

LEARNING IN COMPLEX SYSTEMS

by

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DEDICATION

For Lolo Mimi

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LIST OF ABBREVIATIONS

Common Operational Picture	COP
Comprehensive Cooperative Agreement	CCA
Continuous Improvement Working Group	CWIG
Department of Defense	DOD
Department of Homeland Security	DHS
Disability Integration Advisors	DIA
Disaster Recovery Centers	DRC
Emergency Management Institute	EMI
Emergency Management	EM
Emergency Support Function	ESF
Federal Coordinating Officer	FCO
Federal Emergency Management Agency	FEMA
Federal Response Plan	FRP
FEMA Office of the Inspector General	OIG
FEMA Qualification System	FQS
FEMA State and Local Program Support Directorate	SLPS
Global Positioning Satellites	GPS
Government Accountability Office	GAO
Homeland Security Digital Library	HSDL
Homeland Security Information Network	HSIN
Incident Command System	ICS
Incident Management Assistance Teams	IMAT
Information Technology	IT
Interagency Incident Management Group	IIMG
Lesson Learned Information Sharing	LLIS
Mississippi Emergency Management Agency	MENA
National Academy of Public Administration	NAPA
National Academy of Sciences	NAS
National Aeronautics and Space Administration	NASA
National Disaster Recovery Framework	NDRF
National Earthquake Hazards Reduction Program	NEHRP
National Geospatial-Intelligence Agency	NGA
National Hurricane Center	NHC
National Incident Management System	NIMS
National Oceanographic and Atmospheric Administration	NOAA
National Operations Center	NOC

National Preparedness and Response Authority	NPRA
National Response Framework	NRF
National Response Plan	NRP
National Security Agency	NSA
National Weather Service	NWS
Non-Governmental Organization.....	NGO
Principal Federal Officer.....	PFO
Remedial Action Management Programs	RAMP
Senate Committee for Homeland Security and Government Affairs	HSGAC
U.S. Department of Health and Human Services	HHS
U.S. Northern Command	NORTHCOM
U.S. Pacific Command.....	PACOM

ABSTRACT

LEARNING IN COMPLEX SYSTEMS

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This dissertation examines organizational and institutional learning in disaster response networks from an intercrisis perspective. Using a complex systems framework to analyze disaster response networks and the distinct properties of their constituent parts, the author identifies relationships and processes that characterize multi-organizational responses to disasters to identify and evaluate learning within and across emergency events. Starting with a traditional organizational learning model, the author observes and assesses rational-analytic learning efforts conducted by government and government-sponsored agents, following major catastrophes. Formally required by FEMA, after action learning is an expectation of organizations engaged in emergency response to ensure the reduction of errors and misjudgments and to improve response. Seemingly a straight forward, rational linear event driven process, the author found that emergency events and multi-organizational response efforts do not fit that logic for multiple reasons. A case comparison of responses to Hurricane Andrew, Katrina and Super Storm Sandy informed the conclusions found in this paper. The findings of this research suggest needed

modifications in both theoretical models and processes to promote more effective learning in emergency response organizational systems, such as disaster response networks.

CHAPTER ONE: INTRODUCTION

On September 14, 2017, “Time Magazine” published a striking cover picture. It was a satellite image of the Gulf of Mexico. The western end of the Gulf showed an image of Hurricane Harvey, taken on August 25, going onshore in Texas. On the eastern end, an image from September 10 showed Hurricane Irma darting through the Florida Keys. The issue title read: “The storms keep getting strong. And so do we.” The lead story declared the response to both storms a success, arguing things could have been much worse. We can summarize the authors’ conclusions about the response in a quote from the article **Invalid source specified.:**

“...we’re clearly doing a far better job than we ever have of learning on the fly—and applying what we learn.”

One week after the Time issue, Hurricane Maria made landfall on the U.S. Territory of Puerto Rico. This time, there would be no glowing reviews of the response. Harvey, Irma, and Maria—in one year—would claim three of the top five spots on FEMA’s list of the most destructive storms in U.S. history in terms of cost, when adjusted for inflation. Harvey made landfall as a Category 4 storm in Texas. Irma was one of the most powerful Atlantic storms on record and made landfall seven times. Four

of those times as a Category 5 on Caribbean islands, once as a Category 4 in the Florida Keys, and finally as a Category 3 in Southwest Florida. Maria made landfall in Puerto Rico as a Category 4 **Invalid source specified..** Where Harvey and Irma suggested that Americans had finally learned how to cope with catastrophic storms, Maria reminded us of how much more we needed to learn.

Many have come to view Maria as the worst response to a hurricane since Hurricane Katrina in 2005, and some argue it was worse than the Katrina response itself. Indeed, the Maria response left millions on the island territory without power for weeks, and some for months, as FEMA struggled to deliver necessities to the beleaguered island. In the press, confusion over the response devolved into a debate over how to count the dead. It appeared that, just as we celebrated improvement, Maria delivered a tragic reminder of our limitations. The emergency management (EM) community, from senior leaders down to first responders, were left to ask: “what more can we do?”

The phrase “lessons learned” seems straightforward enough. In fact, the idea of lessons learned is not only viewed as an appropriate vehicle for organizational improvement, it has become so expected that hardly anyone questions what it means to learn a lesson from disaster response operations. After all, individuals learn all the time. Therefore, it follows, that groups of people learn too, but do they? If they did, how would they learn? This research is an attempt to help address that question. Recognizing that groups do not learn the way individuals learn was an important first step. Developing an

understanding of how organizations learn was the next step. Not unlike authors that range from the Time Magazine writers to Federal Emergency Management Agency (FEMA) planners, the assumptions at the outset of this study expected that these lessons learned were implemented systematically. The evidence suggests otherwise.

The literature and the evidence collected for this research suggests that basic questions about learning and disasters lack consensus answers. Additionally, an understanding of who learns, and how that entity applies lessons learned, was scatter shot at best and in complete disarray at its worst. The truth is that we do not know how to learn about how learning takes place in disaster response networks, and yet, elected officials and EM professionals regularly evaluate the nation's capacity to learn the lessons of past disasters.

This research, therefore, is a modest effort at informing our understanding of the process behind these evaluations and working toward an answer to the research question posed here:

Do disaster response networks learn?

The question is loaded. Like a movie treasure hunter, the answer did not simply appear where "x" marked the spot. To arrive at an answer, several critical steps were necessary. First, it was necessary to define what was meant by the term "learning." While it might be the most overused verb in the after action reviews, hardly any time is

dedicated to explaining what it means “to learn.” The second question that needed additional answers was the question of “who learns?” Ostensibly, the answer is the network. The problem was that “the network” could mean many things, especially when it comes to learning. Third, and based on the second question, it became necessary to understand how the network managed to learn, if at all.

There are several reasons to research this topic. First, growing social and economic interdependencies in our communities have forced government to adapt and draw on intergovernmental capabilities to address broad societal problems (Kettl, 2014). Government now has a hand in more everyday lives than ever possible, because the public depends on cellphones, roads, foreign goods, and the development of new urban, and suburban, communities that all need regulation and oversight across multiple economic sectors. It is, perhaps, a strange twist of fate that these developments are taking place in areas that are most vulnerable to disasters (i.e. earthquakes, tornadoes, hurricanes, terrorist attacks, etc.).

Another reason to engage this topic is for the sake of theory building. While the traditional views of public administration served us well throughout most of the 20th Century, previous frameworks for specialization and the division of labor do not adequately explain how organizations—public and private—partner with each other to satisfy expectations beyond the scope of one organization’s capabilities. This research hopefully serves as a modest contribution toward an emerging new theoretical lens for

modern governance and the provision public goods and services. Early efforts have shown considerable promise, and this effort will lean on them heavily.

A final reason worth mentioning is because of the urgency of the matter. The earth is changing, and Americans are moving to vulnerable, high-density populations centers. The combination poses serious risks to the safety and well-being of the American public. Public administration scholars should have a role to play in shaping a government response to this challenge. After all, policy pronouncements alone will not translate into effective action. The Administrative State needs to evolve its understanding and further new, effective operating models, while preserving the values of due process, transparency, and democracy.

Disasters and Learning in the United States

Disasters, natural or contrived, create fear and a pervasive desire to avoid repetition of the experience and consequences. They are life catalysts, an abrupt departure from normal life. Victims experience losses that range from the trivial of their daily routines to life itself. Generally, all victims desire a return the lives they led before disaster struck. On some occasions, they introduce an opportunity for a better life. On other occasions, lives will never fully recover. For all occasions, government has become an indispensable actor in shaping post-disaster lives.

Major elements of this topic require clarification from the start. For example, public discourse frequently equates disasters with hazards. A hazard is a human agent or natural threat to the normal conduct of daily life. These include earthquakes, hurricanes, floods, pandemics, and terrorist attacks (McEntire, 2006). Disaster do not occur until a hazard interacts with a populated geographic area. For example, a hurricane that wanders up the middle of the Atlantic Ocean, never approaching land, is a hazard, but it does not generate a disaster. An earthquake in the remote reaches of Siberia does not create a disaster, because it never interacts with a population center. Having established this distinction, I characterize disasters as such:

Disasters occur when hazards—natural or contrived—disrupt the population of geographic area by damaging or destroying lives, property, or both.

Because disasters are so broad in size and scope, it is generally understood that preventative measures, at least for natural disasters, will never achieve complete success (National Academy of Public Administration, 1993). By the same token, the expectation of effective performance in mitigating the immediate effects of disasters has become a part of the modern social contract. Ineffective performance, it follows, violates that contract. This can erode confidence in government, whose most fundamental function is the guarantee of security for its people. Recent decades have seen this guarantee co-opt safety and security even in the face of nature's most violent events. Indeed, the federal

government's growing role in disaster response has expanded dramatically over the last 50 years (Roberts P. S., *Disasters and the American State*, 2013).

Today, government's response to disasters act as a de facto test of its ability to honor its most fundamental commitments. It is a somewhat cruel irony that low probability events can have such a high impact. Not only on the affected areas, but also on the public's perception of government's effectiveness across the board. Honed through intense scrutiny, positive or negative perceptions and attitudes about disaster response operations can eclipse anything else government does for the year without incident. It is no wonder that elected officials and bureaucrats alike devote so much time and effort trying to understand where things go wrong, and what can be done to fix mistakes.

When multiple disasters strike a region, I refer to these events collectively as a catastrophe. As happens frequently in public administration, these events can shape disapproving views of government's efficacy, when in fact they are not representative of the overwhelming majority of response efforts. One catastrophe can obscure every effective response previously conducted within the same calendar year. In the case of Irma, Maria did the job in a matter of days.

EM professionals divide disasters into four phases, or processes that distribute and assign resources, which include people, capabilities, and funding. These phases are preparation, response, recovery, and mitigation, according to FEMA's Emergency

Management Institute (EMI) (FEMA Emergency Management Institute, 2017).

Henceforth, I will focus on the response phase, occasionally referencing the other phases as appropriate. Since disaster response networks include a diverse, large group of participants, organizing their efforts is no small task. To that end, the Federal Government has devised a number of plans and protocols to facilitate coordination and “unity of effort” among intergovernmental partners and private sector participants. There are too many of them to list here, but I will briefly discuss the most important documents—both in practice and to this research.

Today, disaster response networks turn to the National Response Framework (NRF) as a shared understanding of how they are to operate. The document serves as a charter for the ad hoc, temporary organization that is a disaster response network. The NRF replaced the National Response Plan (NRP) in 2008, and it integrates the “lessons learned” from Katrina. The NRP, in turn, replaced the Federal Response Plan (FRP), which was published in 1992 after Hurricane Hugo. Added to the NRF are annexes, which further clarify roles and responsibilities within the network, depending on circumstances (FEMA, 2013).

The Emergency Support Function Annexes (ESF) establish structures around functional capabilities and identify lead agencies for each. The Support Annexes describe how network participants should “coordinate and execute common functional processes and administrative requirements” of the NRF. They address requirements in mission

areas that include critical infrastructure, financial management, public affairs, and volunteer management. They are not incident-specific, but rather, they are meant to support the NRF's all-hazards approach. Finally, the Incident Annexes strive to help the network adapt to the unique circumstances that correspond to distinct incident categories—they are hazard-specific. For example, a cyber incident will emphasize capabilities that may not be as important in response to a nuclear/radiological incident. These annexes convey to the network the character of the surge required to respond to an incident (National Response Framework, 2008; FEMA, 2013)

Because of the diversity of organizations within the network, the Federal Government also established the National Incident Management System (NIMS) in 2004. While the NRF assigns roles and responsibilities, the NIMS defines the “structures and protocols” that establishes a consistent vocabulary and business process development approach across the network. In the years since its first edition, FEMA has developed training modules meant to indoctrinate EM professionals accordingly (National Incident Management System, 2008). The NIMS, in essence, recognizes that variations in disciplines, regional vernacular, and organizational cultures call for a proverbial single sheet of music from which to work.

Efforts to fix mistakes in the execution of these plans and procedures unfold in a sequence of evaluations and discussions that constitute the government's attempts to learn from experience. At an individual level, our understanding of learning is fairly

straightforward. Take graduate school, for example. Students are evaluated on what they have learned, and projects, such as these, allow instructors to gauge a student's capacity to apply lessons learned effectively. Employees, and other professionals, are evaluated on their development, which requires learning new skills or retaining knowledge they have already learned. In those contexts, individuals avoid or correct mistakes by learning useful knowledge, developing effective strategies, or both. In these networks, agency leaders fix plans and adjust operational strategies. It is perhaps this final point that makes "learning" a logical description for how disaster response networks improve. Yet, these networks are not individuals, with one brain, taking new knowledge and applying it to achieve a desired outcome. What happens when learning is required of multiple individuals or groups that lack natural interdependencies and ongoing relationships? Applying anthropomorphic qualities to a collection of people is fraught with problems but is also a common practice.

The literature on organizational learning is substantial. Volumes of books, essays, training manuals, and online media cover the topic. It is not unusual for these writings to perpetuate the assumption that organizations can learn the way individuals learn. The differences among the various ideas on learning emerge in how lessons learned are applied. Terms and concepts such as "transformation," "business process re-engineering," and "post mortems" all refer to organizational initiatives designed to generate lessons from suboptimal experiences. Every lesson is treated as an opportunity for improvement. For the most part, all of these initiatives follow a traditional learning process: 1) new

experiences, 2) recognizing a problem, 3) analyzing issues, and 4) implementing solutions for improvement (Huber, 1991; Mahler J. G., 2009).

Disaster response, however, presents two fundamental problems to our traditional understanding of learning. Since disasters touch every facet of a community's economy, disaster response operations require contributions from government's entire portfolio of services, goods, and tools. This team of intergovernmental organizations and private sector partners forms a network that organizes around specific events. In recent decades, the rise of these networks has started to draw the increased attention of researchers, as government continued to expand its role in people's daily lives (Agranoff, 2007). Of all the networks that serve government purposes, disaster response networks are arguably the least understood. These networks are temporary, and their members always change, as do the circumstances they face (National Academy of Public Administration, 1993). That means these networks do not enjoy the institutional memory that is organic in more traditional hierarchies. It is always borrowed from the last network's experience. This raises the second problem. No event is the same as the next; so no past experience can offer definitive solutions to the problems bearing down on the current network.

As a result, these networks not only have to learn from others' experiences; they also have to translate and apply others' lessons for use in present circumstances. The task is like trying to successfully organize and direct a professional sports team to win game after game. Yet, there are constantly changing playing conditions, rules, players and, as a

result, outcomes. What, and how, to learn would be impossible to consistently identify, specify, and master. Keeping with the metaphor, emergency managers have to determine who plays, what strategies are most appropriate for success at the time, and how to distribute resources accordingly. The rise of these circumstances, against the backdrop of the public's growing expectations for government's performance in response to disasters has given rise to EM as a formal, independent discipline.

EM will serve as the stage and scenery of this analysis. The rise of EM as an independent discipline and profession is a positive development, but it brings with it challenges that are typical for newly-developing fields of study. EM is defined as the processes that distribute and assign resources, which include people, capabilities, and funding, in preparation for, response to, recovery from, and mitigation of hazards, according to FEMA's Emergency Management Institute (EMI) (FEMA EMI, 2017). It is worth mentioning that this definition is one of several available from the agency's EM training materials, which bear out an informatics problem facing practitioners and researchers alike. FEMA provides 15 distinct definitions for EM (Blanchard B. W., 2008).

The absence of a common understanding of key terms and concepts is apparent in documents, reports, testimonials, and after action reports on disasters. Blessed with the benefits of hindsight, these are generally more focused on specific events and the strategies and tactics that failed against them (Comfort, 2007). Hardly any of these arrive

at a consensus for terms and concepts discussed in previous evaluations. Out of necessity, this research had to propose a method for observing learning in these networks.

This calls for a foundational understanding at the start. Disaster response networks include several organizations. Some share pre-existing working relationships, such as first responders. Others may only interact during crises, such as structural engineers and medical professionals. The intergovernmental members of these networks usually complement one another in terms of capabilities, but their goals and priorities vary. Within these organizations are individuals that represent diverse professions. These professions compel individuals to learn functional competencies, which in aggregate define the character of the organizations to which they belong.

We know competencies at the functional level must advance and evolve. It is not likely that firefighting skills have not improved over the last several decades. Are we to believe that structural engineering has not advanced in the last 25 years? Technology has certainly altered the capabilities these professionals can bring to bear on a disaster event. Global Positioning Satellites (GPS), on-demand data, and wireless communications alone have been game changers. One can safely conclude then that individuals within these networks are always learning, because competencies always improve. Does that mean that members of a disaster response network have competencies that improve? Does the development of competencies equate to network learning? Or, does network learning require a different kind of understanding?

From one major disaster to the next, the resulting narratives suggest that problems persist despite internal advancements. These so-called sticky problems may stem from the following challenges. First, disasters overwhelm resources and personnel; so even peak performance cannot overcome the size and scope of challenges wrought by these events (Kettl, 2014). Second, even if the network successfully executes as per the plan and the recommendations of previous after action reports, how will it succeed in when circumstances exceed the scope of plans that govern the response.

After nearly every major disaster, problems coping with uncertainty and novel events take center stage. EM professionals, policymakers, and community stakeholders work through these problems, devise solutions, and modify operational plans accordingly, but as already noted, the network and the circumstances will change. The environment and the network membership itself does not repeat. For these reasons, this research does not consider disaster response networks as typical intergovernmental networks, operating in static conditions to deliver a government service. Rather, disaster response networks are complex systems (Kapucu, 2009).

To contrast, a static network executes predictable interactions because conditions are stable. At the very least, one can reasonably guess within a range of possible outcomes when agents interact within a static network. That's not true for a complex system, where the number of possible outcomes when agents interact is a function of the many possible circumstances dictating the interaction. How then does a complex system

learn? What is the reasonable expectation for success under these circumstances? The remainder of this chapter will detail the challenges facing this research, future researchers, and the strategy devised to arrive at workable inferences about this topic.

Research Goals

The research program for EM, and the theoretical literature surrounding collective action in the face of major disasters, is very young. The value proposition of such a program is to *achieve an outcome that improves disaster response*, which FEMA defines as the capability to respond to all hazards (Federal Emergency Management Agency, 2015). Exploring the literature, conducting interviews, and reviewing statements yielded insight that served as basic research in this field. However, considerable ground work will be necessary to effectively investigate this topic, explain it to others, and to produce a repeatable method of inquiry for this research. By itself, achieving the latter will satisfy one of the objectives of this research. The objectives of this inquiry are as follows:

1. **Objective 1:** *Define concepts and variables with greater precision to refine future research questions.*
2. **Objective 2:** *Build on the complex adaptive system framework applied to disaster response networks.*
3. **Objective 3:** *Isolate learning processes and challenges to inform future post mortem efforts.*

Despite the angst generated by disasters, there is a scarcity of literature about learning in disaster response networks. As already mentioned, technical reports do little to refine concepts and definitions, offering instead “how to” frameworks for action. Congressional reports generally assign fault and push recommendations. Emergency management documents, and they are numerous, adopt recommendations and promulgate new plans and procedures. Overcoming notable ontological problems in this field needs to be a priority. Chapter 1 introduces concepts, assertions, and assumptions that will anchor this research.

Chapter 2 reviews the literature, explains how concepts were operationalized, and discusses the gaps this study hopes to address. Chapter 3 will detail the research design for this study and explain the methods used to explore an unorganized, and young, body of knowledge with a framework that endeavors to make sense of it. The chapters that follow will serve as case studies. Chapter 7 will comparatively assess each case study through a complex systems framework in an attempt to isolate learning processes as they unfolded over time. Chapter 8 will summarize the findings and, hopefully, inform future researchers, practitioners, and even policymakers with questions that push this research program further.

Having adopted the assumption that learning does take place at the functional level (within unique disciplines and professions that make up a disaster response network), this inquiry focuses on management and coordination at the network level. To

close this introduction, this discussion turns to core learning problems plaguing EM professional and disaster response networks.¹ Progress against key research challenges now calls for an organization of key concepts, aligning them within the bodies of knowledge to which they correspond. The rest of this chapter is devoted to that task.

We can sum up the objectives for disaster response to hazards from guiding documents along two lines of effort. The first is to save lives and property where possible. The second objective of disaster response is to save “normal” life for the community—if possible but not at the expense of the first objective. For most hazards, these objectives are quite achievable. From spilled hazardous materials to forest fires, citizens usually return to a semblance of their status quo with relatively minimal costs or effects. Some hazards, however, incur catastrophic costs and effects. All hazards create “wicked problems,” which refers to societal problems where solutions cannot be engineered by public administration planners, because they cannot formulate problems with mechanical precision (Rittel & Webber, 1973). That being said, the historical record suggests that there is an underpinning expectation in the discourse that EM professionals should develop strategies to fix real (or perceived) problems with response operations.

EM refers to the discipline that weaves together the processes of preventing, mitigating, preparing for, responding to, and recovering from hazards. While challenges affect every phase of EM, from prevention to recovery, a focus on response efforts offer

¹ Not all members of a disaster response network are emergency management professionals.

promise for this research, because of the amount and character of data (Blanchard B. W., 2008; McEntire, 2006). For most of American history, EM was left to the purview of local government. For most hazards, it remains the purview of local government. I exclude these events because they do not mobilize the same level of effort to learn that catastrophes do.

FEMA cites the Congressional Act of 1803 as the seeds of its beginning, but it is notable that early disaster response laws were reactionary, and such legislation focused on ad hoc assistance to areas affected by one hazard or more (Federal Emergency Management Agency, 2015). It wasn't until the 20th Century that momentum for increased Federal EM took hold over disaster response operations, following with the passage of the Disaster Relief Act of 1950. The law began to set the stage for Federal coordination over State and local governments in disaster response operations. The functional outcome was the formation of assistance programs, but the mindset at the Federal level was tilted toward national security. Civil defense efforts, in the context of the Cold War, prepared for a war against the Soviet Union, which included the possibility of nuclear war (Schneider, 1998). This mindset would reemerge with the national security concerns that brought disaster response back into the spotlight 51 years later.

It was not until 1979, when President Jimmy Carter signed FEMA into existence, that a central, Federal organization assumed a more overarching "managerial" role in disaster response operations (Federal Emergency Management Agency, 2015; National

Academy of Public Administration, 1993). FEMA was, and continues to be, the strongest effort to centralize EM for disasters big and small.

The agency coordinates action in every phase of EM: preparation, response, recovery, and mitigation. The participants in those phases include actors from throughout the spectrum of the affected area's local economy. Non-profit and for profit organizations also join these intergovernmental networks in response operations. While this paper mostly focuses on response operations, it necessary to briefly discuss preparedness as it relates to the network's ability to response effectively.

Strong evidence suggests that looming low probability events with high impacts do little to motivate preemptive measures that would shore up disaster response operations. That evidence is supported by the consistent underfunding for related EM programs year-after-year (Kettl, 2014). This type of diminished attention is also happening as the risks associated with disasters increase. As population centers grow in size and density, infrastructure continues to age. When combined with a major disaster, such as Hurricane Katrina, these factors naturally expand the breadth of the area affected and the extent of the potential losses. The result is frequently a paradox of expectations. Communities prioritize EM below more immediate concerns, take on risks in their development plans, but expect disaster response operations to perform as planned.

All response operations depend on first responders for execution. This includes public safety personnel, such as firefighters, police, and paramedics (McEntire, 2006). These professionals undergo significant training to succeed in their respective fields. Other members of the disaster response network, such as American Red Cross volunteers, likely do not undergo the same level of training, but their contributions to disaster response cannot be understated. Major disasters affect every facet of a community—infrastructure, finance, transportation, medical services, and social order to name a few. Police will naturally try to keep people out of harm's way, but doctors and nurses may pursue personal high risks to serve their function by caring for the injured. EM must ultimately balance this; highlighting the importance of coordination, but also, offering a clue behind the cause of failure. One could easily see how any imbalance would result in failures. Resources and staff overwhelmed, tradeoffs become necessary, and when wrong, they exact terrible prices.

There's nothing standard about a major disaster, aside from the presence of devastation. After action documents consistently adopt a strong sense of “do task “X” this way instead,” when describing the implementation of lessons learned with a strong emphasis on procedure. The evidence collected and analyzed in this inquiry suggests this a narrow focus on procedure will come up short every time. However, this procedural emphasis is consistent with scholars' past observations about a mechanistic, or engineering, approach to fixing administrative systems designed to address fluid societal problems (March & Simon, 1958; Rittel & Webber, 1973). Nevertheless, the after action

review process suggests that planners treat learning as a linear process, connecting experience to organizational memory vis-à-vis information processing and analysis (Huber, 1991; Mahler J. G., 2009)? The problem with this linear model, however, is that networks form ad hoc, constitute different and diverse members, and address unique problems. The only thing linear about disaster response networks might be the evolution of the plans that guide their operations.

A few scholars, such as Louise Comfort, Naim Kapucu, and Donald Moynihan, have taken a serious look at the learning process during disaster responses, afterward, and in between. Comfort and Kapucu are among others that offer an alternative view of these networks, acknowledging their complexity and raising questions about learning in the face of uncertainty. The applied literature, both from the legislative and executive branches, virtually ignores complexity. At the operational level, government agencies lean heavily on training to identify problems, recommend solutions, and institutionalize improvement measures.

Some methodological challenges also emerged in the attempts to compare emergency response plans and how they evolve. Continuing the sports metaphor, comparing plans is a problem since the size of the field changes and the personnel turnover never keeps core competencies the same (Mahler J. G., 2009). From the Emergency Support Functions, which are the function-centric services first outlined in the Federal Response Plan (Federal Emergency Management Agency, 1999), to the

terminology within plans, variation in meaning and scope makes linear “before and after” comparisons problematic. It is no wonder that so many failures persist. To understand what is happening, this research attempts to cut through the clutter by looking at variation in the learning process itself at the network level. The research strategy adopted examines the process in practice behind generating lessons learned.

Organizational Memory and Learning

At the outset, this research recognizes that a traditional understanding of learning dominates learning efforts in practice, but the realities of EM and disaster response suggest a modified understanding is necessary. To that end, this research attempts to generate inferences about learning in complex systems by illuminating the gap between understanding and reality. The results hopefully contribute to an evolving understanding of learning in these networks. The objective of this section is to begin to map out the learning processes. This process borrows from the learning literature and is adapted to the cycle of disaster response, after action review, after actions, and finally back to disaster response again. This narrative begins with a discussion on what is meant by organizational memory, and what role memory plays in guiding subsequent actions designed to arrive at new, desired outcomes.

The Department of Homeland Security’s Lessons Learned Information Sharing Program, which recently consolidated with the Naval Postgraduate School’s Homeland Security Digital Library, boasts of holding 23,000 documents on the experiences and

opportunities for improvement captured during homeland security events. Accepting that experience is the progenitor of new knowledge, these documents have the potential of outlining the evolution of experiences manifested from the variations of national EM plans through the decades. The FRP, a reaction to Hurricane Hugo, demonstrated that important gaps in planning translated into critical missteps in execution in response to Hurricane Andrew (GAO, 1993). The ink on the FRP was barely dry, when outrage led to its first set of major revisions. Finally, in 2004, the United States discarded the FRP entirely for the NRP. The experiences of 9/11 exposed inadequacies of the FRP and renewed an emphasis on information sharing and interoperability. It is notable to mention here that 2004 also resulted in the largest reorganization of government in the Post War Era. FEMA became one agency, among 19 others, within the Department of Homeland Security (Federal Emergency Management Agency, 2015).

Within NIMS and the NRF are appendices, sub-plans, functional strategic plans, and every other sort of guiding document possible to address every facet of life in a community. These documents are intended to serve as the organizational memory of a disaster response network (March & Simon, 1958). However, it is generally accepted that organizational memory also resides in the culture shared by an organization's people (Walsh & Ungson, 1991; Mahler J. , 1997). On this basis, the challenges for the coordination and management of a disaster response network are two. First, the sheer number of functional plans, overarching frameworks, policies, directives, and strategies brought to bear on emergency managers leading these networks is daunting. Second,

disaster response networks, for the most part, are not enduring organizations. Therefore, one culture, shared by all, is not possible organizationally, while it is likely very strong among highly-specialized professionals—such as medical practitioners. This puts an added emphasis on EM plans, but as noted, navigating these documents is a challenge.

The purpose of memory then is to facilitate cognition, or the ability to process information (Comfort, 2007; Diaz, 2010). This study examines two pathways to institutional memory: 1) standard operating procedures (SOPs) and 2) culture. It includes all EM plans and frameworks when referring to SOPs. Culture is understood to be the informal norms and rules or priorities that are adopted by a community (North, 1990; Wilson, 1989), and communities can form around disciplines, geographic spaces, economic interests, and other interdependent networks. Cognition, as it relates to both pathways, plays a critical role in how emergency managers define problems, which directly influences the solutions applied against problems. Problem awareness is the beginning of the learning processes (Mahler J. G., 2009).

Members of a disaster response network must analyze circumstances and apply solutions accordingly, choosing prescribed courses of action or spontaneously organizing a new form of response. Solutions, for this study, are courses of action or interactions, pursuing specific outcomes during specific sets of circumstances. These solutions serve as the primary source of lessons learned for disaster response. Effective solutions depend on accurate problem assessments, and in the area of coordination and management, that

seems to be a key challenge. Regardless, solutions become prescribed, through EM plans, to address future, similar circumstances. This is likely a poor strategy when problems are ill-defined, and circumstances never stay the same. The final part of the learning process institutionalizes new knowledge into organizational memory. Evidence in after action reports suggests the gap between SOPs and action, however, serves as a strong indicator of how well new knowledge influenced action.

Consequently, this study shows how SOPs serve as a knowledge resource for members of a disaster response network, but it will also show how managers responsible for coordination are disadvantaged from the start. Processing a knowledge resource is known as sensemaking (Weick, Sutcliffe, & Obstfeld, 2005), which combines with cognition of circumstances and cultural norms to produce solutions. In summary, culture influences how network members construct problems and interpret SOPs during the sensemaking process. It then follows that direction from management suffers from risks that stem from misinterpretation. Gone wrong, these risks lead to failed operational outcomes, which are reviewed in after actions in a sorting process. Effective solutions are tagged for adoption. Ineffective solutions open discussions on improvements. New knowledge then gets institutionalized in organizational memory. The challenge facing researchers is distinguishing between ineffective solutions and misinterpreted implementations.

Disaster Response Networks

Hazards call on a broad swath of government services, agencies, and private sector partners (Kettl, 2000). These partnerships, or networks, are necessary when addressing novel problems, or when problems are inconsistent in their scope and solutions are not readily available or known (Provan & Lemaire, 2012). Wicked problems, such as disasters, are changing our understanding of how collective action should be organized, and the emerging construct is a dynamic one.

Scholars and practitioners agree that traditional hierarchies are inadequate to the task. Yet, SOPs organize knowledge functionally, as if to support a traditional hierarchy. EM plans emphasize unity of effort and clear divisions of labor. NIMS and the NRF offer flexibility, but Emergency Support Functions (ESF) emphasize a classical economic approach to problem solving. In essence, planners make plans that attempt to create certainty from uncertainty. Under stable conditions, this might be possible. However, disaster events are never identical. Conditions in the community, which are never static, could produce different outcomes were the same hazard to befall the region over-and-over again. Tornadoes on a Saturday may damage schools, but students were in the safety of their homes. Of course, a weekday would completely change the complexion of the event. In Florida, significant numbers of retirees spend their winters in the state. If a late hurricane were to make landfall in November (two did in 2004), response operations would have to account for populations needs that would be different (at least in scope) for a storm in early August. The number of probable outcomes, resulting from the

convergence of shifting circumstances, is the reason uncertainty cannot be eliminated. If plans cannot inform actions, when novel circumstances dictate action is required, decisions and associated actions result from something else.

For this reason, many are beginning to recognize managing complexity offers a more promising strategy **Invalid source specified..** Additionally, a systems approach offers greater explanatory power for these networks. Disaster response networks are complex adaptive systems. These systems are complex, not because of the number of agents operating within them, but because their interactions have the potential for a wide array of possible outcomes (Axelrod & Cohen, 2000). These systems are different from stable networks and virtually alien to traditional hierarchies. The latter have clear lines of command, predetermined roles and responsibilities, and operate best for routine work.

Stable networks refer to interdependent organizations sharing and applying resources against mutual problems through regular communication. A complex system is similar in some regards, but vastly different in most. For starters, a complex system includes a population of agents that may, or may not, be in regular communication. Unlike a traditional hierarchy, cooperation supplants authority the driving force for action. Finally, almost nothing about a complex system is routine.

This systems approach provides distinct advantages for this research. First, it allows for loosely-coupled associations among member parts of the network, where

cooperation, not fiat, leads to coordinated action. This is significant because it increases the role of sensemaking. Where certainty is possible, sensemaking becomes less relevant, since processes were designed to enable quick action. In other words, sensemaking is prepacked in the presented solution. This does not logically carry the proverbial water in complex systems. Agents within disaster response networks are already doing non-routine work, since hazards are relatively rare events. The result is ad hoc decision making, based on available information, to arrive at desired outcomes. Deficient information, poor cognition, or both generates decisions that lead to suboptimal outcomes.

Chapter Summary

The key takeaways from this introduction should establish a foundation from which the rest of this document follows. This chapter worked to distinguish key terms, such as the difference between a disaster and a hazard. It also discussed EM and the national plans intended to govern administrative functions (and subordinate functions) during response operations, and the evidence suggests challenges reside at the level of overarching decision making. This chapter also suggested the need to adopt a complex systems framework for disaster response networks. The learning model introduced here is also cyclical, and it forms the basis for a traditional learning model to account for learning activities conducted in the name of these disaster response networks.

The decision to adopt this approach came with tradeoffs. Complexity does not offer a neat, linear perspective of the network, especially over time. Variations in network membership, or agents, make linear comparisons problematic, but complexity, by its nature, limits the ability to generate a simple model. This chapter also ties learning to lessons learned derived from experience. I will clarify experience here to mean direct (firsthand experience) and indirect (vicarious experience) as the source of lessons learned (Huber, 1991).

