

Disaster Response: Lessons Learned from the May 2007 Greensburg Tornado

by Bradley Jenkins

On May 4, 2007, severe weather ravaged the midwest United States, wreaking havoc throughout the state of Kansas. As night fell on Kiowa County, a tornadic supercell developed, creating the conditions for a catastrophic tornado to form near the small town of Greensburg. At 9:45 p.m., an EF-5 tornado struck Greensburg, leveling the rural town.

Many Americans watching reports from the Greensburg area were shocked to see the destruction, and a flood of aid from across the nation began pouring into Greensburg. Helping hands, financial assistance, and a myriad of products and services offered by individuals and private businesses alike provided much needed assistance to the devastated town. This aid, in cooperation with the efforts of various state and federal agencies, would become a key component in Greensburg's response and recovery.

Through analyzing the coordinated response to this tragic event, this article will examine how well local, state, and federal agencies worked with each other and with volunteer and non-governmental organizations to respond to and prepare for the recovery of Greensburg. By analyzing the response to the Greensburg tornado, this article will draw parallels that can be used to strengthen interagency cooperation and serve as a vital learning tool for agencies during future disaster events. The lessons learned can provide critical insight to what can be done to strengthen communities' resilience and build cooperation among the many agencies that play critical roles in disaster response and recovery.

Emergency Management Past to Present

In the U.S. and around the world, communities are experiencing an increase in man-made and natural disasters.¹ This increase is due to many factors including increased urbanization and population density, the occupation of hazard-prone areas, and changes in global weather patterns.²

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Governments and societies must change how they prepare for and respond to these hazards.

In previous decades, a splintered system dominated the emergency management landscape, leaving each community, county, and state responsible for preparing for the hazards it faced.³ This fragmented system often created significant risk exposures to communities, and limited resources resulted in significant loss of life and property. Acknowledging that this broken system was no longer acceptable, the U.S. government has taken steps to help communities across the nation better prepare.⁴ By adhering to a standardized set of policies, it is hoped hazard risks can be minimized, allowing communities to quickly and efficiently recover with minimal disruption, loss of life, or damage to property.⁵

In the 1970s, the National Governors' Association, acknowledging the need for a more comprehensive and systematic method for addressing emergencies and hazards, developed a method for managing emergencies that included a four phase approach. In 1978, the National Governors' Association, in concert with other entities, requested that President Carter reorganize federal emergency preparedness programs, which subsequently became the Federal Emergency Management Agency (FEMA).⁶ Shortly after the agency's creation, FEMA adopted the all-hazards approach to emergency management as suggested by the National Governors' Association.

The all-hazards approach has evolved and developed over time and is widely recognized as the most appropriate method for dealing with hazards and emergencies. The approach divides emergencies and hazard events into four phases:

1. Mitigation is any sustained action to reduce or eliminate long-term risk to people and property from hazards and their effects.⁷ Mitigation activities include but are not limited to land use regulations, building codes, and insurance programs.

2. Preparedness is a state of readiness to respond to any emergency or disaster.⁸ Examples of preparedness include contingency planning and creating mutual aid agreements between agencies and localities. Additionally, preparedness includes the use of drills and exercises to prepare for a hazard event.

3. Response is a phase in the emergency management cycle that involves activities to meet the urgent needs of victims during or immediately following a disaster.⁹ This phase includes activities like search and rescue, evacuation, emergency medical assistance, and firefighting.

4. Recovery is a phase in the emergency management cycle that involves actions that begin after a disaster, once emergency needs have been met.¹⁰ During recovery, communities and governments must determine how to restore basic services, rebuild the community, and bring back a sense of normalcy.

Tornado Hazard Data

Tornadoes are one of the most frequently occurring major hazard events in the U.S., occurring approximately 1,253 times per year, claiming an average of 77 lives per annum.¹¹ When comparing the frequency and number of annual casualties caused by other natural disasters in the U.S., it becomes apparent that special attention should be taken when planning for tornadoes, especially in the Midwest and South-Central regions of the country known as "tornado alley."

Historical data obtained from the National Oceanic and Atmospheric Administration (NOAA) indicates that approximately 57,099 tornadic events occurred in the U.S. from January 3, 1950, through December 22, 2011.¹² Of these tornadoes, 3,842 (or 6.72 percent)

occurred in the state of Kansas, with 58 (or 1.5 percent) of Kansas tornadoes occurring in Kiowa County.

