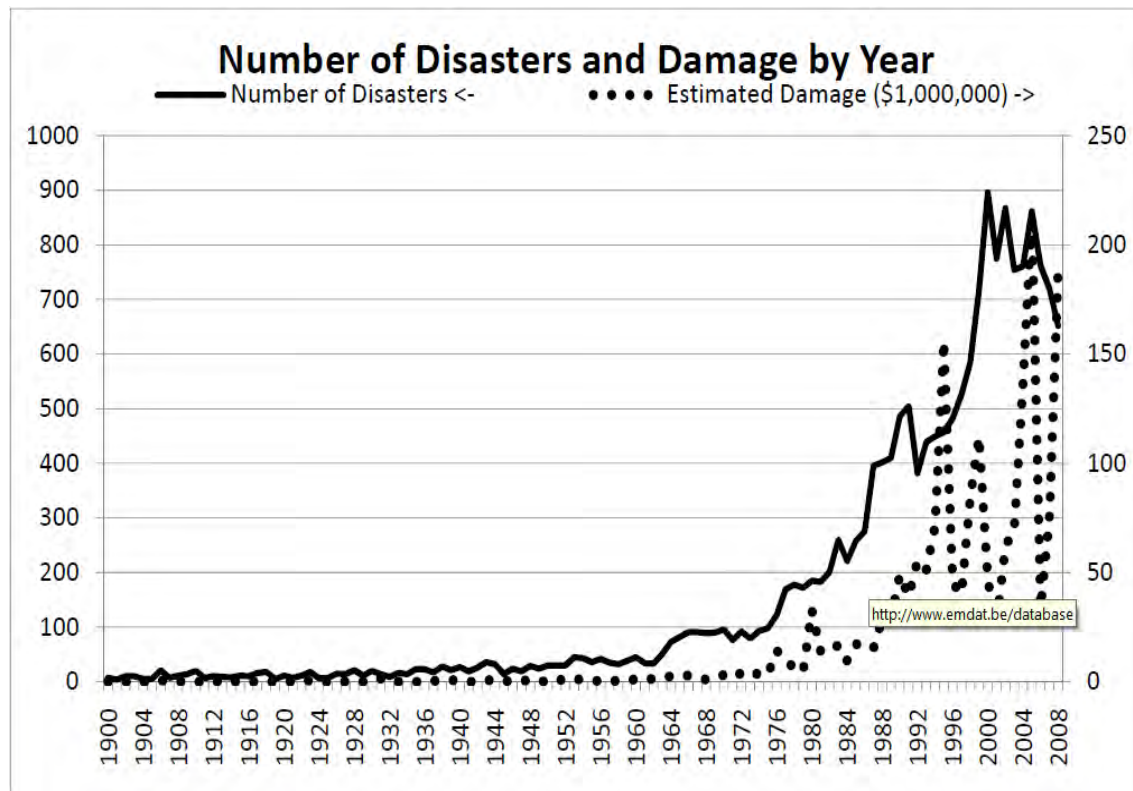


Figure 1. Increase in Number and Damage from Natural Disasters (From Whybark, Melnyk, Day, & Davis, 2010)

The available literature suggests the private sector consists of a significant part of the overall economic welfare of most nations, and in particular, the United States. Further, the literature indicates it is incumbent upon the private sector to have a robust resiliency and well-defined continuity of operations plans to get up and running quickly in the wake of disasters. In the book, *Business Continuity Management: A Crisis Management Approach*, Dominic Elliott et al. (2002) outline the social and technical impacts of business interruptions and the need to build resiliency throughout the business operations (p. 2).

As noted in *The Federal Response to Hurricane Katrina: Lessons Learned*, "More often than not, non-governmental organizations (NGOs) successfully contributed to the relief effort in spite of government obstacles and with almost no government support or direction. Time and again, government

agencies did not effectively coordinate relief operations with NGOs. Often, government agencies failed to match relief needs with NGO and private sector capabilities” (Townsend, 2006, p. 64).

3. Future Role of the Private Sector in Disaster Preparedness

The literature thus far suggests disasters are causing increasingly larger economic and social impacts throughout the globe, the federal government recognizes the importance of the private sector in disaster preparedness, and the private sector already is playing a role in disaster relief, albeit mostly self-generated. However, the literature to support a more clearly defined role of the private sector in the entire disaster preparedness cycle does not seem to exist. In fact, conversely, literature is readily available supporting the lack of coordination between all levels of government and the private sector. Retired Coast Guard Commander Stephen Flynn and Daniel Prieto (2006) directly support this point by suggesting that, “the capabilities, assets, and goodwill of the private sector to bolster our homeland security remain largely untapped” (p. 1). Similarly, Nathan Busch and Austen Givens authored an article that explored both the opportunities and challenges in public-private partnerships in homeland security. More specifically, the article highlights examples of successes where the private sector has significantly contributed to the ability of the federal government, as well as state and local governments, in responding to a disaster, with the most recent example of the Deepwater Horizon oil spill (Busch & Givens, 2012, p. 1). In addition, the authors also stress some of the obstacles preventing even further cooperation including access to information, sharing proprietary information among competitors, and organizational liabilities for companies that share information with government regulators (Busch & Givens, 2012, p. 10).

Busch and Givens’ exploration of some of the resistance felt by both the public and private sectors in what has traditionally been public sector territory can be further investigated by reviewing literature that focuses on the academic perspective of capital markets, as well as discussions on the benefits of

combining public, private and non-profit communities, such as the concept of Megacommunities. For instance, Michael Porter developed a model for companies to use when evaluating their position within their portion of the overall economy. If the discussion of Porter's model is framed through the disaster response lens, it is possible to notice several areas in which businesses need to not only be aware of but perhaps heavily involved in working through the disaster response from a business continuity, as well as customer resiliency perspective. For instance, in the wake of a large natural disaster, a business will have to be attentive to disruptions in its supply chain and whether or not that leaves it vulnerable to having its customers move to other competitors (Porter, 2008, p. 34). Moreover, much of what Porter has discussed in many aspects of his works centers on companies gaining a strategic competitive advantage. If customers see a company like Home Depot assisting them when they are most in need, but does not see a similar response from Lowe's, that customer may be inclined to give their future business to Home Depot over Lowe's, and thus, create a competitive strategic advantage (Porter, 2008, p. 34).

The book by Mark Gerencser et al., *Megacommunities: How Leaders of Government, Business and Non-Profits Can Tackle Today's Global Challenges Together* further explores combining the resources of the public and private sector. The book describes the need for the public and private sector to form a collaborative partnership to combat the wicked problems facing the United States today. Walter Isaacson, President and CEO of the Aspen Institute, describes the concept in the foreword of the book as follows.

These new complexities are a natural consequence of a world made smaller by greater integration and interdependency. Issues that arise in this environment can abruptly and unpredictably escalate, with a scale and magnitude that can quickly overwhelm the effected institutions. As a result leaders from all the sectors face a growing need to operate in a more open, distributed, and collaborative manner that recognizes the shared nature of risks, rewards, and responsibility. Unfortunately this type of activity is not intuitive for most leaders. (Gerencser, Van Lee, Napolitano, & Kelly, 2008, Foreword)

As outlined previously, ample policy documents and research to support the concept of incorporating the theories set out in the Megacommunity concept are available; however, the practice of establishing a true collaborative and integrated network between the public and private sector has yet to be realized. Further examining this concept using a network approach also further supports the position of increasing the private sector role in disaster preparedness.

As described in the literature regarding Hurricane Katrina and many other larger scale disasters, the events are often described as overwhelming to the disaster response system. Review of literature on network theory indicates increasing nodes or entities within a network can consequently improve the resiliency of and the redundancy within the network (Barabasi, 2003, p. 24). In reviewing the disaster preparedness system as a network, literature exists that would support incorporating the private sector as a separate “small-world” network to help further strengthen the ability of the larger response network to withstand the overwhelming demand vectors that occur during large-scale disasters (Lewis, 2011, p. 12).

While broad literature supporting private sector involvement is not necessarily readily available, literature to demonstrate successful components within the homeland security arena that fuse components of the public and private sectors that improve overall U.S. security capability is. The Maritime Transportation Security Act (MTSA), which was the defining legislation for the Coast Guard after 9/11, created the requirement for Coast Guard Captains of the Port to establish maritime security committees. These committees were intended to assist the Coast Guard in developing a comprehensive maritime security plan for the port community to include both public and private entities (Maritime Transportation Security Act (MTSA) of 2002, (a) (2)). The maritime security committees have received high praise across all spectrums from the membership of the committees as noted by a GAO report, “Area maritime security committees have provided a structure to improve the timeliness, completeness, and usefulness of information sharing between federal and nonfederal stakeholders.

Stakeholders stated that among other things, the committees have been used as a forum for sharing assessments of vulnerabilities, providing information on illegal or suspicious activities and providing input on portwide security plans—called area maritime security plans—that describe the joint strategies of the Coast Guard and its partner agencies for protecting key infrastructure against terrorist activities” (U.S. Government Accountability Office, 2005).

Overall, an ample supply of literature is available to support the research. From the policy perspective, the literature clearly indicates the need to incorporate the private industry; however, literature that articulated the policy for the “how-to” on using the private sector throughout the preparedness cycle was not available. The literature on business continuity and the role of the private sector in disaster response is again abundant and further indicates the need to better define its role in the preparedness cycle. Based on reporting from the GAO, as well as from the information provided by the private sector members of the maritime security committees, the literature suggests these committees could be the foundation for expanding the role of the private sector in the U.S.’ formal disaster preparedness cycle.

D. HYPOTHESIS

Response and relief operations at the federal, state, and local level can be further improved by providing a better-articulated plan for incorporating the private sector, which can provide the response community with access to numerous resources that have historically proved invaluable to response and relief operations. For instance, national-level corporations can provide access to robust logistics infrastructures, as well as large inventories of supplies from other parts of the nation not impacted by a disaster. Moreover, whether a national-level or regional business, most companies will have a sound understanding of the local community and can help first responders better anticipate the needs of the community.

E. METHODOLOGY

The methodology used to research this topic consists of a combination of policy analysis and case study review. The underlying issue, as discussed in the problem statement, is existing federal, state, and local policy is not available to account adequately for the ability of the private sector to participate in the disaster preparedness process. The case study is used to both highlight capabilities of the private sector, as well as emphasize the short falls of existing policy.

1. Policy Analysis

Many of the over-arching policy documents present the case of expanding partnerships at all levels of government, federal, local, state, and tribal. In addition, these same policy documents also articulate the need to establish and maintain partnerships between the public and private sector (National Strategy for Homeland Security, 2003, p. 12). The role of the private sector is further defined under the NRF, and more specifically, the PSCSA, where the relationship is intended to provide effective and efficient use of private-sector and federal resources, enable timely exchange of information, and maintain public and market confidence in times of crisis or catastrophe (Department of Homeland Security, 2008b, p. PRV-2). These policies have come under significant scrutiny and criticism after major disasters, and require further analysis and recommended changes.

2. Case Study

In conjunction with the policy analysis, a case study is used to highlight the positive contributions that the private sector made during disaster relief/recovery efforts in the wake of Hurricane Katrina. Professor Stephen Horowitz (2008) makes the case that for-profit private sector companies operate in the free market economy, which inherently demands they have a focused market discipline, while at the same time, exhibit agility to respond to ever-changing market conditions (p. 2). In his lessons learned report, Professor

Horowitz details universally unanimous agreement by local officials that Wal-Mart's response was critical in helping prevent events from getting even worse.

The case study of Hurricane Katrina is used to provide the foundations to the conclusions and recommendations. The case study is intended to demonstrate the gaps in existing policy that inhibit the private sector from becoming more involved in the preparedness cycle. In addition, the case study highlights the capacities and capabilities that private industry has contributed to responses and uses those examples as the drivers for amending existing policy to incorporate these capabilities.

F. SIGNIFICANCE OF RESEARCH

Existing literature suggests the private sector is not only willing, but also quite capable of making significant contributions to disaster response and relief operations. Additionally, the literature also suggests that all levels of government, federal, state, and local, recognize the importance of establishing partnerships with the private sector; however, all too often, it seems that the role of the private sector occurs on an ad hoc basis. This research contributes to the national discussion of the coordination between the public and private sector in the preparedness cycle. More specifically, this research helps develop a series of suggestions and recommendations to integrate the private sector successfully in all facets of the preparedness cycle to allow for seamless integration during disaster response and relief efforts.

G. INTENDED CONSUMERS

The intended consumers of this research are federal, state, and local policy developers, as well as private sector industry groups and consortiums, such as supply-chain managers and organizations, such as Business Executives for National Security (BENS).

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II. PREPAREDNESS OVERVIEW AND POLICY REVIEW

A. HISTORY OF DISASTER PREPAREDNESS AND EMERGENCY MANAGEMENT

Disasters have been occurring since the dawn of time and will continue as long as the earth remains in existence. Although it could be argued that he had some inside information, Noah is perhaps one of the earliest and best examples of someone able to prepare for and survive a disaster. From the days of Noah building his ark, through Mt Vesuvius, the Black Plague, the Great Chicago Fire, 9/11, and Hurricane Katrina, humankind has faced a myriad of disasters and has greatly expanded its ability to prevent and/or respond to such events. Before exploring what it takes to respond to a disaster, it is important to determine what actually makes a disaster a disaster. Dr. E. L. Quarantelli, who co-founded the Disaster Research Center in 1963, describes disasters as:

Sudden on-set occasions that seriously disrupt the routines of collective units, cause the adoption of unplanned courses of action to adjust to the disruption, have unexpected life histories and pose danger to valued social objects. (Dynes, Quarantelli, & Rodriguez, 2007, p. 11)

Understanding a disaster in this manner helps everyone realize, although maybe obvious to some, it is the impact on collective units, perhaps better phrased as societal groups, that truly determines whether an event can be classified as a disaster. Under this definition, a Category 5 hurricane that never makes landfall, while a severe storm, will never be classified a disaster. However, a simple event, such as a cow tipping over a lantern in a barn, can lead to an entire city burning down, claiming 1,200 lives, and can rightfully be classified as a disaster (Nobleman, 2005, p. 43). Understanding the nature of the disaster itself is critical, such as understanding preventative measures against earthquakes. However, it should not be “the how” for which first responders are necessarily preparing. The true purpose of preparedness and response needs to

be centered on those impacted. It is the demands from society that dictate the levels of disaster preparedness. As this world, civilizations, and societies continue to evolve, so does the demand on response agencies.

B. SOCIETAL EVOLUTION AND SOCIETY'S ROLE IN DISASTER PREPAREDNESS

While firmly established dates as to when societies and civilizations started to take shape exist, many can be traced back to approximately 11,000 B.C. when groups started to settle in one place to domesticate animals and engage in food production (i.e., farming) (Diamond, 1997, p. 93). Since this time, societies and civilizations have become increasingly complex and ever more reliant on government services. As societies became more stable, they began to provide excess capacity for food, and became dependent on staying in one location to maintain their stockpiles. This stability, in turn, led to the emergence of the political elite who dictated the distribution of excess food production (i.e., taxation) to those who would provide services other than farming (e.g., craftsmen, builders, scribes, etc.) for the rest of the society (Diamond, 1997, pp. 90, 285).

While some societies have continued to evolve from simple farming communities into large industrial complexes, other societies have continued to exist largely unchanged in technological advances yet have increased significantly in population. For instance, the tsunami demonstrated the vulnerability, impoverished nations have in the face of disasters, industrialized/modern societies are equally as vulnerable due to the increased complexity of the society, as noted by the effect Hurricane Katrina had on New Orleans.