While Chapter 3 will delve into the design of this study in greater detail, the basic foundations of this study merit some attention here. The traditional learning model adopted works to describe the learning process as it happens. The reason for this decision is simple. The traditional process is how these networks conceptualize learning, conduct learning activities, and attempt to institutionalize lessons. Following the case studies, we will revisit these cases using a complex adaptive system lens. The cases used in this research focus on major catastrophes wrought by hurricanes. Specifically, this paper examines the cases of Hurricanes Andrew (1992), Katrina (2005), and Sandy (2012). Through document reviews and comparative methods, the goal of these case comparisons is to improve our understanding of what lessons are learned, how, and why.

CHAPTER TWO: LITERATURE REVIEW

Scholars do not address disaster response networks with the consistency found in literature on other forms of collective action. At times, they speak of them in terms of traditional hierarchies. At other times, they refer to them as complex systems. Several variations of organizational theory in between both ends also make appearances in the literature. This study applies a complex systems lens to disaster response networks, but it tests a learning model generally used from more traditional public administration literature. This fusion of models is set against an EM backdrop that is itself a field in its early stages of organization.

This chapter begins with a review of predominant learning literature in public administration. The learning model developed in Chapter 3 borrows heavily from widely-adopting thinking on learning in government organizations. The decision to lean on this scholarship was a practical one. In practice, the researchers tasked with reviewing the performance of disaster response networks generally follow the traditional views on learning in public administration. For that reason, it makes sense to review that literature, identify its explanatory strengths, and discuss its shortcomings for complex systems.

The next part of the chapter discusses the literature on complex systems. Disaster response networks are complex systems because their operations take place against a backdrop of great uncertainties. The distinction from complicated systems is important. In this research, the latter refers to systems with many participants. These participants interact with one another, and those interactions are generally governed by pre-defined conditions, which result in outcomes that are usually predictable—at least within a narrow range of possible outcomes. Complex systems, on the other hand, deal with interactions among participants that can result in a wide range of probable outcomes. Novel circumstances and changing conditions can affect these interactions, which generates a level of uncertainty not present in traditional hierarchies, structured networks, and complicated systems (Axelrod & Cohen, 2000). The distinction is significant, as argued here, because learning in this context calls for more than prescriptive procedures designed to optimize effectiveness and efficiency through predictable processes. Effective learning in these systems more closely resembles adaptation, which then calls for intercrisis learning that enhances the system’s capacity for adaptation (Comfort, 1994; Moynihan, 2008).

Finally, this chapter reviews the EM literature. Social science has dedicated considerable attention to EM, but there is no evident consensus on any one framework for understanding disaster management in general terms. The National Academy of Sciences has funded disaster research under the auspices of the National Earthquake Hazards Reduction Program (NEHRP), which started in 1977 (NAS, 2006). The NEHRP, and

other disaster-related research, experienced a surge in scholarly activity following the events of 9/11. Research questions surrounding government's role in the wake of the nation's worst terrorist attack in history abounded. By extension, scholars took interest in the way government organized in preparation for and in response to hazards—natural and contrived. In parallel, government itself began reformulating its role in disasters.

Several scholars have examined learning in disaster response. Many EM professionals and policy analysts have done the same. Accordingly, their work features prominently in this research. Fewer have examined how learning in these networks takes place. That is where this research focuses and where it hopes to fit in the scholarly landscape. Increasing complexity beyond disasters makes such research a prudent effort. From the menace of a pandemic to the ongoing threat of cyber conflicts, government and its partners in the private and public sectors form systems that are charged—explicitly and implicitly—with the defense of our social and economic stability. To be sure, they are not meant to prevent change; they are established to mitigate unintended change resulting from catastrophe.

Public Administration and Learning

The literature on learning in government organizations is as old as public administration itself. In this portion of the chapter, I discuss scholars' general understanding of organizational learning. Perhaps since Frederick Taylor, public administrators have pursued the optimal method of delivering public goods and services.

Public administration scholars, in turn, have approached their work against the backdrop of that goal. March and Simon helped set the tone for today's public administration discourse on learning in 1953. They helped organize models of bureaucracy that moved beyond Weber to address complexities tethered to human decision-making, or at least the framework through which public administrators arrive at decisions (March & Simon, 1958).

Rationality, and its limitations, factor heavily in their analysis of bureaucracy and how it learns—a perspective that continues to influence organizational learning strategies. The difference between achievement and aspiration serves as the impetus for “innovation” in organizations, March and Simon argue. Innovation in this context is possible through modes of knowledge transference to arrive at “problem-solving,” which one could summarize into two categories: 1) experience and 2) others’ experience. The distinction for organizations being that the activity is a group effort, and the dynamics of the group itself enriches the process and aids in the identification of optimal solutions. At that point, organizations develop programs, which include defined procedures to operationalize solutions. Programs conceptualize their aspirations in the goals they set forth for themselves, and those goals result from the selection of desired outcomes among an array of possible outcomes, which presumably favor the realization of aspirations. Over time, goals change to conform to evolving aspirations (March & Simon, 1958; Lindblom, 1979).

Lindblom evolves the argument further in noting that solutions are never final, since complexities preclude the possibility of developing permanent solutions. The result is a process of analysis, problem-solving, and prescribed solutions that repeat as long as problems persist, which they do because each instantiation presents new problems for solving. Additionally, social processes factor into problem-solving, which does not necessarily have to occur under the auspices of a conscience, coordinated effort (Hirschman & Lindblom, 1962). Thompson would later add to this view of learning in the concept of “opportunistic surveillance,” which refers to the “scanning of the environment” to develop new operational strategies (without the stimulus of a problem). His discussion surrounding a “task environment” expands on the discourse of uncertainty in decision-making, where he argues that external forces and internal interdependencies introduce uncertainty for organizations. The result is that problems vary over time and under diverse circumstances; so, it follows that solutions had to do the same (Thompson, 1967). Hence, pursuing potential solutions without the immediate threat of problem becomes itself the rational exercise.

Argyris would go on to build on these arguments by discussing how our understanding of problems can evolve as well, and how that evolution alters the learning effort. By this time, Argyris starts reframing decision theory in the context of learning, which he narrows to decisions predicated on the identification of errors. Errors, he observes, are any features of “knowledge or knowing that makes action ineffective.” While the term overlaps with previous definitions of “problems,” an important distinction

is noteworthy. Errors are focused on operations or procedures, and problems can apply to operations and outcomes. Single-loop learning, as Argyris describes it, involves the alteration of procedures to better align performance with desired outcomes (Argyris, 1976). Put another way, organizations adapt their procedures to improve strategies in pursuit of improved results or reducing the difference between outcomes and aspirations. The selection of new procedures, and the process supporting that selection, is when learning takes place for organizations.

The argument then follows that problems that are understood differently can result in double-loop learning, which describes a wholesale change in procedures to develop new strategies that reflect the organization's new understanding (Argyris, 1976). Comfort elaborates further in isolating the core learning challenge for organizations as the inability to understand problems beyond the scope of experience and articulates the challenge of designing organizational processes that can negotiate problems effectively (Comfort, 1985). This point comes to the fore in Comfort's later work, which the chapter will touch on shortly. To this point, the learning literature works mainly from decision theory as it relates to problem-solving, but Comfort helps begin a transition to learning literature that focuses more closely on the journey new knowledge takes from experience to organizational memory in a complex system. The shift represents a move away from rational choice in the strictest sense toward behaviors resulting more from social constructs that result from self-organization vice strict principal-agent models.

Huber would follow Comfort by developing a model for organizational learning and, from that model, he creates an ontological framework focusing on the journey of new knowledge from experience to institutional memory. The process borne out of this framework develops a theory around the way experience creates new knowledge and enables organizational learning. The scholarship, at this juncture, transitions from learning as a function of satisficing to learning as a series of processes in constant motion—and perpetually repeating themselves (Huber, 1991). These organizational processes then take place within two dimensions of an organization. The first, drawing heavily from the traditional view of learning, is the rational-analytic model, which offers a descriptive view of learning as systematic efforts for information processing, storing, and retrieving (as circumstances dictate). The other way organizations, according to Mahler, is through culture, which acknowledges the informal institutions that form from shared interpretations of information and adopted norms (North, 1990; Mahler J. , 1997). A critical distinction between the two resides in the final resting place of organizational memory, where rational-analytic processes institutionalize new knowledge in plans and procedures and cultural learning institutionalizes lessons in the adoption of values and norms.

In both, organizations behave as information-processing systems that codify accepted procedures in operational plans and accept behavioral values into the culture. The latter being defined as the accepted approach to perceiving and prioritizing problems (Walsh & Ungson, 1991). Mahler would go on to illustrate the interplay between

procedures and organizational values in her comparative case analysis of NASA's Challenger and Columbia disasters. Her work describes how new knowledge, commonly known in practitioner circles as "lessons learned," struggles to translate into new procedures or shared values. The comparative study generates detailed narratives surrounding the efforts to learn from experience within a procedural framework, while also addressing the learning process within NASA's culture. The dynamic between shifting priorities—procedurally and culturally—offers keen insight into how lessons become adopted and unlearned. In NASA's case, problems were not necessarily understood differently, nor were there major shifts in problem-solving. Instead, experience and priorities changed with time, attrition, and reorganizations (Mahler J. G., 2009). These changes eroded the organization's ability to apply procedures honed from lessons learned appropriately, and cultural barriers—from the top-down and by occupation—degraded NASA's capacity for sense-making at the decision level. This effectively obscured the substance of operational problems (Argyris, 1976; Weick, Sutcliffe, & Obstfeld, 2005).

Culture would go on to take a larger role in the learning literature in more recent scholarship. Schein argues that culture and leadership are inextricably connected, since leaders validate informal institutions in the decisions they make and the behaviors they reward. Leaders also set the example through their own behavior, because those decisions and behaviors shape the organization's values (Schein, 2010). Schein was not the first to discuss culture and learning. Simon, Weick, North, Mahler, and others addressed culture

and the idea of shared values and assumptions unique to an organization. However, Schein's emphasis on leadership is notable because it mirrors an emphasis in many, significant learning initiatives at public and private entities that invest considerably in leadership training. The idea behind such training to help leaders mold culture into a form that is consistent with supporting its aspirations. In this view, learning is less about sense-making, rational choice, or procedures. It is, instead, a function of an organization's social dynamics, which leaders influence heavily—a prevalent assumption in EM literature on lessons learned.

Leadership, however, can take many forms, and it is frequently the case that professional leadership resides within the communities of practice that form (formally and informally) within an organization. These communities can form around organizational competencies that reflect the expertise and capabilities of its members. As with the rest of the organization, those members evolve over time and the membership turns over; so, the organization follows suit. More recently, literature on communities of practice within organizations have come offer additional insight on leadership and institutional memory, where these communities serve as the repository of lessons learned and leadership in a professional sense. This type of leadership does not derive authority from organizational structure; rather, it comes from a general acceptance of norms and procedures deemed optimal through professional norms. This view moves away from a top-down view of learning to competency building through the disciplines, occupations, or other shared functions that reside within an organization. Members share knowledge

and establish norms across the organization, which are built on the credibility of the members' collective expertise (Wenger, McDermott, & Snyder, 2002).

By this point, the literature has offered important insights about learning in public administration. However, some critical challenges persist. The literature describes learning as a process or a series of processes, which have sequential properties. It argues that if A, then B follows. The literature also paints a compelling picture of these processes in motion both in technical and in cultural terms. This observation is not a “one or the other” assertion; rather, it is an understanding that learning takes place in both domains. Rational choice and agency underpin the logic behind learning as an organizational process that starts with understanding problems to applying solutions. Problem-solving, in the traditional public administration sense, manifests itself in how structures are developed to address perceived cause-effect relationships between behaviors and consequences (Comfort, 1985; Mahler J. , 1997). Most notably, the rational-analytic view describes a systematic approach to learning that begins with information gathering and ends with business process re-engineering—to borrow from the parlance of management consultants. In this view, leaders can strive to structure their organization optimally against the challenges they face. This assumes, of course, an optimal solution is available, discoverable, or both.

In contrast, the discussion on culture offers useful ideas on the contributions made by unspoken rules in an organization. Members of these organizations adopt informal

institutions and, in doing so, they accept a general framework for priorities, while also adopting assumptions implicit to a value system that underpins both. This view of learning moves away from a focus on information-gathering, procedures, and consequences. Instead, it emphasizes the role of prioritizing aspirations through norms, and it assumes the competency to act supports those priorities, as opposed to priorities driving the development of competencies. The challenge in the learning literature on culture is the state of the data. While noteworthy observations have been documented on culture, a systematic understanding remains elusive. At the very least, the substance of this data compels scholars to pursue qualitative methods to arrive at workable inferences about culture. The challenge is that values are difficult to rank and define, which reduces the explanatory power of rational choice. Moreover, the problems facing public organizations can be abstract, as opposed to mechanistic. Mahler's study of NASA looks at a culture and technical procedures that are couched in the engineering and scientific constants of safe space travel. Problems such as poverty, national security, and community resilience introduce a level of nuance that can bring culture further into the fore, as these issues are more value-dependent.

It is clear that knowledge passes over time through deliberate adjustments to procedures and the evolution of organizational norms and values. Important contributions have been made to understanding how processes work in both a rational-analytic and a cultural development learning model. Yet, both approaches lose theoretical strength when complexity becomes a factor and, by extension, uncertainty. Complexity explains that

while learning processes are in motion, so are changes to problems and corresponding solutions, since interactions among agents and their environment can yield so many expected—and unexpected—outcomes.

Networks and Complex Systems

Organizations cannot learn the way people learn. As the learning literature shows, there are dynamic processes that scholars approximate as “learning” in organizations. This section of the literature review discusses the organizational forms in which these processes unfold. Organizational knowledge exists in its individual members and in the institutions that comprise them. The structure and culture, or cultures, within these organizations therefore are critical to our understanding of how knowledge is stored, communicated, interpreted, and acted upon. The literature in this regard offers a variety of models to understand how organizations structure interactions among constituent parts and prioritize values and norms. There are three general frameworks for organization used in the EM literature. The most common is related to the literature on traditional hierarchies.

The literature on hierarchies is the most developed body of work addressing government organizations. As such, the assumptions adopted within the discourse are so imbedded that few even question their utility—despite the context. These assumptions are closely tied to traditional tenets of public administration. They include the importance of specialization, an emphasis on unity of effort, a focus on clear lines of authority, and

efforts to standardize procedures. Hierarchies effect action by fiat, because its leaders are empowered to direct subordinates' actions; this lens has in turn fostered a rich literature on agency theory (Powell, 1990; Williamson, 1999; Kettl, 2000). In this sense, the view of organizations continues to adopt an industrial underpinning of mechanistic traits, despite scholars' best efforts to introduce more nuanced dynamics—such as norms, culture, and values—into descriptive analyses of organizations (March & Simon, 1958).

More recently, scholars have started to discuss the provision of government goods and services through intergovernmental networks or systems—the former garnering far more attention thus far. Modern social and political challenges call for networks of organizations to deliver solutions, because those challenges frequently span beyond the scope of any one organization's capabilities. This development is altering public administration as it was previously understood, because governance now transcends the traditional struggle of federalism (i.e. federal agencies and their relationships with state agencies or congressional oversight) to a struggle to reconcile diverse interests across a coalition of government and non-governmental partners. The result is a diverse network of players with equally diverse systems of accountability, information-sharing, and organizational goals (Kettl, 2000). The literature describes several types of these networks, but generally it identifies two forms: 1) formal and 2) emergent. Formal networks exist by mandate, and emergent networks are voluntary in nature. In other words, emergent networks form when multiple organizations work cooperatively in response to a task environment that calls for collaboration— such as inter-municipal

transit authorities (Chisholm, 1989; Popp, Milward, MacKean, Casebeer, & Lindstrom, 2014).

There is a fine line between describing a network as emergent and applying a systems approach. Simon argued that organizations were in fact systems of interrelated roles, and roles provide members of an organization the framework from which to make decisions (Simon, 1991). The use of the term “systems” in this work builds on that assertion and leans on subsequent work that expands this view of systems beyond one organization and into the network. The distinction made between networks and systems lies in the character of the interactions that take place in both.

Networks

This research adopts a common definition for networks as three or more organizations working collaboratively toward a common purpose. The network literature generally discusses networks from two perspectives—purpose and governance. The former refers to the types of problems a particular network might solve. Some of the literature is very specific about the purpose of a network, adopting a functional perspective that is prevalent in EM reading (Provan & Lemaire, 2012). Other researchers have applied broader categories that reflect the nature of the problems they address. An example includes the categorization that follows (Popp, Milward, MacKean, Casebeer, & Lindstrom, 2014):

1. Policy Networks that share a common interest in policies due to members' interdependence in their shared policy sphere (e.g. the U.S. interagency delegation to the International Atomic Energy Agency);
2. Collaborative Networks that integrate operations to address public issues beyond the scope of one organization (e.g. disaster response networks); and
3. Governance Networks, where coordination in support of specific policy outcomes takes place (e.g. the U.S. Intelligence Community).

The governance of these networks, not to be confused with Governance Networks, poses significant analytical problems for researchers (LaPorte & Consolini, 1991). Public administration especially faces significant theoretical challenges in developing a dominant paradigm for networks. Disparate geographies, diverse authorities, clashing cultures, and diffuse leadership makes comparative studies a challenge, and produces nominal data that imposes significant ontological tradeoffs, when researchers try to develop structured data sets.

Networks also depart from a classical understanding of organizations that depend on rigid structures and clear roles and responsibilities, which have served as an epistemological backbone of public administration studies (Kettl, 2000). Reducing networks to its parts can be problematic as well. Network members do not connect as cogs in a machine, their integration can vary with the operating environment. These are among the several reasons making general inferences across the network's entirety poses

challenges. For that reason, many scholars have turned their attention to the nature of the interactions that take place among network members. This research follows down that analytical path.

Moe's work provides a compelling summary of an economic view of interactions within organizations and helped inform a robust body of work on agency theory in public administration. In this view, scholars characterize interactions as transactions where participants' decisions are based on utility maximization, and not on the direction of the firm, based on power dynamics, as it was previously understood (Moe, 1984; Long, 1949). Whether economics or power, both views have since guided how administrators structure organizations and the work they do. The placement and availability of incentives and disincentives litters the literature that bases organization design from an economic perspective—made most evident in pay-for-performance initiatives in government. The power perspective pays closer attention to roles and responsibilities. This view places special emphasis on authorities and functions, or put another way, it works hard to assign accountability.

Powell was part of the effort to build on these traditional views in the network literature. He argued that network interactions occur when members engage in “reciprocal, preferential, and mutually supportive actions” (Powell, 1990). Powell's research provides the kind of thick description of networks that introduces the importance of relationships, shared values, and reciprocity. In this view, culture plays a larger role for

interactions. His observations were descriptively insightful and enriched network interactions by introducing the role of informal institutions, yet this advancement also introduced research challenges that persist to this day.

The early research pegged networks as a type of collective action on a continuum between two extreme points with hierarchy on one end and markets on the other—power in contrast to economics respectively. It was understood that networks occupied a space somewhere in between (Powell, 1990). Powell’s arguments, and subsequent others’, characterized networks as something more than a point on the continuum. Their work describes network members working to achieve mutual goals and developing shared values. Concurrently, the description of network members working toward a common goal, adopting a unity of effort, and assigning clear roles and responsibilities continues to parallel the literature on traditional hierarchies. The combination poses new questions about how networks divide labor and assign roles, but scholars generally continue to discuss networks through the hierarchical, rational choice lens. The tradeoff leaves questions unanswered about values and norms. The challenge thus far emerges in the diversity of interpretations for both. Does “protect life” include livestock and pets? Does “safeguard property” include arresting families stealing food out of necessity? If it does, how do we reconcile it with “protect life.” Shared values do not necessarily translate into consistent decision-making and actions across an organization or network.

Several scholars, however, believe networks can develop shared values. These scholars have described networks as knowledge-sharing webs, where members identify problems, transmit their assessments, and, in turn, receive guidance about action in response (Comfort, 1985; Agranoff, 2007). This approach offers some explanation for the role of culture in shaping interactions, since it conceptualizes an exchange of ideas that is not limited to narrow, two-way processes. The model adopted for these interactions is frequently a web or net, which researchers describe networks of nodes, each representing constituent parts, and some nodes exerting more influence over the rest of the net than others. The influence these nodes exert can be legitimate, drawing from the understanding that varied forms of power shape interactions (Weber, 1947; LaPorte & Consolini, 1991).

These webs present networks as systems that process new information in sequences that take place on several levels. Scholars argue that they continuously scan environments, interpret new data, and learn. The learning in this network model includes action that follows the interpretation of new data. In this view, the purpose of network interactions is to learn how to proceed in changing environments, since organizations (or the network in this case) continues scanning for new developments (Daft & Weick, 1984). Learning, in this sense, then occurs on three levels of the network: 1) procedures, 2) interpretations, and 3) structures (Popp, Milward, MacKean, Casebeer, & Lindstrom, 2014). These conceptual frameworks offer useful methods of dividing organizations and networks, and they are especially helpful in conceptualizing the flow of information from

node to node. The three levels of networks provide a useful framework in that they allow for researchers to organize information flows that translate into knowledge that guides action. Procedures make manifest new knowledge in a defined sequence of actions. Interpretations, from a cultural perspective, emerge from cognitive frameworks applied to phenomena with consistency across the network. Structures are built to support strategies for success derived from organizational knowledge.

Within the structure of a network, influencing nodes exist and form “dyadic relationships” with other members. A modified model that incorporates both is the “lead organization network,” which aptly describes a formal network operating at the direction of one member (Provan & Lemaire, 2012). It is in the literature on influence where discussions of management and leadership emerge. Robert Agranoff’s thorough research of networks in government poses research questions with a focus on management of these networks, which is consistent with a wide swath of network literature that works hard to analyze governance leadership in networks. (Agranoff, 2007; Popp, Milward, MacKean, Casebeer, & Lindstrom, 2014). Managers, after all, are responsible for defining procedures, offering guidance for interpretations, and establishing structure. The unique aspect of networks, however, is that procedures and structures are not static in dynamic task environments. Interpretations, in this regard, underpin which procedures apply and which structures are optimal. Whether in academic or professional writings, management and leadership play critical roles in developing an organization or network’s ability to interpret new information consistently. There is evidence to suggest that

structure needs culture to serve as an effective vehicle for developing shared values and consistent interpretations (Moynihan, 2005).

Culture is the “coercive background structure” or the “unwritten rules” network members depend on to arrive at common understandings and decisions. Leaders play an important role in shaping culture (Schein, 2010; Kettl, 2014). This common belief is perhaps the reason culture change has become a lucrative cottage industry in the management consulting industry. Culture creates a shared conceptual framework for “encoding and interpreting” information. To illustrate the point, Douglas North recounts the story of Alexander Hamilton’s preparation for his duel with Aaron Burr, explaining how the ill-fated Hamilton listed the reasons not to go through with the duel, but he proceeded anyway. He did so because dueling “was the accepted way to settle disputes among gentlemen” and declining the challenge would damage his standing on the public stage (North, 1990). In the absence of clear direction, which is common when task environments are rapidly-changing or novel, culture is then likely to influence decision-making.

In summary, economic-, power-, and culture-driven decisions all offer different explanations for the interactions that take place inside networks. Alone, each makes tradeoffs in the factors that influence interactions, but drawing from each of the three offers a useful framework for explaining the outcome of interactions within a network.

Complex Systems

Having discussed how scholars understand networks, this chapter now turns its attention to the emerging understanding of complex systems. These are distinct from traditional networks because they better reflect the dynamic nature of both network members and the environments in which they work. Economic considerations, power dynamics, and cultural influences speak to the nature of the interactions that take place within a network. However, they do not account for the continuing state of change within the network membership and in the environment. Network members, or agents, interact with each other, and they interact with their operating environment. The number of possible outcomes related to those interactions make them complex, and the span of possible problems that can emerge in an operating environment can demand that networks become adaptive (Axelrod & Cohen, 2000). Some scholars even argue that interactions within complex systems are not repeatable (Kapucu, *Interorganizational Coordination in Complex Environments of Disasters: The Evolution of Intergovernmental Disaster Response Systems*, 2009).

Following in the footsteps of some of the noteworthy scholars of disaster response networks takes this inquiry into the research on complex adaptive systems. This research differentiates a complex adaptive system from a network for several reasons that draw from that literature. This section of the chapter will discuss those reasons and make the case for adopting complexity as the theoretical framework for disaster response networks moving forward. As an emerging framework in this regard, some measure of clarity is

necessary to proceed. Many terms and concepts in the complexity literature, as it relates to disaster response, are inconsistent, as a dominant paradigm has yet to take form. The following review of the literature will anchor those perspectives to network interactions, as they relate to the operating environment and network members.

Comfort observes that systems that pursue control, by imposing structure, in dynamic environments risk collapse but, by the same token, a complete lack of structure obfuscates the channels through which information might flow effectively across a system (Comfort, 1994). Perrow characterized interactions that were strictly defined as tight coupling systems. In a tight coupling system, procedures follow sequences that are “invariant.” Loosely coupled systems, by contrast, entail more voluntary associations among agents, which allow for greater autonomy in relation to collaborative efforts (Perrow, 1999). This framework for complex systems explains a key distinction between “normal accidents,” where systems’ procedures and structures fail as a result of a misstep and system-level complex failures, which result when a suboptimal or incorrect set of procedures are applied to problems.

Perrow’s levels of interaction also proves useful in isolating where things go wrong in disaster response networks. He breaks down systems into subsystems, units, and parts. A part is the first level of a system, a unit is made up of parts, and units make up a subsystem; where he describes “parts” as the smallest unit with a role influencing the system’s environment (Perrow, 1999). The utility gained in these distinctions allow

researchers and practitioners to distinguish where errors and learning might occur—meaning that units might learn, but subsystems as a whole might not. Another example might be parts learning, then changing, which results in units losing lessons learned. It is the number of possible outcomes from these scenarios that increase the complexity of these networks.

When one considers that each of Perrow's levels of complexity harbor their own, distinct procedures, interpretations, and structures, the question of how coordination takes place at all comes to the fore. Disaster response plans, standard operating procedures, and other formal institutions constitute the procedures and structures that govern EM systems and enable coordination. Complex problems call on networks to process challenges and define appropriate strategies for self-organization as action becomes necessary (Comfort, 1994; Kapucu, *Interorganizational Coordination in Complex Environments of Disasters: The Evolution of Intergovernmental Disaster Response Systems*, 2009). Moynihan calls this intracrisis learning, when complex systems learn how to proceed as uncertain conditions unfold. While the research questions in this inquiry are more focused on intercrisis learning, learning from one crisis to the next, one measure of intercrisis learning must be how the system improves its capacity for intracrisis learning. That improvement must result, at least in part, from experiential learning that is embedded into the system through procedures and structures (Moynihan, 2005).

The system in this regard functions in two ways. First, it is a sense-making network that processes information about the environment (Weick, Sutcliffe, & Obstfeld, 2005). That information then triggers procedures and structures—pre-defined and spontaneous—that inform agents’ actions across the system. Determining the procedures and structures to employ is left to both EM plans and leadership interpretations. The short period of uncertainty, when the system is adapting, is consistent with Comfort’s arguments about self-organizing. Axelrod and Cohen refer to this self-organizing trait as the selection of strategies with the aim of achieving desired outcomes, or at least as close as possible to desired outcomes. The selection of strategies that improve on previous experiences is referred to as adaptation (Axelrod & Cohen, 2000; Comfort, 1994).

As scholars continue to develop research methods for analysis of complex systems, Kapucu used social network analysis software to map a complex system. This method measured the “degree of centrality” an agent represented in the complex system by rendering the number of other agents that had to associate with it. The software used linkages defined in the FRP, NRP, and NRF to create visualizations of the network using quantitative methods to count interactions between agents, depicting network nodes (Kapucu, *Interorganizational Coordination in Complex Environments of Disasters: The Evolution of Intergovernmental Disaster Response Systems*, 2009). Assuming increased linkages enhance communication, the model suggested that the NRP was better suited for coordination than the FRP. Social network analyses show promise for depicting these systems, their nodes, and their interdependent links, but questions persist regarding causal

relationships that address decision making and strategy selection. Learning offers some promise of adding that type of context to mapped interactions.

In summary, the defining characteristic of complex adaptive systems is the uncertainty that stems from non-repeatable processes. It is noteworthy that complexity also takes place from the system level down to the parts, which represent the lowest level of action at each level of the network. This paper applies Axelrod and Cohen's term of "agent" as referring to any part, unit, or subsystem that is interacting any other system subcomponent or the task environment. Adaptation then is possible at each level, but this research will generally discuss agent interactions at the subsystem level and higher.

Emergency Management

Social science inquiries in the EM field have come a long way, in a relatively short amount of time. The EM research program, however, continues to demonstrate the characteristics of a young field of inquiry. This last portion of the chapter will summarize two distinct bodies of work. The first is a focus on the history of EM and the formulation of critical concepts. This literature endeavors to organize the policy and public administration phenomena surrounding disasters in a manner that reflects an action-based perspective. Put another way, the literature describes EM from the perspective of a leader organizing actions in response to the threat, onset, and aftermath of a disaster. The second focus, which was discussed in part in the network literature, explains the challenges facing EM in theory and practice. These challenges generally fall under two problem sets:

1) the citizens' growing expectations for effective disaster response performance and 2) the shifting burdens of authority and responsibility in the nation's federal system of government.

The NAS review of the social science research on hazards and disasters summarizes scholarship's progress in organizing critical concepts and phenomena unique to disasters. Their work was performed under the auspices of NEHRP, which like the FRP started with a focus on seismic disasters. NAS describes EM research as falling under two strains: 1) hazards research and 2) disaster research. The hazard research under this rubric has focused on vulnerability and mitigation, where disaster research has focused on response and recovery. The former generally tries to understand a hazard itself, what it is capable of, and how it might affect a region. The latter focuses more on response efforts, and how government should manage the effects of a disaster—once it is underway or complete. This study will delve deeper into the latter and endeavor to address a few of the opportunities for inquiry suggested in the research program proposed by NAS (NAS, 2006).

To start, NAS advises against using the distinction between hazard and disaster research, because it contends an integrated approach is necessary to accommodate the interdisciplinary nature of disaster response scholarship. Their review also found that EM research was suffering from acute “informatics” issues, specifically the lack thereof. NAS calls for improved data standardization, data management, and archiving to enable more

robust research and improved after action analyses. The absence of key data sets, they argue, is handicapping more advanced social science research in the field (NAS, 2006).

In attempting to build a cohesive research program, some scholars have taken important steps to review the evolution of EM field in the United States. Their work cataloged and organized the facts surrounding the nation's disasters and the corresponding responses. With each disaster, the community of scholars posing research questions grew. As previously stated, much of the initial interest in EM came from the Cold War and the prospect of a nuclear conflict. During that period, disasters took place, and scholars made minimal progress in understanding government's response, which is likely because government's response—especially at the federal level—was marginal, ad hoc, and focused on recovery. Indeed, how the nation, and by extension government and scholars have understood disasters, has evolved considerably since the start of the 20th Century (NAS, 2006; Roberts P. S., 2013; Kettl, 2014).

Ostensibly, the formation of FEMA in 1978 should have triggered greater interest in EM research, but it was, instead, the late 1980s and early 1990s that brought about an inflection point for the field. Three macro-level events generated increased attention to the EM field. First, Congress passed Stafford Act in 1988. The law finally established a system for disaster declaration and relief. Second, the Cold War concluded and left a civil defense professionals in search of new missions to pursue. Third, 24-hour cable news broadcast live images of devastation resulting from Hurricanes Hugo and Andrew. As the

public became more aware of the impact of disasters and the effectiveness of the government's response, the demand for improvement grew significantly (NAS, 2006; Roberts P. S., 2013; Rubin, 2012).

It was during this period that researchers and professionals coalesced around the model of disaster preparedness, mitigation, response, and recovery. Each of these phases of disaster have spurred the development of studies in social science and beyond. From public administration to civil engineering, disasters pose problems across the spectrum of an entire community's economy and society. The implications span issues from social justice to structural integrity. The diversity of agents participating in disaster response helped further research on networks, which were discussed earlier in this chapter.

In 1997, Birkland characterized disasters as social constructions that served as "focusing events." He argued that society's understanding of disasters shapes expectations that have evolved from acceptance of nature's wrath to blaming government for failing to prepare, mitigate, respond, and recover effectively. Disasters are focusing events because they are sudden and rare and, as a result, they set policy agendas and mobilize an otherwise inattentive constituency into action, when conditions are most stark (Birkland, 1997).

Similarly, other scholars have argued that some prominent policy formulation theories offer useful theoretical frameworks for understanding developments in EM. They say Kingdon's policy streams effectively explain the evolution of EM and contend

that three streams: 1) problem recognition, 2) policymaking, and 3) politics and policy adoption converge when a policy window opens, which may occur in the wake of a disaster. They also offer punctuated-equilibrium theory, which describes policy and policy actors in a state of equilibrium until a punctuation forces the recreation of a new equilibrium, or an impact significant enough to bring about system-wide change (Roberts, Ward, & Wamsley, 2012; Kettl, 2014).

The system view in this literature also tends to focus on federalism, bureaucracies, and questions stemming from the appropriate roles and powers shared among them. These research questions deserve the scholarly attention they get. They also demonstrate how the public's views on the EM roles of federal and state government agencies are shifting. The responsibility for disaster response previously was the purview of states, and for most disaster declarations that remains true. However, catastrophic events have led to growing calls for proactive, federal action. Scholars generally agree that U.S. federalism is accommodating. In the early 20th Century, federal aid to disaster afflicted areas was not a foregone conclusion. Legislators debated the necessity of acting at all. Today, elected leaders face considerable outrage when response efforts—perceived or real—fall short of public expectations (Roberts P. S., 2013).

Questions about the evolution of federalism in the United States merit considerable attention in the rich field on that topic, but observations about those ongoing changes also spur a question vital to this research. Scholars and practitioners recognize

that learning involves closing the gap between expected and actual performance outcomes. If expectations about federalism are changing, what hope do lessons learned from previous disasters have to effectively address present-day expectations? The rules of that game change with each event; so, the strategies of previous events may not match expectations. In the parlance of the learning literature, when the public recognizes problems differently over time, the social construction of disaster changes in parallel (Roberts P. S., 2013).

It is up to network leaders then to update procedures, interpretations, and structures to match those changes. Since this usually happens after the new construct becomes evident, we need to accept the possibility that failure is unavoidable. Research questions left unexplored in response for this problem might involve studies about how system leaders might acknowledge shifting expectations at the onset of a new disaster, or how might leaders manage public expectations before recovery begins? Put another way, if disasters are indeed social constructs, what tools are available to public administrators who wish to define that construct for the public? Finally, this changing construct introduces another element of complexity. Changing agents, task environments, and public expectations present a stark reality for network leaders that need to recognize those dynamics accurately and subsequently perform effectively.