These tornadoes have had a tremendous impact, causing significant monetary losses to individuals, governments, and businesses. It is estimated that losses due to tornadic events are in excess of \$1 billion per year in the U.S. alone. A notable example of the damage caused in a single event is the EF-5 tornado that struck Joplin, Missouri, in 2011, killing 158 people, injuring over 1,000, and causing an estimated \$2.2 billion in damage.¹³

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The Greensburg Tornado

A pattern of severe weather was experienced in the central plains region between May 4 and 7, 2007. During this time, NOAA received over 100 reports of tornadoes and 429 reports of damaging hail, as well as reports of high winds.¹⁴ As this severe weather system moved through the plains on May 4, a supercell thunderstorm formed, causing four tornadoes in the state of Kansas. An EF-5 tornado formed in Comanche County at approximately 9:00 p.m. and moved northeast 28.8 miles, approaching Greensburg at 10:05 p.m.¹⁵

Prior to the storm arriving in Greensburg, local weather spotters radioed the Kiowa County Sheriff's Office informing them of their observation of an impending tornado. The first tornado sirens were activated at 9:15 p.m., and residents began seeking shelter. Additional

tornado warnings occurred in Greensburg at 9:19, 9:36, and 9:41 p.m., and officials urged residents to take immediate shelter.¹⁶ Four minutes after the final tornado warning at 9:45 p.m., an EF-5 tornado hit Greensburg, cutting a 1.7 mile-wide path through the city.¹⁷

The primary tornado remained in or near Greensburg for between 15 and 20 minutes and destroyed an estimated 95 percent of the city's infrastructure.¹⁸ The tornado destroyed 961 homes in Kiowa County and damaged 172 others. Additionally, three schools were destroyed, 24 businesses were critically damaged, and 110 businesses were damaged beyond repair.¹⁹ Electrical service to the city was knocked out, natural gas service was impeded, landline phone service was inoperable, and cellular phone service was severely limited.²⁰ Eleven people lost their lives as a result of the Greensburg tornado, and another 60 were injured.²¹ Estimates place the total damage in Greensburg at more than \$250 million dollars.²²

City and County Level Mitigation

The city of Greensburg's small size did not allow for the city to employ its own emergency services (fire, police, ambulance, etc.), which were instead provided by the county.²³ As such, Greensburg did not have a formal plan—beyond the utilization of warning sirens placed throughout the city, as required by federal law—should a hazard event occur within its city limits.

At the time, Kiowa County employed a part-time emergency manager who was responsible for the county's overall emergency plan. According to Kiowa County Emergency Manager Ray Stegman, prior to the May 2007 tornado, the county relied solely on an informational pamphlet from the early 1990s as its emergency operations plan. According to Stegman, the pamphlet was generic in theme and content, providing inadequate preparation for a significant hazard event. (This pamphlet was

lost in the May 4, 2007, tornado and cannot be located for examination or consultation.) While the county had several people well versed in the fundamentals of emergency response, little formal county-level planning and no mutual aid agreements were in place at the time of the tornado.

State Level Mitigation

In order to comply with the Disaster Mitigation Act of 2000 (DMA), the state of Kansas utilized a detailed standard operating procedure to outline policies and requirements for cities and counties regarding mandatory and voluntary mitigation and preparedness actions. Under the Kansas Hazard Mitigation Plan, dated November 2004, stated that “mitigation be addressed in the required comprehensive emergency management plan developed by each county.”²⁴ This requirement was not met by Kiowa County, and no enforcement action was taken by the state to ensure compliance.²⁵

In order to comply with the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986, also known as Title III of the Superfund Amendments and Reauthorization Act, the state of Kansas established the Kansas Commission on Emergency Planning and Response (CEPR).²⁶ CEPR was initially established by Kansas Statute Chapter 48, Article 9, to ensure adherence to the EPCRA and was specifically focused on addressing dangers related to hazardous industrial materials emergencies. Since establishment, the commission has expanded to become a more comprehensive emergency management agency. Today, the Kansas CEPR promotes utilizing local emergency planning committees (LEPCs) to address most community hazards, including both man-made and natural hazards.²⁷

Federal Level Mitigation

Federal preparedness falls mainly under the jurisdiction of FEMA, although exceptions

do exist. While the policies that govern federal actions during major disaster events are ever-changing, the primary policy that has governed federal emergency response during the past decade is the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988, as amended, which is the statutory authority for most federal disaster response activities, especially those associated with FEMA. The DMA also governs federal emergency response.