Researchers in the field of sociological responses to disasters offer perspectives that may enable response agencies to predict some behaviors that allow for improved responses, as well as a perspective on societal evolution regarding disasters. For instance, the Ottoman Empire did not mandate fire

prevention measures as late as 1826, “since calamities were considered an expression of the will of God” (Dynes, Quarantelli, & Rodriguez, 2007, p. 19). Even in this current day and age, some still share a similar sentiment regarding divine intervention and disasters.

The Rev. Jerry Falwell and the Rev. Pat Robertson were roundly criticized for suggesting that the Sept. 11 attacks were divine retribution for abortion, homosexuality, feminism and the proliferation of liberal groups. (Cooperman, 2005)

It is almost certain that this is a wind of torment and evil that Allah has sent to this American empire, a Kuwaiti official, Muhammad Yousef Mlaifi, wrote Wednesday in the Arabic daily Al-Siyassa under the headline “The Terrorist Katrina is One of the Soldiers of Allah . . . (Cooperman, 2005)

These opinions clearly demonstrate some of the varying behavior patterns that can be expected during disaster responses. Moreover, demographic changes have altered what first responders encounter during disasters, some planned for, many unplanned for. For instance, in this country, dramatic increases have been seen in elderly households, single-parent families, and disabled persons across communities in the United States (Dynes, Quarantelli, & Rodriguez, 2007, p. 186). In addition, socio-economic factors significantly impact an individual’s ability to persevere during a disaster especially as it applies to providing their own evacuation logistics. Another example of societal expectations impacting response operations occurred during Hurricane Katrina when people began demanding to be rescued along with their pets. This new and unplanned demand on responders drained resources and hampered the response. These evolutions in society and subsequent expectations on first responders during disasters compel agencies to evaluate and evolve plans, doctrine and tactics constantly, and to integrate further all facets of society in the disaster preparedness system.

C. THE SCIENCE OF DISASTER PREPAREDNESS

The nation's disaster response system is a multi-layered and complex network of public, private, tribal, and non-governmental organizations that contribute in one form or another to responding to incidents. The NRF is the guiding document that establishes national level policy and procedures and outlines how all layers of this system are supposed to work together.

This NRF is a guide to how the Nation conducts all-hazards response. It is built upon scalable, flexible, and adaptable coordinating structures to align key roles and responsibilities across the Nation, linking all levels of government, nongovernmental organizations, and the private sector. It is intended to capture specific authorities and best practices for managing incidents that range from the serious but purely local, to large-scale terrorist attacks or catastrophic natural disasters. (Department of Homeland Security, 2008a, p. 2)

Like most other policy documents, the NRF came into being after a series of disasters highlighted shortfalls to the existing disaster preparedness capabilities of this nation; most notably, Hurricanes Katrina and Rita during 2005. For instance, the Bush Administration's first National Strategy for Homeland Security listed the following three strategic priorities.

Prevent terrorist attacks within the United States

Reduce America's vulnerability to terrorism

Minimize the damage and recover from attacks that do occur (Department of Homeland Security, 2003, p. vii)

It is clear the administration's post 9-11 focus was on terrorist activity and did not mention other incidents with regard to their impact on homeland security. However, just a few years later, the Bush Administration's second National Strategy for Homeland Security changed dramatically as noted by the President's introduction to the document.

Just as our vision of homeland security has evolved as we have made progress in the War on Terror, we also have learned from the tragedy of Hurricane Katrina. We witnessed countless acts of courage and kindness in the aftermath of that storm, but I, like most Americans, was not satisfied with the Federal response. We have

applied the lessons of Katrina to this Strategy to make sure that America is safer, stronger, and better prepared. (Department of Homeland Security, 2007, Preface)

Just as it was observed how societies evolve, it is absolutely critical that this country's disaster preparedness capabilities evolve. The complexities of the threats and society challenge agencies during local, regional, and national level incidents. With that, it is absolutely critical that all layers of the homeland security network follow a repeatable and common preparedness process. The disaster preparedness cycle as outlined in the NRF in one such methodology that enables a system to learn and evolve as the threats and society evolve (see Figure 2).



Figure 2. Disaster Preparedness Cycle (From Department of Homeland Security, Federal Emergency Management Agency, n.d.b.)

The question remains of whether the NRF or any other guiding documents adequately prepare this country to manage catastrophic incidents or worst-case scenarios. The recent track record of responding to regional and national level catastrophic incidents, or worst-case scenarios, indicate this nation has a long way to go to respond successfully to these types of incidents. The NRF has a separate annex that defines a catastrophic incident as follows.

A catastrophic incident, as defined by the NRF, is any natural or manmade incident, including terrorism, that results in extraordinary levels of mass casualties, damage, or disruption severely affecting the population, infrastructure, environment, economy, national

morale, and/or government functions. A catastrophic incident could result in sustained nationwide impacts over a prolonged period of time; almost immediately exceeds resources normally available to State, tribal, local, and private-sector authorities in the impacted area; and significantly interrupts governmental operations and emergency services to such an extent that national security could be threatened. These factors drive the urgency for coordinated national planning to ensure accelerated Federal and/or national assistance. (Department of Homeland Security, 2008c, p. CAT-1)

While the NRF describes what agencies should do and how they interact, agencies have fallen short of effectively managing catastrophic or worst-case scenarios.

III. HURRICANE KATRINA CASE STUDY

A. BACKGROUND

Hurricane Katrina has been described as the most devastating natural disaster in U.S. history (see Figure 3).

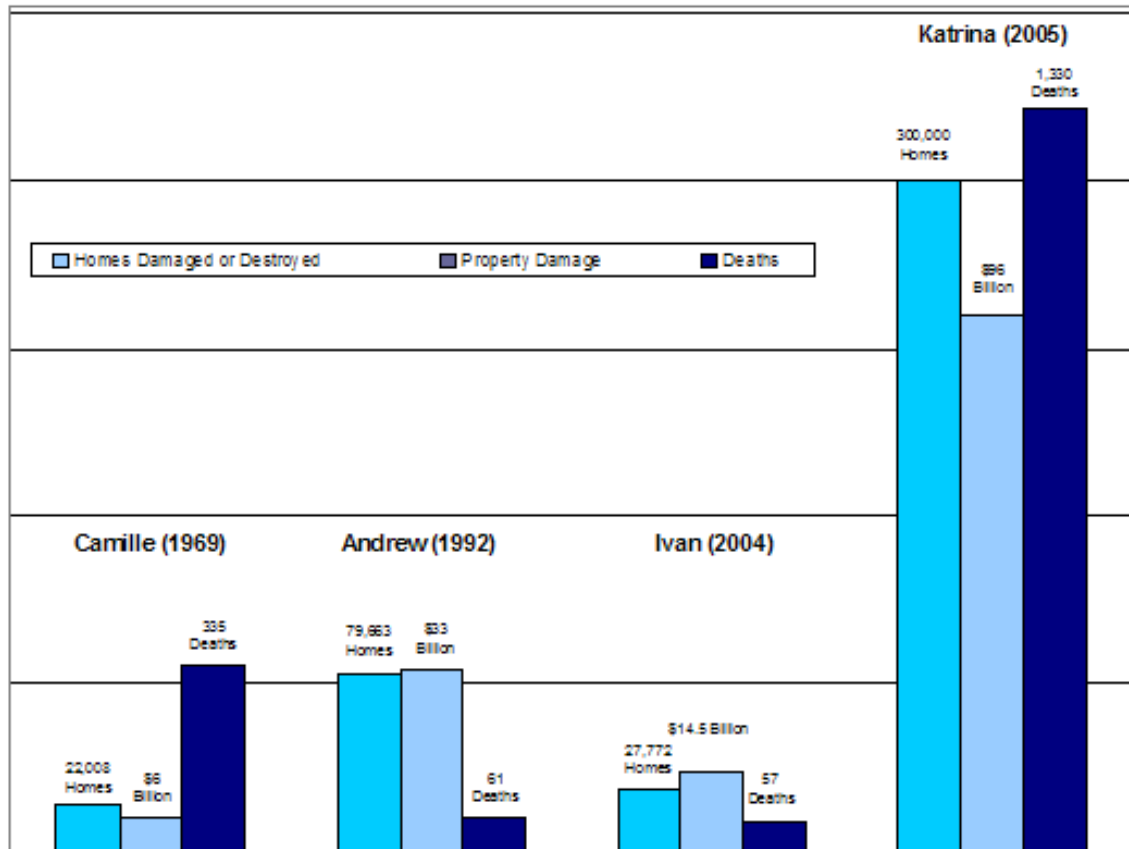


Figure 3. Impacts of Natural Disasters in the United States (From Townsend, 2006)

As Figure 3 clearly indicates, Hurricane Katrina brought about the largest cost in terms of property, which is explored in more detail as follows. However, in terms of impact on lives lost, Hurricane Katrina ranks behind other events, such as the Galveston hurricane of 1900 and the San Francisco earthquake.

Regardless of the metric used to describe the impact, Hurricane Katrina glaringly

demonstrated some of the shortfalls and/or failures in the U.S. national preparedness system.

Even before Hurricane Katrina became a named storm and before the warm air from the Sahara met the cooler waters of the Atlantic Ocean, residents of New Orleans and Louisiana knew a chance always existed of major devastation to the city due to its construction below sea level. New Orleans was founded in 1718 and has always faced the threat of flooding as it sits in the “tidal lowlands” of Lake Pontchartrain to the north and is bordered by the Mississippi River to the south (U.S. Government Accountability Office, 2006b).

Based on the history of flooding within the city and the geographic challenges, the Army Corps of Engineers was charged to develop hurricane protection barriers around New Orleans through the passage of the Lake Pontchartrain and Vicinity, Louisiana Hurricane Protection Project in the Flood Control Act of 1965 (U.S. Government Accountability Office, 2006b).

Under the act, the Army Corps of Engineers was supposed to design and construct a network of levees and flood control machinery throughout and around the city of New Orleans and Lake Pontchartrain. Under the act, the Army Corps was supposed to fund 70% of the project while state and local funds would account for the remaining 30% (U.S. Government Accountability Office, 2006b). Additionally, the Army Corps was directed to build the system to withstand a “fast-moving Category 3 hurricane and a surge of 9.3 feet to 13.5 feet on a 200–300 year cycle with an initial budget of \$85 million and a completion date of 1978 (U.S. Government Accountability Office, 2006b).

Throughout the history of the project, numerous design changes occurred due to environmental concerns, as well as engineering inputs. At the time Hurricane Katrina hit, the project was estimated to be about 60%–90% complete with an expected completion date of 2015 and a revised budget of over \$700 million” (U.S. Government Accountability Office, 2006b).

B. SETTING THE STAGE

Every year, the National Oceanic & Atmospheric Administration (NOAA) releases the outlook for the upcoming hurricane season. NOAA issued the 2005 assessment on May 16, 2005 and predicted an above-average hurricane season with a 75% chance of seven to nine hurricanes and three to five of those becoming a Category 3 or higher. In addition, NOAA updated this projection on August 2, 2004 to a 95%–100% chance of an above normal hurricane season (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Atlantic Oceanographic and Meteorological Laboratory, Hurricane Research Division, 2006). In fact, along with the revised prediction, the National Hurricane Center (NHC) director also issued the following statement.

Knowing precisely where a hurricane will strike and at what intensity cannot be determined even a few days in advance. ...residents and government agencies of coastal and near-coastal regions should embrace hurricane preparedness efforts and should be ready well before a tropical storm or hurricane watch is posted. (Department of Commerce, National Oceanic and Atmospheric Administration, 2005b)

Not only was the upcoming hurricane season predicted to be higher than average, the federal government sponsored a hurricane exercise in New Orleans over the course of the year prior to Hurricane Katrina intended to prepare agencies for a worst-case scenario of a Category 5 hurricane making a direct impact. In fact, the simulation projected 61,290 dead and 384,257 injured or sick in a catastrophic flood that would leave swaths of southeast Louisiana uninhabitable for more than a year (Associated Press, 2005). Despite the fact that this exercise occurred less than a year prior to Hurricane Katrina, and the residents, and state and local governments, were all well aware of the fact that New Orleans was under sea level and extremely vulnerable to any type of storm surge, a series of significant failures happened, which if prevented, could have saved many of the 1,300 lives lost in New Orleans.

C. STORM APPROACHING

Starting on August 23, the National Weather Service (NWS) began tracking Tropical Depression Twelve, which would become Tropical Storm Katrina on the following day as the 11th named storm of the season (Knabb, Rhome, & Brown, 2005, p. 1). By August 25, the storm was gaining in strength as it was bearing down on the southeast coast of Florida and was upgraded to a Category 1 Hurricane. Further, the NHC was predicting that the storm would turn toward the Alabama/Florida panhandle once it entered the Gulf of Mexico (Department of Commerce, National Oceanic and Atmospheric Administration, 2005a).

The storm made landfall on August 25 at 6:30 pm across southern Florida with winds over 80 mph. As the storm moved across the southern part of the state, it resulted in 14 deaths, a million power outages, and over \$1 billion in property damages (Rourke, 2005). Even as a Category 1 storm, Hurricane Katrina created significant damage and disruptions to the citizens of southern Florida. FEMA and other emergency service organizations were conducting relief efforts in the immediate wake of the storm itself after having pre-staged trucks of ice, water, and food in Alabama, Louisiana, Georgia, Texas, and South Carolina (Department of Homeland Security, 2005b). Figure 4 depicts the amount of pre-staged equipment in the southern United States available by August 29. In addition, FEMA, working with the local state agencies in Florida, began deployment of multiple emergency response teams and advanced elements, as well as coordinating video teleconferences between state and local officials.

Hurricane Katrina: Federal Commodities on Hand Pre-Landfall (as of August 29, 2005)

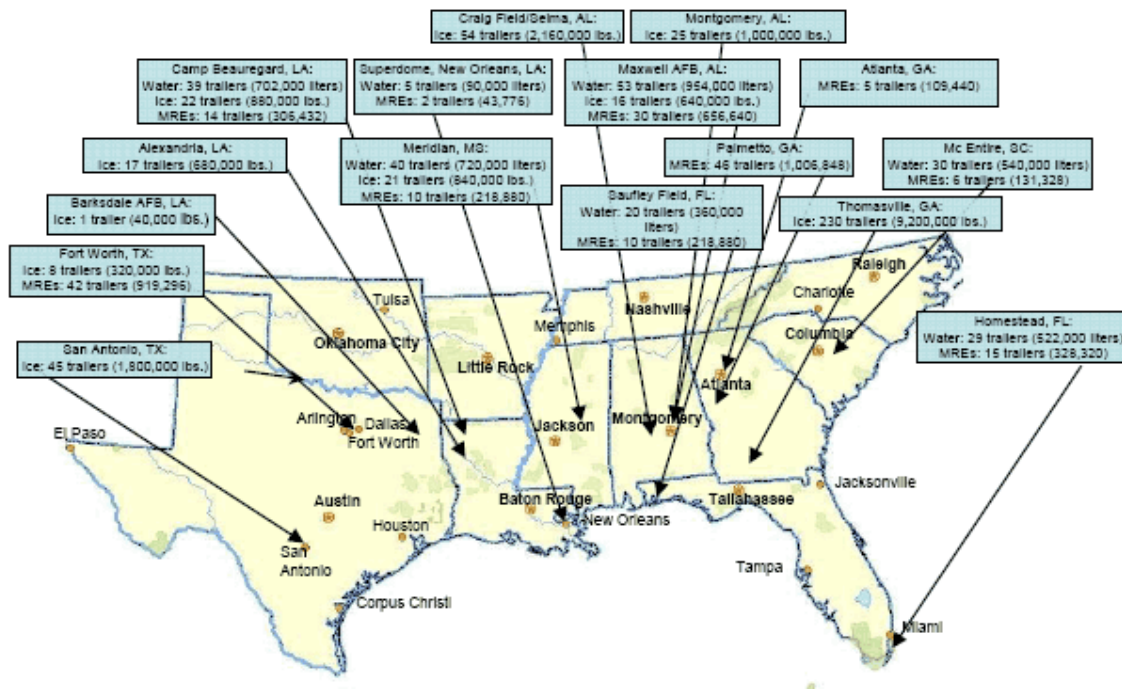


Figure 4. The Federal Response to Hurricane Katrina: Lessons Learned (From Townsend, 2006)

A few examples are available of private sector assets being pre-staged in anticipation of damage to bridges and agriculture, such as pre-staged bridge repair barges by Norfolk Southern Railroad and offshore freighters loaded with agriculture by the Cargill Corporation (Townsend, 2006, p. 23). In addition, large companies, such as Walmart and Home Depot, activated their own emergency planning “war rooms” to cope with the pending storm, to prepare for business continuity planning, as well as working with vendors to stream supplies into the areas hit by the storm (Ward, 2005, p. 18).