EM research, however, may not be there yet. Social science work in the field is continuing to explore the governance types of response networks, specific problems

related to disaster response (e.g. evacuation studies), and the behaviors exhibited by those affected by disasters. To clarify, the latter two represent the distinction between studies on the optimal methods for conducting an evacuation versus the varying reasons why some members of the public choose to evacuate and others do not. Scholars and practitioners are continuing to develop studies that yield useful descriptive analyses of these response problems, and planners continuously update procedures and structures accordingly.

Summary of Literature

This chapter summarized the literature relevant to this analysis and attempted to capture the broad themes from three bodies of work—each in different stages of development. While researchers have offered valuable explanations for learning, complex systems, and EM, even more questions remain unanswered. Many answers, however, will have to wait. It is evident that an EM literature needs to develop further before certain questions get answers. Scholars are still developing concepts and defining units of analysis. They are continuing to refine a working ontology for this field, and they remain in pursuit of effective, useful research methods.

The NAS study on EM research summarizes some of these challenges well. The nature of disasters—impacting whole communities and every facet of a resident’s life—calls for an interdisciplinary approach to disaster response research. The study urges the use of “early reconnaissance” to collect data that enables interdisciplinary studies. From a

social science perspective, scholars used case studies and inductive reasoning to build working frameworks for EM research in a relatively short period of time. While some quantitative work has aided in understanding behaviors and decisions, the complexity of these events compels researchers to balance those efforts against qualitative work (NAS, 2006). Quantitative models are limited by the complex nature of disasters, which raises serious data reliability problems when examined closely. Inferences from these models are as limited as the data that inform them, which according to NAS is in relative disarray (Brady, Collier, & Seawright, 2010; NAS, 2006). Sea levels, infrastructure, and EM resources alone present measurement problems when drawing comparisons from one event to the next—not to mention changing constituent parts of a unit, novel disaster problems, and shifting public expectations.

As research continues to chip away at these epistemological problems, progress is possible using the existing literature to help organize analyses, and help researchers distinguish the many possible units of analysis available in a disaster response operations. This work may not answer the bigger questions stemming from complexity and EM, but it might help formulate important, interim questions, which would hopefully inform data collection in the future. Data gaps, and questions about how data could be structured or standardized, weigh heavily on this research program. Additionally, data archiving poses a persistent problem for researchers. Even when data is collected, sometimes access to it is not readily available. In fact, during the course of this research, the FEMA Lessons Learned Center, which houses many of the critical reports in this field, shut down for

weeks, before reappearing as part of the Naval Postgraduate School's database of reports and literature on Homeland Security (NAS, 2006).

Practitioners and victims will face even more complex challenges in the future, as economies become more interdependent, communities in vulnerable areas continue to swell, and public expectations increasingly call for effective government solutions in the face of the worst nature, and people, can inflict (Kettl, 2014). Many of these challenges are operational in nature, which is to say they are focused on procedures, interpretations, and structures. However, many of the most pressing research questions tie into changing expectations for disaster response. Researchers need to develop methods of analysis that could inform the public and system agents about the state of performance expectations or, at least, the prospect of managing them effectively. If expectations define what “success looks like,” learning will depend on common interpretations of success, in order to support the selection of the appropriate procedures and formation of effective structures in response to disasters.

CHAPTER THREE: RESEARCH DESIGN

The previous chapter surveyed the literature on learning, complex systems, and emergency management. Of the three, the learning literature enjoys the greater depth of scholarship. The literatures on complex systems and emergency management are continuing to organize and test new ideas. The challenge addressed in this chapter revolves around the effort to develop an analytical framework that effectively draws from all three and, in doing so, contributes to the process of organizing the field. The framework proposed here establishes a baseline for understanding learning in a complex system or, at least, one way learning might take place in a complex system. This field does not offer much by way of general analytic frameworks that enable a broad discussion on the topic of “learning in complex systems.” This chapter offers a strategy for addressing the ontological challenges littered across the EM literature. Definitions and concepts from that body of work are adopted and clarified in the subsequent pages.

The foundation established early in this chapter serves to anchor the research that follows. The data supporting this study is largely qualitative. There are three primary reasons for this. First, there are too few cases to adequately form a sample from which to generalize. Second, the character of the data available for this research are not quantitative. The interactions that occur in a disaster response network are unique to each

disaster; the tradeoff in aggregating those interactions would result in the loss of key distinctions that merit understanding. What's more, interactions do not share equal values, when trying to address questions that go beyond their occurrence. Finally, as this research program continues to develop, a qualitative approach allows this study to further refine concepts and phenomena associated with this growing field of study.

The observations of learning in complex systems are connected to a learning model that organizes the activities associated with organizational learning. In the absence of an established model for learning in complex systems, this study adopted, and adapted, that model for learning, which is generally used in traditional, hierarchical organizations. The model offers a clear conceptualization for how new knowledge, derived from experience, becomes institutionalized behavior. From the start, it was expected that the model would fall short in areas where complex systems diverge most from traditional organizations—most notably, the changing composition of individuals, agencies, or both. The learning model, however, offered two critical advantages in the analysis that follows. First, an initial study of the emergency management doctrine and training resources suggests strong undertones of hierarchical thinking in the most important prescriptions enshrined in policies and plans that frequently discuss “command-and-control.” Second, the model offers a starting point grounded in an existing body of scholarship. It was expected that explanatory gaps between the model and the cases would yield useful questions, which might someday inform future research.

Communities have become more complex since the days of Frederick Taylor. Future social and political problems will demand action from complex systems. A systems approach to public administration could help address some of the complexity taking shape around us. From autonomous vehicles to cybersecurity, the traditional delineations between government (state and federal), industry, and nonprofits will continue to blur as problems call for collective action from complex systems. Modern problems are so grand in scope and size that one public, or private, entity cannot solve them alone. These developments give merit to research that is dedicated to understanding complex systems in public administration. This research strives to contribute to the ongoing development of that understanding.

Learning Model

As the title suggests, the research behind this paper focuses on learning in complex systems, but what does it mean to say a system learns? A fairly straightforward concept at face value, learning is a dependent variable that requires careful attention when defining it at an organizational level. Learning is most understood in an anthropomorphic sense. An individual acquires new knowledge, internalizes it, and alters his or her behavior or choices accordingly. Collective learning occurs differently. Groups do not process collective thoughts that are shared seamlessly across an enterprise. Individuals do not act on the basis of a shared consciousness with other members in a group. Cognitive limitations force group members to recognize new knowledge, interpret that knowledge, and act on it based on distinct interpretations (Weick, Sutcliffe, &

Obstfeld, 2005). Without careful coordination, varying interpretations can lead to actions and decisions that stray far from the intent of lesson learned.

Scholars have developed a number of models to detail the process of organizational learning. The last chapter covered a few of them. This inquiry adapts one of those models to produce a general understanding of the journey new knowledge undertakes. The learning literature itself would acknowledge that a neat, linear process acts only as a representation of many processes that enable organizational learning (Mahler J. G., 2009). This process, therefore, is a broad generalization. Within it are processes that merit their own research and, indeed, scholars have dedicated years and books to each phase accordingly. For our purposes, the learning process offers guideposts that allows us to operationalize the chronological journey of new knowledge. The model adopted in this chapter is more than a conceptualization of the learning process; it also served as the framework for inquiry. Each phase in the learning model that follows guided data collection and analysis to ensure the work remained focused.

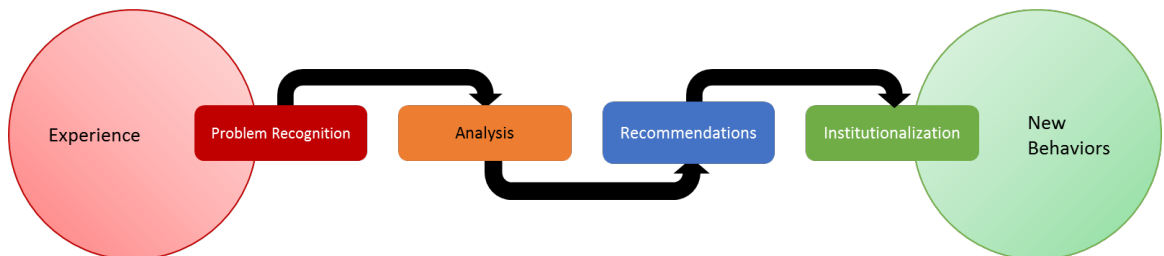


Figure 1 The Learning Process

The model assumes learning occurs using a rational-analytic approach, where network stakeholders survey disaster response operations, isolate problems, and arrive at recommendations for improvement vis-à-vis analysis and inference (Mahler J. , 1997). Discussed in detail in Chapter 2, the phases operationalized in Figure 1 (above) borrow heavily from Huber and Mahler (Huber, 1991; Mahler J. G., 2009):

1. **Problem recognition:** In this phase, network stakeholders review the results of response operations and seek out performance areas that need improvement. These are called problems. How problems are recognized and what questions they generate are critical. Misdiagnosis can be the foundation for future failure, as is any failure to recognize problems clearly. This inquiry makes the distinction between operational problems and outcome problems, which are explained further shortly.
2. **Analysis:** This second phase describes the collection of data and the narratives reviewed in order to answer questions generated during problem recognition. Mahler describes this phase as analysis and inference, where one assesses the gap between performance and expectations (Mahler J. G., 2009). The challenge for a complex system, in this regard, lies in the plethora of diverse—sometimes competing—expectations across the network (Kettl, 2014). In this research, this phase describes the process of reviewing events by collecting data on the problems recognized during problem recognition.
3. **Recommendations:** The third phase of the process is where courses of action are developed to improve operations. These recommendations describe how problems

unfolded and direct changes to prevent problems from reoccurring. Changes to the structure of the network, the sequence of communication, and the distribution of decision rights are typical examples of the areas where recommendations tend to focus.

4. **Institutionalization:** This phase describes the process by which recommendations alter institutions within the system. Institutions can be formal, or clearly-outlined rules and plans, or they can be informal, which may include new professional norms (North, 1990; Mahler J. G., 2009). As Simon observed, the “memory of organizations is stored in human heads” (Simon, 1991). Disaster response networks pose especially difficult problems, because the human heads change with attrition and each event. How the system accepts or rejects recommendations will inform the learning observations made in this phase of the process.

Of these four processes, problem recognition poses the most interesting challenges. Misdiagnosis can lead to continued failure, as previously mentioned, but for complex systems, problems also vary at each level of the system. For example, operational problems, in this research, refers to the gap between expectations and reality in the conduct of disaster response operations. The inability to evacuate neighborhoods on time, completely, or both is an operational problem. Outcome problems are the problems that result from an operational problem. In keeping with the example, these are the problems manifested when individuals that didn’t evacuate are left without electricity

and food supplies. The problem, ostensibly, in this example is that victims failed to evacuate, but let us consider that proposition for a moment. There is no guarantee that food and power will be available at the destination of their choice after evacuating. So, was evacuation the problem or was it the absence of electricity and water? This research will not attempt to prescribe which problem merits EM professionals' attention more. Rather, it discusses it to clarify the focus and purpose of this effort. This research is focuses on operational problems, because these are the problems that most closely align to the learning model. Operational plans, which result from learning, are the behaviors and decisions prescribed through a process that starts with experience and ends with institutionalization.

The distinction between problems is but one of several intellectual rabbit holes that litter the pathway to this inquiry's primary goals. In examining the learning process, researchers can be tempted to address problems related to disaster response operations. Doing so should be limited to the context of this process. Without clear limits, it is difficult to ignore operational failures that beg for critique and analysis. Furthermore, the breadth of unexplored scholarship in this field can leave a researcher lost in the proverbial woods. Future researchers should consider this chapter a map that helps one navigate into and out of those woods. Like many early maps, precision will take time. Occasionally, it makes sense to point out alternative paths, but they were left to other exploratory efforts, so this one could sustain a clear focus.

All learning analyzed in this study is assumed to be vicarious. The practical effect of this assumption is that evidence of learning doesn't end with changes to standard operating procedures and operational plans. Rather, the comparative analysis in Chapter 7 will seek to observe learning in the experiences of subsequent cases to determine if future experiences played out as intended. This means that disaster responders must understand and internalize the lessons and recommendations borne out of others' experience and execute accordingly (Huber, 1991; Mahler J. G., 2009). This means that this paper recognizes learning as having taken place, when lesson learned become standard, executed practices in subsequent cases. This intercrisis view of learning from disaster to disaster, not within a disaster, offers researchers opportunities to observe how network members learn, or fail to learn, from the experiences of their predecessors in other events (Moynihan, 2008).

Data Collection

Despite the wealth of data available, EM, as an academic discipline, remains a relatively disorganized field for scholarly inquiry. Since disaster response networks can encompass so many professional disciplines, the data is unstructured in its format and substance. To understand learning processes in this field, two dominant data sets are available. The first is a splintering of reports assessing disaster response operations and focused on specialized, or emergency, support functions. The second comes in the form of after action studies conducted to assess overall response performance.

Selecting one over the other effectively establishes the level of analysis for this inquiry. A functional perspective offers a narrow, albeit important, view of the progression of specialized knowledge from experience to institutionalization. After action reviews and discussions provide a more comprehensive perspective of response operations. While after action reports have also assessed functional performance, I focus on those assessing a response at the network level—encompassing the response across the system. Navigating the system calls for a workable framework that distinguishes units of analysis up-and-down the network and across it. To that end, this research applies Perrow’s framework as follows:

Table 1 Disaster response network systems framework

Levels of analysis	Corresponding agents
System	Disaster response networks, telecommunications networks, transportation networks
Subsystem	Federal government, state governments, local governments, and the private sector
Units	Branches of government, departments (federal and state), national non-profit entities (e.g. the American Red Cross), and corporations
Parts	Government agencies (federal and state), municipal agencies, local non-profit entities (e.g. local churches), and local businesses

Each unit of analysis represents a richness in diversity of terms and the procedures, interpretations, and structures unique to them. The diversity of data sets and measures possible from each of the corresponding agents pose steep challenges to validity (King, Keohane, & Verba, 1994). For example, comparing the response time of a

first responder in New York City versus the same performance metric in Slidell, Louisiana, is fraught with problems.

While time is the same in New York City and Slidell, transportation networks in those regions are not. Traffic density and geographic features also vary and can affect response times, and finally, but not certainly least, New York City's public services dwarf Slidell's by several orders of magnitude. Proxy metrics derived from calculations tied to properties of these variables as yet do not exist, as they do for abstract social science concepts. For example, Putnam famously used membership and participation rates within civic groups to gauge the presence (or lack thereof) of social capital (Putnam, 2000). Scholars have not arrived at this development within this field. Another consideration is the sheer size difference. The New York Police Department is significantly larger than its New Orleans counterpart. For this reason, and several others, I limit my comparative efforts to the interactions by both departments with other agents. Put another way, this inquiry is more interested in how local law enforcement interacted with other networks members than how many officers supported the response. To that end, the analysis that follows will continue organizing the data on interactions into three categories: procedures, interpretations, or structures. Interactions take place when agents initiate actions in response to other agents or the operating environment.

Table 2 System interaction types

Interaction types	Description
Procedures	The sequence of pre-defined decisions or actions prescribed for operations (e.g. standard operating procedures)

Interpretations	Interactions based on values and norms that prioritize procedures or determine operational structures. Operational priorities are, therefore, byproducts of interpretations.
Structures	The division of roles and responsibilities, either operationally or by expertise. (e.g. the ESF)

Finally, I'll address the problem of diversity for terms and concepts in the EM field. A 98-page lexical guide of definitions and terms, available on the FEMA training site, offers strong evidence of the progress required to standardize concepts and terms in EM. There are more than 70 definitions for disaster listed in the FEMA lexical training manual, maintained by the Emergency Management Institute (Blanchard W. , 2006). It will be up to qualitative researchers to develop the typologies and taxonomies that reconcile diverging perspectives and overlapping conceptualizations. Any hope of shared understanding of how the learning process works in these systems rests on the development of a body of knowledge that is sufficiently specific to be useful, but generalizable enough for broad application across the network's diverse agents. This balancing act will be among the chief methodological objectives of this research. As critical terms come along, this paper will endeavor to clarify how the reader should understand that term.

The data supporting this comes from diverse sources. The bulk of the data supporting the cases from after action reports produced at the Federal level, though each report includes significant interview data collected from state and local officials. The choice to use Federal reports alone is not meant to discount reports produced by state

governments or non-governmental organizations. Many of these reports rival, if not exceed, the efforts of the federal government. However, my focus on the learning process at the network levels requires learning artifacts at that level. The second source of data came from elite interviews, testimony, and public statements.

The historical record of after action reports offer rich sources of data and evidence. These reports are not only significant for data, they are themselves instruments of network learning. How they were constructed is as important to this research as what they say. Problem recognition takes place when researchers conducting these after action reviews identify notable gaps between performance and expectations. How those researchers collected data, organized it, and developed strategies to close performance gaps is the result of analysis. The recommendations in those reports, just as the recommendations phase would suggest, offered courses of action to implement those strategies. Finally, when recommendations take the form of altered operational plans, new professional norms, or reprioritized policies, lessons learned become part of institutional memory. Evidence that these changes altered subsequent decisions and behaviors suggests that learning took place. The case comparison approach, described next, will offer some insight on the effectiveness of this process at the system level.

These phases of the learning process guided the questions asked during interviews. The researchers that conducted these after action reviews were generally experts in their field, and they were charged by Congress or the President to conduct their

reviews. Problem recognition and analysis were of keen interest during the interviews, because interviewees held the most sway over those phases of the process. Observations on recommendations and institutionalization were generally drawn from the historical records, but interviews were critical for the earlier cases, when digital records and audio recording were scarce. Figure 3.4 outlines the data sources supporting this inquiry.

Table 3 Data sources

Data sources	Description
After Action Reports	Comprehensive reports assessing disaster response operations from a Federal perspective
Congressional testimony/reports	Hearings, written statements, and congressional reports on each of the response operations examined, especially by the General Accountability Office, the Congressional Research Service, and the Congressional Budget Office
State and local officials (indirectly)	Interviews with these officials are key sources of information for the after action reports analyzed in this research
Interviews	Interviews with members of research team, or their leaders, that produced the after action reports
Recorded news interviews and statements	Audio and video files of statements, press conferences, and news interviews by congressional and FEMA leaders
Meeting minutes and transcriptions	FEMA-sponsored lessons learned meetings and after action discussions (e.g. FEMA Think Tank Conference Calls)

While efforts have been made to perform quantitative analyses of complex systems, the available data does not favor this approach, in this instance. The character of the data supporting this research offer fertile grounds for thick descriptions (Geertz, 1973). The documents of interest to this study take a comprehensive view of disaster response network operations, which include a diverse array of interactions and relationships across the network of responders. This research attempts to catalog those

interactions and identify the commonalities that can be operationalized in support of theory building.

To close this discussion on data, a final explanation is necessary to address the data collected from the comprehensive after action reports analyzed for this study. Risks of confusion and disorganization do not end with the diversity of terms and concepts within the EM literature. In addition, we will have to navigate analyses that focus on units, then switch to subsystems with little by way of a transition or an explanation of the interactions assigned to the unit by the subsystem. For example, the NRF, its ESF's, the NIMS, and the National Emergency Communications Plan, create structures that overlap and interconnect. However, when assessing response performance, the reports concentrate on FEMA's failings when referencing those plans. Less frequently, after action reviews call out shortcomings at the level of units and parts within the NRF structure. However, these are frequently attributed to resource shortfalls or underdeveloped capacities, which are in contrast to problems at FEMA that are largely attributed to suboptimal procedures and structures.

Case selection

Disaster response operations vary from event to event and hazard to hazard. To the extent possible, this analysis controls for those variations by selecting the hazard of hurricanes for case comparison. As a reminder, hazards are a natural or contrived event that leads to disasters—or how hazards interact with their afflicted environments

(McEntire, 2006). Certainly, there are similarities in terms of the type of destruction common to a type of hazard, but the results will vary based on where the event occurred, when it took place, and who responded (and how well they prepared).

Hurricanes offered an attractive option for investigation for three reasons. First, hurricanes usually strike in the same general places. Other disasters are not as consistent; in terms of their scope, scale, or geography; to offer cases that are as effective for comparison. A tornado on the rural plains of Nebraska will create different effects from a tornado plowing through a small city in Missouri. This means lessons to be learned will also vary. Communities that are vulnerable to hurricanes share many similarities, and the frequency of these storms lends itself well to the question of learning. Hurricanes are big enough to effect high density and low-density population centers at the same time. So, there are fewer dissimilar effects from one case to the next, unlike a tornado or an earthquake. Responders in hurricane-prone states have several opportunities to gain experience annually, as the Atlantic Storm Season consistently produces storms that threaten these places.

The second reason to use hurricanes stems from the abundance of data available for analysis. Major hurricanes have been the most catastrophic in America's history of disasters. Records on weather events are thorough and go back many decades. The analysis of these storms, therefore, uses methods that have evolved over an equal amount of time. The benefit for this inquiry being that variations in weather data collection and

analysis methods would be less likely to influence disaster response planning, though it should be acknowledged such variations have occurred.

The cases selected for this study were Hurricanes Andrew, Katrina, and Sandy; making landfall in Florida, Louisiana, and New Jersey respectively. Each of these storms caused severe damage, affected high- and low-density populations, and required a significant Federal response. Stretching from 1992, when Andrew made landfall in Dade County, Florida, to 2012, when Sandy slammed into southern New Jersey, major Atlantic storms have caused well over \$300 billion in damage in the United States (Blake & Gibney, THE DEADLIEST, COSTLIEST, AND MOST INTENSE UNITED STATES TROPICAL CYCLONES FROM 1851 TO 2010 (AND OTHER FREQUENTLY REQUESTED HURRICANE FACTS), 2011). In each case, personnel and resources were overwhelmed and, in each, response operations were criticized to the point of creating significant change. In this study, we'll look at those changes through the lens of the learning model.

Hurricanes Andrew (1992), Katrina (2005), and Sandy (2012) left indelible marks on the areas they affected, and they also changed disaster response operations. There are three reasons for beginning with Hurricane Andrew, which landed in Florida in 1992. First, Andrew served as a catalyst for greater formalization of response plans, driving the creation of the FRP of 1992. Prior to Andrew, what we recognize as disaster response capabilities were primarily dedicated to civil defense during the Cold War (Butler, 2012).

Second, the early 1990s ushered in new technologies that expanded the capacity to produce communication, disseminate it, and consume information. Succinctly put, Andrew arrived at the early stages of the information age. This creates a more consistent backdrop of capabilities related to management and coordination, which would indeed struggle without interoperability. Third, mass media changed in the early 1990s. Coinciding with the emerging information age, the 24-hour news cycle began transmitting moment-to-moment footage of the destruction and suffering wrought by disaster. For these reasons, the first case selected was Hurricane Andrew.

Hurricane Katrina shook American confidence in government. The images of desperation in a major U.S. city seemed implausible for the world's most "developed country." In 2005, fresh EM reforms, primarily driven by counterterrorism efforts in the wake of 9/11, failed in breathtaking fashion on national television. Since Hurricane Andrew, the FRP had morphed into the NRP. Lessons learned played a pivotal role in this evolution, yet challenges persisted and the new plan proved inadequate for the necessary Katrina response. Shortly after landfall, the Mayor of New Orleans had to use media outlets to communicate with key disaster response network members (Kettl, System under Stress, 2014). Only 22 years earlier, the Florida Key founds themselves in a similar situation after Andrew. Where did the process come short of realizing the lessons of Andrew? Choosing Katrina as one of the cases opens the potential for insight from documents and emergency managers regarding these questions.

The Northeast United States is the most populous geographic region in the country. When Hurricane Sandy made landfall in 2012, cities from Boston to Philadelphia felt weather effects more commonly observed in subtropical climates. By this time, the NRP became the NRF, and the NIMS had grown in scope and size. Given the lessons learned from Katrina, FEMA even introduced a National Emergency Communications Plan in 2008—another set of procedures and structures left to system-wide interpretation. While Sandy’s network lacked the experience of Andrew’s and Katrina’s, since hurricanes hit the northeastern United States only occasionally, it did have the recent memory of Katrina on its side. The utility of this fact, for comparative purposes, is that it offers some insight about the value of recent memory versus distant vicarious experiences. Much of the network for Katrina, also responded to Sandy—at least, at the federal level. Almost assuredly, many network actors experienced both. The learning literature would suggest their experience should have led to improvements. In many cases, that was true. In others, it was not, according to the case comparisons.

Theoretical framework

A complex adaptive systems lens offers the simplest, most effective lens for the description of a disaster response network. Relationships and interactions, as they are understood, in traditional models of organization do not account for uncertainty. This is largely due to the fact that most organizations work hard to eliminate uncertainty. While the same is true for disaster response networks, it is also an accepted character of their

operating environment. In a complex system, interactions among constituent members are not usually repeatable (Comfort, 1994; Kapucu, 2009).

Briefly recapping Chapter 2, the interactions a system is complex interactions have many possible outcomes (Axelrod & Cohen, 2000). This degree of unpredictability poses serious problems for practitioners and theorists. How does one develop standard operating procedures for non-standard events? How does a theorist generalize inferences about novel phenomena? How can we observe learning?

When disasters strike, elected leaders and EM practitioners pursue improvements in response operations. Unlike an engineering process, akin to resolving mechanical problems with a rocket, and unlike static networks, where interactions can be prescribed and executed with relative certainty; disaster response operations depend processes that work in the realm of probability. That is to say, we know hurricanes lead to high winds, high winds increase the probability of damage to electric infrastructure; therefore, the network will prepare a response for damaged power infrastructure. However, while it is highly probable this response will be necessary, the network cannot know in advance when it can execute, or if another problem will supplant the urgency of a power loss. Do roads need to be cleared first? Does search and rescue need to occur first, or does search and rescue depend—to some degree—on power restoration? Add to these considerations more subtle challenges. Where should the network restore power first? How will it appear if suburban areas are restored before urban centers, or vice versa? What if restoration of

power to suburban areas is more viable than it is to the center of a city, but elder care centers, which include life-sustaining machines, in the city center must have power as soon as possible? In short, complexity makes the selection of procedures and structures a non-trivial decision, and it increases the risks posed by faulty interpretations.

In a sense, we should expect to observe a type of learning that helps a disaster response network's ability to recognize multiple problems, stemming from one situation, and weigh solutions that account for both practical and moral priorities. Moynihan would describe this type of learning as “cybernetic,” since it produces standard operating procedures that create feedback loops that would, in essence, enable intracrisis learning—allowing network leaders to weigh considerations within accepted strategies of prioritization (Moynihan, 2008).

What we can expect, and what we will observe, however, will not align always. This research uses a complex systems framework because the selection of strategies will vary with circumstances. The diversity of agents within the system also merit recognition; so, a complex systems approach aids in that endeavor. Complexity explains two types of variation across all three types of interactions. The first refers to the selection of available strategies—the type and sequence of procedures applied, and the structures adopted. The second type of observable variations are the changes in the available strategies—whether strategies follow plans, evolve from plans, or must be improvised entirely (Axelrod & Cohen, 2000).

Finally, it is important to be clear about the distinction between Kapucu's treatment of a system and Perrow's. The former characterizes how agents adapt interaction through strategy selection (Kapucu, *Interorganizational Coordination in Complex Environments of Disasters: The Evolution of Intergovernmental Disaster Response Systems*, 2009). The latter is composed of units and subsystems that are not necessarily adapting to circumstances or an environment. Rather, they are used here to organize the system and its constituent parts by enabling a clearer discussion of agents and their interactions. Essentially, this paper fuses Perrow's framework onto Kapucu's operating environment, where agent interactions adapt to environmental circumstances. This is in contrast to a breakdown or miscalculation that occurs in pre-defined interactions between any given part, unit, or subsystem in a tightly-coupled system.

Chapter Summary

This chapter outlined the foundations upon which this research is built. Hopefully, it accomplished two goals. First, it should have developed an effective strategy for analysis of complex systems, insofar as it provided a framework that could support the application of an existing theoretical model for learning. Second, the chapter explained how observations would be made, cataloged, and operationalized for analysis. Achieving this second goal was important to following an intercrisis perspective of learning.

This chapter closes by outlining the outcomes pursued in using this strategy and detailing the working hypotheses going into this research. Above all, as introduced in Chapter 1, this work strives to address the research question:

Do disaster response networks learn?

The only consistency from one after action report to the next after action report over, nearly 20 years, is the presence of “lessons learned.” From Andrew to Sandy, different Presidential Administrations, Congresses, and practitioners have characterized lessons learned differently from one disaster to the next, and recurring problems persist. As the role of government continues to expand, we are compelled to understand these failures, but just as importantly, we need to understand how we define failure, how we learn.

At the outset, it is worth mentioning the expectations, which are largely informed from the literature and the researcher’s direct experience working in government. Articulating them here serves two purposes. First, they give us testable precepts that help impose a degree of discipline on the research that follows. Second, the hypotheses that follow offer a glimpse into the amount of bias going into this study, expressed in the expectations held at the beginning of this journey.

First, it is likely that emergency responders continue to develop their skills and competencies between each disaster event. As mentioned earlier, communities of practice

form around functional areas of response operations. Some are more formal and sustaining than others, such as firefighter associations versus food provision services.

Regardless, this research expects that:

H1: Learning challenges predominantly affect the system more than they affect an EM organization, or individual function, within the network. The learning challenge is isolated to network coordination and management. EM professionals continue to develop skills without major disasters, but these events highlight network deficiencies in the application of these EM functions (Birkland, 1997).

The narratives that follow major catastrophes suggest that coordination problems persist. The question is “why”? A hint lies, perhaps, in the sheer number of plans, programs, and systems EM professionals contend with to execute their mission. Numerous emergency support functions (ESF) represent more than one culture, language, and discipline. Indeed, each ESF can easily include a half-dozen agencies, each marshalling professionals with cognitive processes that vary dramatically from one another. This challenge leads to the second hypothesis.

H2: Members of disaster response networks will interpret lesson learned in varied ways, and this translates into uneven—or inconsistent—actions.

Taking a system-level perspective for this study foregoes a considerable amount of rich data, and potential observations that occur at the more granular levels of the

system. However, the expectation behind H2 is that confusion is the result of, or in large part the result of, diverging interpretations of plans and procedures.

This design is ambitious because the substance in question is broad. It relies significantly on the after action reports produced following each case, and in doing so, it overlooks critical data sources. These include the professional communities of practice, which codify lessons learned into new professional competencies over time (Wenger, McDermott, & Snyder, 2002), and the after action reports with perspectives below the subsystem level. A second risk accepted through this research design stems from the broad brush strokes necessary to execute it. Doing so risks overlooking key information-processing structures within the system, which may allow or inhibit the free flow of information needed to overcome operational challenges. Tackling this problem set, using this method, also assumes that learning processes consistently occur in chronological, sequential order. By making the evidence fit into the model, there is a risk of missing new insights on the dynamics of learning in complex systems.

However, we have to start somewhere. The after action reviews, and associated dialogues, offer evidence of an ad hoc organization trying to emulate a more traditional, static organization. They do not offer a systematic approach to learning at the intercrisis level—meaning that studies of response performance are conducted differently from one event to the next. They share no continuity. This leaves researchers with the task of connecting dots. These reasons were used to justify the analytical tradeoffs made, but it is the researcher's hope that such tradeoffs enable future research that fill those gaps.

The contributions, hopefully, from this work will be twofold. First, this design will test the utility of the learning model in complex systems. Second, it identifies and organizes evidence of learning and catalogs it for future studies. To that end, the chapters that follow summarize findings in each case by organizing them into the framework adopted here. At the conclusion of Chapter 4, 5, and 6; Chapter 7 will endeavor to organize key observations in terms of problems recognized, which unit of analysis most owns the recognized problem, and what recommendations are made to learn from problems.

The traditional learning model was built for organizations and networks that operate with relative certainty. Personnel attrition represents the biggest threat to learning, as individuals with deep institutional knowledge leave. Complex systems face the added challenge of uncertainty within their operating environments, and even those with deep institutional knowledge can be inexperienced in the face of novel events. Plans and procedures, which normally serve as elements of organizational memory, may be useless in the face of unforeseen challenges. Moreover, the diversity of organizations that depend on these plans may formulate interpretations of them that vary from the motivations that created them initially.

However, as societies become more complex and economies grow more interdependent, problems will grow beyond the capabilities of any one bureaucracy or

even government. Mass migration, driven by climate change, will require the full breadth of international cooperation possible. Transnational terrorist threats already demand levels of cooperation and information-sharing—sometimes among adversaries—previously unheard of among law enforcement agencies, immigration bureaus, and clandestine services. Developing a stronger understanding of how performance could improve can prepare public administration scholars for future research on complex systems, which will be required for addressing emerging problems. Lastly, the use of complexity theory in public administration remains underdeveloped. If this research can move the proverbial football forward on that application of complexity in government, modest progress will be well worth the effort.

CHAPTER FOUR: A QUIET HURRICANE SEASON

A noted atmospheric scientist predicted a mild hurricane season for Florida in early June 1992. Climate conditions around North America that summer suggested poor conditions for organized storms forming in the Atlantic. The National Hurricane Center reported only six tropical storms formed for the season and, of the six, only four became hurricanes. This was notably below the 50-year average for storm formations in the Atlantic up to that time (Mayfield, Avila, & Rappaport, 1994). It turned out to be a quiet season, but it was not uneventful.

A tropical depression formed in the Atlantic during the early hours of August 16, 1992. The storm boasted a mere 35 mph of sustained winds nearly 1,500 miles east off the Lesser Antilles. As they did every year, storms formed in the Atlantic, and Floridians took modest note of the event. About 24 hours later, the depression intensified only marginally, but it was enough for an upgrade. Hurricane Andrew became the first named storm of the 1992 Atlantic Hurricane Season. The National Hurricane Center bulletins would describe a storm fluctuating in strength over the next three days; sustained maximum strength winds hovered near 50 mph. By the morning of August 21, 1992, the opening line of the NHC bulletin read (National Weather Service, 1992):

“Andrew becoming better organized”

The National Weather Service (NWS) would issue a hurricane watch for the Bahamas the following morning, August 22. A hurricane watch would come into effect about five hours later covering broad swaths of Florida's east coast. Maximum sustained winds doubled to 100 mph from the previous day. In the early hours of August 23, the NWS was preparing to announce a hurricane warning for Southeast Florida. Among those who would eventually evacuate Broward and Dade Counties, 10 percent of them had left on the 22nd. Only another 5 percent of eventual evacuees would follow by the morning of the 23rd. By that evening, 90 percent of Broward and Dade Counties' evacuees left their homes fleeing Andrew's maximum sustained winds of 150 mph and a storm surge projected to rise up to 14 feet "above normal tides" (Post, Buckley, Schuh & Jernigan, Inc, 1993). The Miami-Dade Metropolitan area was estimated to have more than 2 million residents in the summer of 1992 (US Bureau of the Census, 1995); the size and scope of the evacuation was considerable. For residents accustomed to severe tropical weather, it was evidence of a real sense of concern for the "dangerous category four hurricane" (National Weather Service, 1992).