Under the DMA, Congress requires state and local governments to create and adopt a hazard mitigation plan in order to receive disaster-related funds from federal programs.

Under the DMA, Congress requires state and local governments to create and adopt a hazard mitigation plan in order to receive disaster-related funds from federal programs.²⁸ DMA regulations establish criteria that must be met for a state or local mitigation plan to be approved by FEMA, the agency responsible for administering the DMA.²⁹ Although the federal government cannot mandate the creation of mitigation plans by the states, the requirement that such a plan be adopted as a condition of funding eligibility is a significant incentive to do so.

Under the DMA, Section 322, local plans must: “(1) describe actions to mitigate hazards, risks, and vulnerabilities identified under the plan; and (2) establish a strategy to implement those actions.”³⁰ Additionally, the DMA requires that states “(1) identify the natural hazards, risks, and vulnerabilities of areas in the state; (2) support development of local mitigation plans; (3) provide for technical assistance to local and tribal governments for mitigation planning; and (4) identify and prioritize mitigation actions

that the state will support, as resources become available.”³¹

This vague policy leads to equally vague hazard mitigation plans, which meet the requirements under the DMA but are far from helpful in the case of an emergency.

As previously stated, Congress enacted the EPCRA in October of 1986, requiring the governor of each state establish a State Emergency Response Commission, which subsequently required the creation of LEPCs.³² While this law does not apply specifically to natural hazards and disasters, it creates the basic structure in which citizens, businesses, and governments work together to facilitate cooperative emergency planning within a community. In many communities today, LEPCs exist to provide an all-hazards approach to planning and serve as the cornerstone of many community emergency management programs.³³

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County Level Preparedness Strategies

According to numerous reports from FEMA, as well as information contained in situation reports from the event, there were no designated tornado shelters in Greensburg available for public use, nor was there a formal evacuation plan in place at the time of the 2007 tornado.³⁴

At a Kiowa County meeting with cities and communities on May 3, 2007, just 31 hours prior to the tornado, Stegman informed the Kiowa County Commission Chairman of

the lack of preparedness that existed and the dire position of the county and, subsequently, the cities within its jurisdiction. During this meeting, Stegman requested the county’s emergency manager position be upgraded to full-time.³⁵ At the conclusion of the meeting, it was decided to retain the position as part-time, and no headway was made regarding emergency preparedness. While their approval of such a request would have done little to prepare for the coming tornado, the incident serves as a poignant reminder of the important role subject-matter experts play in disaster preparation and mitigation.

Federal mandates require that counties be compliant with the National Incident Management System (NIMS) and maintain an LEPC, but at the time of the Greensburg tornado, Kiowa County was not in compliance with these mandates and no LEPC existed.³⁶

State Level Preparedness Strategies

Resting under the umbrella of the Kansas Adjutant General, the Kansas Department of Emergency Management (KDEM) is the state entity that oversees state-level response to disasters. Under the direction of the KDEM, the Kansas Hazard Mitigation Plan outlines preparedness strategies to be utilized by all state agencies.³⁷ Additionally, various state agencies with post-disaster roles, such as the Kansas Department of Transportation (KDOT), the Kansas National Guard (KNG), and the Kansas Department of Health, each have documents regarding preparedness strategies; some conduct formal and informal exercises and others run full-scale simulations to prepare themselves for emergency and disaster-related events.

At the time of the Greensburg tornado, there were many programs and opportunities for municipalities and counties to coordinate joint exercises with state agencies, but neither Greensburg nor Kiowa County had participated in such activities.³⁸

Federal Level Preparedness Strategies

Federal level preparedness falls under the purview of many agencies, each charged with addressing a different set of needs should a hazard event take place. These government agencies include but are not limited to FEMA, the Environmental Protection Agency, the Centers for Disease Control, Food and Drug Administration, Federal Communications Commission, and the Departments of Homeland Security, Agriculture, and Labor.