As the day progressed on August 26, Hurricane Katrina, downgraded to a Tropical Storm as it passed over Florida, quickly regained hurricane strength as it moved over the Gulf of Mexico. By that afternoon, the track for Hurricane Katrina was upgraded by the NHC and predicted forecasted landfall just east of New Orleans on August 29 as a Category 4 or 5 hurricane (Department of Commerce, August 26, 2005). More importantly, this same forecast predicted storm surges

15 to 20 feet above normal tidal range 56 hours prior to the hurricane making landfall. As a result of this forecast, Louisiana and Mississippi declared states of emergency and each of the Emergency Operations Centers (EOC) from Louisiana, Mississippi, and Alabama were all activated at their highest levels (Department of Homeland Security, 2005b, p. 11).

As the day turned into August 27, the track of Hurricane Katrina continued to solidify for a direct hit in vicinity of New Orleans and the storm continued to gain strength. As a result across the Gulf Coast, from Texas to Florida, federal, state, and local governments began to engage in emergency planning activities to include evacuation warnings, emergency sheltering, call-up of state National Guard resources and other related activities. FEMA was operating under Level 1 operations, which was its highest level consisting of 24/7 staffing (Department of Homeland Security, 2005b, p. 11). Further demonstrating the concern concerning the potential damage the growing storm could create, the State of Louisiana made a request for an emergency declaration to the White House and the President approved the request. The last time a declaration was made in advance of actual landfall of a hurricane occurred in 1999 in anticipation of the arrival of Hurricane Floyd in North Carolina (Department of Homeland Security, Federal Emergency Management Agency, 1999). As a further testament to the mood with regard to Katrina's potential, NHC Director Mayfield directly called multiple state and local officials to underscore the storm's strength and to inform them this could be the "big one" (U.S. Senate Committee on Commerce, Science, and Transportation, Hearing on Disaster Prevention and Prediction, 2005).

Even as the storm and warnings intensified, many local officials feared the worst about getting people out of harm's way. In fact, State Representative Cedric Richmond personally relayed a story to Governor Blanco that he had attended a baseball game and that it appeared that many people either had not heard the warnings or at least were not paying attention to them (Louisiana Office of the Governor, 2005). However, it was not until 5:00pm on the evening of

27 August that the city of New Orleans began to issue voluntary evacuation orders' this delay in beginning even just voluntary evacuations is somewhat mind-boggling when considering the planning factor for New Orleans was to account for at least 100,000 people who would not be able to evacuate due to having no means of transportation (City of New Orleans, Office of Emergency Preparedness, n.d.). Both Louisiana and Mississippi implemented evacuation protocols to enable "contra-flow" traffic on the highways leading away from coastal areas. Compounding the delay in the evacuation order is what Louisiana Governor Blanco described "hurricane roulette" in which citizens would simply ignore any evacuation order due to the complacency of having ridden out similar storms in the past (Louisiana Office of the Governor, 2005).

Hurricane Katrina continued to develop in strength, but perhaps more surprisingly, it grew dramatically in size as well. It grew from a Category 4 to Category 5 storm, which solicited the following warnings from the National Weather Service and the NHC on August 28.

The majority of industrial buildings will become non-functional . . . High-rise office and apartment buildings will sway dangerously—a few to the point of total collapse. All windows will blow out. Airborne debris will be widespread—and may include heavy items such as household appliances and even light vehicles . . . Persons—pets—and livestock exposed to the winds will face certain death if struck. 114. The NHC issued advisories that warned the levees in New Orleans could be overtopped by Lake Pontchartrain and that significant destruction would likely be experienced far away from the hurricane's center. 115. The warning continued, [m]ost of the area will be uninhabitable for weeks . . . Perhaps longer . . . Power outages will last for weeks . . . Water shortages will make human suffering incredible by modern standards. (Townsend, 2006, p. 29)

Based on the strength of these warnings and the personal phone calls leading up to the landfall of Hurricane Katrina, the serious nature of the potential of the storm was barely in doubt. Based on these new and stern warnings even more activity began in preparation for landfall which was nearly 12 hours away. For instance, citizens that were able started to move to shelters of last resort,

FEMA deployed state liaison officers, the U.S Coast Guard pre-deployed disaster response teams, and phone calls between federal and state/local agencies were occurring with regularity (Townsend, 2006, p. 29). On the morning of 28 August, Mayor Nagin along with Governor Blanco ordered mandatory evacuations of New Orleans (CNN Breaking News, 2005). As the day progressed, it became increasingly difficult for evacuations to occur or for supplies to be delivered to areas in need as tropical force winds began to impact the area, especially in the city of New Orleans.

No evidence exists that any private sector support was formally requested prior to landfall at either the local, state, or federal level despite some companies having already pre-staged their own supplies and equipment in anticipation of the storm's impacts. Originally only considered a shelter for those with special medical needs, the Superdome was declared a "shelter of last resort" at which eventually of 12,000 people showed up (Townsend, 2006, p. 29). As such, not enough food and water supplies were available to manage the large influx of people adequately that arrived at the Superdome, which led to the dire conditions during the aftermath of the storm; again, a perfect opportunity for the private sector to have assisted with this dilemma. In addition, "the Red Cross determined the Superdome did not meet their safety criteria and refused to put their staff in harm's way, choosing rather to deliver necessary aid to the dome as soon as the storm had passed" (Townsend, 2006, p. 29). To compound matters, Mayor Nagin stated that the Superdome could actually support upwards of 70,000 people, well beyond the planning factors in the New Orleans hurricane plans (CNN Breaking News, 2005).

D. KATRINA MAKES LANDFALL

According to the NOAA, Hurricane Katrina made final landfall over the west coast of Mississippi after passing over the barrier islands of Louisiana as a Category 3 hurricane with sustained winds of 115 mph and gusts over 130 mph (Townsend, 2006, p. 33). In addition, the storm devastated the coastal regions

with a 27-foot storm surge that flooded coastal areas up to 12 miles inland (Townsend, 2006, p. 33). The devastation completely paralyzed any response efforts since most of the communications networks were washed away, as well as any pre-staged assets in the storm's path. While the relatively flat coastal regions were essentially reduced to rubble, the city of New Orleans received most of the immediate attention during the aftermath due to the significant flooding of the city. In total, Katrina was responsible for over 1,800 deaths with more than 1,500 from New Orleans alone (Louisiana Department of Health and Hospitals, 2006). The amount of devastation was literally unparalleled, which caused a complete loss of power, water, and sewage services. In addition, the storm surge and flooding created an environmental disaster of unprecedented levels that caused major oil spills, the release of raw sewage, and incalculable amounts of contaminated debris. While the point of this thesis is not to detail the extent of the damage, it is critical to understanding the overwhelming challenges facing those in the response effort as it further underscores why it is absolutely critical to incorporate all available assets to a disaster of this magnitude.

E. RESPONSE EFFORTS

Despite the nearly overwhelming odds facing first responders, a tremendous amount of heroic efforts enabled over 1.1 million people to be evacuated and tens of thousands rescued from buildings, hospitals, overpasses, and rooftops, the Coast Guard alone rescued 33,000 people (Department of Homeland Security, 2005a, pp. 7, 47). Despite the many sacrifices and heroics by these selfless first responders, their efforts were significantly hindered due to the failed response system itself. This section examines several key areas of the response effort, and the areas in which the private sector did or could have improved the response.

1. Emergency Sheltering

As noted during the pre-landfall section, neither the New Orleans Convention Center nor the Superdome, were ever intended to house the number

of evacuees that ultimately arrived before and after the storm hit. In the immediate aftermath of the storm, almost 50,000 people occupied both locations when only several hundred were initially expected (Townsend, 2006, p. 39). Wal-Mart had thousands of trucks ready to deliver critical supplies but was unable to work through the bureaucracy of the response and even had three tractor-trailers full of water turned around by FEMA representatives (Horowitz, 2008, p. 3). To the thousands of people trapped in the stifling heat of the convention center and Superdome, these supplies would have been instrumental in helping them cope with the dire situation. Wal-Mart employees even made critical decisions to help local hospitals by taking prescription medication from store inventories to shelters and hospitals that otherwise could not receive supplies (Kennedy School of Government, 2007).

2. Command and Control/First Response Equipment

As stressed by Ward (2005), both Home Depot and Wal-Mart established robust emergency operations centers able to establish reliable communications at the local level through satellite telephones. One of the strongest criticisms the federal, state, and local response efforts received was the lack of structured organization coupled with the complete inability to communicate across the response network (Townsend, 2006, p. 37). Similar to having water and food available for distribution, companies like Wal-Mart and Home Depot also provided supplies critical for the response effort. For instance, Home Depot had ultimately provided over 800 truckloads of equipment and supplies (Bond, 2005).

3. Recovery/Community Resilience

The hardest part of any response occurs after the “disaster-event” and involves the long-term recovery of the community. As has been discussed thus far, Hurricane Katrina presented itself as a “wicked problem” beyond the scope of anything seen in this country’s history. U.S. response systems simply are not constructed in a manner to deal with the long-term recovery of these types of problems. For instance, as of 2010, the population of New Orleans city stood at

354,850, only 78% of the population before Hurricane Katrina (Davis, 2010). According to Rachel Luft of the University of New Orleans, the vast majority of those who did not return to New Orleans were poor and African-American, and many do not have the means to return (Davis, 2010).

Many at the federal and state level do not have the institutional capacity to provide resources for the long haul and further do not have the connection to the local community. In addition, the local governments typically do not have the resources to provide for long-term recovery and rely on charities and other non-governmental organizations to help with this type of situation.

Certainly, great examples of this kind of situation exist, as emphasized by Davis. Many charities have been building houses, such as Brad Pitt's "Make It Right" foundation, that has built 50 homes, or the "Build Now" foundation that has built 38 homes (Davis, 2010), which are great examples of work in the community, but as suggested above, are only drops in the bucket compared to the 100,000 people that have yet return to their communities.

Again, the private sector is suited to play a major role in this area. By definition, the private sector has a long-term commitment to the communities where they do business, as the community provides the critical revenues to stay in business as discussed in Chapter IV.B. This symbiotic relationship is already a motivator for private sector companies to become involved with community resilience projects but more can be done. For instance, FEMA partnered with Home Depot by staffing local stores with FEMA personnel to assist customers with options on fixing/rebuilding homes, and the American Red Cross would directly reimburse Home Depot based on pre-approved repairs to people's homes (Kass, 2010). Paige Roberts, the Mississippi chapter of the Red Cross director of fund-raising and public affairs, stated the following regarding Home Depot, "Home Depot was very conscious of the sensitivity to time," she said. "The experience of recovery would be a lot more effective if all corporations jumped into the mission in the way Home Depot did" (Kass, 2010).

F. CONCLUSION

The timeline of pre-landfall of Hurricane Katrina clearly suggests it is often possible to plan days in advance for a response effort that allows for the pre-staging of equipment, evacuations, and deployment of personnel. Along the way, the case study demonstrates that the private sector was able to provide valuable assistance to people in need despite even being turned away by officials involved in the response. The fact that many private sector companies establish robust emergency operations centers, pre-deploy assets and surge personnel, is demonstrative of their commitment and capability in disaster preparedness. Their full capability was sub-optimized at a time when their resources were most needed. This situation offers no better case to support the hypothesis that the private sector needs to be fully integrated in the disaster preparedness cycle.

IV. ANALYSIS

A. WICKED PROBLEMS AND NETWORK ANALYSIS OF DISASTER PREPAREDNESS

1. Wicked Problems

As discussed in Chapter II.B., U.S. society has evolved into a complex network interconnected to the global community that results in a world in which large-scale disasters and cascading failures appear to be the norm. The term often associated with describing this environment is “wicked problems.” Horst Rittel and Melvin Webber (1973) developed what is thought to be the initial description of a wicked problem in 1973. They outlined 10 traits that characterized wicked problems as outlined below.

1. No definitive formulation of a wicked problem exists (defining wicked problems is itself a wicked problem)
2. Wicked problems have no stopping rule
3. Solutions to wicked problems are not true-or-false, but better or worse
4. No immediate and no ultimate test of a solution to a wicked problem is available
5. Every solution to a wicked problem is a "one-shot operation;" because no opportunity exists to learn by trial and error; every attempt counts significantly
6. Wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is a well-described set of permissible operations available that may be incorporated into the plan
7. Every wicked problem is essentially unique
8. Every wicked problem can be considered a symptom of another problem
9. The existence of a discrepancy representing a wicked problem can be explained in numerous ways. The choice of explanation determines the nature of the problem's resolution.
10. The planner has no right to be wrong (planners are liable for the consequences of the actions they generate) (Ritchey, 2005)

Jeff Conklin further revised the definition and characteristics to take a broader view and give the concept of wicked problems a larger societal context. Conklin's (2006) view is that not only does this nation continue to face problems that meet the criteria that Rittel and Webber outlined, but also faces an increasingly complex society that further compounds the wicked problem itself (p. 11). Conklin defines social complexity as a result of the diverse nature of society and the competing demands within that society. As the diversity of U.S. society increases due to economics, globalization, etc., the desired outcomes as part of a wicked problem become so divergent that collaboration becomes difficult at best to manage. A review of network theory provides valuable insights and potential solutions to facing these wicked problems.

2. Networked Society

Part of what makes American society so complex is its interconnected nature. No better example is the Internet to demonstrate how everyone communicates, makes purchases, searches for information, and develops opinions based on non-traditional media. The Internet continues to evolve as a network just as society continues to evolve as a network. Facebook did not exist just seven years ago, yet according Facebook's reporting, it has close to one billion active users on the social networking site (Facebook, n.d.). The geometric growth of the usage of this system is just one of many examples of how networks, social or otherwise, play such a big part in daily lives to include telecommunications systems, emergency response systems, the national power grid, among many others.

Albert Laszlo Barabasi has written several books in which he examines how networking theory applies to daily lives, and how, by taking a networking theory approach, it is possible understand better some of this nation's social complexities.