At 5 a.m., on August 24, the NWS released another hurricane advisory. It started: "Andrew ashore near Homestead Florida..." (National Weather Service, 1992). Andrew crossed through the lower end of the Florida Peninsula, ravaging the Homestead area and the sparsely-populated Florida Everglades. It missed a direct hit on the heavily-populated areas of Miami and Fort Lauderdale to the North. In four short hours, the storm arrived at the Gulf of Mexico. Nearly every major after action report and discussion agreed that a

more northerly pathway across the state would have increased the devastation dramatically. As it was, authorities recorded a storm tide of 16.9 feet in the area of Biscayne Bay (Rappaport & Sheets, 1993).² Sustained winds ranged from 131 to 155 mph, according to a variety of assessments. Within four hours, Andrew left 160,000 residents homeless, destroyed or damaged 86,000 businesses, and destroyed roughly 28,000 homes (FEMA, 1992). Reports estimated total damage from the storm would come to \$20 to \$25 billion—the largest disaster in American history to date (Post, Buckley, Schuh & Jernigan, Inc, 1993; National Oceanic and Atmospheric Administration, 1993).

Miami and Fort Lauderdale had dodged another bullet but, the country, the government had to process a striking wake-up call. At the time that Andrew was bearing down on Florida, a major storm had not hit Miami directly in 42 years (Reuters, 1992). That streak would continue to this day, but the quiet hurricane season would leave its mark on the United States and its approach to emergency response operations. For decades, civil defense—the precursor to emergency management—existed to prepare for nuclear war, and all the trappings of the ensuing so-called nuclear winter. Andrew would serve as the catalyst that changed the complexion of emergency management thereafter. By the end of the 1992 Hurricane Season, the storm would be the only major storm to have developed in the Atlantic that year. However, the compact, Category 5 storm left its indelible mark on South Florida and all disaster response operations.

² A storm tide is the sum of the storm surge and the astronomical tide.

News reports on August 25 illustrated the devastation. Thousands of homes were left in tatters, powerlines were down across the region, and the Florida Keys had lost contact with the mainland United States (Castaneda & Kanamine, 1992). The timing in Monroe County, home to the Keys, could not have been worse. Authorities in Monroe County were left to contend for the safety of roughly 80,000 residents and an estimated 20,000 visitors. The latter were enjoying one of the last weekends before the beginning of the school year. North of the Keys, but south of Miami, Homestead bore the brunt of the storm (103rd Congress, 1993). In the heart of Dade County, Homestead's electrical power grid was wiped out. Homestead Air Force Base, once home to 4,400 active-duty military personnel was leveled. Andrew tossed military planes, weighing several tons, across the installation with ease. The flight control tower, hangars, administrative buildings, and base housing were gone. As if Andrew itself wasn't devastating enough to the local economy, the Department of Defense would go on to close the base within the year, rather than restoring it. The decision effectively pulled \$480 million annually from the local economy (Clary, 1993). Today, Homestead Air Force Base is used by reserve units, a former shadow of itself. The area around the base looks incomplete, as if someone arbitrarily tore down local businesses and homes overnight and left the rest in a 1992 time warp.

Local authorities would go on to testify that wind, not rain or storm surges, took the worst toll on the region (103rd Congress, 1993). Additionally, several reports published in the weeks to follow accused home construction companies of shoddy

building standards, reinforced by equally sloppy building code enforcement; many saying that construction built to standard might have prevented much of the structural devastation left behind (Getter, 1992). Despite the price tag and life-altering damage, however, the death toll in Florida came to 15 caused directly by the storm; another 29 resulted indirectly from Andrew's wrath (National Oceanic and Atmospheric Administration, 1993).

During the recovery period, FEMA would contend with problems, complaints, fraud, and successes for years to come. Overall, South Florida bounced back. Homestead was never the same again. Andrew itself reinvigorated in the Gulf and would go on to make landfall again in Louisiana. It would inflict another \$1 billion in damage and claim another 17 lives, directly and indirectly (National Oceanic and Atmospheric Administration, 1993).

The sources of information about Andrew's devastation are diverse and, in some cases, present some varied findings. However, one area of consensus is clear in all of them. Response operations underperformed. FEMA, the National Oceanographic and Atmospheric Administration (NOAA), the Department of Defense (DOD), the Congressional Record, and others provided vivid, and varied, accounts of the events surrounding Andrew's wrath. All agreed the overall response needed improvement and generated recommendations from lessons learned.

It is also likely the media shaped the conversations surrounding disaster response operations, if only because of all the conclusions arrived at before formal learning started. While it is certain that some constituents communicated directly with government officials, it is equally likely the earliest perceptions of the disaster's response operations took shape in the national press. Within days of Andrew's landfall, several prominent news outlets made note of the disorder associated with the response. Within weeks, the ire of Congress called for comprehensive assessments to define the problems associated with the response.

On August 25, 1992, President George H. W. Bush was on scene to tour the area and, in addressing the public, he declared that he would order federal troops into South Florida, if the state requested the help (Hunt, 1992). The next day, August 26, the President announced the creation of a "high-level" task force of 27 federal agencies—operating out of Washington, D.C.—that would tackle the challenges emerging in Andrew's immediate aftermath (Bush, 1992). By August 27, Transportation Secretary Andrew Card was touring the devastation as head of the President's task force. Card eventually set up task force operations in Miami, alongside that of the Federal Coordination Officer's, who was responsible for overseeing the network response per the Federal Response Plan (FRP). Their coexistence became the incarnation of the network's dysfunction (McDonnell, 1993; Rubin, Hurricane Andrew Response, 2018). The President's efforts notwithstanding, reports of disorder and despair in the affected region grew louder.

Only hours after the President's tour of the region, stories of the collapse of order started to spread. One report told of a police officer telling an armed local business owner to prepare to defend their property (Manegold, 1992). Volunteers were acting without direction and providing basic needs on their own initiative, unaware of when relief would come or who would need limited resources the most (Lippman, 1992). The scene portrayed in the press painted a picture of a government overwhelmed by events and, as people sought shelter and food, the President's efforts appeared removed from conditions on the ground. While it is not the goal of this research to evaluate the President's decisions, it is, however, necessary for this inquiry to understand how problem recognition took place. The perception of a federal government detached from the aftermath's realities would become theme.

In the early days of the response, the press had acknowledged the dedicated work of disaster response network members, but also made critical observations of the FRP's effectiveness. First published in 1992, the FRP "describes the mechanism and structure by which the Federal Government mobilizes resources and conducts activities to address the consequences of any major disaster or emergency..." It served as an interagency agreement among 26 federal agencies and the American Red Cross that allocated duties, resources, and decision rights for operations under the purview of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (FEMA, 1999; GAO, 1993). The FRP was developed in reaction to shortcomings of the 1989 Hurricane Hugo response. Until

Andrew, Hugo was—at the time—the costliest storm in U.S. history. The Category 4 hurricane ravaged the Caribbean before making landfall in South Carolina on September 22, 1989. The NWS estimates Hugo caused 86 fatalities and somewhere between \$8 and \$10 billion in damage (National Weather Service, 2014).

In large sense then, the FRP itself was borne out of a lesson learned, or problems recognized, during the Hugo. The 1989 storm exposed the limitations of plans developed for civil defense that focused interagency coordination and diverse capabilities, personnel, and mission objectives on Cold War contingencies. Andrew tested the early attempts at improvements, which refocused efforts on natural hazards, on the heels of Hugo and, in doing so, it demonstrated how much further we needed to go, suggesting four possible issues:

1. The FRP did not fully address problems recognized in Hugo's response.
2. Responders did not effectively implement the FRP.
3. Problems with Hugo's response went undiscovered; therefore, the FRP failed to address them.
4. Hugo's solutions were inadequate in addressing problems unique to the circumstances surrounding Andrew.

Two comprehensive efforts were launched in response. Their intent was to understand the issues with the FRP and the overall response. This chapter summarizes both of them, using the strategy outlined in the previous chapter. Notably, the teams that

conducted both reviews worked independently of each other, and they managed to arrive at several similar conclusions (Kliman, 2018; Gordon-England J. , 2018). The organizations that studied the Andrew response and produced network-level analyses of the response were:

1. The U.S. General Accounting Office (today known as the Government Accountability Office or GAO)
2. The National Academy of Public Administration (NAPA)

As chance would have it, FEMA's Office of the Inspector General (OIG) was conducting a review of the agency's overall performance in response operations, and it was about to publish that review as Andrew devastated Florida and Louisiana. The OIG published their report on September 14, 1992. Coinciding with Andrew magnified the effort's findings and exposed the need for an even greater investment in leaning. The experience of Andrew still ongoing, the report would portend what was to come in arguing for clearer "operational command and control relationships between FEMA and various levels of government." In part, the cause of poor clarity was the existence of varying response plans. However, most of the report focuses on challenges internal to FEMA (Miller, 1992). Challenges that impacted the network's ability to perform as expected.

The OIG report previews some of the problems recognized in the subsequent after action reviews. Barely a dozen years since its founding, and two years since Hugo,

FEMA was still maturing as an organization, and the OIG was aware of internal issues that were threats to external operations. The researchers organized these issues into two categories (Miller, 1992):

1. Response planning for domestic and national security events
2. The Federal Response Plan

Notably, these categories, at the time, represented distinct lines of effort within FEMA. The distinction was significant, as the evidence shows, because funding and authorities remained siloed within constituent parts of the agency. When formed, the predecessor organizations that would become FEMA retained their independent authorities and funding streams (Rubin, Hurricane Andrew Response, 2018; Sylves, 2006). For example, FEMA's civil defense mission had the authority to deploy, or pre-position, response assets without a governor's request. FEMA's natural disaster operations were unable to leverage those resources due to statutory constraints (Kliman, 2018).

The OIG report was not an after action report, but it is evident that writers amended the final draft to recognize the work needed to understand the failures of Andrew. The significance of its contribution to the learning process is twofold. First, it offers researchers evidence that FEMA was cognizant of problems connected to response operations prior to Andrew. The question of roles and responsibilities already under scrutiny. Second, it offers a glimpse into the early evolution of today's emergency

response plans. For example, the OIG report asserts that the FRP was originally drafted to organize operations in response to “catastrophic earthquakes.” This evolution of plans offers some insight into how problems are understood—suggesting that terms and standard operating procedures are adapted from old problems to address new ones.

The OIG report uses data collected from interviews and past reports produced by the same office. In light of the publication date, we can infer that few, if any, interviews included responders or stakeholders from the Andrew experience. Annotations on the report suggest it also informed the NAPA report that was conducted in response to Andrew. The OIG report recommended a follow-up report, conducted by FEMA, to address the Andrew response. Based on the timing and the evidence, it appears that the NAPA report served as the follow-up report. Members of the NAPA team noted that FEMA funded their work at Congress’s direction. As of this writing, none of my sources have been able to confirm the NAPA report was the follow-up effort prescribed in the OIG report. Requests for the OIG’s second report, under the Freedom of Information Act, produced no results, and FEMA does not employ a historian.

Coping with Catastrophe

“Unfortunately, the Federal Government’s initial response run through FEMA was widely seen by many of Hurricane Andrew’s victims as a disaster itself.” (103rd Congress, 1993) —Senator Barbara Mikulski, 1993

Senator Mikulski's commentary, during a hearing on Andrew a few months later, would echo in future after action discussions. The Federal Government declared 53 disasters in 1992, and with the exceptions of Hurricanes Andrew and Iniki, those events caused little stir by way of a broad public outcry (FEMA, 2016). It is clear that "mega disasters," such as Andrew, overwhelm emergency response resources and personnel, and we have only recently acknowledged how major disasters disrupt systems. Be they political or of physical infrastructure, these events have a tendency to test our basic assumptions about government's ability to deliver promised goods and services. Examples of these assumptions include notions of public safety, effective communication, and near-seamless coordination among responders.

When 150 mph winds and 17-foot storm surges beset a community, however, those who keep the public safe are themselves victims of the event. The nodes of technology that connect agencies lose power or malfunction, and since local resources are overwhelmed, external help is necessary—interactions among subsystems and constituent parts break down. These events challenge standard operating procedures and plans designed to aid coordination but unable to account for conditions on the ground. The result is myriad complaints of failure that invariably lead to oversight interventions to assess problems and prescribe solutions (McCubbins & Schwartz, 1984).

FEMA's appropriation bill, spearheaded by Mikulski shortly after Andrew, included direction for the NAPA team to assess what happened when Andrew struck.

That report was the first comprehensive, and only independent, review of FEMA's performance in response to a specific event. Notably, it was driven by an oversight body outside the network. Congress funded the NAPA report by way of FEMA's appropriation, directing FEMA to contract NAPA for their report.

Problem Recognition

Coping with Catastrophe, by the NAPA team, was one of the two comprehensive assessments of the Andrew response. The report breaks down response efforts into seven chapters, supported by five appendices. Following the introduction, each chapter assesses major problems with the response and, appropriately, those chapters include supporting recommendations for moving forward. From chapters three through six, the report tackles the response as follows (National Academy of Public Administration, 1993):

1. Chapter Three: The Federal Responsibility and the President's Role in Emergency Management;
2. Chapter Four: FEMA: An Institution Not Yet Built;
3. Chapter Five: The Federal Responsibility – The Role of Congress; and
4. Chapter Six: State and Local Government Organizational Capability and Coordination with the Federal Government.

The NAPA study identifies a number of operational problems, but all of them are couched under the team's call for an "effective emergency management system," arguing in no uncertain terms that the network was fragmented in its organization and execution.

This view of the network in 1992 explains the focus on roles and responsibilities in the report. The project charter for the NAPA report also called for a focus on the roles and responsibilities of agents at every level of the system hierarchy. This approach is noteworthy, because it departs from operational prescriptions that focus on specific emergency support functions. It is also noteworthy because the charter heavily influences the framework through which the NAPA team would assess the Andrew response. The report focused intently on the efforts of the Executive Branch, the Congress, FEMA, and state and local governments in understanding the failings of the system. Each, in the team's view, must play distinct, coordinating roles, in order to establish an effective emergency management system (National Academy of Public Administration, 1993).

Chapter Three in the report focuses on the role of the President in disaster response operations. Stating, unequivocally, that distant executive oversight was not effective. The team adeptly drew contrasts between the mechanisms in place to manage national security events (i.e., the National Security Council), and the absence of any parallel for serious domestic security challenges. The report goes on to note that EM tends to address low probability events, which were not priorities for administrations grappling with immediate problems. The chapter continues by discussing the role of the military in supporting domestic crises. For both the Presidency and the military, the NAPA team calls for a departure from Cold War norms about emergency priorities, resource allocations, and command-and-control lanes. It is in the latter that system

complexities appeared to struggle significantly, as agency authorities became confused and, in doing so, such ambiguities frustrated coordination and action.

The chapter closes by discussing “joint assessment teams” and a reexamination of the FRP. The former, the NAPA team argues, would deploy quickly and early to assess the magnitude of a disaster, which would in turn mobilize the appropriate number, and mix, of EM agents. How those agents mobilize and organize is addressed in the final pages of this chapter, where the NAPA team recommends changes to the FRP. During this portion of the study, an important observation is made. FEMA’s State and Local Program Support (SLPS) Directorate developed the FRP to coordinate the efforts of 26 federal agencies and the American Red Cross in response to national disaster events. It turned out, acceptance and integration of the FRP beyond the SLPS was not a given. The NAPA team, as a result, concludes that the FRP needs renewed attention and its adoption and support across all of FEMA (National Academy of Public Administration, 1993).

Chapter Four of the report focuses on FEMA. The findings suggest, as of 1992, the agency had not yet realized the vision of its enacting legislation in 1979. This chapter served as a de facto review of the progress made in establishing FEMA as a viable organization. The Andrew response, as the report suggests, exposed FEMA’s shortcomings, and called for a decision on the young agency—either strengthen the institution or go another direction. The team observes that despite the passing of time, the organizational siloes in FEMA aligned consistently with the predecessor organizations

merged to create the agency—FEMA lacked a “unified mission” (National Academy of Public Administration, 1993).

The chapter outlined a comprehensive organizational reform for FEMA, arguing for the importance of a shared agency vision, stronger agency management structures and systems, and a reorganization that repositions FEMA’s capabilities and talents in a manner that reflects a singular mission. Exacerbating the fragmentation within FEMA, programming restriction on FEMA funding was limiting management’s ability to align resources, capabilities, and organizational structures efficiently (Rubin, Hurricane Andrew Response, 2018; National Academy of Public Administration, 1993).

Chapter Five in the NAPA report turns its attention on the role of Congress. Immediately, the report raises the specter of splintered authorizing committees for FEMA. The divergence of authorizing statutes for FEMA, according to the report, reinforced the bureaucratic fragmentation that hindered the agency’s ability to prosecute EM—as envisioned at FEMA’s formation. At the time of the NAPA report, twenty committees in the House and Senate had oversight over pieces of FEMA operations. Five committees were responsible for confirming FEMA’s appointee leadership as well. In summary, the agency was not just a low priority, it was a low priority in fragmented pieces across the Congress.

Finally, in Chapter Six, the NAPA report addresses problems at the state and local government levels. Just as states are diverse; so are the problems they exhibit for EM capabilities and resources in disaster response. Notably, this is the lone chapter dedicated to the overwhelming majority of the other agents in the system. The study team found several subsystem problems at the levels of state and local government. I summarize them as follows (National Academy of Public Administration, 1993):

1. **Variable capacity:** states' ability to cope with and respond to disasters varied widely from state to state—and within a state from capability to capability. Additionally, EM professionals were found to exhibit uneven levels of competency.
2. **Underdeveloped standards:** the report found training was deficient at every level of government, existing resources were not adequately used, and in many cases there weren't enough resources available to state and local officials.
3. **Weak working relationships:** ad hoc networks, such as disaster response networks, need opportunities for network agents to form working relationships. The NAPA team found a need for greater familiarization among network members, if they are to execute effectively as a team.

Analysis

Congress asked the NAPA team to assess the Andrew response because it wanted an independent, expert analysis of the problems exhibited in South Florida and Louisiana. NAPA formed in 1967 by congressional charter. The organization is a network of

experts, who include a diverse set of perspectives ranging from former elected officials to scholars and business executives. The group provides non-partisan advice on critical management issues facing government. Their role was further solidified in 1984, when President Ronald Reagan signed NAPA's Federal Charter, which reiterated the organization's focus on "public management and public administration" issues (National Academy of Public Administration, 2018).

Gary Wamsley, a public administration scholar, led the 12-person NAPA team, which included staff with diverse, complimentary backgrounds. All were public sector experts. The team conducted interviews with EM professionals and local government leaders in California, Florida, Hawaii, and Louisiana. At the federal level, the team interviewed legislative staff and leaders in the Departments of Defense and Transportation. Others interviewed at the federal level were members of the Executive Office of the President, FEMA, GAO, and the Office of Management and Budget. In addition, they also interviewed prominent, former federal officials and members of the academic community. In a short time, the NAPA team was able to interview 126 officials. Some interview subjects were member of the Andrew response. Others were not. Some of the California interview subjects had recently responded to riots in the Los Angeles area. As with most NAPA studies, the team worked with their panel to discuss data, organize recommendations, and satisfy the requirements of their mandate (Kliman, 2018).

The NAPA team was focused on the questions posed by their charter, and their approach closely linked to their areas of expertise. Legal questions fell to the attorney on the team, budget questions were fielded by the budget specialist, and FEMA issues were managed by the expert on FEMA. Outrage in Congress, the Presidential election, and highly-critical news coverage did not influence the analysis, according to those interviewed for this study. FEMA was also deferential to the team, providing office spaces and access to key personnel. Interview subjects for this research consistently agreed external forces did not influence the team's work. The review of the Andrew response become a de facto review of FEMA (National Academy of Public Administration, 1993). It should be noted that the brunt of responsibility for failure—from this perspective—was FEMA's—essentially concluding it was responsible for the system failure. We will look at whether or not this method effectively institutionalizes lessons learned across the system in Chapter 7.

In keeping with traditional public administration canon, the NAPA report focused heavily on the gap between expectations and performance in the area of roles and responsibilities. The report, and interviews conducted for this research, reinforce a rational-analytic approach to learning, where subjects are asked about decision-making based on available information, or how their interpretations bore out the procedures they employed in the response. In the report, and later the hearings, there is a general understanding that roles and responsibilities should be clear throughout the response (103rd Congress - Senate Appropriations, 1993). The team placed considerable emphasis

on FEMA, as a nexus of decision-making and action and was among the first major reports to describe the disaster response network as a “system.” The report places special emphasis on the structures of the system and key units and parts.

In the end, the NAPA report served as an important strategic review of FEMA as an organization. It was understood that fixing FEMA would improve response operations. The evidence that follows suggests the efficacy of this approach is mixed. In 1993, the report concedes the limitations of formal structures as a guarantor of success—observing that statutory power is an “insufficient condition for the real power to coordinate” an effective response (National Academy of Public Administration, 1993). The NAPA team’s analysis is thorough with respect to those structures but, despite their observations, it did not appear to examine the informal structures as closely. This leaves considerable gaps in our understanding of how interpretations shaped agents’ understandings of the procedures those structures defined.

Recommendations

Each of the areas of inquiry identified in the charter and analyzed for the NAPA report produced a corresponding set of recommendations. Each set of recommendations adopts varying types of learning strategies. All of them in some way point to a system of disaster response that begins and ends with one, coordinating agency. Notably, they do not say that agency needs to be FEMA. Instead, the report calls for a strengthening of FEMA or a different direction entirely. If the latter, they call for another agency with a

stronger mandate. The team recommends that policymakers commit to creating an emergency management system with clear structures—focusing on roles and responsibilities. Otherwise, they warn, the country should expect similar results in the future.

Chapter 3 of the report is focused on the federal role within the network. To that end, it focuses on changes within the Executive branch and the overall planning. The recommendations pursue changes in the specific parts of the executive branch, which are agents within the response system—most notably the DOD. Parts of FEMA also draw the report’s attention, as the researchers make note of the agency’s inability to adequately assess damage and resource needs on the ground during the response. Finally, a few of the chapter’s recommendations focus on the FRP and other planning elements. In addition to reexamining the FRP, the researchers make a concerted effort to advocate for greater EM professionalism. The table that follows lists these recommendations.

Table 4: FRP recommendations

NAPA Recommendations from Chapter 3 (National Academy of Public Administration, 1993)
1. Retain the current mission and role of the Armed Forces in emergency management and disaster response. Make certain that process and procedures exist for promptly triggering capabilities in major disasters or catastrophes
2. Set in motion a review by DOD of the role of the National Guard with regard to emergency management/disaster response.
3. Establish a Domestic Crisis Monitoring Unit in the White House Office as a responsibility of an assistant to the President. Develop a small staff of detailees to work out of the White House situation room.
4. Amend the Federal Response Plan to include FEMA-led joint assessment teams (federal, state, local, and military). Members should be professionals who train together, are able to operate in adverse environments, and would be supported with FEMA's unique communications assets.
5. Make the Federal Response Plan the President's Response Plan.

6. Modify the Federal Response Plan based on lessons learned to date.
7. Initiate a long-term effort to develop operations plans for each Emergency Support Function of the Federal Response Plan and develop operational plans that link with the federal plans and with those at all levels of government.
8. Develop a graduated disaster scale keyed to damage, life support needs, and casualties. Joint assessment teams should recommend designation of a disaster on that scale, which would establish a common base of assumptions for response and recovery actions on the part of all participating agencies and organizations.
9. Relate the FRP and operational plans for each ESF to the gradations of the disaster scale. Types of people and material mobilized, pre-positioned and dispatched for a disaster should be related to gradations of the disaster scale.
10. If the President designates a cabinet officer or White House staffer as his representative in a disaster, provide that individual appropriate orientation and staff support.

Thirteen years since its establishment, the NAPA team found that elements of FEMA continued to operate with the autonomy and capacity of their predecessor organizations. Chapter 4 recommendations focus on FEMA. Of all the chapters in the report, this one is best positioned to serve as a standalone document. It is a de facto strategic review of FEMA as an organization. Its approach is comprehensive, calling for double-loop learning vis-à-vis two methods. Policymakers, the chapter argues, should either reorganize FEMA completely or abandon it in favor of an alternative, new organization. The chapter's recommendations endeavor to outline an organizational vision and mission, essentially contending that FEMA went more than a decade without a unifying purpose or mission (National Academy of Public Administration, 1993). It goes on to attribute the absence of integration to neglect and an absence of leadership. The finding is reinforced by the common practice of naming FEMA heads from among a

President's stable of high-level campaign supporters, rather than an EM professional (Roberts P. S., Disasters and the American State, 2013).

Table 5: FEMA Recommendations

NAPA Recommendations from Chapter 4 (National Academy of Public Administration, 1993)	
1.	Vision and mission: Create a coherent sense of mission centered on the vision of a high-performance, high-reliability agency of government capable of integrating and coordinating the federal government's emergency management functions.
2.	Strategy: Develop a strategic policy statement outlining the several broad emergency management policy goals (about four to eight such goals) to be achieved during President Clinton's first term.
3.	Values: Work with agency employees to articulate a set of values.
4.	White House communications: Build a continuing relationship with the senior White House officials responsible for domestic policy, domestic crisis monitoring and processing of disaster declarations.
5.	Leadership: Provide a framework for improving leadership.
6.	Preparing for the next catastrophe: Give priority to bring the agency is as prepared as possible for the next catastrophe.
7.	External affairs: Build a strong external affairs unit of career personnel capable of effectively handling media relations in moments of crisis. Public Affairs should include promptly informing disaster victims of where and how help can be obtained.
8.	Performance measurement: Continuously measure performance against goals.
9.	Management systems: Establish the central management systems "glue" to bind the agency together.
10.	Communications and information technology: Establish a modern communications and information resources management system.
11.	Resources: Notwithstanding the demands for deficit reduction, the President and Congress should provide the funding needed to build an effective emergency management agency.

Chapter 5 of the NAPA report, addressing Congress's role, highlighted the challenges associated with oversight from 20 authorizing committees in Congress. Notably, these recommendations acknowledge how diffuse authorizing committees pose challenges to reorganizing FEMA. For example, some FEMA programs operated on

multiyear budgets while others worked on annual budgets. These, among others, are differences that impact planning and operations, since varying time horizons and funding streams foster inconsistent priorities. The chapter's six recommendations propose policy changes above an administrative level of learning. In contrast to the other chapters, this one strives for disambiguation of purpose, instead of roles and responsibilities (National Academy of Public Administration, 1993).

Table 6: Recommendations for the Executive and Legislative Branches

NAPA Recommendations from Chapter 5 (National Academy of Public Administration, 1993)	
To the Executive Branch	
1.	Draft a new legislative charter, building on existing authorities in the Stafford Act, and formally transmit it to Congress as soon as possible to enable action in the 103rd Congress.
2.	Incorporate in the draft charter (1) language to reduce FEMA's presidential appointee positions to two, the director and deputy director (excluding the inspector general), and (2) any authority required by the President to make needed organizational changes.
To Congress	
1.	Enact legislation that will (1) provide a comprehensive emergency management charter through amendments to the Stafford Act to encompass emergencies and disasters of all types other than those administered outside the current body of laws applying to FEMA and (2) reduce to two FEMA's presidential appointee positions.
2.	Designate a single committee in each house of Congress with jurisdiction over "emergency management" and the laws applying to FEMA. The Joint Committee on the Organization of Congress should give this matter priority attention.
3.	Designate a single committee in the Senate to confirm all FEMA appointees nominated by the President and requiring confirmation.
4.	Remove some of the funding restrictions on FEMA's programs, including the earmarking of funds for specific projects, commensurate with initiatives taken and planned by FEMA, to build a high-performance, high-reliability institution for emergency management.

Finally, chapter six tackles the interplay between the federal government and agents at the state and local levels of government. The chapter observes that the nation's federal system of government introduces levels of complexity to the problems associated with disaster response operations. The team attributes the challenge to "an unstable federal emergency management structure," once again implying the absence of a hierarchy as problematic (National Academy of Public Administration, 1993). In doing so, the recurring themes of command-and-control, roles and responsibilities, and levels of authority provide evidence of the common understanding of the time. The NAPA team, Congress, the public were in search of a high-reliability organization to prevent crises in the face of disasters (Moynihan, 2008).

The NAPA team goes on to devote considerable, and duly appropriate, discussion on funding the needs of EM staff and capabilities at every level of government. The chapter makes a compelling argument for the importance of funding EM proactively. It also encourages a move toward "capacity building," using language that resembles the description of military train-and-assist activities overseas. This aspect of their approach is most highlighted in the discussion on incentives, and specifically how state and local governments that do not prepare adequately should not "receive windfalls" from FEMA, following a disaster declaration. To aid in building capabilities, the NAPA team also directed some criticism at FEMA's training facilities and courses, citing them as outdated, in some cases irrelevant, and at times of poor quality. The chapter concludes with recommendations to improve capability building.

Table 7: Recommendations for state and local governments

NAPA Recommendations from Chapter 6 (National Academy of Public Administration, 1993)
FEMA should develop a strategy for improving capacity and consistency of state and local governments for emergency management. This strategy should take into account each state's vulnerability, population and investment in emergency management.
1. The panel recommends the following means to augment capacity:
2. Revising the mission and vision of the State and Local Program Support Directorate to reflect this new strategic approach.
3. Assessing existing capabilities of states, territories and trusts in order to gain baseline information for future actions.
4. Setting performance and other standards for CCA program funding and other special programs and projects.
5. Monitoring and evaluating state and local efforts with respect to meeting those standards and, if need be, withholding funds to gain compliance.
6. Using financial incentives to reward effort and performance in meeting objectives, not only for pre-disaster funding, but for post-disaster assistance.
7. Streamlining many of the post-disaster processes and procedures for a presidential declaration, damage assessment and reimbursement of state and local governments.
8. Improving FEMA training and education programs, both in quality and quantity, for federal, state and local officials responsible for emergency management.
9. Developing a plan to use research and research applications more effectively for decisions regarding operations, programs, and training and research.
10. Encouraging (by funding, if necessary) peer exchanges and mutual aid agreements among all levels of government to share examples of promising or successful practices.
11. Encouraging regional planning and preparedness efforts, such as those for interstate earthquake or hurricane planning.

The significance of the NAPA report remains its comprehensive approach to assessing the response to Andrew. Subsequent Andrew-level events would come to receive similar treatments. At 38 topline recommendations, the NAPA team describes a “system” of underdeveloped interdependencies, weak management processes, and an agency at its center—FEMA—neglected until the onset of crisis and beset by

fundamental organizational problems. As discussed earlier, and as other reports and experts argue, the NAPA team describes a system, but prescribes solutions more appropriate for a traditional, hierarchical organization. Chapter seven of the report contemplates as much, when it questions whether any existing construct is appropriate for emergency response. At the time, it posits the possibility of replacing FEMA. Prophetically, and unfortunately, the team concludes by predicting that a galvanizing event would be necessary to truly “bring about changes in the way America responds to emergencies” (National Academy of Public Administration, 1993). Eight years later, on September 11, 2001, that galvanizing event tragically struck in New York City; Washington, DC; and Pennsylvania. Not surprisingly, many of the problems recognized in the 1993 NAPA report on Hurricane Andrew continued to emerge in the after action assessments following 9/11. The fallout laid bare once more the arguments made in Andrew’s wake, yet applying lessons learned remained a challenge.

Disaster Management

The GAO report was also a comprehensive view of the response, but it offered a more focused after action review. This was, perhaps, because the GAO team was on the ground during the response. GAO researchers arrived in South Florida within 72 hours of the start of the response. Congressional interest in the response was considerable; so, mobilizing the GAO team was not a challenge. Just as the NAPA team, this after action review takes a close look at FEMA.

Problem Recognition

The GAO report focuses on three overarching problems with the Andrew response. Together, these problems provided strong evidence that the FRP and the network were not equipped to handle major catastrophes. The term “major catastrophes” mentioned in the GAO report alludes to a concept that would repeat itself in future after action reviews. These are events that transcend the definition of a disaster and, while there is no consistent definition for “major catastrophe,” the GAO report identifies them as disaster events that overwhelm government’s capacity to respond effectively. The report defines “effectively” as the ability to provide “life-sustaining” needs. The outcome problem facing South Florida, according to the GAO team, is simple. In objective terms, the response to Andrew was not enough for the task. Responders could not deliver enough food, fresh water, and basic services to the storm’s victims (GAO, 1993).

GAO identified two, high-level operational problems in its final report, which was published in July 1993. The report found that the response lacked the ability to (GAO, 1993):

1. Assess in a comprehensive manner the damage and the corresponding needs of disaster victims, and
2. Provide food, shelter, and other essential services when the needs of disaster victims outstrip the resources of the state, local, and private voluntary community.

An analysis of the congressional testimony leading up to the report, and the report itself, shows that the team linked these problems to the Office of the President, FEMA,

and the Congress. However, the team affords the latter far less attention than the NAPA report does.

The GAO report assigns the operational problem of disaster assessment to the President and FEMA. They suggest that intracrisis learning failed during Andrew, because the FRP provided no mechanism or process to understand the magnitude of the event at the federal level, without the state's initial call for help—as per the Stafford Act. Unable to understand the severity of the event, both the President and FEMA could not adequately mobilize resources to meet the challenge. As noted earlier, the FRP became available shortly before Andrew (GAO, 1993). For that reason, GAO reports, agents across the system had never participated in joint exercises, which might have made evident the inability to assess problems early, and accurately.

The second operational problem highlighted speaks to the inability to deliver an adequate response to victims. The GAO team links this problem to FEMA, the American Red Cross, and the DOD. The report, just as the NAPA team did, observes that internal FEMA challenges proved too much to overcome. Directorates, which were previously FEMA predecessor organizations, could not work together—both because of culture and because of diverging statutory authorities (GAO, 1993; Gordon-England J. , 2018). Additionally, the team found that Red Cross was found woefully understaffed for an event of Andrew's magnitude. That shortcoming should have mobilized the only other organization capable of providing shelter, food, and medical services quickly and

broadly. However, the DOD could not mobilize quickly. Questions surrounding cost responsibilities and legal authorities kept military resources from acting quickly. GAO recognized that major catastrophes should be enough to trigger some level of preparation from DOD (GAO, 1993). Highlighting the challenge was the observation that the response network was capable of feeding up to 30,000 victims per day, but Andrew left roughly 250,000 people in distress. The GAO team reasonably concludes looting became a necessary course of action under those conditions (Dexter, 1993).