Each agency sets its own standards for training exercises and conducts simulations and other preparedness activities, including community outreach programs, on its own. These programs vary from agency to agency based on several factors including budget restrictions, federal guidelines, and the state of awareness or concern of the public at large.

With the 2007 Greensburg tornado occurring on the heels of Hurricane Katrina (the worst natural disaster in U.S. history), there was increased awareness and demand to minimize the effects of natural disasters quickly. As a result, emergency response agencies were more proactive in their response actions.

Initial Response

Many of the counties surrounding Greensburg shared radio frequencies for emergency services. As information about the impending tornado was broadcast, neighboring counties began preparing the aid that would be needed. Prior to the tornado's arrival in Greensburg, individuals like Mark McManaman from Pratt County were already en-route to and staging outside the city.³⁹ As the tornado made its way out of Greensburg, McManaman entered the city and began rendering aid.⁴⁰

Within moments of the tornado touching down, Stegman and Kiowa County Fire Chief Jay Koehn responded to the county

courthouse located in Greensburg.⁴¹ During the initial response, Stegman, recognizing that he was a victim as well as the initial response authority, decided that it would be prudent to have an outside responder—in this case the Pratt County Kansas Administrator—act as the initial Incident Commander (IC) until a better assessment of the damage could be made.⁴²

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After learning of the possibility for a major incident in the Greensburg area, Matt Mercer, the Southwest Regional Coordinator for the KDEM, began his trek from Dodge City, Kansas, approximately 45 miles away, and was able to arrive prior to the roadblocks being set up around Greensburg.⁴³ Stegman reported that the first calls to KDEM were made by Mercer, who is quoted as saying to KDEM officials, "I think I'm standing on Main Street in Greensburg. It's all gone."⁴⁴ Although he lost communication with KDEM shortly after making this statement, staff in Topeka received his notification and began to deploy resources within minutes.

Immediately after the initial touchdown, citizens, first responders, and others began searching the debris and rubble for the trapped, injured, and deceased. The initial search and rescue effort was led by community members, local police, and fire officials, as well as people from neighboring communities who responded before formal assistance could be requisitioned and transported to the Greensburg area. Their

efforts were disorganized due to the magnitude of the damage, but as the IC and other command staff gained control of the event, the response effort became more organized. Responders faced severe weather throughout the night, including a second tornado that touched down shortly after the EF-5, hampering initial response efforts.⁴⁵ As dawn approached on May 5, 2007, the city had been thoroughly searched twice and almost completely evacuated.⁴⁶

Local jurisdictions dispatched emergency responders to Greensburg to provide critical assistance in search and rescue operations, as well as triage activities.⁴⁷ Initial responding agencies included the Pratt County fire department and Ford County fire and emergency

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medical services.⁴⁸ Upon their arrival, Pratt County set up triage in the local grocery store parking lot, while Ford County became actively involved in the search and rescue efforts that were already underway.⁴⁹

At approximately 9:45 p.m., less than 45 minutes after the EF-5 tornado hit Greensburg, the State of Kansas Emergency Operations Center (EOC) was brought to Level 4, full-scale activation, and began directing critical services to the stricken area.⁵⁰ At approximately 12:32 a.m. on May 5, 2007, Kansas Governor Kathleen Sebelius declared a state of emergency for Kiowa County.⁵¹

The first major deployment of resources to Greensburg came at approximately 2:30 a.m. when the KNG was ordered to respond.⁵² By 3:00 a.m., resources from as far away as Topeka, located approximately 250 miles away,

had arrived in Greensburg and were providing critical assistance in victim triage and search and rescue.⁵³

Within the first 24 hours, a plethora of local and municipal agencies converged on Greensburg to provide critical assistance while formal state and federal resources were being requested.⁵⁴ The FEMA Damage Assessment Team also arrived, providing critical resources to assess the level of destruction and the necessary information for the issuance of a Presidential Disaster Declaration. The first 24 hours also yielded a request from the Kansas State Governor's Office for a presidential declaration and FEMA's Level II activation of the Regional Response Coordination Center to aid in the coordination of assistance and supplies to the area.⁵⁵