In his book, *LINKED*, Barabasi gives a wonderful history of the development of network theory. He describes how Leonard Euler first simplified a

classic argument of the “Bridges of Konigsberg” into a simple relationship between nodes and links. The problem originally asked if a way existed to cross each of the seven bridges within the city without crossing any bridge more than once. As described by Barabasi (2003), Euler’s “elegant and simple” proof demonstrated that understanding the relationships of nodes and hubs helps define the world live in everyone lives (p. 11). He was able to prove, based on the number of links and nodes that no single path existed across each of the bridges without re-crossing one of the bridges. Once a new bridge was built, this changed the structure of the network and enabled the citizens of Konigsberg to walk a single path across each bridge successfully without repeating any crossing. To Barabasi (2003), this aspect is the most important part of networking theory, in that, once the rules and laws governing the network are understood, it is possible to make changes to achieve desired outcomes (p. 13).

This concept is an essential element in terms of protecting critical infrastructure or planning a response network that relies on resilient communications. Since the time of Euler, numerous contributions have been made to the concept of network theory, which are as equally important to how U.S. society is perceived. For instance, Paul Erdos and Alfred Renyi examined how random networks are formed. According to their theory, over time, each node will have the approximate same number of links. This concept is important to bring forward since it only takes one link for a node to remain connected to a network, and given even a big enough network or nodes and links, each node will have more than one link to the network. In other words, it has built-in redundancy (Barabasi, 2003, p. 24).

Stanley Milgram is another important contributor to network theory as he applied network theory to social interactions and devised what has become known as the “small world problem.” The purpose of Milgram’s study was to find the average path length between any two nodes in a social network (Travers & Milgram, 1969). The Milgram study demonstrated that U.S. social networks are made of relatively short path lengths, or small worlds, with each person

connected to another person through an average of six links (Travers & Milgram, 1969). This concept was popularized into the play “Six Degrees of Separation” by playwright John Guare (1990).

Mark Granovetter explored the concept of social theory even further by explaining how networks exist through “weak ties.” Granovetter (1983) suggests that everyone exists in a world of clustered networks connected to each other through a series of weak links; otherwise, the clusters would form one larger network (p. 209). As explained by Barabasi (2003), this model begins to reflect more closely the real world social network in which relationships determine the level of connectedness vice the completely random model of Erdos and Renyi (p. 44). The Granovetter model becomes even more important upon beginning to explore networks from a hub perspective, as some nodes become hubs with a large number of links and plays a significant role within a network, especially if something damaging happens to that node.

Barabasi introduces his concept of the occurrence of hubs in networks by referring back to the economist Vilfredo Pareto. Intrigued by what seemed to be a high concentration of land owned by a relatively few in his homeland of Italy, Pareto conducted a series of experiments to determine if this situation was pervasive throughout nature. What he discovered became known as the “80/20” rule in which 20% of a population is responsible for 80% of the resources, whether it be 20% of the population owning 80% of the land in Italy or 20% of the peapods in a garden being responsible for 80% of the peas (Bunkley, 2008; Barabasi, 2003, p. 66). When the results of the experiments are graphed, they form what is known as a power law distribution that demonstrates small numbers of nodes have the largest number of links in a network, and conversely, most nodes have relatively few links (see Figure 5).

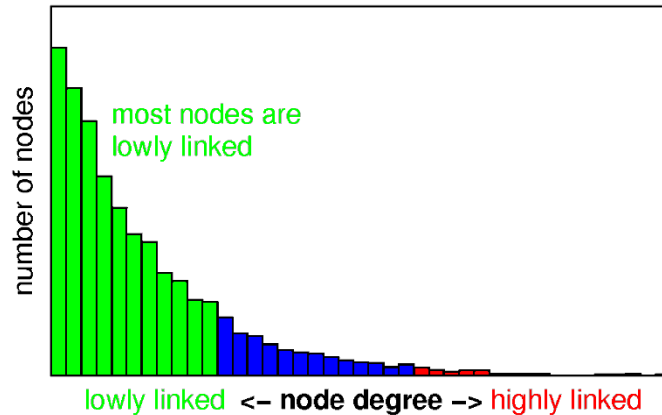


Figure 5. Power Law Distribution (From Network Science, n.d.)

Barabasi discovered a very similar scenario when he and Hawoong Jeong set out to map the connections on the web. Besides from finding hubs on networks following the power law distribution, Barabasi and Jeong also discovered several other important properties of the scale-free (non-random) networks.

Older nodes or nodes with extra attachments tend to attract an even greater amount of attachments; what they call “preferential attachment”

These hubs constitute an Achilles heel of the Internet in that if the correct number of hubs is taken down, it is possible to crash a network (Keiger, 2007, p. 53)

David Cohen writes that the discovery by Barabasi is important as it highlights the real world issues of relying on hubs in this society. For instance, he likened the hubs on the web to hubs in the air traffic system, if one of the airports, such as Chicago, Dallas, Atlanta, or New York, becomes saturated or shutdown, it creates a ripple throughout the entire transportation system (Cohen, 2002, p. 29).

Is this a form of self-organized criticality (SOC)? Ted Lewis of the Naval Postgraduate School discusses this concept in his book *Bak's Sandpile*. Per Bak conducted a series of experiments to explain cascading failures. He likened the concept to a sandpile that continuously has sand added to its top, until the point when a single grain of sand will lead to a cascading failure of the whole pile

(Lewis, 2011, p. 11). This SOC has been linked to many failures in society including the recent economic crash in which the failure of just a few banks, created the biggest economic decline since the great depression. The point Lewis and Cohen are making is that networks have a single or relatively few hubs, and a large number of links are at risk of being overwhelmed, and thus, susceptible to failure.

Another example is that of a young Canadian teenager who all too easily demonstrated the precarious state of the Internet and the danger of the “hub-focused” networks. Operating under the code name MafiaBoy, the teenager executed a denial of service (DoS) attack first at Yahoo!, then several other large Internet-based companies. The basis of a DoS attack is to saturate a hub with enough Internet traffic so that it is unable to respond to legitimate day-to-day business requests (Erikson, 2008, p. 251). MafiaBoy was able to shutdown Yahoo! by easily hacking into personal computers linked to the Internet across the country and programming a series of viruses that set a time-release for a larger volume of “email-bombs.” The email were sent across the Internet into Yahoo!’s network, which overwhelmed the network and caused it to fail by not allowing anyone to access the Yahoo! website (Majid, 2006, p. 30). MafiaBoy demonstrated that you did not have to attack the hub itself directly by trying to infiltrate its security, but that with enough “ghost” traffic, it was possible to prevent the network from responding to requests. The estimates of the damage caused by these attacks range as high as \$1.7 billion in lost revenues (Majid, 2006, p. 30).

Lewis (2011) further discusses the nature of networks and their drive to efficiency, which in effect, creates the SOC. Society’s desire to look toward the bottom line of revenues versus expenditures or outputs versus tax dollars, has placed many networks at risk of cascading failures (p. 12). One way to reverse this phenomenon is to build redundancy, or better yet, resiliency, into the network by having additional nodes equally as capable of handling the demands placed on it.

3. Conclusion

Applying the theories of networks and SOC, it could be suggested that the central role of the federal government in large-scale disasters serves as a major hub connected to all the nodes in the response network. Hurricane Katrina showed that when this hub was overloaded, similar to the MafiaBoy virus, it became unable to respond effectively to the demands placed on it. Meanwhile, vital supplies from the private sector sat idly by as they had no access to the response network, and thus, no communications occurred between it and the federal response personnel. Redesigning the response network to allow the private sector to be situationally aware of the demand signals of the response (i.e., connecting the weak ties of the private and public sector networks) would provide the much needed capacity and capability in the response, but just as importantly, provide a layer of resiliency to the response network to avert the failures experienced during relief efforts, such as Hurricane Katrina.

B. VALUE PROPOSITION FOR THE PRIVATE SECTOR IN DISASTER PREPAREDNESS

Most of the recent responses to natural disasters have been aided by the capacity of the private sector. The evidence presented in this thesis from the Hurricane Katrina case study suggests the full capacity of the private sector was underutilized. Conversely stated, individuals and society in general would have benefitted from an increased role from the private sector.

What is unclear however, is whether or not a value proposition for the private sector exists to lend itself to having its full capacity employed during disaster response operations. Additionally, for this capacity to be utilized most efficiently, the private sector would have to participate in the entire preparedness cycle. This section examines whether or not real economic value exists for the private sector to participate further in disaster preparedness, from planning to execution.

1. Economics of Disaster

The impact of disasters on economic vitality is readily available in numerous studies. It was estimated that the worldwide economic losses incurred during 2004 due to natural disasters was over \$145 billion or over twice as much as in 2003 (Hochrainer, 2007, p. 31). Moreover, a number of studies suggest natural disasters are increasing in quantity and are having an increasing impact on the worldwide economies due to a number of factors including the location of the disaster, large population growth, low use of mitigation and preventative measures, and limited available resources to respond to events among others (Miller & Keipi, 2005, p. 3). As highlighted by the aforementioned 9/11 Commission, the private sector accounts for approximately 85% of the critical infrastructure in the United States and accounts for approximately 80% of the gross domestic product (Department of Commerce, Bureau of Economic Analysis, 2007, p. 9).

The private sector clearly is the engine that drives this nation's economic vitality, and as such, it is critical that it maintains business continuity in the face of a disaster. Moreover, it is equally important to the private sector that communities affected by a disaster recover as quickly as possible to enable them to conduct normal day-to-day business once again, which drives the bottom line for most companies.

2. Value Proposition

The hypothesis of this thesis is that the private sector can and does play a critical role in disaster relief operations. Further, it is being argued that the private sector should play an even larger role in direct support to response planning and operations, especially as the scope of a disaster increases in size to the point it overwhelms the public sector response capabilities. It can be argued that building upon or relying on the capacity of the private sector is redundant and a waste of valuable resources; however, network theory teaches that redundant nodes and hubs on a network provide the best method of protecting the network.

It is important to note that this thesis presents the concept of utilizing both the public sector and private sector capacity to work together during the entire preparedness cycle, thus causing what could be perceived as redundant capability. However, as the discussion in Chapter IV.A.2 demonstrated, redundancy is a method of avoiding SOC and strengthening the network of this country's preparedness systems

The question remains as to whether or not the private sector has an economic incentive to participate fully in disaster response operations. According to a wide range of sources, private sector organizations are responsible to perform at levels necessary to satisfy an array of stakeholders. Pittman defines stakeholders as "any group or individuals who can affect or is affected by the achievement of the organization's objectives" (Freeman, 2010, p. 46). It is important to note that stakeholders apply to more than just the company's stockholders. According to Goodpaster (1991), stakeholders are entities that have economic value at risk in association with a particular organization (p. 54). Moore & Khagram (2004) from the Kennedy School of Government describe the function of the private sector to "create private (economic) value" (p. 2). Further, Moore and Khagram discuss the intrinsic relationship between private organizations and customers.

Private sector companies rely on various revenue streams to conduct all aspects of their business. Revenues come in the form of access to capital markets, but more importantly, from the customers willing to pay money to access the goods and services they offer (Moore, 2004, p. 5). A company's ability to access the capital markets is predominantly dependent on their potential to continue to collect revenues from customers, thus leaving customers as the critical component for success (Moore & Khagram, 2004, p. 5). These examples are just a few of the theories regarding the purpose and role of the private sector; however, most focus on the private sector's fiduciary responsibility to create profit, value, and goods and services to its stockholders, or more broadly, its stakeholders.

Over the last several decades, American society and the international community for that matter have been examining these models and pushing the private sector to contribute more than just goods, services, and profits to stakeholders. Beyond just the boardroom, organizations have responsibilities ranging from ensuring customer satisfaction is maintained, as they are the driving engine of the company's profits, to protecting the environment and assuring the surrounding communities are not adversely impacted due to their business activities.

Robert Kaplan is one of the leaders in this field of study detailing the importance of a "balanced scorecard" as it relates to developing and measuring strategic goals that go beyond just measuring profits; such as customer satisfaction and the ability to innovate. Another emerging field of study being operationalized in the corporate world is the concept of corporate responsibility.

One method of tracking this area was through the development of an accounting practice called the triple-bottom line of economic, social, and environmental accounting and reporting (Brown, Dillard, & Marshall, 2006, p. 5). The triple-bottom line was developed by John Elkington, the co-founder of SustainAbility, and was intended to provide a form of measurements to companies in which they could provide stakeholders a view of the companies commitment or value in environmental and sustainability activities, as well as traditional (i.e., sales revenues, profit, and loss) business activities (Cheney, 2004).

While some could argue this type of metric is merely window dressing to improve an organization's public image, it is still an indication of corporate awareness to the importance of their standing and relevance in communities, from the local level to the international stage (Schilizzi, 2002).

Moore and Khagram applied a strategic planning model they developed for the public sector to the private sector to demonstrate how corporations can benefit from generating public value or taking a "corporate responsibility"

perspective. The original intent of their model was to provide a strategic planning framework for managers in a public entity to highlight the interconnectedness of customer needs, politics, and the mission (see Figure 6).

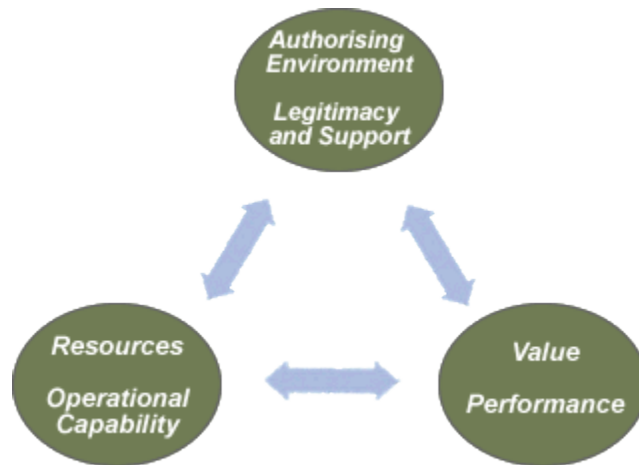


Figure 6. Public/Private Interconnectedness Model (From Moore, 1995, p. 23)

“Judging the value of the imagined purpose of the entity

Manage upward, toward politics, to invest their purpose with legitimacy and support

Manage downward, toward improving the organizations capabilities for achieving the desired purposes” (Moore, 1995, p. 23)

By default, the model demonstrates the inter-connectedness within the private sector between business operations, value, and legitimacy of its operations.

The linkage in the model is that businesses need to do more than just drive revenues to help the bottom line. In effect, they exist to provide goods and services to customers, and as a result, have a responsibility to contribute to communities in a way that will ensure their customers continue to do business with them.

In addition to stockholder/stakeholder perspectives of viewing private sector companies, it is also necessary to examine the market forces at play that create the working environment for the private sector, and in return, dictates

some of the behaviors of organizations. Michael Porter of the Harvard Business School developed a model to describe the forces affecting the private sector (see Figure 7).

The Five Forces That Shape Industry Competition

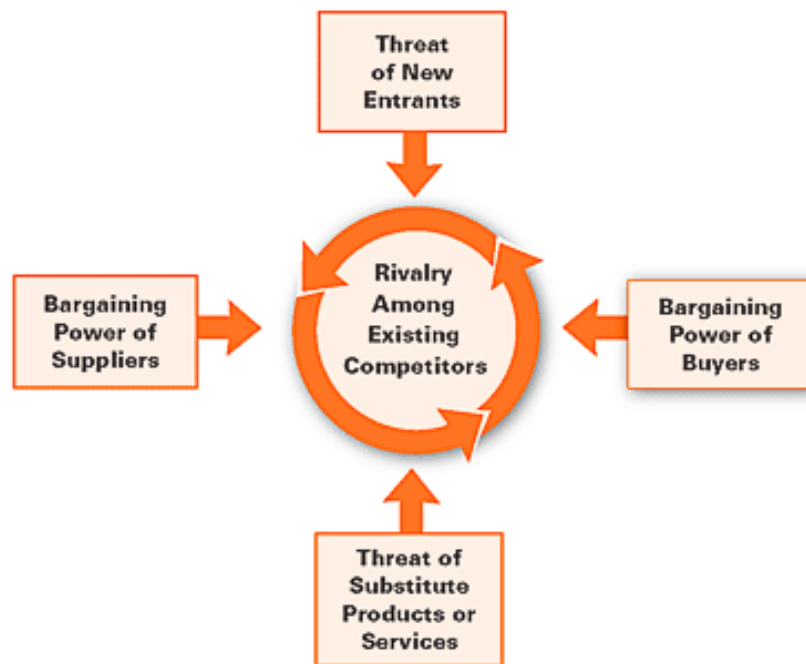


Figure 7. Porter's Five Forces (From Porter, 2008, Executive Summary)

Porter describes his models as follows.