Finally, the congressional record shows the GAO team encouraged a stronger emphasis on capacity building throughout the network—in other words, a system-wide effort to improve EM capability. The report makes mention of this suggestion, but the testimony bears out richer observations related to the capabilities of local and state responders across the system. For example, GAO found that FEMA’s Emergency Management Institute (EMI) was working to develop courses for local and state government responders in support of the FRP. However, those courses were not ready in time for Andrew, because the FRP was not ready until 1992, and the courses, according to EMI statements, took two years to develop (Dexter, 1993). GAO ties underdeveloped competencies across the network to the second operational problem identified in the final report—the inability to provide essential services during the immediate response.

Analysis

Congress created the GAO in 1921. It originally served a financial management function by verifying the “legality and adequacy of government expenditures.” Until 2004, the public knew it as the Government Accounting Office, but “accounting” became “accountability” to better reflect how its work evolved (GAO, 2018). Not unlike NAPA, GAO professionals follow a strict process to conduct their analysis. Their goal has evolved from verifying expenditures to assessing the performance of programs funded by the Congress. The request for a GAO study to assess the Andrew response officially came from 12 members of Congress, including Senator Mikulski, who chaired the committee that mandated the NAPA study (GAO, 1993).

The team’s analytic approach resembled the NAPA team’s methodology. GAO researchers supporting the report served within issue areas of relevance to EM. According to a team lead, they researchers on the ground observed not only the performance of the response, but also, they monitored how organizations worked together, followed directives, and met expectations. Their analysis was reflective of this approach, as they studied the response against program requirements, which are defined as the expectations for effective performance as dictated by statute (Gordon-England J. , 2018).

Interestingly, the GAO team testified about their work, while it was in progress, over the course of the several months prior to the final report’s publication. Their analysis

evolved over that time. Written testimony suggested the final report would identify three operational problems of concern. They concluded with two, but incorporated much of the third problem into the second, which they identified as network members' inability to respond adequately to catastrophic disasters (Dexter, 1993; Gordon-England J. A., 1993).

In all, the team testified before the following committees (in order):

1. The Subcommittee on Veterans Affairs, Housing and Urban Development, and Independent Agencies; Senate Committee on Appropriations,
2. The Subcommittee on Investigation and Oversight, House Committee on Public Works and Transportation,
3. The Senate Committee on Governmental Affairs, and
4. The Subcommittee on Nuclear Deterrence, Arms Control, and Defense Intelligence, Senate Armed Services Committee.

Details of the response varied in the testimony provided to the committees listed, but common themes emerged from the first hearing in January until the final report in July. The top-two operational problems, previously identified, remained relatively the same throughout. GAO had concluded early on what operational problems left the FRP inadequate to the task of the Andrew response, and there was a focus on FEMA, just as the NAPA report had done. The GAO report also contended that system-wide problems were evident in the response to Andrew, and yet the review's focus on the President and FEMA is consistent with a view of learning that emphasis leadership and process. A learning strategy that codifies adopted strategies at the leadership level and promote

modeling throughout the organization through capacity building or, in other words, training (Schein, 2010; March & Simon, 1958).

Recommendations

The recommendations in the GAO report are more focused on response operations, or procedures, vice the NAPA report's focus on structure. The report recommends institutional changes that move forward with FEMA. Similar to the NAPA report, the GAO team organizes recommendations by the agents responsible for implementing lessons learned: the President, FEMA, and the Congress. One recommendation is directed at the President and three are for FEMA. The report concludes with two issues for "consideration" by the Congress, both calling for a restructuring emergency response statutory authorities. The GAO review focuses on decision making at the top of the network, referring to other system agents in terms of their need to build additional capacity.

Its first recommendation encourages the Executive to designate a proxy, described as a "senior official," that would have immediate access to the President and the credibility to provide direction, in coordination with the FEMA Director, on behalf of the White House. The coexistence of the Federal Coordinating Office, the FEMA Region 4 Administrator at the time Phil May, and the President's Transportation Secretary, Andrew Card, working on the response may have generated more confusion than

effective direction (Gordon-England J. , 2018; FEMA, 2012). Clarifying leadership, GAO presumed, would facilitate decision making during response operations.

The second recommendation, the first directed at FEMA, is also aimed at facilitating decision making. The suggestion to establish damage assessment units stemmed from the federal government's inability to properly scope assistance in Andrew's wake. State resources, having been overwhelmed, were insufficient to properly determine the magnitude of the need, which in turn prevent an adequate mobilization of resources to aid South Florida. Notably, this recommendation also calls for internal changes within FEMA to empower the unit appropriately. The mission of such a unit would be to prepare accurate damage assessments for response operations leadership and to model damage assessments when not engaged in response operations (GAO, 1993).

The GAO report's third recommendation was also directed at FEMA, but it is related to the matter of drawing resources from DOD for response operations. The GAO team argued that DOD was best positioned to support major catastrophes, but too many obstacles prevented an effective mobilization following Andrew. The report acknowledged the statutory and customary limitations on using the military for domestic purposes and, more specifically, it recognized the importance of maintaining civilian control over response operations. However, the Red Cross did not have the volunteers nor the logistical capacity to deliver food, tend to the wounded, and reestablish order as the military could. Those were among the reasons that the GAO advocated for changes in

statute and practice that would enable the military to act quickly when catastrophe hits (GAO, 1993).

The final recommendation directed at FEMA sought to increase the amount of support the agency provides constituent members of the network. This recommendation, just as with the NAPA report, is among the few times the review turns its attention away from FEMA and the President. This recommendation in the report is subdivided to address the following (GAO, 1993):

1. Increasing grant funding to match response needs
2. Upgrading training and exercises
3. Assessing each states preparedness and response capabilities

This fourth recommendation in the report carries undertones of FEMA's continuing transition from civil defense to emergency response—reinforcing many of the NAPA report observations. At this this time, FEMA did not monitor state EM performance, nor had it established performance standards, according to the GAO report. The latter raising the specter that in the absence of standards, how was learning even possible across the system?

Finally, the report concludes with a call for the Congress to empower FEMA with the authority to take more proactive steps when disasters strike. The United States' federal system of government, at the time, continued to expect states to lead response

efforts, and in large part, that has not changed to this day. However, major catastrophes inhibit a state's ability to assess damage, which in turn delays the assessment necessary to trigger the mechanisms in place to bring EM resources to bear. The GAO report recommendations seek to mitigate that challenge, but the report recognizes that Congress must grant FEMA the authority to preposition resources before states request them. When Andrew hit, FEMA could only initiate the FRP with a disaster declaration by the President at the state governor's request, as per the Stafford Act (Gordon-England J. A., 1993). Andrew made landfall on Monday, August 24, 1992, the State of Florida did not recognize the shortfall in supplies until the second day after landfall and, by then, the situation on the ground was untenable (Peach, 1993). FEMA could have acted faster, if it did not have to wait on the state.

Chapter Summary

Hurricane Andrew was not only a watershed event for EM. It was also a transitional event. The end of the Cold War reshaped national priorities, and it essentially displaced civil defense in the face of a nuclear attack with an emphasis for disaster response, because the probability of the former was more remote. The change cannot be understated. Civil defense was a national security effort, which meant federal authorities were more expansive. Emergency response, on the other hand, belongs to the states, until the states themselves can't handle them. That was not always the case in U.S. history.

The lessons learned by the NAPA and the GAO teams are rooted in traditional public administration tenets that include unity of command, span of control, and clear roles and responsibilities (Gulick, 2008). Both teams identified system-level problems and prescribed changes at within units and parts to address those problems. Both reports call on the President for more leadership. The FEMA focus certainly reinforces the belief that the system can “learn” if only proper, effective centralized authority could facilitate decision-making empowered by lessons learned. Neither report acknowledges, in depth, the degree to which the field of EM is difficult to navigate intellectually. As if negotiating the taxonomy of myriad disciplines were not difficult enough, neither report takes time to identify the types of problems facing the system (e.g. operational problems versus outcome problems). Both teams took great care of collecting and analyzing data, but neither implemented a systematic approach to the learning process.

The NAPA and GAO reports move up and down levels of analysis. It recommends within FEMA within the same document that asks the Congress to consider abolishing the agency entirely. At points, the reports discuss system-wide learning through FEMA, and then their focus narrows to operational problems within FEMA and other parts and units. The GAO report, more so than the NAPA report, also addressed the adequacy of the FRP—a system-level problem as it attempted to define the overall structure. In doing so, it supports the argument that plans serve as the institutional memory of organization (March & Simon, 1958). Except for culture, no other institutional vehicle serves this purpose. What neither report addresses in detail is the

complexity of these operations in the face of changing, and even novel, operational conditions. Both teams identified problems and generated recommendations that are consistent with a traditional understanding of effective hierarchical organizations.

From a systems perspective, however, a number of questions emerge. The table that follows summarizes the problems common to both reports.

Table 8: A system perspective of the Andrews after action reports

Level of analysis	Corresponding agent(s)	Problem	Recommendation
System	Disaster response network	Food and shelter in the immediate aftermath were inadequate.	Create teams to deploy early and provide accurate assessment of needs in affected areas. Improve the pre-positioning of response resources.
Subsystem	State governments	State governments did not have the capacity—in terms of resources and EM expertise—to respond as effectively as planned in the FRP.	State governments should receive additional resources and training to respond more effectively.
Unit	The White House	The Office of the President needs stronger engagement with response operations	Designate a proxy for the President, with direct access to the President, to act with authority and maintain Executive control over operations.
Unit	Congress	Oversight of FEMA, and other system units and parts, is diffuse, at times overlapping or competing, and generally unclear.	The Congress should streamline authorizing and appropriating oversight of FEMA and broad system elements
Part	FEMA	Unclear vision and mission. FEMA	Establish a new organization or adopt a strategic vision, under a

		never fully integrated after its establishment.	unified mission.
Part	DoD	Major catastrophes overwhelm existing response resources. Only DoD maintains resources that can deploy and scale quickly, but its role in response operations is limited and unclear under certain circumstances.	Establish structures and procedures
(National Academy of Public Administration, 1993; GAO, 1993)			

This breakdown of the system, subordinate agents, problems, and recommendations represents a broad, but representative, view of the lessons to learn from the Andrew experience. By no means is this list exhaustive. Both reports outline more problems, throughout the system, that merit attention but, this study focuses on these overarching problems for the case comparison that follows in Chapter 7.

CHAPTER FIVE: HURRICANE KATRINA

In July 2004, the Hurricane Pam Exercise brought imagined catastrophic conditions to Louisiana. The fictional storm dropped 20 inches of rain and resulted in a storm surge that topped levees near New Orleans. One million were displaced, and half that amount in buildings were destroyed. The response network included officials representing 50 organizations from every level of government and relevant volunteer organizations. These professionals developed “action plans” to address areas of significant damage and need, including managing dangerous debris, providing up to 1,000 shelters for the displaced, devising transportation plans for search and rescue operations, and preparing medical resources and facilities overwhelming demands (FEMA, 2004).

Hurricane Pam was an exercise meant to prepare the response network for a future, catastrophic event in Louisiana. As late as July 2005, members of the network were attending workshops meant to institutionalize the lessons of Pam for what was to come (IEM Consulting, 2006). The ink was barely dry when Hurricane Katrina made landfall near Buras, Louisiana, by way of a quick romp through South Florida, on August 29, 2005 (Hurricane Katrina Lessons Learned Staff, 2006). When Katrina struck, some participants of the Pam exercise applied the lessons of recent months with limited success

(HSGAC, 2006). Only days from the four-year anniversary of 9/11, Katrina left the Gulf Coast in shambles, and it questioned the value of every step taken to prevent catastrophe, since the tragic terrorist attack. FEMA took considerable criticism, and the new Department of Homeland Security was exposed as a project that had stalled in the developmental phase. While some arguments against those perceptions remain valid, the evidence of widespread failures at every level of the system were evident.

Pam raises interesting questions about the learning process. The exercise afforded network agents an opportunity to recognize problems in advance. While it was impossible to foretell with precision how performance would unfold, it was possible to understand the structural vulnerabilities a major storm might expose in the New Orleans area. Levees, highways, and transportation assets are finite and tangible resources, their limits are quantifiable and should have triggered appropriate mitigating strategies and action plans prior to the storm. However, in the years that followed Andrew, other storms made landfall in the United States without the kind of destruction wrought by Katrina. In fact, only weeks before Katrina, Hurricane Dennis made landfall in the Florida Panhandle—a day trip from New Orleans (National Hurricane Center, 2005). Between the lessons of Pam, the passing of Dennis, and the myriad storms flirting with catastrophe in Louisiana, anyone can reasonably conclude Katrina could not have been a surprise. Yet, the shock of its catastrophic effects caused nothing less than a national trauma that questioned our confidence in government.

Roughly one year after Pam, Hurricane Katrina laid waste to much of the Gulf Coast of the United States. In what would amount to the largest, most devastating natural disaster in U.S. history, Katrina cost an estimated \$96 billion in damage, claimed approximately 1,300 lives, and rendered 300,000 homes uninhabitable (Hurricane Katrina Lessons Learned Staff, 2006). Thousands of families were displaced. As devastating as the numbers were, the images broadcast from the immediate aftermath were even more heart wrenching. Americans watched families stranded on rooftops, heard of violent crimes in the Superdome and convention center, and surveyed the devastation of long-standing landmarks on television—from casinos in Biloxi to energy infrastructure in Mobile and to the Ninth Ward of New Orleans. The story unfolding on television told of a newly-created Department of Homeland Security failing at homeland security, and its failures pummeled DHS's constituent agency FEMA.

It is true that Hurricane Hugo preceded Andrew and, arguably, catalyzed the transition away from a Cold War, civil defense EM approach. However, Hugo's lessons were not as precise as Pam's. Hugo took place a few years before Andrew, and the affected regions were vastly different from each other, in terms of geography, infrastructure, and demography. The Hurricane Pam Exercise, on the other hand, was precisely about the New Orleans area. Hurricane Dennis had already mobilized the network in the weeks preceding Katrina. These events alone suggest the response network for Katrina should have enjoyed distinct advantages. The after action reports make evident the network failed to capitalize on them.

The narrative emerging out of the Gulf Coast in late August 2005 was compelling. The “Times-Picayune” was reporting that massive flooding was underway in the city of New Orleans and people were stranded on rooftops (NOLA.com, 2005). Reports of widespread devastation in Alabama and Mississippi also painted a post-apocalyptic image of water rising up to street signs in Mobile, Alabama, and floating casinos wedged into small town buildings in Gulfport, Mississippi (Whoriskey & Gugliotta, 2005; Treaster & Zernike, 2005). Affecting the nation, crude oil prices spiked as Katrina shut down significant swaths of U.S. oil refinery infrastructure that was (and remains to this day) situated along the Gulf Coast (U.S. Energy Information Administration, 2005). The net effects on energy prices were national—extending the storm’s impact across the country as fuel prices spiked. Katrina was living up to the nation’s worst expectations, and the full extent of the disaster would come into focus in the early aftermath.

The Katrina response lives in popular lore as one of the worst failures of American government. New Orleans known vulnerabilities stacked the deck against responders to be sure, but the general consensus was that the system response failed on multiple levels. Exacerbating the problem was the fact the newly-formed DHS—in the wake of 9/11—did not rise to the challenge for which it was formed. The response did not inspire confidence that the nation’s homeland security reforms were prepared to deal with another tragic event. The post-mortems that followed Katrina took on a different tenor than those in the aftermath of Andrew. As with Andrew, many small, functionally-focused after action reviews proliferated the EM discourse. Unlike Andrew, there were

more comprehensive assessments of the response. That being said, a political underpinning supplanted the non-partisan approach of the NAPA report in 1992.

As in 1992, the earliest after action reports were of a narrow focus. Problems with building construction were once again noted in a FEMA report, which the agency published in April 2006. In contrast to the post-Andrew efforts, comprehensive after action reports were produced by both chambers of Congress and the White House. Two criteria guided the selection of these reports for inclusion in this study. First, all three reports are comprehensive, covering every facet of the response. Second, each of the publishers were in the strongest position of authority to elicit lessons learned and institutionalize them.

Table 9: Katrina reports

Title	Source	Date of Publication
Hurricane Katrina: A Nation Still Unprepared	109th Congress, U.S. Senate	December 31, 2005
A Failure of Initiative - Final Report of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina	109th Congress	February 15, 2006
The Federal Response to Hurricane Katrina – Lessons Learned	The White House	February 23, 2006

FEMA also published a review of the responses in March 2006. As in 1992, the Office of the Inspector General (OIG) conducted study. The observations from this report are referenced in the pages that follow, but I will not apply the learning model to the OIG report, because it doesn't take a comprehensive review of the response. The OIG report

focuses on FEMA alone. It is, however, worth mentioning for two reasons. Handwritten notes on the OIG report from 1992 suggest the NAPA report was developed in lieu of an OIG assessment, such as the one produced for Katrina in 2006. Consequently, the Katrina OIG report represents some measure of continuity stemming from the NAPA effort in 1992. A second reason to note the report is because it represents an administrative review of the response, which was less likely to face political considerations. Unlike the studies examined for the learning process, however, the OIG report narrowly focuses on FEMA.

A Nation Still Unprepared

“People think Andrew was the big one...[Hurricane Andrew was] “within a gnat’s eyelash of being our nightmare and [becoming] the big one,” said Robert Sheets, Ph.D., former NWS Director, as he raised the prospect of mass flooding in New Orleans, if Andrew had hit city, during testimony to Congress in 1992. (HSGAC, 2006)

The Senate Committee on Homeland Security and Governmental Affairs, during the 109th Congress, published their report on the final day of 2005, and nearly four months to the day since landfall in Louisiana. Nearly 800 pages in length, and divided into 28 chapters and five appendices, the report covers a lot of ground, but it reads more like a narrative than an assessment of the events surrounding Katrina. It details Katrina’s journey from the Atlantic to the Gulf and, in the process, it identifies problems at each level of the system and with each type of interaction.

The report works hard to retrace the events that unfolded at key points of the system. It is worth noting that it directs considerable attention to the Gulf region's vulnerability issues—most notably in New Orleans. In this sense, the narrative details problems in the preparedness phase of the disaster. Nevertheless, several facets of the response needed to address these vulnerabilities, such as telecommunications infrastructure and the now infamous levee system. In its discussion of the response, its assessments focus on the states of Louisiana and Mississippi, then the Executive Branch.

The senate team concludes with a summary of the NRP's shortcomings and charges of "waste and fraud" in FEMA itself. Senior staff from the committee formed the team of researchers, which included congressional staffers, researchers, attorneys, and EM professionals. In total, 39 staff came from the majority Republicans and 33 from the Democrats. Neither total includes senior staff, support staff, nor of course, the members, which were chaired by Republican Senator Susan Collins of Maine (HSGAC, 2006).

Problem Recognition

Katrina took place on the heels of one of the largest reforms in U.S. government history, which created DHS expressly to address threats—contrived and natural—to U.S. soil. Those reforms gave rise to policy and administrative prescriptions borne out of the 9/11 experience and were meant to keep Americans safe and inspire confidence in our security. Instead, disaster conditions following Katrina portrayed an ineffective system. The NRP had replaced the FRP, which performed poorly in response to Andrew and was

ill-equipped for 9/11. Additionally, a surge in funding provided resources for Homeland Security, as domestic security concerns—at the national level—rose in to the top of the policy agenda (Gall & Cutter, 2012). These considerations fall outside of this analysis, but they are relevant insofar as they offer context for some of the motivations behind the learning process after Katrina.

At the outset, the report lists two sets of overarching problems. The first set is listed in the Executive Summary. The second set is in the first chapter. Some of the problems overlap, others are ambiguous in character, and all of them make significant efforts to identify problems up-and-down the system hierarchy. To aid comparison, Table 10 lists both sets of problems side-by-side. Both were meant to summarize the overarching problems surrounding Katrina, but the report does not explain how these relate to one another. An interview subject, however, might offer a clue. According to member of the senate team, the report was constructed quickly out of many concurrent efforts (Berick, 2018). As it was the first to be published, it is possible there was an oversight in the review that left us with two sets of problems. Given both the ambiguity of the problems listed, and the breadth of problems discussed in the report, I will provide some examples of the problems in the table at each level of the system discussed in the report.

Table 10: Problems identified by the Senate team (HSGAC, 2006)

Executive summary problems	Chapter 1 problems
Long-term warning went unheeded and government officials neglected their duties to prepare for a forewarned catastrophe.	A failure on the part of all levels of government to plan and prepare for the consequences of Katrina.
Government officials took insufficient actions or made poor decisions in the days immediately before and after landfall.	A failure to heed the warnings of a looming catastrophe during the weekend preceding the storm, and a failure on the day of landfall to recognize that the worst predictions had come true.
Systems on which official relied on to support their response efforts failed.	A failure on the part of government leaders to think “big” before Katrina struck and to challenge existing planning assumptions in the face of what was known to be a “nightmare scenario.”
Government officials at all levels failed to provide effective leadership.	A failure on the part of all levels of government to plan and provide for the timely and effective evacuation of the elderly, the sick, and the disabled from New Orleans, and the evacuation of tens of thousands of able-bodied residents who did not have personal transportation.
	A failure to act on the lessons of past catastrophes, both man-made and natural, that demonstrated the need for a large, well-equipped, and coordinated law enforcement response to maintain or restore civil order after catastrophic events.
	A failure to plan for and provide in a timely manner mass medical care and temporary shelter for tens of thousands of Katrina victims that all levels of government knew were likely to be impacted by a catastrophic hurricane.

The chapter on Louisiana’s EM institutions is especially striking, as it discusses improvements underway to address problems raised by the Hurricane Pam exercise. These problems were generally in the areas of logistics and transportation, which proved crucial in the face of the evacuation problems that led to mass tragedy in New Orleans.

Exacerbating the situation, Louisiana, as most other states, was still adapting to newly the newly developed the NRP and NIMS, not to mention the recently-established DHS (HSGAC, 2006).

The operational problems discussed in the report became common knowledge during the response. Failed evacuation efforts, deplorable sanitary conditions, squalid shelter conditions, and shortages of food and fresh water were in the news frequently, and they receive their due attention in the report as well. The report also examines system level infrastructure issues, which included the problem of residential development near the levees, what the levees themselves could withstand, the capacity to evacuate a major metropolitan area quickly, and telecommunication breakdowns strain the system's ability to process information at all.

With these environmental vulnerabilities exposed, EM professionals were overwhelmed and emergency planning offered little help in many cases. When asked about emergency plans related to the levees breaching, the U.S. Army Corps of Engineers New Orleans District could not clearly confirm which plan was followed, and if any was consulted at all. The Corps had up to four EM plans to pick from, each guiding interactions with the rest of the system in their own unique way—and those didn't include the state-level and federal plans (HSGAC, 2006).

Mississippi faced similar concerns, only their environmental limitations posed different risks. The Gulf Coast of Mississippi did not have the metropolitan resources and infrastructure in place in New Orleans. Food shortages and overcrowded shelters became a common problem. Staff and volunteers were also short; would-be first responders and volunteers quickly became victims as well. Nevertheless, the Mississippi Emergency Management Agency (MEMA) was further along in its modernization of EM plans by the time Katrina hit, when compared to Louisiana's. Unlike its neighbor to the West, Mississippi expected a category 3 hurricane to leave those affected stranded from a full response for at least 72 hours, and MEMA planned its response with that expectation (HSGAC, 2006).

FEMA, according to the report, exhibited a wide variety of problems, but the consistency of these problems with 1992 was striking. Once again, not enough food and water was made available to victims. Once again, leadership at the top was either confused or lacking entirely. Critical medical services were also unavailable. An estimated 25,000 people lived in the Superdome with "no toilet facilities" for five days. The White House, under a second President Bush, had made Homeland Security a signature policy issue, but the new DHS Secretary and the FEMA Director were not communicating clearly with each other and the President. According to the senate team, Michael Brown, and most of this front-office staff had little to no emergency management experience prior to their time at FEMA. Coupled with communications challenges, their underdeveloped competencies aggravated their decision making

problems. A final note about FEMA, the report found that the agency was operating at a 15 to 20 percent vacancy rate, which included key leadership roles. This high attrition rate is significant to this research, as it might explain how the lessons of Andrew were lost (Bahamonde, 2005; HSGAC, 2006).

When Katrina hit, DHS was still experiencing challenges stemming from its establishment and significant reorganizations across its subordinate agencies. Plans, such as the NRP, had defined procedures and established structures, but it is clear that interpretations of both fell short. For example, the Senate report points out that then-DHS Secretary Michael Chertoff did not activate the NPR's Catastrophic Incident Annex, which would have expedited the federal government's ability to bring resources to bear. Doing so would have also allowed DOD resources to come to bear sooner—another echo of 1992. In addition, Chertoff did not appoint a Principal Federal Officer (PFO), as per the NRP prescribes. He reasoned, in congressional testimony, the appointment was unnecessary, saying he didn't want another management structure with Brown already leading the team response. As it was, Brown was overwhelmed and Chertoff did not follow procedures and structures, due to his interpretation of how both needed to be implemented (HSGAC, 2006).

When the report turns to the President, it lists three specific problems at the White House. First, it asserts that the President's staff should have been aware of the risks to New Orleans. Not just because of Pam, but also because it was a scenario discussed long-

before Katrina (see Dr. Sheets' quote from 1992). As in 1992, the White House also lacked the situational awareness needed to manage the response effectively and, once again, the White House's initial response to Katrina fell short. Even more striking, Andrew Card was the White House Chief of Staff, when Katrina struck. He was also the head of President George H.W. Bush's task force on Andrew. President George W. Bush did make efforts to follow the Stafford Act and the NRP guidance, deferring key decisions to the governors, but every risk assessment prior to Katrina should have signaled the need for a more aggressive approach from the federal government—starting with the top of the Executive Branch. The report does note that the President issued an emergency declaration for Louisiana and encouraged evacuations before landfall (HSGAC, 2006).

Finally, the report recognized several problems with the NRP itself. These included insufficient training and exercise, the absence of a PFO, confusion over roles, the non-implementation of the Catastrophic Incident Annex, and the failure to establish an Incident Command System (ICS) structure (HSGAC, 2006). Notably, DHS published the NRP in 2005; Katrina hit a few months later. A key gap in our understanding of learning rests in this space. Having established procedures and structures through the NRP, how does the system adopt these to arrive at shared interpretations to guide interactions?

Analysis

The Senate report is thorough. The team interviewed more than 325 witnesses, reviewed more than 830,000 pages of documents, and conducted 22 hearings to collect data on the events surrounding Katrina (HSGAC, 2006). Its approach was to offer a chronological narrative of Katrina for key parts, units, and subsystems. Unlike efforts in 1992, this report spends considerable time on the vulnerabilities present along the Gulf Coast, but especially in New Orleans.

The committee assigned teams to work on each chapter of the report. As much as possible, the team was bipartisan. It included staff from the majority and the minority. It also brought on additional staff to support the breadth of data gathering needed to produce a report roughly four months after landfall. In some cases, researchers travelled to affected sites to conduct interviews and survey the storm's impact, but most remained in Washington reviewing documents and conducting the supporting hearings (Berick, 2018). Curiously, the report only cites the NAPA report from 1992 in Chapter 14, which specifically addressed problems at FEMA. Additionally, this report did not cite a charter or explain its analytical goals upfront. Instead, it is a collection of narratives that discusses how events unfolded in sequence, identifies problems, and offers recommendations. However, each chapter is different in this regard. Some lists problems and recommendations plainly, others simply offer the narrative of events with some insight on performance, and others focus on system vulnerabilities that existed for the storm hit.

Overall, the report provides a rich description of the events surrounding Katrina, but it does not offer an easy path for administrators to follow. Despite the chapter divisions, the narratives overlap in places and offer observations related critical interactions throughout. It does not organize narratives in a manner that makes it easy to identify operational problems easily. The overarching goals offered at the beginning of the report also leave much to interpretation. Another analytical challenge facing the senate team was the time available to do their work. Hearings, studies, and stories coming out of the region continued for months, and in some cases years, after Katrina. Ultimately, however, the loss of life and property, affecting an area the size of the United Kingdom, compelled an immediate effort and helped set the stage for the legislative agenda and reforms that followed (HSGAC, 2006).

Recommendations

The Senate report offers seven core recommendations in the Katrina aftermath. Three of the seven are specific to parts within the system, namely FEMA and a new emergency operations center. The other recommendations address system-level issues (HSGAC, 2006).

1. Abolish FEMA and replace it with a stronger, more capable structure, to be known as the National Preparedness and Response Authority (NPRA).
2. Endow NPRA with the full range of responsibilities that are core to preparing for and responding to disasters.

3. Enhance regional operations to provide better coordination between federal agencies and the states and establish regional strike teams.
4. Build a true, government-wide operations center to provide enhanced situational awareness and manage interagency coordination in a disaster.
5. Renew and sustain commitments at all levels of government to the nation's emergency core management system.
6. Strengthen the underpinning of the nation's response to disasters and catastrophes.
7. Improve the nation's capacity to respond to catastrophic events.

It should be equally noted that most of the recommendations focus on procedures and structure. At the operational level, these recommendations seek to replace FEMA with an organization suited to execute FEMA's mission within the then-new DHS structure. The report also wants NPRA to employ an all-hazards approach in every phase of EM related to disasters, including preparedness which includes construction zoning and other vulnerability considerations. The third recommendation calls for Strike Teams that deploy early, during a disaster, to assess conditions and enable situational awareness back to a national, government-wide operations center. The recommendation for the new ops center calls for careful procedures for the production and dissemination of reporting related to crisis incidents. The fifth core recommendation speaks to the understanding key leaders have for the plans designed to guide response operations. It also calls for improved integration among all subsystems and other constituent agents.

Finally, the report's last two overarching recommendations call for a clarification of key leadership roles during response operations, which would eliminate the PFO while retaining the FCO, and it calls for greater development of the system's capacity to respond to major catastrophes and surge in personnel and resources when needed (HSGAC, 2006).

A Nation Still Unprepared

The Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, hereafter the House committee, did not enjoy bipartisan support—the moniker notwithstanding. Democratic minority leader, Nancy Pelosi, objected to the Republican-led effort. In a statement, she argued select committee would have unequal representation, from both the parties, with a majority favoring the majority. For that reason, the minority leader would not appoint any members of her caucus to the effort (Pelosi, 2005). Nevertheless, five Democrats did join the effort. This political spat is worth mentioning in this research, because it is important to be transparent about alleged motivations behind the report described here. In this case, there were serious misgivings about the objectivity that would be brought to bear on this effort.

The House committee conducted its work from late September 2005 to February 2006. As with the Senate team, the House team had to conduct considerable work in a short amount of time. However, a strong emphasis is expressed in the report on the necessity of acting quickly. It was the team's hope to collect data, recollections, and other

observations while the event was fresh in everyone's minds. The House team took a similar approach as the Senate report, detailing narratives of the events that unfolded along the Gulf Coast (House Katrina Report, 2006).

Problem Recognition

The House team discusses the problems with the Katrina response in its findings, and it characterizes them as failures. The report notes that, while the national EM system is adequate for more common disasters, the system continues to struggle in the face of catastrophic effects, despite significant reforms post 9/11. While the assessment does not articulate its findings in the vernacular of the disaster scholarship, this effort translates their overall finding on initiative as an inability to conduct intracrisis learning.

The House team argues that a “failure of initiative” results when the system is overwhelmed, but system agents adhere to procedures and structures that were established for more stable operating environments. In other words, systems fail to make sense of the environment and adapt accordingly. Instead, it attempts to select the optimal strategy within the existing operational framework (House Katrina Report, 2006; Moynihan, 2005; Axelrod & Cohen, 2000). In addressing culture, the Chair of the House Committee acknowledged the system—most notably FEMA—lacked a “culture of urgency.” Former Congressman Tom Davis’s observation about culture is notable, because it implies that interpretations across the system valued process over outcomes. That is to say, agents across the system lacked a value system and norms that deviated

from procedures and structures, when conditions made it clear their interpretations should have called for neither as drafted (Katrina Hearing, 2005).

The House report lists 14 overarching problems surrounding the events of Katrina. The first was the only one characterized as a success, and it was related to the NWS's ability to forecast the storm's path and effects. I break the other 13 down further, as they related to the two phases of disasters discussed in the report: 1) preparedness and 2) response. Six of them fall under the former; seven correspond with the response effort. One of the problems identified align with both phases. The analysis that follows will focus on the problems of response. Each of the problems included subproblems, which were largely operational problems with a focus on procedures and structures. One common theme throughout each problem was the lack of situational awareness, which seems evident at every level of government by all accounts. Local government could not effectively assess the impact of the storm, state governments depended on local governments for those assessments, and the federal government did not apply its considerable resources in time. Indeed, the only FEMA employee in New Orleans prior to the storm was Public Affairs Officer Marty Bahamonde; his account of events confirms there was considerable confusion among leaders of key units, parts, and subsystems (Bahamonde, 2005; House Katrina Report, 2006).

The House report asserts that evacuations in Mississippi and Alabama were generally well executed. In Louisiana, on the other hand, the most populous, affected

areas evacuated too late. The order to evacuate New Orleans didn't come until 19 hours before landfall. The NHC advisory from Saturday, August 27, at 10 p.m., warned that the "preparations to protect life and property should be rushed to completion" (National Hurricane Center, 2005). The mayor of New Orleans did not issue a mandatory evacuation of the city until 11 a.m. on Sunday, August 28. In Jefferson Parish, which is part of the New Orleans metropolitan area, a mandatory evacuation was limited to the lower, more coastal areas. The leadership in Jefferson claimed the parish lacked the resources needed to implement a complete evacuation (House Katrina Report, 2006).

The level of confusion exhibited during the early days of the response raises significant questions about the NRP, which the House reported was executed poorly. This finding is significant because it does not fault the plan itself (entirely), rather it finds problems with the agents prosecuting the procedures enshrined in the plan. Many did not fully understand their roles and responsibilities per the NRP. The House narrative on the NRP also offers some clues on interpretations within the system. In suggesting the absence of a "culture of urgency," the House elaborates further by saying that reactive procedures and structures could not have generated an effective response in the face of catastrophic events. The House team attributes this shortfall to a deficit in accurate information that would enable effective sensemaking and adaptation (House Katrina Report, 2006). That key agents interpreted standard interactions as sufficient to meet catastrophic conditions suggests system norms that overemphasized procedures and structures at the expense of system goals.

Table 11: Problems identified by the House team (House Katrina Report, 2006).