The American Red Cross established temporary shelters in neighboring Haviland, providing 300 beds within hours of the tornado touching down and opened an additional 300 beds before 24 hours had passed.⁵⁶ Shelter was also established in the city of Mullenville within hours of the tornado.⁵⁷

Emergency support functions (transportation, communications, emergency management, mass care, resource support, search and rescue, hazardous materials, public safety, and external affairs) had also been transferred to or initiated by state agencies within 24 hours.⁵⁸ Personnel from a variety of local, state, and federal agencies were tasked with providing immunizations, mental health services, protective equipment, and supplies. At approximately 7:30 p.m. the day after the tornado, after activating the Regional Response Coordination Center, the Region VII Administrator deployed an Emergency Response Advance Team to Greensburg.⁵⁹

Recognizing the significance of the event, FEMA responded proactively, staging supplies outside the city limits in anticipation of a presidential declaration.⁶⁰ This action allowed

for the quick dissemination of necessary supplies and resources once the declaration was issued.⁶¹

During the initial response period, which lasted only 72 hours, government agencies and private enterprises made great strides, which set up the critical infrastructure needed to mount effective response and recovery efforts.

Long-Term Response Actions

After the initial 72-hour, critical response period, the 15 government agencies involved in the response effort came together to regroup and address the needs of the community. The multitude of agencies created a command area around the Kiowa County Courthouse that allowed for most of the agencies involved to operate from a single location, facilitating timely dissemination of information and allowing greater interaction among agencies. The shared location for the agencies allowed for more effective cooperative efforts than would have been possible if each agency had a separate operating base.

The massive debris removal was accomplished over the course of several weeks. Several agencies inspected the city, and questionable locations, items, and structures were marked for further investigation by specialists before debris removal began. Special attention was taken to ensure that landfills were not tainted with hazardous materials and that questionable materials were analyzed and disposed of in accordance with applicable regulations.⁶² This process included FEMA, Environmental Protection Agency, KNG, Kansas Department of Health and Environment, Centers for Disease Control, City of Greensburg, Kiowa County, and various other outside agencies and resources, as well as the business owners and citizens in the area. Over the course of the response and subsequent recovery phase, it was reported that over 800,000 cubic yards of debris were removed from Greensburg.⁶³

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Radio Interoperability and Communications

Early on, agencies recognized the need to communicate with the citizens of Greensburg, and they collaborated to keep the lines of communication open. As most citizens were no longer in the area, officials utilized AM radio broadcasts, as well as several forms of written communication to disseminate vital information to the public. Collaboration with the Federal Communications Commission, KDOT, and other entities yielded the resources needed to expand the AM range of towers so that more people could be reached via radio.⁶⁴ Printed flyers and a website were also used to pass information along to the public.⁶⁵ The agencies were able to quickly and effectively communicate important information to the citizens of Greensburg because of their forward-thinking, coordinated effort.

Counties surrounding Greensburg shared radio frequencies, which allowed them to monitor the status of the approaching weather system and facilitate the allocation of resources before they were requested from Kiowa County and Greensburg. While no mutual aid agreements requiring neighboring communities to render aid in the event of a disaster were in place, the shared radio frequencies allowed responders near Greensburg to prepare. Though the city of Greensburg had no hazard mitigation plans, the surrounding communities were able to stage resources in and around the city prior to the tornado's arrival.

Record Keeping and Transfer of Command

Available incident action plans (IAPs) indicate that many transfers of command occurred in the weeks following the Greensburg tornado. During this period of time, leaders from various agencies assumed the role of IC during the recovery efforts, and it appears that this responsibility was transferred without significant issue. Daily IAPs were created and disseminated throughout the agencies involved, and documentation was generally kept up-to-date. However, changes in command also led to changes in content and format, information gaps in the official record, and differing levels of detail in the daily IAPs.

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These changes in the format, amount, type, and detail of information provided in the daily IAPs left gaps in reporting and critical details were overlooked, omitted, or obscured. For example, the first IAP dated May 6, 2007, and several dated May 31, 2007, and beyond contained detailed information regarding communications made, briefings that occurred, as well as situation reports from the various active ESF functions. However, many IAPs between these days lacked this level of detail—detail that is useful when reconstructing the events that occurred and how agencies cooperated during the event. The level of detail in the individual IAPs varied greatly from reporting period to reporting period, with some IAPs only including the most basic of information

and detailing to great length the activities that transpired over the reporting period.