If the forces are intense, as they are in such industries as airlines, textiles, and hotels, almost no company earns attractive returns on investment. If the forces are benign, as they are in industries such as software, soft drinks, and toiletries, many companies are profitable. Industry structure drives competition and profitability, not whether an industry produces a product or service, is emerging or mature, high tech or low tech, regulated or unregulated. While a myriad of factors can affect industry profitability in the short run—including the weather and the business cycle—industry structure, manifested in the competitive forces, sets industry profitability in the medium and long run. (Porter, 2008)

If the discussion of Porter's model is framed through the disaster response lens, several areas can be seen in which businesses need to not only be aware of but perhaps heavily involved in working through the disaster response from a business continuity, as well as customer resiliency perspective. For instance, in the wake of a large natural disaster, a business will have to be attentive to a disruption of its supply chain and whether or not that leaves it vulnerable to having its customers moving to other competitors.

Looking back at the earthquake in Japan, Toyota saw significant disruptions in both its production capability, as well as its supply chains, that may result in losses of \$1.5 billion in profits and \$5 billion in net income during the 2nd quarter of 2011 (Morrison, 2011). Not only is Toyota losing sales revenues and profits, it appears as though GM, Ford, and Chrysler have all benefitted from Toyota's problems as they have all seen increase in sales. GM and Ford reported increased sales in the same quarter of 10% and Chrysler reported an increase of 30% while both Honda and Toyota reported decreases in excess of 20% (Kirsher & Durbin, 2011). Even as the earthquake impacted the ability of Toyota to bring models to the market, higher gas prices drove the U.S. car buyer to seek small to mid-size fuel efficient models, which is what primarily drove the rise in sales for the U.S. car makers.

The Japan earthquake is a very good example of how a disaster and the aftermath of a disaster can impact the bottom line of the private sector, which is not to suggest the private sector could have prevented the actual earthquake. Rather, it would appear it is imperative for the private sector to have a place in the response discussions as it applies to its own business continuity, particularly in marketplaces in which a heavy dependence on suppliers occurs and where customers have lots of choices in providers for those products and services, and furthermore, the success of companies, such as Toyota, provide revenues in the form of taxes back to the government, again underscoring their need to be responsive and resilient during a disaster.

Again, reviewing Porter's model and the value proposition of the private sector's involvement in disaster response activities, it is only necessary to look at the impact that disasters have on the ability of customers to be able to continue to expend their resources, which provide the revenues critical to the private sector. This topic was explored in Chapter III as the Hurricane Katrina case study demonstrated how the private sector could help their customers return to normal spending habits.

3. Goodwill

In addition to physically helping affected customers, perhaps the private section could consider another factor in the value. Does the private sector have the ability to gain corporate Goodwill from their actions in disaster relief operations? Goodwill is an asset included on a company's balance sheet to account for items, such as brand name, customer relations, employee relations, patents, and other intellectual property (Wagner, 2009).

Companies have realized that the benefit of participating in disaster response is not just a way of gaining Goodwill but is also a corporate responsibility. For instance, Horowitz stresses how the CEO of Home Depot describes the potential concerning addressing customer needs during a disaster: "If we can be there when a customer needs us most, we can win that customer for life" (Horowitz, 2008, p. 3). One of the issues that has plagued consumers in the wake of disasters is the perception of price gouging. Wal-Mart has established a policy whereby they freeze prices in a region during the disaster relief operations (Horowitz, 2008, p. 7). Another strategy that Wal-Mart employs is its focus on using local store managers and other employees to deal with the media and the public during response efforts. As Diermeier (2011) emphasizes, these local employees have more credibility in dealing with a situation versus a more senior management representative that comes from another location.

4. Conclusion

As noted above, different methods calculate the value that the private sector can attain in the operations of its business. As it specifically relates to their operations during disaster relief, evidence and research exist to suggest that it may be in the economic best interest not only to continue but also to expand its role in disaster operations.

Consumer purchases create the revenues that are the fundamental mechanism enabling businesses to continue their operations. Even though they have a fiduciary responsibility to stockholders, linking to consumer revenues should compel companies to consider all stakeholders (e.g., customers, communities, environment, etc.). Using Porter's competitive strategy model, it is possible to see that a business faces both opportunity and threat when having to operate in an area impacted by a disaster. Further, companies are already implementing strategies to garner Goodwill in communities by providing aid and support to affected customers or potential customers. Therefore, it would seem critical for companies to continue to expend resources and expand their role in the disaster preparedness system.

C. MEGACOMMUNITIES PERSPECTIVE OF DISASTER PREPAREDNESS

Network theory and social complexity explain the interconnected nature in which everyone lives today. Yet, noted previously, the preparedness system only partially addresses the role of the private sector in the disaster response system. The 9/11 Commission clearly articulated the critical role the private sector plays in this nation's economy, yet the policy for incorporating the private sector remains largely a voluntary process, which does not lend itself to rapid integration during a disaster.

Mark Gerencser et al. authored the book, *Megacommunities: How Leaders of Government, Business and Non-Profits Can Tackle Today's Global Challenges Together*, describing the need for the public and private sector to

form a collaborative partnership to combat the wicked problems this country is facing today.

Walter Isaacson, President and CEO of the Aspen Institute, describes the concept in the foreword of the book as follows.

These new complexities are a natural consequence of a world made smaller by greater integration and interdependency. Issues that arise in this environment can abruptly and unpredictably escalate, with a scale and magnitude that can quickly overwhelm the effected institutions. As a result leaders from all the sectors face a growing need to operate in a more open, distributed, and collaborative manner that recognizes the shared nature of risks, rewards, and responsibility. Unfortunately this type of activity is not intuitive for most leaders. (Gerencser et al., 2008, Foreword)

As outlined previously, ample policy documents and research are available to support the concept of incorporating the theories set out in the Megacommunity concept; however, the practice of establishing a true collaborative and integrated network between the public and private sector has yet to be realized. The following analysis considers the concepts outlined in Megacommunities and applies it to finding solutions for enhancing the role of the private sector in disaster preparedness.

The authors of Megacommunities developed the model to explain their concept visually; the blending of the government (public), business (private), and civil society (non-profit) (see Figure 8). This thesis is focusing solely on the relationship between the public and private sector, not to underscore the importance of the non-profit sector, but to focus the analysis on improving the integration of the private sector in disaster response. The non-profit sector, to include the Red Cross and other outstanding organizations, clearly has a place and can have an entire field of study regarding its role in preparedness.

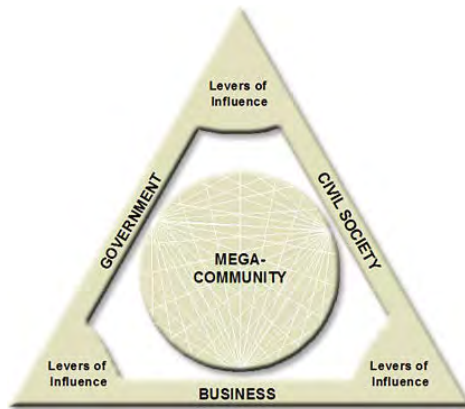


Figure 8. Megacommunity Model (From Gerencser et al., 2008, p. 56)

According to the authors, the critical elements for a successful Megacommunity model are tri-sector engagement, overlap of vital interests, convergence, structure, and adaptability.

Tri-sector Engagement: The fundamental underpinning of the model is that when each sector works together, it can leverage the capabilities and expertise of the others. For instance, the public sector has the authority to commit resources to a particular event, but as Hurricane Katrina demonstrated, but it lacks the expertise in managing large-scale disasters. Similarly, while the private sector can move large amounts of product, it may not have a full understanding of parts of the community most at risk. The citizens most often at risk are not able to participate fully in the marketplace, and thus, have the highest potential to go unnoticed (e.g., large number of evacuees encountered at the Superdome and Convention Center in New Orleans during Hurricane Katrina). FEMA director Michael Brown made this exact observation in the aftermath of Hurricane Katrina, “we are seeing people we didn’t even know existed” (PBS Newshour, 2005). This comment underscores how critical collaborative integration of knowledge and expertise is to managing problems of this nature.

Overlap of Vital Interests: The authors use this concept to highlight the fact that while not everyone in a megacommunity will have the same objectives, a common interest in a problem is shared, which is really an expansion of the “stakeholder” view of a corporation, in that a shared interest exists between management, employees, stockholders, customers, local communities, environmentalists, and government regulators. Each individual stakeholder has seemingly divergent interests, such as customers wanting the lowest price for goods and services while management needs to maximize

revenues to produce the desired return on investment for stockholders. While the objects are divergent, the interest is common and provides the shared forum for the stakeholders to discuss their objectives.

Convergence: Megacommunities will only work if the shared interests of the stakeholders result in a full and equal collaboration among the group. It is the unity of effort, despite potentially divergent objectives, that make the community successful and requires a great deal of trust and a “commitment toward genuine mutual action” (Gerencser et al., 2008, p. 71).

Cross-organizational Structure: Network theory, as described earlier, lends itself to better understanding the concept of the structure necessary to enable the collaboration needed for a megacommunity to thrive. The combination of three different worlds of work, each with its own focused networks, is akin to the “weak ties” or “small world” models that Granovetter and Barabasi examined. Applying the theories of networks and SOC, it could be suggested that the central role of the federal government in large-scale disasters serves as a major hub connected to all the nodes in the response network. Hurricane Katrina showed that when this hub was overloaded, similar to the MafiaBoy virus, it became unable to respond effectively to the demands placed on it. Meanwhile, vital supplies from the private sector sat idly by as it had no access to the response network, and thus, communications between it and the federal response personnel were nonexistent. Redesigning the response network to allow the private and civil sectors to be situationally aware of the demand, signals the response (i.e., connecting the weak ties between these networks) would not only provide much needed capacity and capability in the response, but just as importantly, will provide a layer of resiliency to the response network to avert the failures experienced during relief efforts, such as Hurricane Katrina.

Adaptability: Just as the problem facing the megacommunity, namely a wicked problem, will change and adapt to the environment over time, the community itself must be ready to adapt to meet the challenges it faces collectively. While the bureaucracy of a public-private partnership model may initially provide the impetus for the weak ties of these networks to link together, it may ultimately stifle innovation by adherence to policy or memorandums of understanding. For a megacommunity to be most successful, the model must be nimble and agile to accommodate the changing face of the problem. For instance, the initial response to Hurricane

Katrina was focused on rescuing survivors, but over time, became focused on restoring communities and dealing with managing an unprecedented level of contaminated debris.

1. Megacommunities and Worst-Case Scenarios

Hurricane Katrina, 2004 Tsunami, 9/11, and the Oklahoma City Bombing are events that evoke a series of reactions and emotions to all Americans and many across the globe; whether manmade or a natural disaster, they each in their own way demonstrated this nation's lack of foresight and inability to manage what could be considered worst-case scenarios. Despite their enormous impacts, it could be argued, with the exception of the 2004 Tsunami, they each resulted in a relatively low number of deaths considering the overall potential. For instance, on a typical day, over 50,000 people occupied the Twin Towers but luckily, "only" 2,700 people were killed during the attack, still a staggering number, yet it could have been much worse. Of all these tragedies, the 2004 Tsunami had the greatest death toll, with estimates as high as 330,000 people spread across 14 countries.

This country's disaster planners talk about planning for worst-case scenarios, but unfortunately, the full lessons learned are not integrated in U.S. preparedness goals. For instance, the federal government sponsored a Hurricane Exercise for New Orleans intended to produce a worst-case scenario of a Category 5 hurricane making a direct impact. In fact, the simulation predicted projected 61,290 dead and 384,257 injured or sick in a catastrophic flood that would leave swaths of southeast Louisiana uninhabitable for more than a year (Associated Press, 2005). What would happen if this country faced an even greater disaster, such as a successful nuclear attack by a terrorist group?

The first component of risk, threat, "is a measure of the likelihood that a specific type of attack will be attempted against a specific target" (Jones & Edmonds, 2008). During an interview for *Time Magazine* in December 1998, Bin Laden was quoted as stating the following with regard to acquiring nuclear weapons, "Acquiring weapons for the defense of Muslims is a religious duty. If I

have indeed acquired these weapons, then I thank God for enabling me to do so. And if I seek to acquire these weapons, I am carrying out a duty. It would be a sin for Muslims not to try to possess the weapons that would prevent the infidels from inflicting harm on Muslims" (Yusufzai, 1999). It could be questioned whether or not Bin Laden is using the idea of gaining access to nuclear weapons as a method to distract counter-terrorism efforts from his real targets; however, that seems unlikely given his proven track record of successfully executing threats. According to then Undersecretary of State John Bolton, "I don't have any doubt that al Qaeda was pursuing nuclear, biological and chemical warfare capabilities. It's not our judgment at the moment that they were that far along, but I have no doubt that they were seeking to do so" (Boettcher & Arnesen, 2002). Regarding the question of threat, it is a logical conclusion to suggest the threat of a terrorist group, specifically Al Qaeda, attempting to use a nuclear device against the United States is all too real. In fact, on July 14, 2006, then DHS Secretary Michael Chertoff stated the following.

The single biggest threat we worry about, in terms of protecting this country and securing the homeland, is the threat of a weapon of mass destruction. And at the very top of the scale is a nuclear device or a radiological device. (Department of Homeland Security, 2006)

Since any recent nuclear attacks have not occurred, the impacts of the nuclear bombs dropped on Hiroshima and Nagasaki are examined as a surrogate.

The death toll for Hiroshima and Nagasaki has been assessed as high as 340,000 when long-term impacts, such as cancer and radiation poisoning, are considered (U.S. Department of Energy, Office of History & Heritage Resources, n.d.). This number is even more staggering when considering the combined population of these two cities was approximately 600,000. The impacts to the city were just as devastating as nearly every structure within one mile of ground zero was destroyed, and less than 10% of the buildings in the city survived without any damage, with the blast wave shattering glass in suburbs 12 miles away (U.S.

Department of Energy, Office of History & Heritage Resources, n.d.). Again, assuming New York City, specifically Lower Manhattan, remains the primary target, the devastation for a successful detonation of a nuclear device would almost be incalculable. The estimated population of Manhattan is 1.6 million covering a 23 square mile area, the number of people on the island of Manhattan swells to 2.87 million when the commuting workforce is taken into account (U.S. Department of Commerce, Census Bureau, n.d.). A successful nuclear detonation in the middle of Lower Manhattan could quite possibly result in several hundred thousand dead or severely wounded. In addition, assuming a similar level of architectural damage as experienced in Hiroshima and Nagasaki, it is likely the economic impact of the attack could reach \$1 trillion in just a few weeks due to lost economic output and effect on the worldwide financial markets (Bunn, 2010). Without overstating the obvious, the consequences of a successful nuclear attack on Lower Manhattan would be second to none with regard to the primary impacts (lost lives, economic impacts, etc.) Moreover, the secondary impacts, terror instilled in all major cities across the globe, are virtually inestimable.