Findings of the Bipartisan Select Committee	
Preparedness	Response
The accuracy and timeliness of National Weather Service and National Hurricane Center forecasts prevented further loss of life	The failure of complete evacuations led to preventable deaths, great suffering, and further delays in relief
The Hurricane Pam exercise reflected recognition by all levels of government of the dangers of a catastrophic hurricane striking New Orleans	Critical elements of the National Response Plan were executed late, ineffectively, or not at all
Levees protecting New Orleans were not built for the most severe hurricanes	Massive communications damage and a failure to adequately plan for alternatives impaired response efforts, command and control, and situational awareness
DHS and the states were not prepared for this catastrophic event	The military played an invaluable role, but coordination was lacking
Command and control were impaired at all levels, delaying relief	The collapse of local law enforcement and lack of effective public communications led to civil unrest and further delayed relief
Medical care and evacuations suffered from a lack of advance preparations, inadequate communications, and difficulties coordinating efforts	
Long-standing weaknesses and the magnitude of the disaster overwhelmed FEMA's ability to provide emergency shelter and temporary housing	FEMA logistics and contracting systems did not support a targeted, massive, and sustained provision of commodities
	Contributions by charitable organizations assisted many in need, but the American Red Cross and others faced challenges due to the size of the mission, inadequate logistics capacity, and a disorganized shelter process

Other examples of the NRP execution problems centered on the recently-created DHS Secretary's indecision regarding key elements of the NRP. These include the absence of a declaration of an incident of national significant and the late convening of the Interagency Incident Management Group (IIMG), which could have generated an

improved common operational picture across the system. By design, the IIMG would have facilitated execution and, perhaps even more importantly, centralized the interpretation of the operating environment. The Secretary also failed to designate a Principal Federal Official, per the NRP. The result was confusion about leadership at the federal level. Finally, as in the Senate report, the House observed that the Secretary did not activate the Catastrophic Incident Annex, which would have reprioritized system structures to acknowledge that Katrina would overwhelm state and local resources (House Katrina Report, 2006).

The problem of communications breakdowns and interoperability across the system represents one of the earliest tests to my hypothesis regarding improvement derived by technology advancements. In the case of the Katrina response, communication break downs did not depart from the experience during Andrew, as I might have expected. Damaged infrastructure, technical interoperability, and organizational interoperability problems abounded in the days before and after Katrina. Even when different agents retained the technical capacity to communicate, there was no guarantee that their communications equipment, or signals, were interoperable. Even when they were interoperable, the diversity of interpretations stemming from the same events and observations was enough to diminish the system's capacity for sensemaking considerably (House Katrina Report, 2006).

Also, as in 1992, the Department of Defense and other U.S. military entities would come to play a pivotal role in response to Katrina. The problems associated with the military response was less about effectiveness and more about operational efficiency. At the time of the crisis, Katrina resulted in the largest deployment of U.S. troops on U.S. soil since the Civil War. Units from the 82nd Airborne and the 1st Cavalry Divisions were joined by U.S. Navy ships that included the Nimitz Class carrier, the U.S.S. Harry S. Truman (DoD, 2005). The House report explains that U.S. Northern Command (NORTHCOM), U.S. Transportation Command, the Regular Army, the three states' National Guard units, the Coast Guard, and other DoD bureaucracies struggled to communicate with each other and critical DHS elements. Confusions regarding unity of command issues, in part related to the indecisions related to the NRP's execution, which DoD had prepared to execute by the book (House Katrina Report, 2006).

The challenge for this approach, however, is what happens when events overwhelm the proverbial book. In this case, it caused integration issues for an organization and culture that functions on a chain of command, or it doesn't function at all. Additionally, military units operate based on orders that stem from civil authorizations. During the Katrina response, many key commanders were not sure which title of the U.S. code was dictating their operations at any given time (House Katrina Report, 2006). In the face of death and destruction, these confusions appear as mere minutia, but the military trains for and executes with great attention to detail. In a sense, soldiers do not spend much time interpreting the operational environment; so, it is up to

commanders to make those interpretations. Without clarity at their level, procedures and structures at the frontlines break down.

The problems associated with law enforcement were most prevalent in New Orleans, which also included observations previously inconceivable in the United States. The city's law enforcement professionals were affected along with the rest of the community, and they could not respond adequately to unrest and crime resulting from the storm. Almost inadvertently, the House report noted that the absence of law enforcement on the street not only led to lawless behavior by some of the storm victims, but it also hampered local authorities' ability to collect accurate information on the ground. Concurrently, and in large part because of that, New Orleans law enforcement leaders struggled to manage public information and temper unsubstantiated reporting in the press (House Katrina Report, 2006). One witness gave testimony to the committee that the "President and local officials issued 'shoot to kill orders'" during the response. While the report does not confirm that assertion, it is highly descriptive of the conditions in the affected communities, at least as they were perceived (Hodges, 2005). Many observed these hardships disproportionately affected the city's African-American residents.

Equally troubling were stories of failed medical evacuations. The House report confirmed many stories published in the press at the time, regarding stranded patients and elderly that were dependent on medications rendered unavailable by the storm. In testimony, one evacuee claimed several women miscarried pregnancies due to the

inadequate response (Hodges, 2005). The narrative on medical services and evacuations in the report addressed problems in both the preparation and responses phases of the event, which is why it is the only problem spanning both columns of Table 11. A review of the House report's assessment yields two overarching observations. First, the number of parts and units within this subsystem was considerable. The Department of Health and Human Services (HHS), which leads ESF-8, oversaw a sprawling network of agencies and organizations (these included government, state, non-profit, and corporate) attempting to work together during the response. Interactions among these agents proved difficult to coordinate using the existing procedures and structures. Second, private entities, such as hospitals, are supposed to maintain emergency plans that include evacuation procedures. On the rare occasion these plans were fully-formed, they posed challenges in coordination. These coordination problems stemmed conflicting views of responsibilities within ESF-8 and the execution of the National Disaster Medical System between FEMA and HHS (House Katrina Report, 2006).

The problem of commodity shortages, such as food, fresh water, sanitary necessities, seems self-evident in the face of an event like Katrina, but this research is especially interested in the descriptive narratives on the interactions that took place among key units and parts within the logistics subsystem. The logistics problem in response to Katrina represents one of the few aspects of the system that shares characteristics with a tightly-coupled system. Providing adequate logistics requires a sequential process of developing requirements, identifying vendors, managing the supply

chain, and delivering goods—broadly speaking. In the House report, the processes within this subsystem failed with frequency. Officials in Alabama, for instance, described FEMA official unilaterally changing formal requisitions that state officials constructed carefully to meet local needs. Also, Alabama’s process was not the same as Louisiana’s or Mississippi’s, while Louisiana used a software system that was inoperable with FEMA’s electronic system for logistics. In each state, and within FEMA, consistent execution was rare, and just as tightly-coupled systems, problems at any point in the sequence would cascade down the series of steps required to perform effectively (Perrow, 1999; House Katrina Report, 2006).

Similar problems afflicted the support from charitable organizations and other non-profit groups, most notably the American Red Cross, which leads ESF-6. The House narrative on these organizations wanders into the recovery phase of Katrina. This work concentrates on problems during the response. First, Louisiana’s plans did not include the Red Cross in helping provide shelter. Officials in Mississippi observed that Red Cross volunteers lacked a good understanding of NIMS. The report would once again cite FEMA as hampering logistics and requests by reducing—or in some cases—eliminating requisitions from the Red Cross (House Katrina Report, 2006).

Three possible reasons for this pattern of behavior seem likely. First, FEMA officials erred on the side of efficiency, and they perceived requests from the states and the Red Cross as duplicative or exaggerated. Such a notion, however, suggests FEMA

officials did not grasp the magnitude of the event. Second, costs became a worry for these officials, and they attempted to manage them through the requisition process. While their stewardship of the taxpayers' interests is admirable, it was clearly out of place during a response to the nation's largest natural disaster in history. Third, perhaps FEMA officials felt that they knew something that states and Red Cross officials didn't know. As a result, they altered requisitions accordingly. This seems the least probable, since the NRP and the reality on the ground dictated that the contrary had to be true. States and local officials, working with the Red Cross, were much closer to the affected regions and people. Whatever the reasons, these points are discussed here to highlight that an inconsistent understanding existed, and because of it varying interpretations led to the adoption of suboptimal procedures.

Analysis

The political maneuvering at the start of the House effort appeared to make little impact on the analysis behind the report. The team that worked on the report included Democrats and Republicans. The former came to join the effort as volunteers, once their leadership decided against assigning members. Staff from both parties journeyed to the Gulf Coast to witness the devastation, engage key stakeholders, and develop the draft published in February 2006. Once released, the report met some skepticism from leading Democrats, who argued the report did not call for enough accountability of key leaders, including the President and DHS Secretary Michael Chertoff (Spencer, 2006; Davis,

Chair of the Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina, 2019).

The House report based its analysis on a mandate set forth in H.R. 437, which called for a study of the “development, coordination, and execution by local, State, and Federal authorities of emergency response plans and other activities” in preparation for and response to Hurricane Katrina (109th Congress, 2005). Setting aside political considerations, the evidence suggests the report effort stuck to the mandate in evaluating the performance of the Katrina response. It did not deviate much from previous studies, such as the NAPA report from 1992 and its sister report by the Senate. The findings of the report were also consistent with that of the Senate’s, which was a bipartisan effort. In fact, the House team led the effort to acquire documents to support their work and that of the Senate’s.

The House also conducted nine hearings, each focused on areas deemed to exhibit the biggest performance shortfalls. Witnesses at each were diverse and ranged from Chertoff himself to New Orleans evacuees, whose future housing needs remained in doubt at the time of their testimony. One hearing was dedicated to their plight and the concerns surrounding racial inequities laid bare by the storm. In addition to Chertoff, the committee also questioned Brown, who was largely blamed for incompetence as FEMA’s Director during the response (Katrina Hearings, 2005).

“A Failure of Initiative” reviews events in narratives aligned to the overarching problems with procedures at each level of the system—both public and private organizations. While the team highlighted opportunities for improvement with the NRP, it spoke more about the flaws in execution than in the plan itself. Data collection came from hearings, document reviews, and engagements with key Gulf Coast stakeholders, where staff worked to isolate myriad outcome and operational problems. The team reviewed more than 500,000 pages over five months, and they conducted their research in a manner that addressed the NRP’s performance explicitly. Where possible, they used secondary research, including surveys from the University of Colorado’s National Hazard Center, Harvard University, and the Kaiser Family Foundation (House Katrina Report, 2006).

At the end of the report, Democrats thought the analysis fell short of holding key leaders to account. While the committee chair, Congressman Tom Davis, argued a more systemic view of the problems associated with the response was more appropriate. We will turn to these diverging views later but, for now, they are relevant in discussing the analytical framework pursued by the House committee and supported by the Democratic leadership. If we are to understand learning in terms of key leaders, we must then focus on competencies, expertise, and individual execution. This approach contrasts a systemic analysis, which looks more broadly at the various agents that interact with each other, their roles and responsibilities, and the organizational interdependences (Pelosi, 2005; Davis, 2006). The report articulates this contrast perfectly in saying:

There is a big difference between having enough information to find institutional fault, which we do, and having information to assign individual blame. (House Katrina Report, 2006)

Recommendations

The House report is different. Unlike other efforts, it does not provide a list of problem-specific recommendations. It argues recommendations were not a part of its charge in H.R. 437. Instead, and throughout the report, the committee urges future disaster response networks to adhere more closely to the NRP, NIMS, and the ESF structure. It admonishes key leaders and advises them to pay closer attention to the EM tenets enumerated in those procedures and structures.

The report also concludes with suggestions for a narrow focus of individuals and groups at each level of the system. To leaders, it urges them to make quick decisions, with less than complete information, during a period of disaster response. By the same token, it urges staff supporting key principles to “*prioritize*” more effectively and focus on response operations more than the public relations effort. It then asks those on the front line of the response to produce more precise reporting. Local reports, according to the House committee, frequently listed critical needs, but they failed to explain “when or how or to whom” those needs should be directed. To all government leaders, the committee admonishes statements and reports based on incomplete or unsubstantiated

rumors. An effective response requires precise, accurate information. Finally, the report strongly encourages the media to fulfill a more productive role during the chaotic aftermath of Katrina-like events. Reporting, it argues, frequently magnified inaccurate problems on the ground and, since key responders could not accurately assess conditions, those reports redirect vital resources to areas that in truth didn't need them (or, at least, didn't need as much of them) (House Katrina Report, 2006).

Despite the absence of specific recommendations, the concluding chapter of the House report offers recommendations that account for an aspect of learning left mostly unaddressed previously—culture. The “Failure of Initiative,” and the concluding recommendations articulated in the report, asks agents within the system to reprioritize their values and adjust their norms to address practical problems with more urgency; these include challenges associated with the protection of lives and property. By contrast, the Katrina system prioritized structure and procedure over their interpretations of the events unfolding. For those claiming poor assessment prevent effective interpretation, the committee urges greater efforts at making accurate assessments or acting decisively with the information that is available. An example expanded upon in the report highlights the indecision surrounding the evacuation of New Orleans, which lagged well behind evacuation orders in other parts of Louisiana, Alabama, and Mississippi (House Katrina Report, 2006).

Briefly, it is important to summarize the relevance of their claims, and the counterpoints made before, during, and after the House report. They are relevant insofar as the types of questions asked, the nature of the data collected, and the framework through which we understand the system's response to Katrina—or for that matter, any other disaster. While averting a political argument, let us assume individuals within the system should be held to account for system performance. If yes, then how would we evaluate performance? How would we unpack decisions at the levels of a part or unit within the system, versus decisions at the subsystem level that depend on those lower level decisions? In analyzing the response, it becomes clear that performance measures, which would establish an equitable approach to accountability, are problematic in a task environment this dynamic. The House report, as in the other reports examined for this study, does not advocate for a framework that works toward a system of performance management.

The Federal Response to Hurricane Katrina: Lessons Learned

“Our National Response Plan is a 600-page government document, complete with organization charts, procedures, rules of engagement, annexes and enough government acronyms and jargon to make your head spin.” (Federal News Service, 2006) —Frances Townsend, Assistant to the President for Homeland Security and Counterterrorism, February 23, 2006

The White House produced the third, overarching report related to the Katrina response, and that effort was led by Townsend, who ascended to the position of Homeland Security Advisor via a string of positions in the Departments of Defense and Justice. She was also a senior intelligence official at the U.S. Coast Guard. In the aftermath of Katrina, the President became the recipient of withering criticism in the press and among the victims that perceived a leader on vacation, while the Gulf Coast came apart in a few short days. This lessons learned report is the first after action review in this study that was produced by the White House at the direction of the President.

Bush called for the review on September 15, 2005. The final publication followed the House report by about one week. The White House report represents a departure from past, comprehensive after action reviews. It was, in a sense, a self-assessment. It starts with a thorough discussion on Katrina's place among past hurricanes, explaining its unprecedented size and scope. The report also offers a narrative of the Administration's understanding of federalism, the Stafford Act, the NRP, and NIMS. It reiterates the state government's primacy disaster response operations. By the same token, the report laments failures that recent, post-9/11 reforms should have prevented. In this regard, it opens the assessment with a recommendation to move on from the NRP (Hurricane Katrina Lessons Learned Staff, 2006).

In sum, the White House report spends considerable time evaluating procedures and structures. It explains the ESF structure, defends the value of NIMS, and admits to

critical shortfalls in leadership. The report also keeps to the Federal portion of the response; it steers clear of assessing state and local efforts. Unlike other report, it does not organize itself around problems, followed by recommendations. Instead, the White House team lists 17 “critical challenges” and generates 125 recommendations (Hurricane Katrina Lessons Learned Staff, 2006). However, the critical challenges serve more as categories of concern. The report avoids using negative language by articulating problems as “lessons learned.”

Problem Recognition

Characterizing problems as lessons learned seems like an effort to repaint glaring failures in a positive light. This perception is not likely far from reality. However, this practice of using positive language is common. Many government managers believe that employees should view problems as “opportunities for success.” For example, the first lesson learned in the White House report reads as follows (Hurricane Katrina Lessons Learned Staff, 2006):

“The Federal government should work with its homeland security partners in revising existing plans, ensuring a functional operational structure—including within regions—and establishing a clear, accountable process for all National preparedness efforts. In doing so, the Federal government must:

- *Ensure that Executive Branch agencies are organized, trained, and equipped to perform their response roles.*

- *Finalize and implement the National Preparedness Goal.”*

Written in the more traditional, problem-centric language, this lesson learned might, instead, read as follows:

Executive Branch agencies were not organized, trained, and equipped to perform their response goals, and the Federal Government needs to set goals to create a posture of national preparedness.

The utility of reframing problems this way falls outside the scope of this study. In practical terms, however, this paper will categorize the lessons learned from the White House report within the problem recognition process of the learning model. A cursory reading of the report’s lessons learned might create the impression they are, instead, recommendations. On this point, this researcher would disagree for two reasons. First, the narrative of the report focuses on procedures and structures. When lessons learned read like recommendations; they lack specifics on how the pronouncement will alter procedures and structures. Second, the recommendations—as listed in the report—fulfill the role of prescribing specific measures to improve procedures and structures. Regardless, Townsend herself acknowledges them as failures or problems during her press briefing for the release of the report (Federal News Service, 2006).

Returning to the more traditional language used in after action reports, we can safely assess that lessons learned in the White House report focus on operating

procedures and roles and responsibilities. In contrast to the congressional reports, where the overwhelming discussion focused on problems with the response, the White House report spends the majority of its narrative focused on recommendations. In examining the problems with the Katrina response, the White House focused on the NRP, NIMS, and the ESF structure. It is, perhaps, appropriate given that the Executive Branch produced this report; so, it would have the most immediate ability to effect change as a result of lessons learned.

Table 12: Problems identified by the White House team

Katrina Lessons Learned (Hurricane Katrina Lessons Learned Staff, 2006)
<p>National preparedness: The Federal government should work with its homeland security partners in revising existing plans, ensuring a functional operational structure—including within regions—and establishing a clear, accountable process for all National preparedness efforts. In doing so, the Federal government must:</p> <ul style="list-style-type: none"> • Ensure that Executive Branch agencies are organized, trained, and equipped to perform their response roles. • Finalize and implement the National Preparedness Goal.
<p>Integrated use of military capabilities: DHS and DOD should jointly plan for the latter's support of Federal response activities as well as those extraordinary circumstances when it is appropriate for DOD to lead the Federal response. In addition, DOD should ensure the transformation of the National Guard is focused on increased integration with active duty forces for homeland security plans and activities.</p>
<p>Communications: The DHS should review our current laws, policies, plans, and strategies relevant to communications. Upon the conclusion of this review, the Homeland Security Council, with support from the Office of Science and Technology Policy, should develop a National Emergency Communications Strategy that supports communications operability and interoperability.</p>

Katrina Lessons Learned (Hurricane Katrina Lessons Learned Staff, 2006)
<p>Logistics and evacuation: The DHS, in coordination with State and local governments and the private sector, should develop a modern, flexible and transparent logistics system. This system should be based on established contracts for stockpiling commodities at the local level for emergencies and the provision of goods and services during emergencies. The Federal government must develop the capacity to conduct large-scale logistical operations that supplement and, if necessary, replace State and local logistical systems by leveraging resources within both the public sector and the private sector. The Department of Transportation, in coordination with other appropriate departments of the Executive Branch, must also be prepared to conduct mass evacuation operations when disasters overwhelm or incapacitate State and local governments.</p>
<p>Search and rescue: DHS should lead an interagency review of current policies and procedures to ensure effective integration of all Federal search and rescue assets during disaster response.</p>
<p>Public safety and security: The Department of Justice, in coordination with DHS, should examine Federal responsibilities for support to State and local law enforcement and criminal justice systems during emergencies and then build operational plans, procedures, and policies to ensure an effective Federal law enforcement response.</p>
<p>Public health and medical support: In coordination with DHS and other homeland security partners, the Department of Health and Human Services should strengthen the Federal government's capability to provide public health and medical support during a crisis. This will require the improvement of command and control of public health resources, the development of deliberate plans, an additional investment in deployable operational resources, and an acceleration of the initiative to foster the widespread use of interoperable electronic health records systems.</p>
<p>Human services: The Department of Health and Human Services should coordinate with other departments of the Executive Branch, as well as State governments and non-governmental organizations, to develop a robust, comprehensive, and integrated system to deliver human services during disasters so that victims are able to receive Federal and State assistance in a simple and seamless manner. In particular, this system should be designed to provide victims a consumer oriented, simple, effective, and single encounter from which they can receive assistance.</p>
<p>Mass care and housing: Using established Federal core competencies and all available resources, the Department of Housing and Urban Development, in coordination with other departments of the Executive Branch with housing stock, should develop integrated plans and bolstered capabilities for the temporary and long-term housing of evacuees. The American Red Cross and DHS should retain responsibility and improve the process of mass care and sheltering during disasters.</p>
<p>Public communications: DHS should develop an integrated public communications plan to better inform, guide, and reassure the American public before, during, and after a catastrophe. DHS should enable this plan with operational capabilities to deploy coordinated public affairs teams during a crisis.</p>

Katrina Lessons Learned (Hurricane Katrina Lessons Learned Staff, 2006)
<p>Critical infrastructure and impact assessment: DHS, working collaboratively with the private sector, should revise the National Response Plan and finalize the Interim National Infrastructure Protection Plan to be able to rapidly assess the impact of a disaster on critical infrastructure. We must use this knowledge to inform Federal response and prioritization decisions and to support infrastructure restoration in order to save lives and mitigate the impact of the disaster on the Nation.</p>
<p>Environmental hazards and debris removal: DHS, in coordination with the Environmental Protection Agency, should oversee efforts to improve the Federal government's capability to quickly gather environmental data and to provide the public and emergency responders the most accurate information available, to determine whether it is safe to operate in a disaster environment or to return after evacuation. In addition, DHS should work with its State and local homeland security partners to plan and to coordinate an integrated approach to debris removal during and after a disaster.</p>
<p>Managing Offers of Foreign Assistance and Inquiries Regarding Affected Foreign Nationals: The Department of State, in coordination with DHS, should review and revise policies, plans, and procedures for the management of foreign disaster assistance. In addition, this review should clarify responsibilities and procedures for handling inquiries regarding affected foreign nationals.</p>
<p>Non-governmental aid: The Federal response should better integrate the contributions of volunteers and nongovernmental organizations into the broader national effort. This integration would be best achieved at the State and local levels, prior to future incidents. In particular, State and local governments must engage NGOs in the planning process, credential their personnel, and provide them the necessary resource support for their involvement in a joint response.</p>
<p>Training, exercise, and lessons learned: DHS should establish specific requirements for training, exercise, and lessons learned programs linked through a comprehensive system and common supporting methodology throughout the Federal, State and local governments. Furthermore, assessments of training and exercises should be based on clear and consistent performance measures. DHS should require all Federal and State entities with operational Homeland Security responsibilities to have a lessons learned capability, and DHS should ensure all entities are accountable for the timely implementation of remedial actions in response to lessons learned.</p>
<p>Homeland security professional development and education: DHS should develop a comprehensive program for the professional development and education of the Nation's homeland security personnel including Federal, State and local employees as well as emergency management persons within the private sector, non-governmental organizations, as well as faith-based and community groups. This program should foster a "joint" Federal Interagency, State, local, and civilian team.</p>

Katrina Lessons Learned (Hurricane Katrina Lessons Learned Staff, 2006)

<p>Citizen and community preparedness: The Federal government, working with State, local, NGO, and private sector partners, should combine the various disparate citizen preparedness programs into a single national campaign to promote and strengthen citizen and community preparedness. This campaign should be developed in a manner that appeals to the American people, incorporates the endorsement and support of prominent national figures, focuses on the importance of individual and community responsibility for all-hazard disaster preparedness, provides meaningful and comprehensive education, training and exercise opportunities applicable to all facets of the American population, and establishes specialized preparedness programs for those less able to provide for themselves during disasters such as children, the ill, the disabled, and the elderly.</p>
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Analysis

The staff that worked on the White House report conducted their work in much the same way as the Senate and House efforts. They also traveled to the affected Gulf Coast region to speak with local stakeholder. Their work leans heavily on data from documents that included existing plans, correspondence among key leaders, and discussions with principals from the Katrina response. Notably, the team also used testimony from the hearings conducted in the House and the Senate to address the Katrina problems. The same hearings that resulted with the reports previously discussed in this chapter.

Officially, the team included 10 staff in the White House, most worked on the President's Homeland Security Council or the National Security Council. Based on available biographies, most were regarded as subject matter experts in homeland security or national security; none held any operational experience as a first responder or an emergency manager. Today, three of the staff hold key leadership position at DHS. Most

notably, one of them is the current DHS Secretary, Kirstjen Nielsen. Additionally, there was a “Katrina Lessons Learned Review Group,” which included 10 senior staff from DHS, DOD, HHS, Justice, and Transportation. Finally, a closer look at the White House report also makes evident that, of all the after action reports examined for this inquiry, this report is the only one that makes little to no mention of the methods employed for data collection.

Much of what we know about the White House effort comes from press interviews and briefings. While the alignment isn’t perfect, the critical challenges in the report correspond with ESF structure in the NRP, as it was written at the time. The recommendations within each address issues related to structures and procedures, but also, it speaks to building professional EM competencies unique to each ESF. The decision to insert lessons learned, as used in this report, during the chronological retelling of the events surrounding Katrina is useful, if readers want to understand when problems were realized during the crisis. This approach, however, does not organize problems within a traditional public administration framework, such as roles and responsibilities and leadership decision making. All these elements are present in the report, but it falls on the reader to identify and organize them as such.

Recommendations

The White House report lists 125 recommendations, which apply to every facet of the federal response. We can generally bin the recommendations in two buckets. First,

those that direct a component part of the system to conduct additional study on the procedures they oversee during a response. The second set of recommendations go ahead and modify the existing procedures and structures that support system-wide learning, such as the establishment of a National Homeland Security University. As with previous assessments, the White House report also wanders into problems and recommendations related to the preparedness and recovery phases of the disaster. To focus this discussion, I will briefly discuss the recommendations related to response operations and learning.

Given the breadth of the recommendations in the White House report, I selected a few that were consistent with recommendations from past reports. These selections aligned to categories of: 1) sensemaking, 2) roles and responsibilities, 3) the role of the military, and 4) capability building. The report lists recommendations that range from the establishment of formal subsystems to procedural changes at the level units and parts. Examples of proposed subsystems in the report include a National Information and Knowledge Management System and a National Reporting System. Since this is not evaluating the assessment or the response, recommendations selected allowed this research to focus on the learning process for the corresponding problems as they unfolded over time.

Katrina, as Andrew did, demonstrated that when local and state officials become overwhelmed, getting accurate information about conditions on the ground become much harder. Recommendations surrounding sensemaking called for procedural, structural, and

technical improvements communications. On the technical side, the report calls for improved use of “advanced technologies” for the Emergency Alert System. More common were the recommendations that aim to improve communication among agents at each level of the system. With critical infrastructure destroyed, first responders struggled to share information and, as a result, information sent back to operations centers was incomplete. The net result was an inadequate understanding of the task environment at the highest, key decision-making levels of government. The report also acknowledges the critical need for a National Operations Center, which would consolidate reporting from operations centers distributed across the system—usually supporting a subsystem or unit within the response effort (Hurricane Katrina Lessons Learned Staff, 2006).

The recommendations focused on the NRP, NIMS, and the ESF structure demonstrate how the Katrina experience can reshape the institutional memory of a disaster response network. Not unlike the FRP in 1992, Katrina served as early test for the NRP, which was only finalized months before the catastrophe. The plan was largely developed by the RAND Corporation, in coordination with various interagency representatives providing input (Harrald, 2012). The White House calls for the latter to revisit their efforts and examine the procedures and structures that enable the NRP/NIMS construct for response operations. Additionally, the recommendations related to the NRP and NIMS reiterate White House support for ESF structure, but it also calls on additional training to ensure agents are every level align their procedures and structures with those prescribed in the NRP and NIMS. The White House team also calls for clarification of

duties between the FCO and PFO, which was created under the NRP construct (Hurricane Katrina Lessons Learned Staff, 2006).

In addressing the role of the military, the report calls out specific military capabilities that, in its estimation, should be brought to bear sooner, under catastrophic situations. Once again, a recommendation calls for improved coordination between DOD and FEMA, which had the added complication of confusion over dealings with DHS as well. Throughout the report, and in Townsend's own comments, the White House is apprehensive about the use of the military to support domestic crises. However, in its recommendations, the team goes so far as to call on the support of the National Security Agency (NSA) and the National Geospatial-Intelligence Agency (NGA) during response efforts. Both are Title 50 organizations, which means they are limited by laws that prevent intelligence collection on U.S. persons (Hurricane Katrina Lessons Learned Staff, 2006). The recommendation does not address this challenge.

The final set of recommendations discussed offer new developments in the area of capability building. In the past, after action reviews called for capability building in the form of additional funding and training. In this report, the recommendations call for greater professionalism in the EM ranks—addressing specific disaster-related competencies—and improved capabilities at the federal level. Among these was a call to expand the National Infrastructure Simulation and Analysis Center's modeling and analysis capability. They also call for increases in objective-driven training programs and

interagency exercises. Additionally, the report calls for the expansion of Remedial Action Management Programs (RAMP) at each operational component within the system. RAMP is supposed to “ensure agencies are enacting lessons learned” (Hurricane Katrina Lessons Learned Staff, 2006).

Chapter Summary

The response to Hurricane Katrina is widely accepted as a massive government failure. The scope and breadth of the devastation became a stage for social inequities exposed on live television—images most would have thought came from a developing country. As in 1992, the state of disaster response was undergoing significant change. However, the establishment of DHS and the surge of attention on homeland security made the national dynamic different. Andrew struck when EM was an emerging discipline and policy after thought. Katrina tested a new system, established in response to 9/11, and it performed well below the nation’s expectations.

The congressional reports on Katrina assessed the response in the tradition of the 1992 NAPA report, despite lacking full third-party independence. Both reports evaluated the response in terms of procedures and structures at the system, or subsystem level, with an emphasis on FEMA. Both acknowledged the response encompassed a wide swath of diverse participant, which spanned three states dozens of counties, and scores of municipalities. Both cited problems with the NRP and leadership at every level, but most especially at the highest levels of the state and federal governments.

The White House report took a different route. It assessed problems down to the lowest level of the federal response, and it produced recommendations at a granular level that addressed operational problems. The specificity of its recommendations merit further investigation. It is clear, in some cases, the research team was aware that some improvements that were waiting in the wings prior to Katrina. The storm merely provided additional justification for implementation. In other cases, the report's prescriptions seem sensible, but they are not consistent with Townsend's own observation about the NRP being a 600-page behemoth "that will make your head spin." The White House report calls for the establishment of new procedures and structures at every level of the system, even detailing new programs down to the level of government agencies. The report, however, offers sparse insight on how implementation will take place, who will manage it, how will we measure progress, and what it would take to fund programs or change programs.

At a system level, Table 13 consolidates the recommendations following Katrina. Unlike the NAPA and GAO efforts, the recurring themes across each after action review are harder to reconcile. Not because problems were that different, but because the recommendations varied so greatly. The other analytical challenge was that problems at every level were so numerous, none of the reports boil them down to one or two that need attention. For the purpose of observing the learning process, this paper will continue using the matrix developed for the previous chapter.

Table 13: A system perspective of the Katrina after action reports

Level of analysis	Corresponding agent(s)	Problem	Recommendation
System	Disaster response network	The NRP, and its execution, fell short of expectations.	Reinforce the NRP through revisions that improve the clarity of roles and responsibilities and provide NIMS training to enhance its execution.
Subsystem	State governments	Coordination with the federal government needs improvement.	State governments should receive additional resources and training to respond more effectively.
Unit	The White House	The Office of the President needs improved situational awareness and a more proactive posture in its role, as defined by the Stafford Act.	Improve the flow of information back to the White House by developing an improved Common Operational Picture, within a National Operations Center.
Unit	Congress	Programs designed to improve the nation's capacity for disaster response need to mature	Fund programs that improve EM and disaster response.
Part	FEMA	FEMA failed to facilitate the delivery of critical services, commodities, and information to the right people, at the right time.	Senate: Establish a new organization. White House: Retain FEMA to oversee response and recovery
Part	DoD	Coordination with FEMA and other DHS parts was inefficient and, at times, ineffective	Clarify roles and responsibilities, increase joint training opportunities, expand DOD capabilities available to the response
(HSGAC, 2006; Hurricane Katrina Lessons Learned Staff, 2006)			

As in the previous chapter, the breakdown above represents a broad, but representative, view of the lessons to be learned from the Katrina response. By no means

is list exhaustive. Instead, this table enables a case comparison made in Chapter 7. By summarizing problems and recommendations for each storm, it is my hope we can trace the learning process and observe the changes that evolved since Andrew.

CHAPTER SIX: HURRICANE SANDY

On March 1, 2013, Senate Appropriations Committee of the 113th Congress held a special hearing on the “Rebuilding after Hurricane Sandy.” Testifying that day was the FEMA Director, Craig Fugate. His opening remarks signaled a response vastly different from those following Andrew and Katrina.

“Why our response worked the way it did has a lot to do with your efforts and the efforts of others after Hurricane Katrina to address known shortfalls,” said FEMA Director, Craig Fugate, to Senator Mary Landrieu of Louisiana, Chair of the Subcommittee on the Department of Homeland Security. (113th Congress, 2013)

Early in this research, it was remarkable to discover the number of after action reports produced in the wake of Hurricane Andrew. The challenge with these reports was that each addressed low levels of the system for disaster response, and few efforts were made to examine the response at a system level. Following Katrina, both chambers of Congress, the White House, and FEMA were among those to produce a comprehensive assessment of the response. Fast forward to Sandy, and the action efforts more closely resembled the environment in 1992. There are many functional and organization-specific reports, and only one comprehensive report at the federal level, which FEMA conducted.

It is worth noting that, by 2013, Mikulski had become chair of the full committee that commissioned the NAPA report in 1992. Twenty years later, the same committee would not request the same from FEMA and Fugate.

The public generally viewed the response to Hurricane Sandy as a success. The press lauded the President's efforts in reaction to Sandy and, following the so-called superstorm, the most controversial aspects of the storm stemmed from arguments over climate change and the role it played in creating the conditions that made Sandy possible. There were, of course, areas in the response that needed improvement, but the overall sentiment suggested that, finally, plans and execution came together as expected. This was a curious reaction, given that Sandy became the second-costliest storm in U.S. history. Damage totaled an approximated \$65 billion, which was more than double Andrew's costs and about half of Katrina's (National Hurricane Center, 2018). The storm damaged or destroyed more than 300,000 homes and affected more than 250,000 businesses. An estimated 165 victims died as a result of the storm (113th Congress, 2013; Federal Emergency Management Agency, 2013).

One might argue that Sandy was only a Category 1 at landfall; so less severe conditions made it easier for the response to improve. There are a number of flaws in that argument. First, the storm threatened the entire Eastern Seaboard at one point, before it finally made landfall in New Jersey on October 29, 2012. Second, Sandy struck the most densely populated areas of the country, some estimates assert that 8.5 million people lost

electrical service—roughly three-quarters of the total populations of Mississippi, Alabama, and Louisiana combined. Third, in geographic terms, it was the largest storm in U.S. history. (Blake, Kimberlain, Berg, Cangialosi, & Beven II, 2013; U.S. Census Bureau, 2018).