Additionally, these IAPs were not retained in a central repository for future analysis. Instead, Stegman housed the available IAPs, and they were not complete. Other agencies involved did not retain such records after an initial period of time, leaving gaps in the official record of the response to the event.

Observations and Recommendations

The Greensburg tornado provides an opportunity to examine how agencies across the federal government interact when their combined efforts are required to address a disaster. The need for local, state, and federal agencies to cooperate in the aftermath of the Greensburg tornado was exacerbated by the small rural community's inadequate disaster planning and lack of a response and recovery framework.

Inadequate disaster planning is not acceptable public policy. Prior planning minimizes the devastating effects of hazard events, preventing greater loss of life and damage to property. Mitigation planning also enables city, county, state, and federal entities to better respond to such events, allowing greater coordination and cooperation. What follows is a series of recommendations to improve future disaster preparation and response.

Hazard Mitigation Planning and State Enforcement

While laws existed requiring hazard mitigation plans, they were not actively monitored or enforced by the state of Kansas, which resulted in many counties, including Kiowa County, having inadequate plans, if any. This lack of planning left the Greensburg community ill-prepared to respond to the devastation. Initial response and rescue efforts were ad hoc, and without clearly defined roles, responsibilities, or leadership. Also, although

residents were advised to take shelter, the City of Greensburg did not have shelters designed to resist tornadic winds and debris at the time of the incident.⁶⁶

Prior planning would have better facilitated response and recovery efforts and minimized confusion. Earlier planning would have also provided for public tornado shelters and better disaster communication capabilities.

In the future, all counties should compile comprehensive hazard mitigation plans, regardless of federal and state regulations, ensuring the safety of their communities. State-level systems should be leveraged to ensure compliance with applicable laws pertaining to hazard mitigation planning at the county level. Furthermore, submitted county plans should be analyzed for feasibility and comprehensiveness. Incentives should be provided to counties who are not otherwise able to fund the research and preparation of hazard mitigation plans, ensuring that equality in planning exists among counties of all sizes and economic situations.

Communications and Record Keeping

It is significant to note the level of cooperation that occurred within the community in the wake of the tornado, especially with the absence of prior planning. Responding agencies went to extraordinary lengths to communicate with the people of Greensburg, keeping them up-to-date on the response efforts. However, there is still room for improvement.

Emergency management components of cities, namely police, fire, and emergency medical services, should not be ad hoc arrangements cobbled together in the exigency of a crisis. Instead, these entities need to establish compatible communications systems to enable rapid and wide-spread communications during emergency situations and exercise them routinely. Additionally, operational channels of surrounding communities and counties should be monitored so that the immediate needs of

surrounding communities can be anticipated and resources allocated before formal requests for assistance are made. This would shorten initial response times, reducing the impact of hazards on communities.

Similarly, more organized record keeping would also enable communities and agencies to better respond to future disasters. As mentioned earlier, frequent changes in command led to gaps in the official record of the response efforts. The IAPs are the seminal documents recording the response efforts in Greensburg, and as such should have adhered to a strict format employed by all leading agencies.

The NIMS utilizes template-type forms, such as the IAP, to record events, decisions, and activities. However, detailed supplemental materials should be created to guide the IC and other leaders as to the type of information that should be included in such documents. These supplemental materials may include checklists to ensure continuity in reporting as command is passed from one individual to another. Periodic training and certification for those likely to become ICs during a hazard event would help to ensure that each IC is prepared to fulfill the duties of this position including completing forms, recording activities, and maintaining continuity of information in the official record.

Mutual Aid Agreements

Kiowa County had no mutual aid agreements in place at the time of the Greensburg tornado; nevertheless, it had significant response from neighboring communities, both in physical and personnel assets. While the ad hoc response from neighboring communities was beneficial, pre-existing agreements would increase the effectiveness and timeliness of the response.