2. Conclusion

Hurricane Katrina demonstrated this nation's inability to manage what ultimately resulted in a fraction of the impact that planners had predicted for a hurricane impacting New Orleans only several months prior to its landfall. This situation would be miniscule when comparing it to the utter devastation faced if Al Qaeda or other terrorist network successfully set off a nuclear device in Lower Manhattan. Further, Katrina highlighted the need for a megacommunity approach and looking at this problem through the lens of a worst-case scenario only further underscores the need to engage all available resources fully to respond to an event of this magnitude.

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V. CONCLUSION

The analysis presented the basis for incorporating the private sector in disaster preparedness through a network-focused approach using the Megacommunity concept as a guide. The very foundation of the private sector is the symbiotic relationship between a company and consumers, and the relationship they have in the marketplace of goods and services being traded for revenue turned into profit (e.g., net positive value) for stockholders. From this perspective alone, the private sector has the innate responsibility to maintain an uninterrupted marketplace to keep the flow of goods, services, and revenues at full speed. Overtime, consumers have come to expect more from companies and companies have responded by adopting socially responsible practices and a penchant to build Goodwill within communities, greatly expanding the definitions of value, as well as expanding the beneficiaries of this newly defined value beyond traditional stockholders to a more broadly defined group of stakeholders.

As noted above, different methods calculate the value that can be attained by the private sector in the operations of its business. As it specifically relates to their operations during disaster relief, evidence and research is available to suggest that it may be in the economic best interest to not only continue but to expand its role in disaster operations.

Consumer purchases create the revenues that are the fundamental mechanism enabling businesses to continue their operations. Even though they have a fiduciary responsibility to stockholders, it is the linking to consumer revenues that should compel companies to consider all stakeholders (e.g., customers, communities, environment, etc.). Using Porter's competitive strategy model, it is possible to see that a business faces both opportunity and threat when having to operate in an area impacted by a disaster. Further, companies are already implementing strategies to garner Goodwill in communities by

providing aid and support to affected customers or potential customers. Therefore, it would seem critical for companies to continue to expend resources and expand their role in the disaster preparedness system.

Just because it is in the economic best interest of the private sector to be further involved in disaster preparedness, is that enough to dictate a larger and more defined role alongside the government?

During the analysis of the megacommunities concept, the response to Hurricane Katrina was used to demonstrate the current federal disaster system's inability to manage the storms impacts even though the actual devastation was a fraction of the impact that planners had predicted during a planning exercise only a few short months prior to the actual landfall. Despite the overwhelming amount of resources applied in this disaster, neither enough resources nor effective coordination was available to keep up with the demands placed on the governmental response effort. In fact, it was largely the private sector that received the most praise for its ability to respond effectively to needs within the local community.

Even though Hurricane Katrina could be classified as a "wicked problem," its own set of impacts and challenges would be miniscule when comparing it to the utter devastation faced if Al Qaeda or other terrorist network successfully set off a nuclear device in Lower Manhattan. Further, Hurricane Katrina highlighted the need for a network-based megacommunity approach and looking at this problem through the lens of a worst-case scenario only further underscores the need to engage all available resources fully to respond to large-scale events of this magnitude.

Applying the theories of networks and SOC, it could be suggested that the central role of the federal government in large-scale disasters serves as a major hub connected to all the nodes in the response network. Hurricane Katrina showed that when this hub was overloaded, similar to the MafiaBoy virus, it became unable to respond effectively to the demands placed on it. Meanwhile,

vital supplies from the private sector sat idly by as they had no access to the response network, and thus, no communications were available between it and the federal response personnel. Redesigning the response network to allow the private sector to be situationally aware of the demand signals of the response (i.e., connecting the weak ties of the private and public sector networks) would provide the much needed capacity and capability in the response, but just as importantly, provide a layer of resiliency to the response network to avert the failures experienced during relief efforts, such as Hurricane Katrina. Combining this network approach along with the model put forth in megacommunities, the areas to improve national disaster response capabilities come into focus.

According to the authors, the critical elements for a successful Megacommunity model are tri-sector engagement, overlap of vital interests, convergence, structure, and adaptability. These elements all have similarities in the world of networks.

Tri-sector engagement explains the interaction between government, private sector, and society. In network terms, these areas could be seen as three separate but inter-related nodes or hubs with their own separate networks. The overlap of vital interests describes why these three separate communities need to rely on and interact with each other and where the network theory starts to take hold. Although separate networks, they each have many shared vital interests. For instance, the foundation of the U.S. government comes from the people, and in turn, the people rely on the government to provide order to society, broad services, etc. Similarly, the private sector relies on the payment for goods and services from society to return value to stakeholders, and society in turn, relies on the private sector to provide unfettered access to those goods and services. The relationship between the private sector and government is slightly different but transactional all the same. For instance, the role of government at times is to regulate industry to protect against a variety of abuses (e.g., labor, environmental, unfair competition, etc.) while at the same time, relies on a vital private sector to contribute taxes to run the government, as well as providing

services for which the government cannot, such as the private sector based military industrial complex.

The next concept of megacommunities, that of structure, shows where networks are fundamentally essential to enable the collaboration necessary for a megacommunity to thrive. The combination of three different worlds of work, each with their own focused networks, is akin to the “weak ties” or “small world” models that Granovetter and Barabasi examined. Mark Granovetter explored the concept of social theory even further by explaining how networks exist through “weak ties.” Granovetter (1983) suggests that everyone exists in a world of clustered networks connected to each other through a series of weak links; otherwise, the clusters would form one larger network (p. 209). As explained by Barabasi (2003), this model begins to reflect more closely the real world social network in which relationships determine the level of connectedness vice the completely random model of Erdos and Renyi (p. 44). The Granovetter model becomes even more important upon beginning to explore networks from a hub perspective, as some nodes become hubs with a large number of links and plays a significant role within a network, especially if something damaging happens to that node.

One of the underlying requirements for megacommunities to succeed is the notion of convergence, or that of shared interest. As demonstrated by the modern adaptation of expanded stakeholder groups, balancing the needs and interests of diverse groups can be difficult. Within the disaster response framework, the disaster itself and the collective desire to respond to impacted citizens, restore services, and in general, return to “normal” provides an initial convergent object. Typically, as time moves forward during large-scale disaster relief efforts, individual or group needs can diverge from the initial objectives of the response effort. For instance, as experienced during the Deepwater Horizon oil spill, the initial efforts focused on saving lives and securing the source of the oil leak. As time moved forward, groups began to use the incident to leverage their interests, such as reducing deepwater offshore drilling, improving inland

fisheries habitats, furthering economic development, etc. The integration of multiple nodes (i.e., weak links) into the response network enables some of these divergent issues to continue to be addressed while not overloading a single node within the network.

The next element of the Megacommunity concept is that of cross-organizational structure. Redesigning the response network to allow the private and civil sectors to be situationally aware of the demand signals of the response (i.e., connecting the weak ties between these networks) would not only provide much needed capacity and capability in the response, but just as importantly, it provide a layer of resiliency to the response network to avert the failures experienced during relief efforts, such as Hurricane Katrina, which showed that when the government hub was overloaded, similar to the MafiaBoy virus, it became unable to respond effectively to the demands placed on it. Meanwhile, vital supplies from the private sector sat idly by as it had no access to the response network, and thus, communications between it and the federal response personnel were unavailable.

The final element to megacommunities is adaptability. Earlier in this thesis, the topic of SOC was introduced to explain the benefits of increasing nodes or hubs on a network to prevent the network from failing. The example of the MafiaBoy virus demonstrated the relative ease with which networks can be overloaded. Network theory teaches that with more nodes and hubs, the network becomes more resilient and adaptable. Again, linking the nodes of the Tri-Sector Engagement concept of government, society and the private sector increases the resiliency and adaptability of the network.

The research contained in this thesis presents the case that increasing evidence demonstrates that disasters, manmade, natural, or otherwise, are impacting society in an increasing manner in many ways including fatalities, cost to individuals, the private sector and the global economy. Further, as the scope of these disasters increase, and as their impacts increase, the ability to manage the response to these disasters has outstripped the traditional governmental

centric disaster response philosophy. Using a network focused perspective, the analysis supports the Megacommunity concept by linking the governmental disaster response network with the private-sector's disaster response capability and capacity to enable the overall response effort to deliver a more comprehensive and efficient response to the segment of society impacted by the disaster.

VI. RECOMMENDATIONS

The literature and real-world experience thus far suggests that disasters are causing increasingly larger economic and social impacts throughout the globe, the federal government recognizes the importance of the private sector in disaster preparedness, and the private sector already is playing a role in disaster relief, albeit mostly self-generated. FEMA Administrator Craig Fugate aptly stated the following, "There's no way government can solve the challenges of a disaster with a government-centric approach. It takes the whole team. And the private sector provides the bulk of the services every day in the community" (Department of Homeland Security, Federal Emergency Management Agency, n.d.b.).

However, policy to support a more clearly defined role for the private sector in the entire disaster preparedness cycle does not seem to exist. In fact, conversely, literature is readily available that supports the lack of coordination between all levels of government and the private sector. Retired Coast Guard Commander Stephen Flynn and Daniel Prieto (2006) directly support this point by suggesting, "the capabilities, assets, and goodwill of the private sector to bolster our homeland security remain largely untapped" (p. 1). It is absolutely imperative from a homeland and national security perspective that the private sector is given the necessary tools to participate actively in all aspects of the preparedness cycle. Some models of success are available to copy but many have limitations. For instance, INFRAGARD is a highly successful and national level organization led by the Federal Bureau of Investigation (FBI) that relies on the coordination of the public and private sector to protect portions of the nation's critical infrastructure. However, it relies on voluntary enrollment by the private industry. Conversely, the Coast Guard has been given statutory authority to lead an interagency Maritime Security Committee (MSC), which incorporates both the public and private sectors. As part of this authority, the Coast Guard has created joint operation centers that formally incorporate the role of participants during all facets of the disaster preparedness cycle, but more importantly, provide a "seat

at the table” during response operations. This legislatively mandated model provides the foundation to expand this concept across all sectors. A model gaining in popularity at the state level and could be used to expand the MSC model is the Business Emergency Operations Center (BEOC) concept.

The following recommendations use the Coast Guard MSC model as the foundation to create a similar statutory authority to expand the role of BEOCs throughout all levels of the disaster preparedness cycle to encompass local, state, regional, and federal levels of response.

A. MARITIME SECURITY COMMITTEE

The Maritime Transportation Security Act (MTSA) of 2002, which was the defining legislation for the Coast Guard after 9/11, created the requirement for Coast Guard Captains of the Port to establish maritime security committees. These committees were intended to assist the Coast Guard in developing a comprehensive maritime security plan for the port community to include both public and private entities (Maritime Transportation Security Act (MTSA) of 2002, (a)(2)). The MTSA gave the Coast Guard the regulatory authority over any entity operating in and around port facilities to include both vessel and facility operations. The maritime security committees have received high praise across all spectrums from the membership of the committees to the GAO. In fact, the GAO stated the following.

Area maritime security committees have provided a structure to improve the timeliness, completeness, and usefulness of information sharing between federal and nonfederal stakeholders. Stakeholders stated that among other things, the committees have been used as a forum for sharing assessments of vulnerabilities, providing information on illegal or suspicious activities and providing input on portwide security plans—called area maritime security plans—that describe the joint strategies of the Coast Guard and its partner agencies for protecting key infrastructure against terrorist activities. Nonfederal stakeholders, including state officials, local port authority operators, and representatives of private companies, said the information sharing had increased their awareness of security issues around the port and allowed them to

identify and address security issues at their facilities. Likewise, Coast Guard officials said the information they received from nonfederal participants had helped in mitigating and reducing risks. (U.S. Government Accountability Office, 2005)

Information sharing between the public and private sector is often criticized whether it be in the course of normal business or during an actual emergency response. One of the aspects that makes the maritime security committees successful is that many of the members, both public and private individuals, have received security clearances to give them the necessary access to critical information that enables effective partnerships.

For instance, although it is still in the trial phase, the Coast Guard has received legislative authority and the funding to support the creation of three interagency/public/private operations centers. These operation centers provide literal and figurative “seats at the table” for all the stakeholders within a port community, to include law enforcement, intelligence, industry, and community groups, to collaborate on developing deliberative planning documents, but also provide the venue to host all these groups during an actual emergency response. The GAO described these command centers in the following way:

Interagency operational centers (Charleston, Norfolk, and San Diego), represents a step toward further improving information sharing, according to participants at all three centers. They said area maritime security committees have improved information sharing primarily through a planning process that identifies vulnerabilities and mitigation strategies, as well as through development of two-way communication mechanisms to share threat information on an as- needed basis. In contrast, interagency operational centers can provide continuous information about maritime activities and involve various agencies directly in operational decisions using this information. Radar, sensors, and cameras offer representations of vessels and facilities. Other data are available from intelligence sources, including data on vessels, cargo, and crew. (U.S. Government Accountability Office, 2005, p. 16)

As noted in this description, one of the critical elements that makes this committee successful is the ability for both public and private sector representatives to receive security clearances and have access to some intelligence information. Although the granting of clearances is sometimes slow and cumbersome, it is eventually effective in tightening the partnerships among the key stakeholders. Additionally, it is up to the discretion of the Captain of the Port, as the Federal Maritime Security Coordinator to decide which representatives are granted access to intelligence information. This feature of the committee is a key component to making it successful as members of the committee are operating on a level playing field across all levels, private or public. Naturally, information needs to be shared carefully, and only after thoughtful consideration, however, remains effective in establishing a collaborative spirit among the committee members.

A somewhat unique feature within the federal government, not even the National Infrastructure Protection Plan identifies granting of security clearances among the private sector. In fact, it only states that the private sector should provide recommendations and subject matter expertise (Department of Homeland Security, 2009, p. 2). Furthermore, the language used to describe the role of the private sector is that it is “encouraged” or may “voluntarily” participate. For instance, under the Critical Infrastructure Information Act of 2002, the private sector can voluntarily submit sensitive information pertaining to critical infrastructure; however, the sharing of information is handled very carefully due to privacy and proprietary concerns (Department of Homeland Security, 2009, p. 136).

Finally, the other key element of the success of the maritime security committee is the openness this forum creates concerning the diverse parties that comprise the committees. While the membership is extensive, it is not limiting as the Captain of the Port has the authority to recommend other groups become part of the committee based on local or regional needs.

B. BUSINESS EMERGENCY OPERATIONS CENTER

The MSC, as noted by the GAO, is a laudable example of the benefits of formally linking and creating the structure to incorporate the resources and capabilities of the public and private sectors. The research contained in this thesis suggests few if any other examples mirror this concept to the extent that a legislative mandate exists to create it, and one that provides what many believe is the most critical element in any disaster relief operation, access to information, including the ability to credential and provide appropriate security clearances properly to ensure the membership has all the relevant information to make decisions. As mentioned above, INFRAGARD closely resembles the MSC but is a voluntary member based organization. Similarly, FEMA has created a National Business Emergency Operations Center (NBEOC), which is likewise voluntary and has no statutory authority to compel membership to participate in the full disaster preparedness cycle (DHS FEMA, National Business Emergency Operations Center). Moreover, the participants are only connected virtually (e.g., conference calls, etc.) and none of the private sector participants have a real “seat at the table.”