FEMA After-Action Report

There is only one report available for a comprehensive look at the Sandy response, and I will review its contents in this chapter. Under Fugate, FEMA published its after action report on July 1, 2013. It is considerably shorter than all the reports previously examined for this research. The report organizes its analysis of the response under four themes, each supported by areas of “strength” and “for improvement.” As in the White House report from 2006, this FEMA report is careful to frame language so as to avoid negative language.

The genesis of the themes is unclear in the testimony addressing the report, and the report itself does not explain the origins of the themes fully. Whereas previous reports specifically address elements of the FRP or the NRP, the Sandy report’s themes offer a mix of assessments on procedures and structure on one hand, and interpretations on the other. FEMA’s after action assessment for Sandy organized problems under four overarching “themes” (FEMA, 2013).

1. Ensuring unity of effort across the federal response
2. Being survivor-centric

3. Fostering unity of effort across the “Whole Community”
4. Developing an agile, professional EM workforce

Problem Recognition

Each theme in the report lists strengths and opportunities for improvement. I recognize the latter as problems. In total, the report identifies 14 problems related to the response. In some instances, the problems listed bleed into the recovery phase. The Sandy report makes frequent reference to the National Disaster Recovery Framework (NDRF), which serves as the guiding document for recovery operations in the same way the NRF guides response operations.

Table 14: FEMA After Action Report “Areas for Improvement” by theme

Four themes and “areas for improvement” (FEMA, 2013)
Ensuring unity of effort across the Federal response
Integrating Federal senior leader coordination and communications into response and recovery operations
Coordinating ESFs and Recovery Support Functions (RSFs) to support disaster response and recovery
Refining the mission assignment process
Implementing incident management structures
Using planning and analysis to drive operational decision-making
Ensuring continuous improvement of disaster doctrine, policies, and plans
Being survivor-centric
Meeting survivors’ needs during initial interactions
Ensuring survivors have equal access to services
Reducing the complexity of the Public Assistance program
Fostering unity of effort across the “Whole Community”
Coordinating among states, localities, and tribes
Developing an agile, professional EM workforce
Ensuring a qualified disaster workforce
Mobilizing the FEMA workforce for disaster response
Supporting deployed personnel

The theme on “unity of effort” included the highest number of problems identified in the FEMA report. Most of the six problems under this theme are focused on structure and procedures and, despite the generally-accepted notion of the successful response to Sandy, most of those procedural and structure problems refer to familiar issues in the area of roles and responsibilities. Two of the six, however, are new developments in the problem recognition.

The first four problems under the first theme address coordination problems. According to the report, the number of senior leaders engaged in the response created a novel problem of coordination across the system. FEMA found that the NRF does not address how those leaders should communicate with each other, nor does it detail how they should coordinate with the system’s varying operations centers. The second problem listed referred described coordination problems within the ESF structure. The FEMA report alleges that ESF departmental leads at the federal level assumed too many of the duties enumerated to the subsystem they lead, instead of leading the activities of the agencies and organizations assigned to their respective ESF. Third, FEMA found that the “mission assignment process” took too long to complete. Mission assignments, the report explains, are work orders FEMA issues to system elements, in order to accomplish specified tasks and ensure FEMA covers the funding for those tasks. According to the

report, the 10-step process took more than 24 hours to process in 40 percent of the assignments (FEMA, 2013).

The fourth problem discussed under the first theme in the Sandy report details confusion about structure. FEMA's plans call on it to establish incident management structures that are suited to circumstances. According to the report, these structures are usually based on functional operations but, when events encompass large geographic areas, a geographic structure can be established, or a mix of geography- and functional-based management is employed. The response to Sandy adopted the mixed approach, and this led to confusion in coordination efforts within FEMA and between FEMA personnel and the states. Two other challenges, or subproblems, emerged within these structural problems. First, FEMA did not make full use of the staff that could serve as Division Supervisors under the selected system. These were employees that met standards per the FEMA Qualification System (FQS), which is a performance-based qualification based on demonstrated knowledge and skills of specific incident management positions (FEMA Qualification System, 2015). Second, the transfer of authorities between the regional FEMA team to the field operations team generated confusion across key areas of the system. Regional Response Coordination Centers, which coordinate FEMA's early response at by FEMA region, is supposed to transfer incident management to the field operation, once the FCO has it underway (FEMA, 2013).

The last two problems under the “unity of effort” theme are different from problems previously discussed in this research, and both are the first problems recognized that tie directly to learning. The first was related to the use of past analysis and planning documents to guide operations. In a striking finding, the report references a survey of FEMA’s deployed planners found that 64 percent “either never used, nor had access to, regional hurricane plans.” This was not to say that no planning documents guided the Sandy response. At the top of the system, key leaders adopted and developed plans put to into effect. However, the planning problem was further complicated, when diverse coordinating offices and centers were developing and working off differing planning documents. The last problem under “unit of effort” addressed continuous improvement, which highlighted FEMA’s emerging, formalized effort to integrate lessons learned. According to the Sandy After-Action, FEMA was able to effectively collect data to formulate lessons learned, but there was no mechanism in place to apply past lessons learned during the response. This problem, in the context of this study, is remarkable. It is the first time an after action assessment addresses the application of lessons learned during the crisis (FEMA, 2013).

The second theme, “being survivor-centric,” also represents a departure from traditional after action assessments. The theme does not evaluate interactions based on procedures and structure. Instead, it looks at network interactions by prioritizing an interpretation of procedures and structures that emphasizes survivor needs. While it may seem self-evident that the needs of survivors should be a high priority, past experiences

found that an emphasis on procedure may have come at the cost of survivor needs. In addressing problems under this theme, FEMA is fostering learning on the cultural side of the network, insofar as it prioritizes outcomes over procedures. The third problem under this theme was related to FEMA's Public Assistance program, which largely falls to the recovery phase. I will only expand on the problems related to the response.

The first problem addressed access to survivor services at large. The report breaks issues of access down into three areas for improvement. The first was related to staffing concerns for newly-combined efforts in Community Relations and Applicant Services. The former traditionally engaged survivors in local neighborhoods, while the latter previously served them at shelters or Disaster Recovery Centers (DRC). To improve access to services, FEMA had combined the functions, but the report found access issues persisted. These issues included the adequate collection and reporting of key information from survivors. Additionally, the information collected was unstructured and reporting the information was difficult. While a mobile application was available to streamline the process, many responders lacked the tablets necessary to use it. The report then identifies issues at the DRCs. Specifically, it highlights inefficiencies with Applicant Services and inconsistencies in the services available from one DRC to the next (i.e. some nonprofits or banking services were available in one DRC but not another). The final subproblem related to access addressed shortfalls at FEMA call centers. According to the report, the centers were overwhelmed by the number of calls, which included service applications and requests for information, place after Sandy (FEMA, 2013).

The second problem under the “survivor-centric” theme addressed confusion related to Disability Integration Advisors (DIA). The report defines their role as one of a “deployable workforce” charged with “assisting survivors with access and functional needs.” At the time Sandy hit, FEMA was still implementing an FQS for DIA roles. The report alludes to the possibility that factored into the confusion. According to the report, field operations and other deployed staff were unsure of the DIA function, which challenged their mandate to ensure equal access to services (FEMA, 2013).

The third theme in the Sandy report sought to highlight efforts at “fostering unity of effort across the whole community.” In contrast to the second theme, this view of unity of effort expands to the whole system. In the first theme, the focus was on the subsystem that included all Federal Government agents. The one problem highlighted under the third theme addresses coordination challenges between the FEMA and state and local governments. Specifically, due to the character of the region Sandy hit, organizing and coordinating efforts among so many jurisdictions proved difficult. Many municipal governments in the region border one another, unlike other regions of the country that might have large swaths of unincorporated land between towns. Additionally, New York City and New York State placed competing requests of federal agencies, because they did not fully adopt the Unified Coordination Group construct, which is defined in the NRF. Finally, tribal integration needed clarification, since Sandy became the first instance of a response including a tribal affairs liaison. In the report, FEMA acknowledges that the

system needs to recognize tribal sovereignty, which entitles tribes to initiate and oversee disaster protocols independently of the state and local governments (FEMA, 2013).

In 2012, FEMA's leadership reoriented the agency's deployable mission to increase the number of personnel deployed to a response. The response to Sandy became one of the largest FEMA deployments in history, but the After-Action report found some early challenges with the new deployment model, as it related to an event the size of Sandy. The final theme in the report identified four problems. Each problem was related to operational gaps resulting from FEMA's new deployment-driven service model. The first was to ensure the workforce was qualified, which meant either developing appropriate an FQS for each of the roles needed for the response, or getting enough people trained within their corresponding FQS. The second problem stemmed from mobilization challenges. In some cases, not enough staff were available to deploy, in other cases field operations struggled to secure deployable staff with the right skill sets. Support services for those deployed were organized under the third problem in the final theme. These services included issues at the Personnel Staging Area, which organized staff and assignments. Logistical and administrative support for non-FEMA personnel was also an issue, since many lacked the IT equipment or even clothing needed to support the response. Adequate lodging also became a support shortfall, as FEMA admitted in the report that it did not fully account for how to house a deployment force that big. Finally, the deployment was so big that continuity of operations became a problem, as FEMA Headquarters and Regional Offices lacked the personnel to conduct "Mission Essential

Functions.” These ranged from distributing grants to risky lost capacity in other FEMA regions; should another event occur there. Put simply, the FEMA workforce was stretched too thin (FEMA, 2013).

Analysis

Fugate established the Sandy Analysis Team to reviews the response to Sandy in the weeks that followed the event. The report focuses on FEMA’s efforts during the response to Sandy in New York and New Jersey. As with previous after action methodologies, the team reviewed events in chronological fashion and collected lessons learned from system agents through the now-defunct FEMA Lessons Learned Information Sharing system. The report draws from more than 200 interviews that were conducted with staff at every level of the response. The team also analyzed 44 quantitative data sets, using them to assess how the response evolved in the weeks after landfall. The team also distributed a survey to the Surge Capacity Force, which included more than 8,600 deployed personnel. As previously noted, the analysis organizes its findings into four themes, and each theme recognized “strengths” and “areas for improvement” in their narrative (Nimmich, 2013; FEMA, 2013).

Table 15: FEMA After Action Report “Strengths” by theme

Four themes and “strengths” (FEMA, 2013)
Ensuring unity of effort across the Federal response
The President expedited Federal disaster declarations
Using an online crisis management system to coordinate Federal response operations
Being survivor-centric
Meeting survivor needs through innovation

Fostering unity of effort across the “Whole Community”
Integrating response and recovery efforts with nongovernmental partners
Developing an agile, professional EM workforce
Completing one of the largest and most diverse personnel deployments in FEMA history

The analysis that followed Sandy took on a different tenor, which was likely related to the overall positive perceptions of the response. Notably, the report makes little mention of leadership gaps, as was prevalent in previous assessments. For example, President Obama took the unusual step of accepting verbal requests for disaster declaration from three states, which waived the written request requirement and enabled full, federal response sooner than it would have occurred otherwise (FEMA, 2013). The move was a departure from President Bush’s strict adherence to procedure in 2005. This contrast is raised here to identify a shift in the analysis of the response. The Sandy report makes little mention of the problems identified during Katrina and, in doing so, it does not articulate the effect of changes that resulted from past experience. Put another way, the report does not discuss how Bush’s decisions may have, or may not have, influenced Obama’s.

Since recognition of strengths falls outside the learning model employed, I will not expand on each strength here. However, I will put them into context in Chapter 7. The second set of observations in the report that fall outside the scope of this research were related to the recovery phase of the disaster. Finally, the Sandy After-Action Report is a more definitive document than its predecessor assessments, especially those included in this study. The analysis of the Sandy report excludes recommendations, because it

articulates management steps already underway to address areas of improvement by the time the report is published. This assessment includes the actions already underway to address the “areas of improvement.”

Recommendations

The Sandy report does not explicitly list recommendations, and it offers only a cursory look at remedial initiatives underway as a result of Sandy. In fact, there was no publicly-available, organized listing of the administrative changes underway as a result of the FEMA Sandy After-Action report. Drawing from the report text, congressional testimony, and FEMA leadership statements, this inquiry was able to identify some of FEMA’s “next steps” to address the problem recognized in the Sandy response.

Under the “unity of effort” theme, FEMA looked to develop additional training, exercises, and outreach to facilitate improved coordination and communication throughout the ESF structure. An example of a step taken in that direction was an exercise in 2013; it was a Principals’ Level Exercise. The exercise was meant to help Cabinet members better understand their roles and responsibilities under the NRF (Nimmich, 2013). To address mission assignment issues, FEMA established an Executive Steering Commission to update the process. Two immediate steps taken in Sandy’s wake, by FEMA, were to add functionality to the agency’s crisis management system and to publish mission assignments in excess of \$1 million dollars online, which would advance the transparency for all relevant agents. In January 2013, FEMA also updated the

“Incident Management Handbook” to clarify the structures that govern interactions among key incident managers (FEMA, 2013).

Under the second theme, FEMA also updated the “Incident Management Handbook” to include the DIAs’ roles in response operations and continued work on the training relevant to help potential DIAs become FQS-ready. FEMA also conducted what it called a “FEMA Think Tank Conference Call” on February 2013, which shared best practices and discussed “innovation solutions” in EM—an estimated 600-700 responders participated. The call reflected FEMA’s use of the Innovation Team deployed in response to Sandy. Many regarded the all-volunteer Innovation Team as a critical success. The team helped FEMA lead intracrisis learning in a variety of ways that ranged from improving communication across the response by deploying satellite communications to identifying and providing translators needed to address medical requirements among survivor groups (Serino, 2013; FEMA, 2013).

In addressing concerns about the response workforce and interagency coordination, FEMA launched a one-year pilot that restructured the Incident Management Assistance Teams (IMATs). The pilot adopted greater flexibility in hiring practices to ensure the right skills sets were brought aboard, and it also made IMAT members complete a 12-week training program to prepare to deploy. The pilot was to last 12 months. At the conclusion, FEMA and other leading organizations would evaluate its

performance and determine whether or not to retain or revise the effort long-term (Nimmich, 2013).

In the same month as the Conference Call, FEMA established the Continuous Improvement Working Group (CIWG). FEMA charged the group with monitoring continuous improvement actions. According to the Associate Administrator for Response and Recovery at the time, Joseph Nimmich, testified that the CIWG had already overseen the implementation of 30 percent of the recommendations resulting from Sandy by September 2013. Additionally, the agency updated continuity operations plans in an effort to ensure they scale adequately during a response similar in size to Sandy, addressing an area for improvement under the fourth theme in the After-Action Report.

Chapter Summary

Efforts to learn from the Sandy response took a dramatic turn from previous catastrophes. Notably absent from after action efforts was the Congress, which reinforced a contention that “fire alarm” oversight adopted in Sandy’s wake. It is likely that a combination of the perceived successful response, and FEMA’s proactive approach to remediation led to a more passive reaction in the Legislative Branch (McCubbins & Schwartz, 1984). The Sandy After-Action Report also departs from a problem-centric assessment of response operations. Instead, it establishes themes that align with mission values—priorities leadership sets for network members.

This decentralization of assessments, following Sandy, effectively redistributed learning processes from the system and subsystem level down to the units and parts. This is evident in the resurgence of after action assessments at the functional levels with a focus on procedures and structures. The existing comprehensive analysis, prepared by FEMA, was focused on FEMA activities, but it pegged those activities against priorities for improvement within the agency and across the system. The establishment of the Lesson Learned Information Sharing (LLIS) Program was, at the time, one vehicle for collecting lessons learned from disparate agents at lower levels of the system. The LLIS required verification that contributors were emergency responders or homeland security officials at any level of government; today network members submit their lessons learned to the Homeland Security Digital Library (HSDL). The LLIS was consolidated with the HSDL in 2015, and it is maintained by the Naval Postgraduate school (Department of Homeland Security, 2015).

This new approach inverted the flow of learning processes. During Andrew and Katrina, evaluators identified problems and recommended changes to procedures and structures to solve those problems. Subordinate elements of the network needed only to train on, adopt, and execute those changes. The approach by time Sandy came around established priorities, identified management changes within FEMA, and encouraged procedural and structural changes to develop within other parts of the system—offering guidance for those changes with updates to the “Incident Management Handbook,” the NRF, and other guiding documents. The new approach is consistent with leadership

direction to focus on priorities, and in so doing, alter culture throughout the system. Table 16 summarizes learning activities that altered the institutional memory of the system, it excludes the fourth theme from the Sandy report. The last theme included largely solutions that required administrative actions within FEMA itself.

Table 16: FEMA After Action Report “Areas for Improvement” by theme

Four themes and “areas for improvement” (FEMA, 2013)		
Priority: Ensuring unity of effort across the Federal response		
Area for improvement	Changing interactions	Solution
Integrating Federal senior leader coordination and communications into response and recovery operations	Seeking to improve procedures, structures, and interpretations shared by key leaders	FEMA publishes the National Emergency Communication Plan in 2014
Coordinating ESFs and Recovery Support Functions (RSFs) to support disaster response and recovery	Seeking to clarify procedures and structures to improve coordination among ESFs	Conducting exercises and updating the NRF (FEMA published the second edition in 2013)
Refining the mission assignment process	Streamlining a specific procedure	Established an Executive Steering Commission to update the process and update the Incident Management Handbook accordingly
Implementing incident management structures	Making it easier to select, establish, and execute structures and procedures appropriate for events	Updated the Incident Management Handbook, continued FQS development of the workforce
Using planning and analysis to drive operational decision-making	Prioritize data for analysis by interpretations of operational outcomes	Transition toward outcome-based data and metrics from the system
Ensuring continuous improvement of disaster doctrine, policies, and plans	Establish procedures for capturing lessons learned, prioritize sharing of lessons learned	Established FEMA’s Lessons Learned/Continuous Improvement programs and launched the Continuous Improvement Working Group (CIWG)

Priority: Being survivor-centric		
Area for improvement	Changing interactions	Solution
Meeting survivors' needs during initial interactions	Internal restructuring to prioritize recovery expertise at the point of interface, vice a "middle man" customer service interface	Transferred FEMA's Community Relations—Assess, Inform, Report function from External Affairs to the Recovery Directorate
Ensuring survivors have equal access to services	Clarifying structures that account for the role of the DIA during the response	Updated the Incident Management Handbook, continued FQS development of the workforce to field improved DIA support
Priority: Fostering unity of effort across the "Whole Community"		
Area for improvement	Changing interactions	Solution
Coordinating among states, localities, and tribes	Modifying structures and procedures to recognize a distinct agent with the system	Updated the Stafford Act and Regional Incident Support Manuals to reflect tribes' unique status as sovereign constituent members of the network

Absent from the Sandy After-Action Report were many observations about the response efforts by state and local governments. FEMA's OIG published response assessments for New York and New Jersey respectively, but as in years past, it did not generate a comprehensive assessment. Sandy struck the most populous region in the United States, which posed significant risks, but by the same token, the region also boasted the largest, seasoned first responders in the nation. It included police forces tested by 9/11, hospitals fielding acute trauma cases daily, and infrastructure on land, under land, on water, and for air transport that is not available anywhere else in the country. How local resources factored into the response would have helped clarify the picture of the federal response.

A final aspect of the review after Sandy is climate change. From Fugate to Congress and the White House, there was a consensus that Sandy was in part the result of climate change. This conclusion seemed to further direct after action attention and efforts to the preparedness phase of disasters, since many key stakeholders viewed Sandy—in size and scope—as a new operating reality for which the system needed to adapt (113th Congress, 2013).

CHAPTER SEVEN: COMPARING CASES

Each of the storms examined in this research were historic. Each served as milestones in the continuing evolution of disaster response networks, and each marks an opportunity to assess the institutionalization of the lessons learned from the previous event. This chapter highlights examples of how learning took place from Andrew to Sandy, the methods employed to transfer knowledge over a 20-year span, and how our understanding of disaster response has evolved. From Andrew to Sandy, the evidence suggests that lessons learned influenced changes to procedures and structures, which in turn operationalized recommendations derived from past lesson learned. The comparative discussion that follows will endeavor to highlight where this occurred, and where it occurred but failed to translate into action. Concurrently, this analysis also uncovered evidence of change in the way learning itself occurs in this networks. This chapter briefly discusses those developments.

From a distance, the persistence of problems in disaster response operations can cast valid doubts about a disaster response network's capacity to learn. However, the evidence examined for this research suggests that processes that approximate learning do, in fact, alter responses operations over time, and those changes do improve performance. Unfortunately, this conclusion must be gleaned from interviews, historical reviews, and inference because there is no system of learning in place to monitor the progress and

results of lessons learned implementation. In sum, these networks do not have a systemic approach to learning. This research assumes lessons were learned because recommendations from 1992 were manifested in standard operations by 2005. However, the connection between the lesson learned from 1992 and the execution in 2005 is inferred, because the after action reports do not provide any continuity between their evaluation of response performance, and how that evaluation connects to previous such efforts.

For that reason, the first part of this chapter follows the progression of some of the most prominent lessons derived from the case study events. While the progression of lessons over time was not uniform, the historical record and interviews indicate several concurrent efforts ferried lesson learned from after action reviews to standard operations. The examples detailed here highlight where, and when, those lessons were institutionalized. In a few examples, the record suggests lessons were left behind or unlearned.

Transferring lessons over such a long period of time is no small feat. Institutional knowledge is a perishable resource, if not effectively passed to succeeding professionals and leaders. As a result, this chapter also discusses the vehicles employed to transfer lessons learned, catalog them, and revisit them for updates. Specifically, this discussion will cover the modes of institutional memory that most significantly contributed to the preservation of past lessons and their application in future events. As previously

discussed on learning, the pathways of knowledge from experience to new behaviors are uneven, diverse, and dynamic. The vehicles for institutional memory are likely not an exhaustive list of the modes through which lessons learned are retained. They are, however, the most frequently discussed in the literature and the case studies examined in this research.

Lastly, this chapter analyzes the evolution of network learning for disaster response operations. Conducting a case comparison over a 20-year span had many challenges, but there were also benefits. One of the unintended benefits of this research design was an ability to observe network evolution and adaptation. The case comparison that anchors this chapter, and this research, was separated by time and circumstances enough to distinguish clear variants in the learning processes since 1992. The span of time between cases also proved useful in isolating changes to the learning processes themselves.

In summary, there were changes that took place after these storms triggered a desire to improve response operations. This chapter argues many of those changes resulted from learning. Elected officials and EM leaders employed learning methods consistent with the model adopted for this research: problem recognition, analysis, and institutionalization to effect improvements, which resulted from revised procedures, changed structures, and novel interpretations that guided interactions among system agents. When newly-guided interactions led to performance achieving desired results, we

can infer that lessons were indeed learned. When interactions led to performance that resulted in shortfalls. Three possibilities came to the fore. Either problems were not properly recognized, lessons were not learned effectively, or lessons were unlearned.

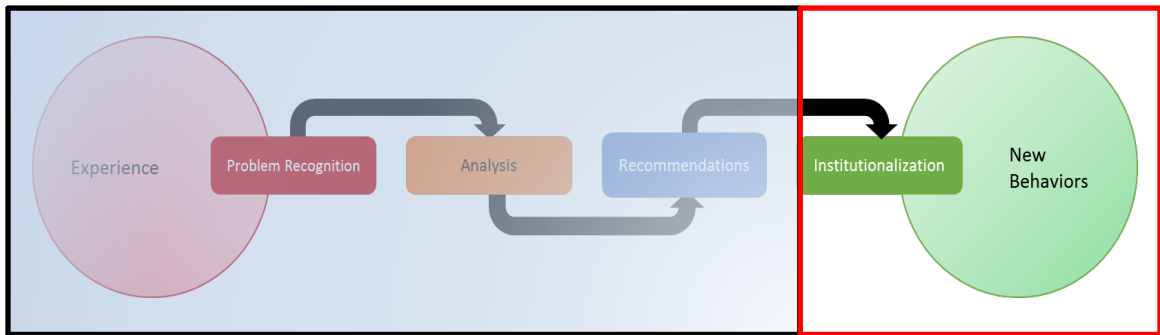


Figure 2: Learning process focused on new behaviors

Intercrisis Learning

Significant changes resulted from the tragedies surrounding Andrew and Katrina. At the system level, key legislation enabled a restructuring of the system that took account of lessons learned. Changes to the institutional memory of the system also altered the responses that followed. The summaries that follow focus on the evidence of institutionalization that resulted in new behaviors manifested in network interactions defined by procedures, structures, and interpretations.

Hurricane Andrew

When the reports on Andrew were published, both the NAPA and GAO teams asserted the need for an effective “emergency management system” at the Federal level.

Such a system, it was argued, would address needs when state and local resources were overwhelmed. The table that follows reviews the problems and recommendations made after Andrew.

Table 17: A system perspective of the Andrews after action reports

Level of analysis	Corresponding agent(s)	Problem	Recommendation
System	Disaster response network	Food and shelter in the immediate aftermath were inadequate.	Create teams to deploy early and provide accurate assessment of needs in affected areas. Improve the pre-positioning of response resources.
Subsystem	State governments	State governments did not have the capacity—in terms of resources and EM expertise—to respond as effectively as planned in the FRP.	State governments should receive additional resources and training to respond more effectively.
Unit	The White House	The Office of the President needs stronger engagement with response operations	Designate a proxy for the President, with direct access to the President, to act with authority and maintain Executive control over operations.
Unit	Congress	Oversight of FEMA, and other system units and parts, is diffuse, at times overlapping or competing, and generally unclear.	The Congress should streamline authorizing and appropriating oversight of FEMA and broad system elements
Part	FEMA	Unclear vision and mission. FEMA never fully integrated after its establishment.	Establish a new organization or adopt a strategic vision, under a unified mission.
Part	DOD	Major catastrophes overwhelm existing response resources. Only DoD maintains resources that can deploy and scale quickly, but its role in	Establish structures and procedures

		response operations is limited and unclear under certain circumstances.	
(National Academy of Public Administration, 1993; GAO, 1993)			

Hurricane Andrew changed EM in the United States forever. By some accounts, the event also influenced the election of 1992, contributing to President George H. W. Bush's loss. The new President, Bill Clinton, would appoint a new FEMA Director, James Lee Witt from Arkansas. Witt was seasoned EM professional, and in this regard, EM experience at the Director's level was a new development. He strengthened SOPs and fostered a singular mission at FEMA, working to build a cohesive mission at the agency. Witt met with the NAPA team, and by their account, many of their recommendations, as they pertained to FEMA, were implemented (Witt & Morgan, 2002; Rubin, Hurricane Andrew Response, 2018).

By the time Katrina made landfall in Louisiana, FEMA had performed the largest prepositioning of commodities in the agency's history (Hurricane Katrina Lessons Learned Staff, 2006). Additionally, efforts to develop capabilities at the state and local level, in coordination with FEMA, had been taking place, such as the Hurricane Pam Exercise that concluded in the weeks prior to Katrina. FEMA's work with the states in the years shortly after Andrew expanded under Witt. For example, he led the creation of Performance Partner Agreements and Cooperative Agreements between FEMA and the states to work toward specific outcomes when disasters strike. The agreements provided

resources to develop state-level capabilities in support of outcome-based objectives (Bohl, et al., 1999; Sylves, 2006). These partnerships and their supporting capabilities continued to evolve until the catalyst event that was 9/11.

When 9/11 hit, the FRP continued to identify the FCO as the President's point person during response operations. However, when Katrina hit, the NRP added two layers above the FCO. They were the PFO and the Secretary of Homeland Security. In this particular case, the lesson of Andrew, by the time Katrina hit, strayed in the opposite direction from realization. The additional layers between the FEMA Director and the President confused an already confusing dynamic under crisis circumstances (HSGAC, 2006). The net result was an unlearning of the lessons of Andrew, as it related to the importance and value of clear executive leadership.

The NAPA report became the only after action report that addressed the confusing oversight structure over FEMA in the Congress. If any progress was made with regard to streamlining oversight, it was arrested, and possibly further complicated, with the establishment of DHS, which introduced additional oversight from committees that retained their duties over the department's constituent organizations. However, in the years leading up to DHS, the consensus among those interviewed for this study suggests that Witt's arrival helped secure FEMA's continued existence. He, they say, took serious steps to develop the agency's first vision and mission statements, and he implemented aggressive initiatives to foster a singular mission and culture at the agency (Witt &

Morgan, 2002; Sylves, 2006; Rubin, Hurricane Andrew Response, 2018; Gordon-England J. , 2018).

In the time since Andrew, DOD's role in disaster response grew considerably. The amended FRP from 1999 added flexibility for FEMA requesting DOD support beyond structural engineering, which DOD already led as a primary in the original ESF structure. Prior to that, DOD claimed its alignment under the Stafford Act was unclear (Forces Command, 1993). By the time 2005, DOD's role was clear, but the sequence of events was unclear. Army elements acted on initiative to preposition themselves, in some cases, before FEMA requested support (HSGAC, 2006). While DOD's place in the structure of the response was clearer than in 1992, the procedure was not.

Hurricane Katrina

Many viewed the response to Katrina as the worst EM failure in U.S. history, and for most that debate the point, they only do so because of the 2017 response to Hurricane Maria. The failure of Katrina was even more pronounced in light of the reforms enacted following 9/11. Instead a robust, organized response to catastrophe along the Gulf Coast, Americans witnessed the nation's response become overwhelmed. From Andrew to the Pam Exercise, the knowledge of a worst case scenario in New Orleans was widely known, but the response came up short anyway. The table that follows, from Chapter 5, lists the overarching problems and recommendations summarized from the after action reports for Katrina.

Table 18: A system perspective of the Katrina after action reports

Level of analysis	Corresponding agent(s)	Problem	Recommendation
System	Disaster response network	The NRP, and its execution, fell short of expectations.	Reinforce the NRP through revisions that improve the clarity of roles and responsibilities and provide NIMS training to enhance its execution.
Subsystem	State governments	Coordination with the federal government needs improvement.	State governments should receive additional resources and training to respond more effectively.
Unit	The White House	The Office of the President needs improved situational awareness and a more proactive posture in its role, as defined by the Stafford Act.	Improve the flow of information back to the White House by developing an improved Common Operational Picture, within a National Operations Center.
Unit	Congress	Programs designed to improve the nation's capacity for disaster response need to mature	Fund programs that improve EM and disaster response.
Part	FEMA	FEMA failed to facilitate the delivery of critical services, commodities, and information to the right people, at the right time.	Senate: Establish a new organization. White House: Retain FEMA to oversee response and recovery
Part	DoD	Coordination with FEMA and other DHS parts was inefficient and, at times, ineffective	Clarify roles and responsibilities, increase joint training opportunities, expand DOD capabilities available to the response
(HSGAC, 2006; Hurricane Katrina Lessons Learned Staff, 2006)			

Congress enacted six legislative reforms to address the Katrina response. These were in addition to the changes made Administratively, pushed by the White House and

DHS. Prominent among these was the Post-Katrina Emergency Management and Reform Act of 2006, which identified more than 300 provisions—procedural and structural—designed to address the failings of the response (CRS, 2006; GAO, 2008).

Initially, FEMA modified the NRP to include lessons learned from Katrina in 2006, but the plan was eventually replaced by the NRF. The transition from plan to framework, as stated in the NRF, acknowledges a shift from pre-established procedures to incident-specific planning that should take place by the system as events are unfolding. The NRF is, in essence, a move to enable intracrisis learning, by providing roles and responsibilities, while giving the network the flexibility to adapt procedures and priorities to the circumstances at hand. The NRF also retained, and in part encouraged modifications, to the NIMS, which remains in use today (Federal Emergency Management Agency, 2008). In the years since Katrina, FEMA revised the NRF twice more in 2013 and, again, in 2016.

Also noteworthy are two examples of steps taken to address the second problem during the Katrina response. The Post-Katrina legislation established 10 Regional Administrator positions, which are appointed by the FEMA Director, in consultation with state officials. The leaders would help facilitate interactions between Federal resource and the states, clarifying procedures, maintaining structures, and syncing priorities during response operations. Additionally, the legislation transfers the Office of Grants and Training (G&T) from DHS back down to FEMA. G&T provides funding and technical

assistance to state, local, and tribal governments working to improve their preparedness and response capabilities (CRS, 2006).

DHS did establish the National Operations Center (NOC) following the Katrina response. Today, the NOC is charged with developing a common operational picture (COP) for “senior-level decision making.” The NOC aggregates reporting passed through field emergency operations centers and other ops centers within the system, where staff process “message traffic” and fuse information to inform the COP. Information-sharing platforms, such as the Homeland Security Information Network, or HSIN, offer network participants platform for sharing reporting (Department of Homeland Security, 2018). Most of the reporting is unstructured, but through NIMS and FEMA-provided training, the years have seen progress in the realm of interoperability in terminology and concepts.

The Post-Katrina Act also authorized funding increases for FEMA in the immediate years that followed. Appropriations increases were 10 percent in each year from fiscal year 2008 through 2010. Additional funding increases were also made, but perhaps of equal importance, Congress lifted authorization restrictions the slowed the delivery of funding to initiate operations or disburse monies to victims. Increased spending resulting from Katrina, as authorized by Congress, continued well into 2015 (CRS, 2006; Hoople, 2013).

When it came to FEMA, Congressman Bill Shuster, who chaired the House Subcommittee on Economic Development, Public Buildings, and Emergency Management in the 109th Congress, may have expressed the prevailing sentiment best. “As imperfect as FEMA may be, FEMA is the only Government entity with the experience and the expertise to manage and coordinate the disaster recovery,” Shuster said at a hearing on the recovery effort. FEMA continued despite the Senate’s recommendation to move on and establish a new agency. In fact, Congress doubled-down on FEMA by reintegrating functions taken away with the establishment of DHS, specifically moving the DHS Preparedness Directorate back under FEMA. Legislation also elevated FEMA’s status within DHS and restored much of its autonomy. The addition of the regional offices further expanded FEMA’s reach and reinforced the nation’s new commitment to a national EM system with FEMA at its center. Notably, while the new agency called for by the Senate was never established, the most significant reforms for FEMA were recommended for the would-be FEMA replacement discussed in the Senate’s Katrina after action study (109th Congress, 2005; CRS, 2006; HSGAC, 2006).

Finally, the reforms after Katrina called on DOD to provide an “inventory” of available resources and services that could support a civil mission, if called upon to do so. Additionally, the legislation required DHS to identify primary points of contact at NORTHCOM and U.S. Pacific Command (PACOM), in order to streamline operational

control of deployed DOD assets (CRS, 2006).³ By the time Sandy made landfall, NORTHCOM had activated Defense Coordinating Officers in three FEMA Regions to begin coordinating DOD's substantial support to the response. Support included, in addition to active duty personnel, helicopters, fuel, and generators. The Defense Logistics Agency was made available to support waste water clean-up efforts and the removal of hazardous materials. These efforts were in addition to DOD's standard response support to structural issues through the U.S. Army Corps of Engineers, and the mobilization of the National Guard (NORTHCOM, 2012; American Forces Press Service, 2012).