The state should enact requirements mandating all localities determine what services and resources neighboring communities have that could be leveraged during a major incident and negotiate agreements to share them during

a disaster or other major incident. Mutual aid agreements can be used to streamline the process of requesting assistance from neighboring jurisdictions and would allow immediate access to resources needed before state- and federal-level resources can be activated for a community. By having prearranged agreements, it is possible to reduce response times, thus saving lives and minimizing property damage.

Exercising Plans

Because there were no formal hazard mitigation plans, no training exercises took place in which city or county emergency agencies were provided an opportunity to respond to a simulated disaster. Such exercises allow emergency responders, governing bodies, aid organizations, and private enterprises to practice their roles and responsibilities, better preparing them for a disaster. Without training exercises, agency, individual, and procedural strengths and weaknesses were never identified and modifications could not be made.

To better prepare for future disasters, the state should enact legislation requiring counties and cities to exercise their hazard mitigation plans on an annual basis. State emergency management officials should monitor these exercises and help identify and address shortcomings revealed and lessons learned. Such a requirement will strengthen the resiliency of the state as a whole.

Conclusion

In the absence of a formal plan, communities are able to come together in an ad-hoc fashion to mount a response in order to save lives and minimize property loss. Although agencies, public and private, were able to mount a major response, communities cannot take for granted this level of response. Had the disaster event occurred in a more populous area, without shared radio frequencies and available resources, the results could have been far different with significant loss of life and property being a credible possibility.

Although significant policy and regulations were in place regarding community preparedness, failures by agencies tasked with oversight resulted in a gross lack of planning in Greensburg. The immediate response of neighboring communities was a reactive, ad-hoc response to an eminent threat and was not the result of pre-planning or preparedness by Greensburg. This situation highlights the need for sound policy as well as enforcement of such policy to ensure the coordinated effort to a major disaster event in order to mitigate threats to life and property. **IAJ**

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NOTES

- 1 Stanley A. Changnon, Roger A. Pielke, David Changnon, Richard T. Sylves, and Roger Pulwarty, “Human Factors Explain the Increased Losses from Weather and Climate Extremes,” *Bulletin of the American Meteorological Society*, Vol. 81, March 2000, pp. 437–442, <<http://journals.ametsoc.org/doi/pdf/10.1175/1520-0477%282000%29081%3C0437%3AHFETIL%3E2.3.CO%3B2>>; National Oceanic and Atmospheric Administration, “Billion Dollar U.S. Weather/Climate Disasters 1980-2011,” 2011.
- 2 David A. McEntire, “Triggering Agents, Vulnerabilities and Disaster Reduction: Towards a Holistic Paradigm,” *Disaster Prevention and Management*, Vol. 10, Issue 3, 2001, pp. 19–196; Dennis S. Mileti, *Disasters by Design: A Reassessment of Natural Hazards in the United States*, Joseph Henry Press, Washington, DC, 1999.
- 3 William Waugh Jr., *Living with Hazards, Dealing with Disasters*, M.E. Sharpe, Armonk, NY, 2000.
- 4 Ibid.
- 5 United Nations web page, “International Strategy for Disaster Reduction: Disaster Risk Reduction in the United Nations,” 2009, <http://www.unisdr.org/files/9866_DisasterRiskReductionintheUnitedNat.pdf>, accessed on March 11, 2012.
- 6 Waugh.
- 7 Anna K. Schwab, Katherine Eschelbach, and David J. Brower, *Hazard Mitigation and Preparedness*, John Wiley & Sons, Inc., Hoboken, NJ, 2007.
- 8 Schwab, et al.
- 9 Schwab, et al.
- 10 Schwab, et al.
- 11 National Oceanic and Atmospheric Administration web page, “2012. U.S. Tornado Climatology,” <<http://www.ncdc.noaa.gov/oa/climate/severeweather/tornadoes.html>>, accessed on February 8, 2012.
- 12 Ibid.
- 13 National Oceanic and Atmospheric Administration, “Billion Dollar U.S. Weather/Climate Disasters 1980-2011.”
- 14 National Oceanic and Atmospheric Administration, 2007b., “Tornadoes, Heavy Rain Hammer Central Plains, More Storms Expected,” May 7, 2007, <<http://www.noaanews.noaa.gov/stories2007/s2855.htm>>, accessed on February 9, 2012.
- 15 Mike Umscheid, “Historic Greensburg Supercell of 4 May 2007: Anatomy of a Severe Local ‘Superstorm,’” lecture, Great Lakes Meteorology Conference, Valparaiso, IN, April 5, 2008, <<http://www.noaanews.noaa.gov/stories2007/s2855.htm>>, accessed on March 1, 2012.
- 16 National Oceanic and Atmospheric Administration, “Tornadoes, Heavy Rain Hammer Central Plains, More Storms Expected.”
- 17 Federal Emergency Management Agency web page, “Tornado Damage Investigation: Greensburg, Kansas 1699 DR-KS,” October 24, 2007, <http://www.fema.gov/pdf/about/divisions/greenburg_ks_tornado_damage.pdf>, accessed on March 15, 2012.
- 18 Boise Incident Management Team, Greensburg Kansas Tornado FEMA Assistant, “Final Narrative,” June 12, 2007, <http://www.wildfirelessons.net/documents/Greenburg_Tornado_Narrative_