Conversely, many states have adopted a model in which private sector businesses are full participants in the EOC to include developing planning documents all the way to being actively present and involved in the physical EOC during a crisis. The organization called Business Executives for National Security (BENS) documented the emergence of the BEOCs through a survey of all the states. According to the survey results, varying levels of sophistication and structure to the BEOCs exist but their responsibilities encompass the following areas (Business Executive for National Security, 2011, p. 12).

- Assess and track the status of private sector problems and needs

- Assess the impact to the private sector of problems reported by other entities

- Gather information on private sector operations by phone, fax, email, Internet, news media, and other means available

- Provide the EOC with information regarding private sector issues (key operational timelines, facility locations, building access needs, transportation issues, relocation logistics, security issues, recovery priorities)

- Make resource offers on behalf of the private sector to the EOC, as resources become available. Provide information for EOC status reports as requested

- Disseminate relevant information and guidance from the EOC to private sector contacts as authorized

- Provide brief verbal status updates as requested regarding current viability of the private sector and key infrastructure providers

- Provide a shift change report/briefing to the next private sector liaison on duty

- Participate in meetings and conference calls as needed during the shift

It is interesting to note the BENS 2011 study further supports the thesis by noting that similar structures were not in place at either the regional or federal level. As highlighted earlier, FEMA has created the NBEOC, which is a step in the right direction; it does not have the same structure of participation as noted by the BENS study. A quick review of the Louisiana BEOC (LABEOC) provides a timely and constructive analysis of the benefits of formally incorporating the private sector into the disaster preparedness process.

As a result of the lessons learned in the wake of Hurricanes Gustav and Ike, the state of Louisiana established a BEOC that established “links with over 200 critical infrastructure facilities, assets and industry organizations from across the 18 critical infrastructure and key resources sectors identified by the Department of Homeland Security...providing a voice for over 180,000 business across the state” (Day et al., 2010, pp. 221–2). The LABEOC has a defined set of guidelines and objectives that encompass virtually all aspects critical during response to a disaster outlined as follows.

- Enhance pre-disaster preparedness and resilience

- Facilitate bi-directional public-private communication of critical information

- Estimate economic impacts of a disaster

- Expedite the resumption of normal business operations

Maximize the use of Louisiana businesses

Assist in coordinating the flow of goods and services

Coordinate volunteers and donations (Day et al., 2010, pp. 222–223)

While the efforts and focus of the LABEOC are noteworthy, the ability of the entity to be successful is equally supported by the availability of a dedicated facility for members of the LABEOC to operate from, as well as a structure in place to support the flow of communications to and from the state EOC as noted in Figure 9.

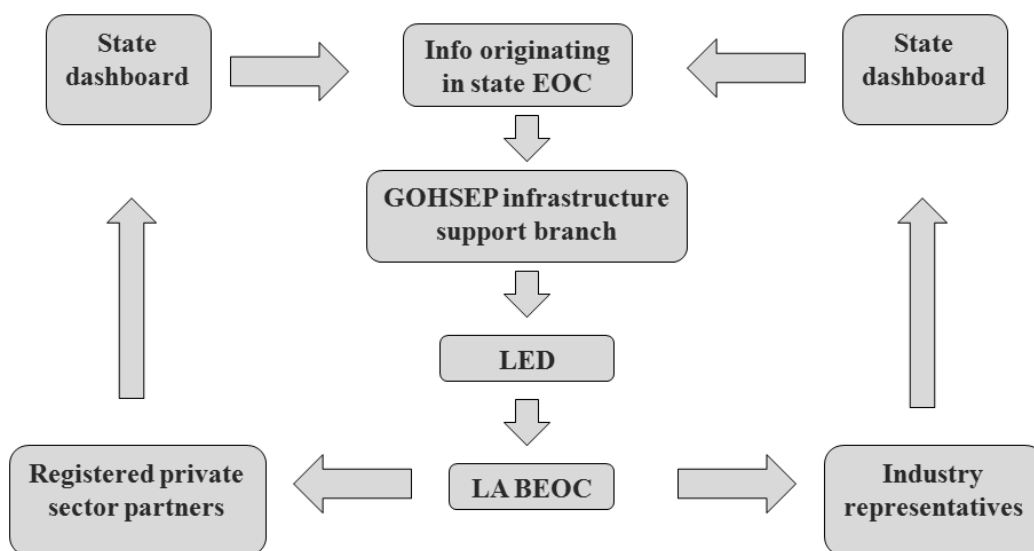


Figure 9. LABEOC Communications Flow (From Day et al., 2010, p. 226)

As demonstrated in Figure 9, the LABEOC provides the connectivity with the private sector to be able to relay pertinent information back into the state EOC to assist in managing the response operations. Day et al. reviewed the efforts of the LABEOC and credited the organization with providing positive impacts in several areas in alignment with the goals established by the LABEOC, which are highlighted as follows.

Economic Impact Assessments The LABEOC team estimated the volume of the spill corresponding to various scenarios of spillage, as well as the impact to various sectors of the state economy by engaging

subject matter experts from universities, in consultation with industry. This work assisted in determining the impacts of the oil spill to the Louisiana economy.

Proposal/Idea Collection In response to Governor Jindal's call for innovative ideas, the LA BEOC team created a web portal that collected ideas and proposals, and forwarded them to the appropriate agency. The proposal categories included Coastal resource protection, dispersal and skimming, fish and wildlife; remediation and recovery, well shut-off effort, and boom. A science panel, consisting of experts from around the state, was established to review proposals, make recommendations, and forward to BP and the USCG.

Private Sector Resources The LA BEOC team researched local, state, and national private sector resources available to meet specific needs identified by the Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) in managing and responding to the oil spill.

Helpful Links The LA BEOC team published an informative website making relevant links available including those for volunteers and donations. as well as other emergency services available to the public (LAEBOC, 2010).

The LAEBOC is a relevant example of the benefits of including the private sector in the disaster preparedness cycle including planning, training, execution, and evaluation. Moreover, the LAEBOC demonstrates the further need to formalize this concept to and including the federal/national level.

C. RECOMMENDATION

The focusing feature of MTSA 2002 was to require the Coast Guard Captain of the Port (COTP) to create area maritime security plans. Using this feature as an impetus, the Coast Guard used the COTP regulatory authority to require all port stakeholders (primarily private industry groups) to submit facility security plans based on standards set in the Security Act, as well as other regulations. The requirement for these plans was the initial impetus that enabled the committees to be successful as industry and the Coast Guard worked closely together to ensure each of the plans was properly submitted. As a result of the cooperation and information sharing, the committees continue to reap dividends

in planning and response situations. Additionally, the state-level BEOC initiative provides a proven and successful concept to incorporate the private sector similarly into the disaster preparedness process.

National level policy should follow the same methodology of using legislative and regulatory authority to require industry to provide comprehensive disaster planning and response plans. Additionally, policy needs to establish the logistical and information-sharing infrastructure (i.e., BEOC's) necessary to support as many private sector groups as possible in the national preparedness system. Finally, updated policy should provide necessary legislative authority to mandate private sector participation, as well as addressing legal issues surrounding liability concerns addressed in many states under Good Samaritan Laws.

1. Structure

Clearly, the private sector itself is a complex network of various industries and businesses and incorporating them into one BEOC type of structure would likely prove unwieldy if not completely dysfunctional. The National Response System already addresses the complexity of the governmental agency dilemma by defining the roles and responsibilities of government agencies under the Emergency Support Functions (ESF), as outlined in the introduction to the ESF Annexes.

The Incident Command System provides for the flexibility to assign ESF and other stakeholder resources according to their capabilities, taskings, and requirements to augment and support the other sections of the Joint Field Office (JFO)/Regional Response Coordination Center (RRCC) or National Response Coordination Center (NRCC) in order to respond to incidents in a more collaborative and cross-cutting manner. (Department of Homeland Security, Federal Emergency Management Agency, 2008, Introduction)

Table 1 provides the scope, roles and responsibilities in each of the ESFs.

Table 1. Roles and Responsibilities of the ESFs (DHS, FEMA, NRF)
(Continues on next page)

ESF	Scope
ESF #1— Transportation	Aviation/airspace management and control Transportation safety Restoration/recovery of transportation infrastructure Movement restrictions Damage and impact assessment
ESF #2— Communications	Coordination with telecommunications and information technology industries Restoration and repair of telecommunications infrastructure Protection, restoration, and sustainment of national cyber and information technology resources Oversight of communications within the Federal incident management and response structures
ESF #3—Public Works and Engineering	Infrastructure protection and emergency repair Infrastructure restoration Engineering services and construction management Emergency contracting support for life-saving and life-sustaining services
ESF #4—Firefighting	Coordination of Federal firefighting activities Support to wildland, rural, and urban firefighting operations
ESF #5—Emergency Management	Coordination of incident management and response efforts Issuance of mission assignments Resource and human capital Incident action planning Financial management
ESF #6—Mass Care, Emergency Assistance, Housing, and Human Services	Mass care Emergency assistance Disaster housing Human services
ESF #7—Logistics Management and Resource Support	Comprehensive, national incident logistics planning, management, and sustainment capability Resource support (facility space, office equipment and supplies, contracting services, etc.)
ESF #8—Public Health and Medical Services	Public health Medical Mental health services Mass fatality management
ESF #9—Search and Rescue	Life-saving assistance Search and rescue operations
ESF #10—Oil and Hazardous Materials Response	Oil and hazardous materials (chemical, biological, radiological, etc.) response Environmental short- and long-term cleanup
ESF #11— Agriculture and Natural Resources	Nutrition assistance Animal and plant disease and pest response Food safety and security Natural and cultural resources and historic properties protection and restoration Safety and well-being of household pets

ESF #12—Energy	Energy infrastructure assessment, repair, and restoration Energy industry utilities coordination Energy forecast
ESF #13—Public Safety and Security	Facility and resource security Security planning and technical resource assistance Public safety and security support Support to access, traffic, and crowd control
ESF #14—Long-Term Community Recovery	Social and economic community impact assessment Long-term community recovery assistance to states, local governments, and the private sector Analysis and review of mitigation program implementation
ESF #15—External Affairs	Emergency public information and protective action guidance Media and community relations Congressional and international affairs Tribal and insular affairs

Table 1. (Continued from previous page)

Moreover, each ESF is assigned a primary federal agency responsible for executing the responsibilities within that ESF. Additionally, that primary agency already has the responsibility for coordinating with the private sector, as well as support agencies, state, and local organizations. Building off this authority, the NRF should be expanded to include formalizing the policy to include the private-sector BEOCs organized by ESF at the regional and national level to support the state organizations. Similar to the state BEOCs, the regional BEOCs and the already FEMA established NBEOC would need a physical structure to enable representatives from the private sector to be in the room and have a seat at the table during all phases of the disaster preparedness cycle. To make it easier for the private sector to be fully involved, legal issues need to be considered.

2. Legal Issues

While the structure to support the inclusion of the private sector is critical to the process, just as critical is the legal, statutory, and regulatory authority to guide the process. As noted in the analysis of the MSC, GAO indicated that one of the most significant impediments to the inclusion of the private sector is the access to critical information, whether it be classified or otherwise deemed sensitive, and thus, requiring limited distribution. Moreover, it was documented in the BENS study that many firms are hesitant to participate more formally due to potential liability concerns (Business Executive for National Security, 2011, p.

21). Finally, the statutory authority given to the Coast Guard Captain of the Port to compel private sector participation in the MSC should be mirrored across the ESF structure for the BEOCs as noted above.

While many states have what are commonly referred to as Good Samaritan Laws, no nationally recognized standard exists nor are any current provisions available within the NRF to support clarifying the role of the private sector, especially as it pertains to liability for their involvement. For instance, while first responders are typically protected by either their agency or state law, what would happen if a driver for a Home Depot truck accidentally crashed the vehicle being used and injured a bystander. Is the individual, in the reasonable execution of disaster response duties, liable? Or, is it the parent organization? Alternatively, should they be shielded from liability under the Good Samaritan code?

As noted previously, the MTSA provided the statutory authority specific to the Coast Guard and its Captains of the Port. The Stafford Act affords the opportunity to provide the overarching statutory authority similarly. Therefore, the Stafford Act should be changed to provide the authority for the ESF primary agencies to create regional and national BEOCs. In addition, the Stafford Act needs to be changed to provide the legal protections similar to the state-level Good Samaritan Laws to insulate the private sector from certain liabilities in the execution of bona fide disaster response related duties.

LIST OF REFERENCES

- The 9/11 commission report: Final report of the national commission on terrorist attacks upon the United States.* (2004). Washington, DC: Government Printing Office.
- Aldunate, R. G., Pena-Mora, F., & Robinson, G. E. (2005). Collaborative distributed decision making for large scale disaster relief operations: Drawing analogies from robust natural systems. *Complexity*, 11(2), 28–38.
- Associated Press. (2005, September 9). *Government simulation predicted 61,290 deaths*. Retrieved from *USA Today* website: http://www.usatoday.com/news/nation/2005-09-09-katrina-simulation_x.htm
- Barabasi, A.-L. (2003). *Linked: How everything is connected to everything else and what it means for business, science, and everyday life*. Cambridge: Perseus Books Group.
- Boettcher, M., & Arnesen, I. (2002, January 25). *Al Qaeda documents outline serious weapons program*. Retrieved from CNN website: <http://archives.cnn.com/2002/US/01/24/inv.al.qaeda.documents/>
- Bond, P. (2005, September 4). Home Depot: As experience grows, big orange refines script for storm response. *Atlanta Journal-Constitution*, p. 1C.
- Broad College of Business. (2010). *Broad supply chain professor part of national disaster relief initiative*. Retrieved from <http://broad.msu.edu/information/news/item?oid=1895>
- Brown, D., Dillard, J., & Marshall, R. S. (2006). *Triple bottom line: A business metaphor for a social construct*. Retrieved from Recercat website: <http://www.recercat.net/bitstream/handle/2072/2223/UABDT06-2.pdf;jsessionid=4C92988CA1F290957E668ADDD456232F.recercat1?sequence=1>
- Buchanan, M. (2002). *Nexus: Small worlds and the groundbreaking science of networks*. Angela von der Lippe. (Ed.). New York: W. W. Norton & Company.
- Bunkley, N. (2008, March 3). *Joseph Juran, 103, pioneer in quality control, dies*. Retrieved from *New York Times* website: http://www.nytimes.com/2008/03/03/business/03juran.html?_r=1&

- Bunn, M. (2010). *Securing the bomb: Securing all nuclear materials in four years*. Retrieved from NTI website: http://www.nti.org/e_research/cnwm/overview/cnwm_home.asp
- Busch, N. E., & Givens, A. D. (2012, October). *Public-private partnerships in homeland security: Opportunities and challenges*. *Homeland Security Affairs* 8, art., 18.
- Business Executive for National Security. (2007, January). *Getting down to business: An action plan for public-private disaster response coordination*. Retrieved from <http://www.bens.org/document.doc?id=11>
- Business Executive for National Security. (2011, September). *A review of BENS 2007 business response task force report*. Retrieved from <http://www.bens.org/document.doc?id=52>
- Cheney, G. (2004, July 12). The corporate conscience and the triple bottom line. *Accounting Today*.
- City of New Orleans. Office of Emergency Preparedness. (n.d.). *Hurricanes annex—Part three: Sheltering*. New Orleans, Louisiana.
- CNN Breaking News. (2005, August 28). *New Orleans mayor, Louisiana governor hold press conference*. Retrieved from <http://transcripts.cnn.com/transcripts/0508/28/bn.04.html>
- Cohen, D. (2002, April 13). All the world's a net. *The New Scientist*, 2338, 24–29.
- Conklin, J. (2006). *Dialogue mapping: Building shared understanding of wicked problems* (1st ed.). West Sussex, England: John Wiley & Sons, Ltd.
- Cooperman, A. (2005). Where most see a weather system, some see divine retribution. *Washington Post*, <http://www.washingtonpost.com/wp-dyn/content/article/2005/09/03/AR2005090301408.html>
- Davis, M. (2010, August 28). *Five years later, a richer, whiter New Orleans*. Retrieved from http://www.salon.com/2010/08/28/new_orleans_katrina_demographics/
- Day, J. M., Strother, S., Kolluru, R., Booth, J., Rawls, J., & Calderon, A. (2010). Enhancing private sector engagement: Louisiana's business emergency operations centre. *Journal of Business Continuity & Emergency Planning*, 4(3), 216–230.
- Department of Commerce. Bureau of Economic Analysis. (2007). *A primer on GDP and the national income and product accounts*. Washington, DC: U.S. Government Printing Office.