Hurricane Sandy

FEMA's After-Action Report for Hurricane Sandy signaled a new approach to learning. First, the report transitioned from a format that built its analysis on problem recognition. Instead, the report outlines operational priorities where leadership is trying to focus improvement. Additionally, data collection was more organic in the report. Previously, interviews served as the primary source of assessment data. The Sandy report indicated that FEMA used survey data, operational quantitative data, and interviews. Past reports made no mention of system agents collecting data for the express purpose of supporting lesson learned activities post-disaster. Additionally, FEMA's use of "Think Tank Conference Calls" provided a forum for network participants to conduct a live hot wash of response operations, several hundred would attend these calls, offer their

³ Under the unified command structure used by DOD. Military elements deployed for operations within an Area of Responsibility (AOR) fall under the operational command of the Combatant Command responsible for the corresponding AOR.

insights, and question senior leaders in attendance. The Think Tank immediately after Sandy included the DHS Secretary and the Deputy Secretary of Energy (Serino, 2013)

The Sandy report does not devote much attention to the problems of the past, which were so dominant in the aftermaths of Andrew and Katrina. However, those problems merit some small amount of attention here. First, as emphasized in 1992, the nation needed a national EM system, and it had one in place by the time Sandy hit. By a twist of fate, FEMA survived to become the centerpiece of that system. It is true that additional clarity was needed in the structure of the ESF framework and interagency communications during Sandy, but these challenges never elevated to the point of congressional oversight hearings. By contrast, both were acute problems in 1992 and 2005. Fugate said it himself, “why our response worked the way it did has a lot to do with your efforts and the efforts of others after Hurricane Katrina to address known shortfalls,” during a hearing in 2013 (113th Congress, 2013).

Finally, Sandy posed the first potentially catastrophic test of the changes implemented since the Katrina reforms. While the Sandy report does not explicitly evaluate how those reforms performed, congressional testimony and reports suggest the lessons of Katrina influenced the response significantly. First, the President played an active role during the response, expediting disaster declarations and supporting Fugate’s efforts on the ground. Obama’s direct involvement in the response was enough to negate previous calls for an effective proxy, or representative of the President, to emphasize the

urgency of decisions and operations. Obama also personally met with senior EM leaders in the National Response Coordination Center, specifically to discuss response progress as it was unfolding (FEMA, 2013).

Another change from Katrina was discussed as an area of strength, as FEMA deployed an online system called WebEOC to enable coordination and support activities. During the Katrina response, Louisiana, Mississippi, Alabama, and FEMA each employed distinct systems to place requests and coordinate resources (Hurricane Katrina Lessons Learned Staff, 2006). While FEMA's system at the time was online, it was not interoperable with the other systems. WebEOC was the first use of a single, online sharing platform to aggregate and monitor requests. Surveys on the systems performance were largely positive during FEMA's evaluation efforts (FEMA, 2013).

Lastly, the expansion of staff available to deploy for FEMA was astounding, when compared to Katrina. FEMA infamously had one employee in New Orleans during the initial response phase. By landfall on October 29, 2012, FEMA already had more than 900 staff deployed to the region. The FEMA Corps, as it has come to be known, included volunteers, FEMA employees, surge staff from other agencies and non-profit organizations. The difference was evident right away, as FEMA was able to interface with survivors directly, in their communities, and establish collaborative groups with civic and business leaders at the local level. The exchange between the responders and residents not only repositioned FEMA's response as engaged and on the ground; it also

facilitated the flow of information and requests up the network—enabling decisions affecting system-wide resources (FEMA, 2013).

Institutional memory

At the beginning of this paper, it was argued that organizations, networks, and systems do not learn as an individual human would. Over the course of this case comparison, three areas where the lesson learned from past experiences were stored and implemented were clear. These were within FEMA and DHS's national resources, which includes protocols and structures for the various, discreet challenges these systems face. Second, the functional communities of practice surrounding EM and their considerable evolution since Andrew. The professionalization of homeland security has helped foster not only an EM literature, but also a growing consensus for best practices. And, the third vehicle for institutional memory was evident in the leaders at the top of the system.

FEMA and DHS maintain scores of plans that outline procedures and structures for myriad types of incidents, which in applicability from the severity of an event to the type of hazard threatening an area. This discussion has already touched on the various national plans available to guide operations and their evolution. A closer look reveals that not only had the NRP replaced the FRP, but also the NRP underwent at least two major revisions before the NRF replaced it. The NRF, as of this writing, is on its third edition.

These overarching plans are broad and complicated. As a result, DHS and FEMA have taken concrete steps to indoctrinate EM professionals with the tenets of these national resources. FEMA's Emergency Management Institute is one example of a national resource that offers remote training on nearly all NRF and NIMS protocols. The Homeland Security Digital Library and HSIN also represent information-sharing platforms that did not exist in 1992. Contributors, which may be any member of a network, can upload lessons learned, search others' experiences, and reference key planning documents in one place. Lastly, FEMA's academic engagement over the last three decades has produced scores of degree programs in homeland security across the country. Despite the ongoing disorganization of theory, concepts, and terminology in the field, the discipline of EM has made remarkable progress over a short period of time.

Building on EM's progress in the academy, communities of practice, which could be organized to align with the ESF framework, have also helped institutionalize competencies now viewed as critical for a variety of EM professions. Aside from professional organization groups that have gained traction in recent years, FEMA sponsors 230 communities of practice through its S&T Directorate. Members must register to participate. Once they join, they gain access to intellectual capital, online training, and virtual networking capabilities, where members can share experiences directly with one another (Department of Homeland Security, 2018).

Finally, the evidence suggests that leadership matters. The consensus on Witt's ability to save FEMA was resoundingly consistent among those interviewed for this study. Witt was an EM professional when he took the position, and he understood the importance of prioritizing in the face of bruising conditions (Witt & Morgan, 2002; Rubin, 2018; Kliman, 2018; Roberts P. S., 2013). In saving FEMA, Witt also protected one of the primary vehicles for EM institutional knowledge. By contrast, Michael Brown, the FEMA Director during Katrina had minimal EM experience to draw from, when the nation's worst natural disaster hit the Gulf Coast in 2012. As Brown stepped down under intense criticism, Craig Fugate was serving in a senior position in the Florida Emergency Management Division. Obama would go on to nominate him for FEMA Director. Originally a firefighter, Fugate brought decades of EM experience to the job (Moon, 2017). His emphasis on engagement, even with the lowest level members of their network, appeared to improve performance but also generated feedback critical to informing ongoing improvement—during and in between events.

Having established that networks do not learn as individuals, we are left to ask who then does the learning? This research found evidence of learning in the changes made to procedures and structures that were consistent with past recommendations. Perhaps with more time and access to staff, future researchers could verify the links between those recommendations and the changes evident in EM plans.

However, there was some evidence to suggest that learning and leadership share a vital link, which supports Schein's views on the subject (Schein, 2010). After the Hurricane Pam exercise, some leaders took the initiative to implement what they could from the lessons of Pam, which turned out to be timely for Katrina; they "met mixed success." Notably, most leaders that were aware of Pam's results, were waiting on direction—or funding—to proceed with implementing Pam's lessons learned. Those leaders did not fare as well, when Katrina hit (HSGAC, 2006). This vignette is a useful example of the importance of leadership for institutionalizing lessons to memory. Those leaders took ownership of lessons learned and executed accordingly. While it is true that these ad hoc organizations lack a shared institutional memory, it seems that leadership, in part, compensates for this disadvantage by creating a bridge between lessons learned and present-day operations.

System evolution

The case comparison conducted in this research attempted to examine learning processes, through the use of a traditional learning model, in disaster response networks. Before this chapter ends, it is appropriate to briefly discuss changes observed in how learning itself changed over time—from 1992 to 2012. While it was clear that lessons and institutional memory evolved in that time, it was equally clear that an evolution in learning also took place. How we understand networks also matured over that same period; so, it follows that how these networks learn would follow suit. By the same token,

there is evidence to suggest that how we understand problems evolved as well. The following summarizes four observations that suggest these changes did take place.

1. **Moving toward granularity:** In 1992, the NAPA team posed large, existential questions about FEMA and the nation's disaster response network at large. By Sandy in 2013, FEMA itself was directing adjustments across the network—focusing on specific parts and units of the system. Additionally, the Sandy after action effort also signaled a return to procedural and structural adjustments below the subsystem level. This is not to say these changes did not continue at higher levels, but the evidence suggests that the evolution of a national EM system took time. Once it was established, however, learning turned its attention to functions procedures within the system.
2. **Independent toward self-assessed:** The public depended on NAPA and GAO for comprehensive assessments of Hurricane Andrew in 1992 and 1993. Both represent independent views of response operations, where the assessors did not have a vested interest in the execution of change in the system. Katrina introduced a transition, where political considerations weighed heavily as both congressional chambers and the White House conducted after action studies. By 2013, FEMA provided the only system-level after action assessment, and it largely assessed itself. Continued research, especially following the 2017 Hurricane season, should examine the viability of this approach.

3. **FEMA solidifies its role:** In 1992, NAPA recommended that the Congress consider replacing the beleaguered agency. By 2005, the consensus was mixed. The Senate report proposed replacing the agency again, but the other studies found that adjustments to procedures and structure would be enough to improve performance. In 2013, no one broaches the topic of FEMA's replacement or abolishment. On the contrary, since Katrina, the agency has grown in autonomy. This may be the result of the Federal Government's now established role in disaster response, which was not a foregone conclusion in 1992.

4. **Data come to the fore:** Both in the response operations, and their subsequent evaluations, the assessing teams relied on interview data and hearings to detail response efforts and evaluate performance. The Sandy After-Action Report included more diverse data sets in its assessment, including lessons learned submitted by network members, survey data, and some performance metrics. How that data was structured and the reporting mechanisms employed to collect it were not detailed. NAS argued disaster response suffered from an informatics crisis. This research supports that conclusion. The absence of a systemic method of collecting, organizing, and analyzing data on response operations disadvantages researchers and practitioners alike. This is not to say that interview data is useless. On the contrary, the argument here highlights our limited ability to make the most of qualitative data sets that inform these learning efforts.

Andrew, Katrina, and Sandy in effect served as stress tests for the American disaster response system. It is important to recognize these stress tests also coincided with the growing expectation of Federal interventions, when disasters strike. As evident in the after action reports, the relative youth of the system and changing expectations have altered the gap between performance and expectations, or in this case, who performs (i.e. Federal instead of state governments) and what is expected (i.e. not just the preservation of life and protection of property, but also social equity in the outcomes resulting from catastrophes).

Chapter Summary

The research design used to conduct this study performed best in two regards. First, it helped isolate learning processes in the changes evident in the procedures and structures that govern disaster response networks. Future research needs to better connect these procedures and structures to the operations of the agents that adopt them, or ignore them, as circumstances dictate. The case comparison conducted functioned almost as time-lapse photography at the system level. As the historical record suggests, institutionalizing lessons takes time. The gaps between each of the storms analyzed helped ensure the network was well past the initial surge of efforts to apply lessons learned. Inquiries into those initial surges to apply lessons learned also offer future research opportunities.

Earlier, this paper discussed organizational change that results from environmental developments or innovation. These strategic changes are distinct from learning because the latter is a deliberate effort to alter operations to address flawed outcomes. The new interactions resulting from this learning are clear and unambiguous. Additionally, by limiting observations to the three types of interactions in these networks, this research was able to structure an incredibly messy narrative. The growing threat of disasters merits a call for the development of more efficient methods for analyzing these systems. The strategy adopted here appeared to effectively help isolate interactions, which might help future researchers to cut through considerable clutter.

CHAPTER EIGHT: TOWARD A NEW LEARNING MODEL

There are several theoretical and methodological gaps that require attention in this field. Above all, this research was an attempt to illuminate, and where possible narrow, those gaps. The consensus around disasters is clear. Complex systems, by necessity, will respond to these events, when they occur, and environmental science suggests they will occur with greater frequency in coming decades. Concurrently, growing communities, without thoughtful prevention policies, expose themselves to vulnerabilities and increased risks.

This challenge calls for an understanding of the nation's capacity to respond to and, in turn, improve future responses to disasters. Public administration should have an important role in that fostering that understanding (Kapucu, 2006). The after action reviews and case studies discussed here generally conveyed narratives about actions, decisions, and consequences surrounding response operations. The sequences of events in these documents tell a compelling story, but they lacked a theoretical framework to put these narratives in context. At this time, there is no vehicle for tying these narratives together to generate a conceptual understanding of the events that unfolded. The framework adopted for this research was an attempt to do just that.

Overall, this research evolved considerably from the start by necessity. Reviewing historical changes offers indications that these networks can learn, but history also shows that past lessons learned will never guarantee the avoidance of mistakes in the future. At times, these mistakes will be the result of unlearned lessons, but frequently, they will result from novel environmental conditions or internal system dynamics. The after action reports process suggests that networks learn by identifying outcome problems and isolating the operational problems that cause them. Then they devise operational strategies to eliminate or reduce the effects of those outcomes, such as pre-positioning commodities or conducting exercises that help network members become familiar with their shared mission and each other. Why then does the perception that they don't learn persist?

One explanation may be that past experience will never completely prepare these networks to face unforeseen challenges. The experience of Hurricane Hugo could not have prepared FEMA for the prospect of tourists stuck in the Florida Keys during Andrew. There was no annex in the FRP for hurricane survivors on an island, only accessible by one road, with a population swelled with visitors. The NRP did not prepare the network for the disproportionate effects (perceived and real) of Katrina on New Orleans' most disadvantaged residents, who were also largely minority communities. Fast forward, to Sandy, and the NRF was not equipped with an Incident Command Structure that could accommodate multiple governors, the mayors of the nation's largest cities, and Federal leaders from the FEMA Director to the President. Never before had there been so

many individuals with that much decision-making authority providing direction, in one affected region, at one time. It was no wonder they experienced confusion regarding senior direction. However, these unforeseen challenges are not adequately recognized as such in the after action studies. We would do well to take note of these critical omissions in the after action reviews.

In the long run, our understanding of these systems will remain limited until researchers develop and answer more mature research questions. These questions would help improve the way scholars and practitioners recognize problems. Better procedures and structures would follow suit, and enable these networks in the face novel, and sometimes, cruel circumstances to meet realistic objectives. This chapter will revisit the research objectives outlined in Chapter 1, discuss how the researcher's expectations fared, propose a different direction for learning, and make some final comments on the research question—explaining why, in fact, the question itself proved inadequate. It concludes by discussing strategies for observing learning in these networks, and where the research program might go from here.

Research objectives and hypotheses

The first chapter outlined research objectives and offered some hypotheses that detailed expectations going into this research. The answers to those questions proved to be more complex than anticipated, but with the advantage of hindsight, the results were sensible. It was clear, at the outset, that early expectations fell victim to the unspoken

assumptions about learning in the after action reports and testimonies. Chief among these assumptions was the notion that learning is a sequential affair that succeeds when problems are simply isolated, solutions are formed, and planners apply solutions—not unlike replacing a faulty cog. This bias does no justice the fluid nature of these networks and the lessons they are supposed to learn.

Scholars generally agree that Americans' views of government's role in disaster response have changed significantly, and those changes have increased the public's expectations (Roberts P. S., 2013). There are few, more dramatic examples of failed policy than catastrophes (Birkland, 1997). However, the after action process does not account for these changed expectations, and the literature does little to factor these into the chronicles of learning in these systems. The original objectives for this paper were intended to help construct a systematic means of analyzing the nation's capacity to improve response operations and meet those expectations. Unfortunately, they do not address the evolving nature of expectations. The hypotheses that followed came to depend on the approach developed to test some initial perceptions of topic.

Research Objectives

The first objective was to “define concepts and variables with greater precision to refine future research questions.” Adapting Mahler's learning processes and Perrow's framework for units of analysis proved useful. The learning process served as the basis for organizing this report, the data collected, and the interview questions asked. Perrow's

framework allowed this research to recognize distinct elements within the system. In turn, those distinctions helped isolate learning processes within subordinate parts of the network—adding to the precision of observations. However, this effort would not presume to claim a resolution on the varying definitions and overlapping concepts prevalent in the practitioner and social science literature (NAS, 2006).

The second objective was to build on the complex adaptive system framework that has grown in prominence in the literature, thanks in large part to Kapucu and Comfort. The contribution from this effort is modest but effective. In the absence of a stable operational environment and static relationships and processes, the use of an interactions typology added necessary character to the interactions observed, and sorted, within the learning model. By organizing interactions within the categories of procedures, structures, and interpretations, this inquiry hoped to introduce a dimension of complex systems research that describes interactions outside of traditional economic or power dynamics. Additionally, the changing nature of problems made evident that system learning required more than the identification and implementation of lessons learned. It also required that systems successfully adopt to novel conditions.

The case comparison found that failures occurred when procedures and structures failed to adapt to conditions effectively. This suggests that mission success hinges on the network's ability to recognize problems during a crisis and assemble successful strategies accordingly. It is up to the intercrisis learning process, in this view, to develop those

strategies to the fullest extent possible, given the short time available to organize during crisis events. In this regard, the results of this study support Comfort's findings on auto-adaptation, which predicts the role self-organizing must assume in the face of disasters. Auto-adaptation, she argue, allows the system to adapt to circumstances as necessary (Comfort, 2007). For example, the absence of an Incident Command System that could accommodate so much "executive" direction during Sandy supports this argument, because it inhibited the network's ability to press forward quickly with a viable command structure. In this view, intercrisis learning should enable the system to recognize challenges and implement appropriate strategies accordingly. In sum, it should be the role of intercrisis learning to not only implement lesson learned, but it should implement lessons learned with the goal of enabling intracrisis learning.

This is not argue that power relationships and transaction-based associations are no longer relevant. They are in the right field of inquiry, where competition is more prominent. The case made here is that, in times of crisis, existential threats make economic and power competitions less relevant and systems organize against common threats. This stems from an existential imperative to cooperate. At the community level, local responders must work together to ensure the community's survival. At leadership levels, the legitimacy to govern is at stake. Using procedures, structures, and interpretations allowed helped this research move past the self-help assumptions behind the decisions and actions taken within the system—assumptions frequently made in studies about bureaucracy.

The third research objective going into this work was to “isolate learning processes and challenges to inform future post mortem efforts.” Based on the results, the first part of this objective was achieved two ways. First, as previously noted, the Mahler model helped organize observations and data about each of the learning processes, but also it guided this research through mountains of unstructured, disorganized data. The after action reports share characteristics, but they are by no means conducted under the auspices of a refined methodology. The learning model helped to isolate the processes needed for study here. Metaphorically speaking, it served as a magnet when searching for needles in various hay stacks.

In terms of informing future post mortem work, the historical record and the evidence suggests strongly that there is a need to better organize and structure data. The system needs to develop a systematic way of capturing lessons learned, institutionalizing them, and evaluating institutionalization periodically. At this time, each of those processes is ad hoc, and there is almost no evidence to suggest they are evaluated continuously from one event to the next. In essence, each after action study starts from scratch, evaluating response performance solely in the context of the immediate event. No comparisons are conducted with past efforts. In addition, building a continuity for systematic analysis will also require a significant knowledge management initiative. First, the digital era has created the capacity to create enormous volumes of data—in the consulting parlance: Big Data. None of the after action reports, most notably for Katrina

and Sandy, include a robust discussion about data collection, nor do they offer guidance on how to structure data.

Reviewing hypotheses

The first hypothesis assumed that EM professionals had been improving competencies through professional learning processes; therefore, all of the system's learning problems were related to network coordination. In hindsight, this expectation created a false choice between the system as a whole and subsystems, units, and parts. First, two parts in particular exhibited significant flaws in their ability to learn and develop critical competencies—FEMA and the White House. Early on, the NAPA report also found issues in the way Congress conducts oversight.

The evidence of learning problems in each of these constituent parts of the network demonstrates coordination does not hold a monopoly on the system's learning issues. FEMA exhibited significant immaturity as an organization in 1992. The reactive posture exhibited by the White House in 1992 and 2005, and the ongoing disarray of oversight committees for disaster response and EM, also exhibit a degree of “leakiness” for processes that won't align with desired outcomes, which suggests these organizations are losing (or ignoring) knowledge gained from these experiences (John & Duguid, 2001). The hypothesis stated that the challenge of learning was isolated to coordination and management. It is true both coordination and management had problems, but there were also learning problems evident within key network members.

In contrast, the rise of communities of practice and the ongoing professionalization of EM has yielded improvements—independent of the after action review process—that merit additional study. The discussions conducted during the FEMA Think Tank events that followed Sandy would have been impossible in 1992. The audio record demonstrates a degree of shared understanding that did not exist after Andrew by all accounts. This suggests two things. The evidence suggests, as the hypothesis predicted, professional competences were advancing. Second, there is no method of tying those advancements to broader EM plans, or at least, there is no mention of these efforts in the after action reviews. This seems problematic, since it suggests that there is no measure internal capacity conducted for the network as part of the adaption process. Referring back to the sports metaphor, the system does not appear to have much visibility of the skills and abilities of the players on the team.

The second hypothesis from Chapter 1 expected members of disaster response networks to interpret lessons learned in varied ways, and in so doing, it would translate into inconsistent actions. The data available in the after action reports suggests this expectation also passed muster. In each of the cases, there were examples of differing interpretations leading to inconsistent actions. This was evident in the differing viewpoints on when DOD should engage a response, following Andrew. It was tragically evident in the varying perspectives regarding indecision levied against governors, the FEMA Director, the DHS Secretary, and the President, when each waited too long on critical decisions related to evacuations, the provision of transportation assets, or the

recognition Katrina would lay bare New Orleans' long-standing socioeconomic disparities.

Learning about learning

In 2006, the National Academies of Sciences assessed the state of social sciences in disaster research. Their assessment found that: “among the most needed types of research are studies that compare systematically the unique circumstances of catastrophic events such as major earthquakes, hurricanes, and acts of terrorism.” This research had always expected to conduct case comparisons by using after action reports from the beginning, but the scarcity of systematic inquiries available for this research was surprising. Comfort and Kapucu certainly published early forays into this type of research, but only one study was found that completed a similar comparison of after action reports and organized recommendations from those reports (Knox, 2013). However, Knox, by contrast, included a state-level report in her analysis.

Early versions of this research followed her approach, but eventually, it was determined that a system-level analysis needed Federal-level after action reports. That said, it was troubling that state-level reporting rarely made its way into the after action discourse, and the contributions of state and local officials were limited to occasional references and interviews. If a system of learning is to form, and if that system were to include the entire network, more, formal opportunities for state and local members' contributions are necessary. Ultimately, the decision to focus on system-level after action

reports focused attention on Federal learning efforts. While this focus was useful in observing lessons learned go from report recommendations to operational doctrine, it left out significant, potential learning observations at the state and local level and, in that sense, this analysis did not examine the network from the top-down.

Methodological Questions

First, organizing data collection and analysis within the learning model proved extremely helpful in isolating and rearranging the data into categories that enabled comparison and furthered theoretical concepts (Maxwell, 2005). Second, by observing changes in interactions shared among network members and their operating environment, this research isolated the observable effects of lessons learned on them. The tables at the conclusion of the case studies were attempts to catalog problems, recommendations, and their corresponding units of analysis, in one place. Bringing the tables from Andrew and Katrina into Chapter 7 facilitated the case comparison, by formulating a continuity of observations on the same units of analysis over time. This strategy proved effective in isolating progress made against lessons learned, but it was not without risks to validity and reliability.

The character of the data, and the disarray of concepts and terms, in this research compels scholarship to create order out of the chaos. This research topic does not have the advantages inherent in assessing the protocols related to flying aircraft, which are complicated but not complex. Put another way, when the National Transportation Safety

Board identifies problems in commercial aircraft; they can depend on strict rules for pilot procedures and relatively unchanged engineering schematics to triage and correct. Since this research topic cannot recreate those conditions, researchers need to build frameworks, test them, and adapt them to make progress.

In creating this order, however, researchers risk losing meaningful distinctions within the array of parts that constitute the system. For example, are we to treat FEMA the same as the Centers for Disease Control? Both are Federal agencies, and both have missions that include crisis management. However, their respective missions focus on different aspects of crisis. This study tried to organize units of analysis to make distinctions based on jurisdictions or functions. FEMA was deemed a part because it belongs in a department, which was deemed a unit. It then followed that those units would belong to a subsystem, which, in this case, represented the Federal government. This method of organization is not without issue, but it offers the starting place for dialogue that needs more participants and ideas.

After Action Reports in Broader Context

A second challenge emerged from the after action reports themselves. The reports are themselves substantial documents that cover a wide swath of issues and actors. None of them make mention of the tradeoffs made in their analysis, nor do they offer alternative explanations for consideration. The reports also fail to provide any strategies

for how institutionalization would take place, nor do they discuss how managers would measure the progress of those efforts.

For example, during Hurricane Katrina, the most vulnerable of New Orleans population suffered tragic loss, in large part due to negligence and the absence of contingency plans to save the elderly and disabled. The nation watched horrified, and appropriately, Congress's critical reviews of the response resulted in changes. Nearly 14 years later, a congressional staffer interviewed for this study argued that corporate entities, which are required by law to develop emergency plans for patients in their facilities, either fail to deliver, or they deliver less than their best efforts. The observation was made that financial incentives and the infrequency of disasters preclude serious attempts to fulfill a required lesson learned. Network members are left to their own devices because "there aren't many vehicles for institutionalizing lesson learned" (Berick, 2018). Put another way, the system has not developed effective processes for measuring progress or accountability among those that do not comply.

Finally, keeping this research to an intercrisis perspective limited the discussion on intracrisis learning. Since people cannot be programmed with instructions they will execute precisely from the last event, past lessons learned need to help network members recognize problems accurately and empower them, as much as possible, with the ability to select the optimal strategies for success, given the circumstances (Pressman & Wildavsky, 1984, p. 175; March & Simon, 1958, p. 199). Yet an overwhelming part of

learning efforts strive to update granular procedures for network members to follow step-by-step. An intercrisis perspective adopts this rational-analytic view of learning, which yields useful observations, but it does not delve deeply into the tie between a lesson learned and how it enables cognition as crises are unfolding. This work is done by Comfort, and further research is needed to explain the connection between intercrisis learning and intracrisis learning, which she refers to in her work on auto-adaptation.

“...a critical component of emergency response is cognition—that is, the capacity to recognize the degree of emerging risk to which a community is exposed and to act on that information” (Comfort, 2007, p. 189)

Rational-analytic learning strategies appear better suited for the accidents where failures can be isolated in one subsystem, or an incident that occurs at the level of parts or units (Perrow, 1999). This manner of intercrisis learning is also effective in “routine crises,” where procedures and structures are not challenged and the need for intracrisis learning is diminished (Moynihan, 2008). Catastrophes, on the other hand, need learning strategies that account for change and uncertainty. Interpretive learning processes might hold the answer. This learning approach contends that system agents learn through dialogue to arrive at shared interpretations of the decisions that are appropriate under the circumstances (Mahler J. , 1997)

The shift is subtle, but it is significant. Instead of engineering and assigning procedures; an interpretive approach would use mission priorities to allow subordinate members of the system to apply procedures appropriately. For example, a problem in the response to Sandy was the problem of coordination among senior leaders. The rational-analytic approach, by definition, pursues the use of the best available option, but when that option isn't listed in the national plans, it is important to adapt plans AND encourage cognition of a challenge that exceeds the scope of the available strategies. This learning strategy would seek to encourage a greater capacity to self-organize, based on the oncoming hazard, known vulnerabilities, and the available resources to respond on the ground. This would not mean responders would need less direction, because operational priorities would come into focus from the start. In a world of limited resources, decision rights over resource allocation should remain the purview of the agent designated to that purpose. What it would mean is that procedures would be left to those who need to execute them.

As Comfort asserts, cognition starts with the recognition of risks to a community. When problems change, solutions in the form of procedures or structures meant for old problems face high risks of failure. The after action process should then pursue data and capabilities that would enable intracrisis learning, as previously addressed. They also need to lead the effort of data management. NIMS offers a good starting point for interoperability, but in execution, the networks need guidance to overcome the “informatics problem” and tap into whatever promise Big Data might offer (NAS, 2006).

That being said, the reports demonstrate progress has been made. The Andrew after action assessments advocated for the need to establish a national EM system. That need was a foregone conclusion by 2005. Katrina, in turn, taught that structure and procedures cannot displace the imperative of action, when inaction threatens the failure of objectives the very same structures and procedures were created to achieve. Sandy's focus on priorities demonstrates this shift away from process-driven evaluations, and those that assessed the Sandy response take great care to focus on survivor support. The Sandy After-Action Report was the first report in this study to dedicate an entire section to survivors and their needs.

A final note about the after action reports. Americans' expectations, when it comes to disaster response, have changed significantly in recent decades. The public has also held these networks accountable to those changing expectations. Returning to the sports metaphor, the American public has been moving the goal posts for decades. How then can these networks meet new expectations with resources and plans built for the last disaster? It would help if after action reviews opened with some comments on evolving expectations.

On Preparedness

In late 2018, FEMA published its 2018-2022 Strategic Plan. The first goal was to “build a culture of preparedness” (FEMA, 2018). In the wake of Katrina, FEMA has worked hard to address preparedness. The previous chapter discussed how Congress

returned the preparedness mission to FEMA. This chapter raises the point because it is almost unfair to discuss response operations without a mention of preparedness. Social science, where possible, should attempt to integrate the phases of disasters in research in order to enable preparedness (NAS, 2006).

There is a public perception that response efforts should overcome the worst that nature and humanity have to offer. That expectation is unrealistic. Part of learning for response operations, therefore, must include an understanding of a community's preparedness posture. Witt put it best by saying that disasters are disasters for a reason. The best responses accept that losses are inevitable, but responders must work hard to minimize losses within the group of priorities set for the mission (Witt & Morgan, 2002).

Preparation needs to take place on two critical fronts. First, it must be an element of community and economic development. For example, if developers build houses next to levees, they, and the communities they are building, should plan for the eventuality that the levee will breach. Second, networks will work well together, if they prepare by training together. In other words, these networks need more Hurricane Pam exercises. While it is true there is value in coordinating procedures and implementing structures through exercises, the act of overcoming disparate interpretations comes through the experience of an iterative dialogue among network members.

Within the first goal in FEMA’s strategic plan is an objective explicitly about learning. The objective prioritizes the sharing of lessons learned and other “insights from after-action” reports. It calls for innovation—technically and organizationally—to prepare for the “critical issues facing EM” (FEMA, 2018). Sharing information, however, is not easy. Even without the informatics problem, the after action reports show that who to share with, and when, is not easy to discern in crisis conditions.

Additionally, organizational silos pose information-sharing challenges, as they do in all organizations. Disaster response networks are no different, and in some cases could be worse. Sharing information, during non-crisis times, may not be in the interest of network members. Nearly 85 percent of U.S. infrastructure is privately owned (Kapucu, 2006). Can anyone legally compel private entities let competitors or the government look “under the hood” in non-crisis circumstances? Preparedness is only possible through transparency, and when disasters strike, response operations should begin in earnest with as few “blind posts” as possible.

Finally, the most glaring blind spot in the after action reports was the state of preparedness among communities hit by Andrew, Katrina, and Sandy. For example, in 1993, during the Andrew after action assessment, the specter of disaster in New Orleans was raised. The Katrina after action assessment make no mention of the limits on a successful response in relation to the level of preparedness undertaken by New Orleans. Without such an assessment, how would future networks determine the size and scope of

their response operations effectively. FEMA needed to recognize not only that New Orleans neighborhoods would become inundated, but it also need to understand the victims would disproportionately affect poor, minority residents.

Conclusion

Where does this research program go from here? It is tempting to propose broad, sweeping research questions for scholars to tackle. The state of theory in this field suggests that those questions will fall to work years into the future. In the physical sciences there is wide acceptance that basic research is a critical precursor to applied research. That argument has merit for complex system theory in government. This research attempted to fuse a traditional hierarchy learning model with a systems approach to organization. That strategy, hopefully, yielded some useful lessons themselves on the avenues for inquiry on this topic available to future researchers. That said; it is clear that additional refinement is necessary.

The Perrow framework for systems (i.e. parts, units, subsystems, and systems) was useful in organizing the myriad, diverse organizations that constitute a network. However, these ontological bins need stronger clarification. In natural sciences, it is understood why dolphins and monkeys are both mammals. Researchers in this field need to strive to approximate the same level of understanding for the organizations that constitute these systems. How should they be organized? By authorities? By jurisdictions?

Concurrently, the problem of data needs significant attention. Already, knowledge management faces incredible challenges in government. The digital workforce produces data at historic rates, and the government's capacity to retain that data grows exponentially over time. However, how should anyone make sense of that data? Right now, agencies review the data collected and organize it ex post facto. With today's capabilities, government needs to establish methods and modes of data collection, storage, and curation. Data collection and management has helped create today's largest technology companies. Government is uniquely suited to direct a structured data collection effort surrounding EM. It needs only to take on the initiative.

Finally, learning is word that originally applied to the phenomenon of a living organism translating experience into new behaviors that avoid pain and maximize benefits. The term offers a conceptual shortcut to explain a similar process in complex systems, but it does not quite capture the dynamic processes churning in these systems. There is merit to the argument that adaptation, as a term, offers stronger explanatory powers to the phenomenon in question here. Borrowing from evolutionary theory, systems adjust in reaction to their environments. Successful strategies survive and evolve. Unsuccessful strategies get dumped.

It is clear that the failures of the past helped shape the successes that followed, and in that sense, learning seems like the appropriate term. In traditional hierarchies, organizations learn and develop new processes around those lessons learned. Then time

and changing priorities generate inertia that allows the same organizations to drift away from those lessons. Curiously, disaster response networks cannot suffer from the threat of inertia, since every instance of their operation is new and ad hoc. They can, however, lose lessons when they are displaced by other priorities, as was the case for Katrina against the urgency of counterterrorism in 2005. The challenge for agents in these systems is to learn how to operate together by interpreting the lessons of the past. They are not asked to remember them and repeat them, as in traditional organizations. These networks assume those lessons are imbedded in the procedures and structures that guide their operations. So, strictly-speaking, one could argue that disaster response networks don't learn per se; they adapt.

Adaptation appears to occur best when leaders interpret circumstances to define priorities. In effect, they establish performance goals and grant networks members the flexibility to bring their expertise to bear, as they understand it would help best. In short, setting priorities allows the system to adapt, using its skills and expertise, toward the fulfillment of those priorities. Perhaps, it is time to move on from the phrase "lessons learned" and think in terms of adaptability. Witt said it best: "once you start to plan for a crisis, by identifying your values and knowing how they will guide your decisions down the road, you have to remember that you can't be the only person making those decisions. Everyone needs to know the values and the plan, inside and out" (Witt & Morgan, 2002).

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