- Department of Commerce. National Oceanic and Atmospheric Administration. (2005a). *National weather service tropical prediction center and national hurricane center. Hurricane Katrina Discussion Number 9.*
- Department of Commerce. National Oceanic and Atmospheric Administration. (2005b). *NOAA raises the 2005 Atlantic hurricane season outlook.* Retrieved from <http://www.noaa.gov/stories2005/s2484.htm>
- Department of Commerce. National Oceanic and Atmospheric Administration. National Hurricane Center. (2005, August 26). *Hurricane Katrina intermediate advisory # 14*, Miami, Florida.
- Department of Commerce. National Oceanic and Atmospheric Administration. Atlantic Oceanographic and Meteorological Laboratory. Hurricane Research Division. (2006). *Frequently asked questions.* Retrieved from <http://www.aoml.noaa.gov/hrd/tcfaq/A3.html>
- Department of Homeland Security. (n.d). *About the office of emergency communications.* Retrieved from <http://www.dhs.gov/about-office-emergency-communications>
- Department of Homeland Security. (2003). *National strategy for homeland security.* Washington, DC: U.S. Government Printing Office.
- Department of Homeland Security. (2005a). *Coast Guard, Hurricane Katrina: The U.S. Coast Guard at its best.* Washington, DC.
- Department of Homeland Security. (2005b). *Hurricane Katrina DHS SITREP # 4.*
- Department of Homeland Security. (2006, July 14). *Remarks by homeland security secretary Michael Chertoff and DNDO director Vayl Oxford at a press conference to announce spectroscopic portal (ASP) program contracts.* Press Release. Washington, DC.
- Department of Homeland Security. (2007). *National strategy for homeland security (version 2.0).* Washington, DC: U.S. Government Printing Office.
- Department of Homeland Security. (2008a). *National response framework.* Washington, DC: U.S. Government Printing Office.
- Department of Homeland Security. (2008b). *Private sector coordination support annex.* Washington, DC: U.S. Government Printing Office.
- Department of Homeland Security. (2008c). *National response framework—Catastrophic incident annex.* Washington, DC: U.S. Government Printing Office.

- Department of Homeland Security. (2009). *National infrastructure protection plan*. Washington, DC: U.S. Government Printing Office.
- Department of Homeland Security. (2010a). *National response framework*. Washington, DC: U.S. Government Printing Office.
- Department of Homeland Security. (2010b). *Private sector planning guide*. Washington, DC: U.S. Government Printing Office.
- Department of Homeland Security. Federal Emergency Management Agency. (n.d.a.). *National business emergency operations center*. Retrieved from http://www.fema.gov/media-library-data/20130726-1852-25045-2704/fema_factsheet_nbeoc_final_508.pdf
- Department of Homeland Security. Federal Emergency Management Agency. (n.d.b.). *National preparedness cycle*. Retrieved from <http://www.fema.gov/national-preparedness-cycle>
- Department of Homeland Security. Federal Emergency Management Agency. (n.d.c.). *Public private partnerships*. Retrieved from <http://www.fema.gov/public-private-partnerships-0>
- Department of Homeland Security. Federal Emergency Management Agency. (1999, September 14). *Emergency aid ordered for Florida hurricane response, news release*. Retrieved from <http://www.fema.gov/news/news-release.fema?id=8554>
- Department of Homeland Security. Federal Emergency Management Agency. (2008, January). *Emergency support function annexes: Introduction*. Retrieved from <http://www.fema.gov/pdf/emergency/nrf/nrf-esf-intro.pdf>
- Diamond, J. M. (1997). *Guns, germs, and steel*. New York: Norton.
- Diermeier, D. (2011, April 12). *Every disaster is an opportunity you must seize*. Retrieved from *Forbes* website: http://www.forbes.com/2011/04/12/disaster-corporate-opportunity-leadership-managing-japan_print.html
- Dynes, R. R., Quarantelli, E. L., & Rodriguez, H. (Eds.). (2007). *Handbook of disaster research*. New York: Springer.
- Elliot, D., Swartz, E., & Herbane, B. (2002). *Business continuity management: A crisis management approach*. New York, NY: Routledge.
- Erikson, J. (2008). *Hacking the art of exploitation* (2nd ed.). San Francisco: No Starch Press.

- Facebook. (n.d.). *Facebook's latest news, announcements and media resources*. Retrieved from <http://www.facebook.com/press/info.php?statistics>
- Flynn, S. E., & Prieto, D. B. (2006). *Neglected defense: Mobilizing the private sector to support homeland security*. Retrieved from Council of Foreign Relations website: http://www.cfr.org/publication/10457/neglected_defense.html
- Freeman, R. E. (2010). *Strategic management: A stakeholder approach*. Cambridge University Press.
- Gerencser, M., Van Lee, R., Napolitano, F. & Kelly, C. (2008). *Megacommunities: How leaders of government, business and non-profits can tackle today's global challenges together*. New York, NY: Palgrave MacMillan.
- Gonzalez, D. (2000, February 17). Havana journal; To Latin neighbors, Cuba plays the good doctor. *New York Times*.
- Goodpaster, K. E. (1991, January). Business ethics and stakeholder analysis. *Business Ethics Quarterly*, 1(1), 53–73. Retrieved from <http://www.jstor.org/discover/10.2307/3857592>
- Granovetter, M. S. (1983). The strength of the weak tie: Revisited. *Sociological Theory*, 1, 201–33.
- Guare, J. (1990). *Six degrees of separation: A play* (1st ed.). New York: Random House.
- Hochrainer, S. (2007). *Macroeconomic risk management against natural disasters*. Wiesbaden: German University Press (DUV).
- Hochrainer, S. (2009). *Assessing the macroeconomic impacts of natural disasters: Are there any?* The World Bank Sustainable Development Network Vice Presidency Global Facility for Disaster Reduction and Recovery Unit.
- Holland, K. (2007, December 23). *Under new management: A new corporate path to disaster relief*. Retrieved from *New York Times* website: <http://www.nytimes.com/2007/12/23/jobs/23mgmt.html>
- Horwitz, S. (2008). *Making hurricane response more effective: Lessons from the private sector and the Coast Guard during Katrina* (Mercatus Policy Series, Policy Comment No. 17). Arlington, VA: Mercatus Center, George Mason University.

House select bipartisan committee to investigate the preparation for and response to Hurricane Katrina, William Lokey, federal coordinating officer, Baton Rouge, written statement for a hearing on Hurricane Katrina response in Louisiana, 109th Cong., 1st Sess. (2005, December 14).

Jones, P., & Edmonds, Y. (2008, March). *Risk-based strategies for allocating resources in a constrained environment*. Retrieved from Homeland Security Studies & Analysis Institute website: <http://www.homelandsecurity.org/journal/Default.aspx?oid=171&ocat=1>

Kaplan, R. S., & Norton, D. P. (1996). *The balanced scorecard: Translating strategy into action*. Boston, MA: HBS Press.

Kass, A. (2010, September 15). *UPS, Home Depot provide disaster relief*. Retrieved from The Atlanta Journal Constitution website: <http://www.ajc.com/business/ups-home-depot-provide-614447.html>

Keiger, D. (2007, Spring). Looking for the next big thing. *Notre Dame Magazine*, 36(1), 49–53.

Kennedy School of Government. (2007). Case Program C16-07-1876.0,5.

Knabb, R. D., Rhome, J. R., & Brown, D. (2005, December). *Tropical cyclone report: Hurricane Katrina, August 23–30, 2005*. Prepared for the National Hurricane Center, National Oceanic and Atmospheric Administration. Miami, Florida.

Krisher, T., & Durbin, D-A. (2011, July). GM, Ford, Chrysler sales up Honda, Toyota hurt by production problems linked to earthquake. *Associated Press*.

LAEOBC. (2010, Summer). Deepwater horizon oil spill. Retrieved from http://www.labeoc.org/labeoc/public_forms/dwhos_history.aspx.

Lewis, T. G. (2006). *Critical infrastructure protection in homeland security: Defending a networked nation*. Hoboken, NJ: Wiley-Interscience.

Lewis, T. G. (2011). *Bak's sand pile: Strategies for a catastrophic world*. Agile Research and Technology.

Louisiana Business Emergency Operations Center. (2010, Summer). *Deepwater horizon oil spill*. Retrieved from http://www.labeoc.org/labeoc/public_forms/dwhos_history.aspx

Louisiana Department of Health and Hospitals. (2006, August 2). Reports of missing and deceased. Retrieved from <http://www.dhh.louisiana.gov/offices/page.asp?ID=192&Detail=5248>

- Louisiana Office of the Governor. (2005, December). *Response to U.S. senate committee on homeland security and governmental affairs and information request dated October 7, 2005*, Baton Rouge.
- Majid, Y. (2006). *Cybercrime and society*. Thousand Oaks: Sage Publications.
- Maritime Transportation Security Act (MTSA) of 2002, 46 U.S.C. § 70112.
- Miller, S., & Keipi, K. (2005). *Strategies and financial instruments for disaster risk management in Latin America and the Caribbean*. Sustainable Development Department Technical Paper Series. Washington, DC: IDB and World Bank.
- Moore, M. H. (1995). *Creating public value strategic management in government*. Harvard University Press.
- Moore, M., & Khagram, S. (2004). On creating public value—what business might learn from government about strategic management. *Corporate Social Responsibility Initiative Working Paper*.
- Morhardt, J. E. (2010). Corporate social responsibility and sustainability reporting on the internet. *Business Strategy and the Environment*, 19, 436–452. doi:10.1002/bse.657.
- Morrison, C. (2011, June 13). *Toyota makes 2012 profit predictions, still feels effects of Japan earthquake*. Retrieved from nooga.com website: http://www.nooga.com/7082_toyota-makes-2012-profit-predictions-still-feels-effects-of-japan-earthquake/
- Network science*. (n.d.). Retrieved from <http://www.network-science.org>
- Nobleman, M. T. (2005). *The great Chicago fire*. North Mankato, MN: Capstone Press.
- Pathak, S. D., Day, J. M., Nair, A., Sawaya, W. J., & Kristal, M. M. (2007). Complexity and adaptivity in supply networks: building supply network theory using a complex adaptive systems perspective. *Decision Sciences* 38(4), 547–580.
- PBS Newshour. *FEMA's Mike Brown*. (2005, September 1). Retrieved from http://www.pbs.org/newshour/bb/weather/july-dec05/breakdown_9-1.html
- Porter, M. E. (2008, January). *The five competitive forces that shape strategy*. Retrieved from Harvard Business Review website: <http://hbr.org/2008/01/the-five-competitive-forces-that-shape-strategy/ar1>

- Ritchey, T. (2005). *Wicked problems: Structuring social messes with morphological analysis*. Swedish Morphological Society.
- Rittel, H., & Webber, M. (1973). *Dilemmas in a general theory of planning*. Policy Sciences (vol. 4). Amsterdam: Elsevier Scientific Publishing Company, Inc. [Reprinted in Cross, N. (Ed.). (1984). *Developments in design methodology*. Chichester: J. Wiley & Sons.
- Rourke, M. (2005, August 30). *New Orleans outlook bleak; 100 dead in Miss.* Retrieved from USA Today website: http://usatoday30.usatoday.com/news/nation/2005-08-30-katrina_x.htm
- Schilizzi, S. (2002, Winter). *Triple bottom line accounting: How serious is it?* Retrieved from the Department of Agriculture and Food Systems Australasian Agribusiness Journals—Online website: http://www.agrifood.info/connections/winter_2002/Schilizzi.html
- Simo, G., & Bies, A. L. (2007). The role of nonprofits in disaster response: An expanded model of cross-sector collaboration. *Public Administration Review*.
- Townsend, F. (2006, February). *Federal response to Hurricane Katrina: Lessons learned*. Washington, DC: The White House.
- Travers, J., & Milgram, S. (1969). An experimental study of the small world problem. *Sociometry*, 32(4), 425–443.
- U.S. Department of Commerce. Census Bureau. (n.d.). *State and county quick facts, New York County (Manhattan Borough), New York*. Retrieved from <http://quickfacts.census.gov/qfd/states/36/36061.html>
- U.S. Department of Energy. Office of History & Heritage Resources. (n.d.). *The Manhattan project: An interactive history*. Retrieved from <http://www.cfo.doe.gov/me70/manhattan/hiroshima.htm>
- U.S. Department of Homeland Security. Federal Emergency Management Agency. (2005, August 26). *National situation update*.
- U.S. Government Accountability Office. (2005, April). *Maritime security. New strictures have improved information sharing, but security clearance processing requires further attention* (GAO-05-394). Washington, DC: GPO.
- U.S. Government Accountability Office. (2006a, September). *Enhanced leadership, capabilities, and accountability controls will improve the effectiveness of the nation's preparedness, response, and recovery system* (GAO-06-618). Washington, DC: GPO.

- U.S. Government Accountability Office. (2006b). *Testimony before the committee on environment and public works, U.S. Senate, Army corps of engineers, history of the Lake Pontchartrain and the vicinity hurricane protection project* (GAO-06-244T). Washington, DC: GPO.
- U.S. Government Accountability Office. (2006c). *Testimony before the committee on government reform, House of Representatives, improving federal contracting practices in disaster recovery operations* (GAO-06-714T). Washington, DC: GPO.
- U.S. Senate Committee on Commerce, Science, and Transportation, *Hearing on Disaster Prevention and Prediction*, 109th Cong., 1st Sess., 11 (2005).
- Wagner, H. (2009, February 19). *Corporate goodwill, the next big write-off*. Retrieved from The Market Oracle website: <http://www.marketoracle.co.uk/Article8982.html>
- Ward, A. (2005, August 29). Home depot prepares for Katrina. *Financial Times*, <http://www.ft.com/cms/s/0/2e968106-1829-11da-a14b-00000e2511c8.html#axzz2jhdfvIBT>
- White House, The. (1988). *Executive order EO-12656—Assignment of emergency preparedness responsibilities*. Washington, DC: U.S. Government Printing Office.
- White House, The. (1996). *Executive Order EO-13010—Critical infrastructure protection*. Washington, DC: U.S. Government Printing Office.
- Whybark, D. C., Melnyk, S. A., Day, J., & Davis, E. (2010). Disaster relief supply chain management: New realities, management challenges, emerging opportunities. *Decision Line*, 41(3), 4–7.
- World Food Programme. (2010). *Private sector logistics support world food programme in Haiti earthquake response*. Retrieved from www.wfp.org
- Yusufzai, R. (1999, January 11) *Conversation with terror*. Retrieved from *Time Magazine* website: <http://www.time.com/time/magazine/article/0,9171,17676,00.html>

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