Only_6.12.2007.pdf>, accessed on April 10, 2012.

19 Ibid.

20 State of Kansas, EOC, 2007b, “Situation Report #2: Tornado May 2007, Topeka, Kansas.”

21 Umscheid.

22 National Weather Service webpage, 2011, “F5/EF5 Tornadoes That Have Struck Kansas,” <<http://www.crh.noaa.gov/ict/?n=toptenkstors>>, accessed on February 7, 2012.

23 Ray Stegman, personal communication, February 1, 2012.

24 Kansas Division of Emergency Management, “Kansas Hazard Mitigation Plan,” Topeka, Kansas. 2004.

25 Jacob Gray, 2012, personal communication.

26 Kansas Commission on Emergency Planning and Response, “2006–2007 Annual Report,” 2008.

27 Kansas Commission on Emergency Planning and Response, “2011 Annual Report,” 2012.

28 H.R. 707, 106th Congress, “Disaster Mitigation Act of 2000,” in GovTrack.us (database of federal legislation), 1999, <<http://www.govtrack.us/congress/bills/106/hr707>>, accessed on December 2, 2012.

29 Ibid.

30 Ibid.

31 Ibid.

32 Environmental Protection Agency, “Emergency Planning and Community Right-to-Know Act (EPCRA) Requirements,” 2012, <<http://www.epa.gov/oem/content/epcra>>, accessed on February 1, 2012.

33 Kansas Commission on Emergency Planning and Response, “2010 Annual Report,” 2011.

34 Federal Emergency Management Agency, “Tornado Damage Investigation: Greensburg, Kansas 1699 DR-KS.”

35 Stegman, personal communication, February 1, 2012; Stegman, telephone interview, August 17, 2012.

36 Environmental Protection Agency, “Emergency Planning and Community Right-to-Know Act (EPCRA) Requirements; Stegman, personal communication, February 1, 2012; Stegman, personal communication, February 9, 2012.

37 Kansas Division of Emergency Management, “Kansas Hazard Mitigation Plan, Topeka, Kansas.”

38 Stegman, personal communication, February 9, 2012.

39 Stegman, personal communication, February 1, 2012; Stegman, personal communication, February 9, 2012

40 Stegman, telephone interview, August 17, 2012.

41 Stegman, personal communication, February 9, 2012

42 Stegman, personal communication, February 1, 2012; Stegman, telephone interview, August 17, 2012.

43 Stegman, personal communication, February 9, 2012; Stegman, telephone interview, August 17, 2012;

- Stegman, personal communication, November 20, 2012.
- 44 Stegman, personal communication, February 9, 2012; Stegman, telephone interview, August 17, 2012
- 45 Greensburg/Kiowa County Disaster, “Incident Action Plan,” May 6, 2007 and May 7, 2007; State of Kansas, EOC. 2007a., “Situation Report #1: Tornado May 2007, Topeka, Kansas”; State of Kansas, EOC. 2007b.”
- 46 Stegman, telephone interview, August 17, 2012.
- 47 Stegman, personal communication, February 1, 2012; Stegman, personal communication, February 9, 2012
- 48 Stegman, personal communication, February 9, 2012.
- 49 Ibid.
- 50 State of Kansas, EOC. 2007a.
- 51 Federal Emergency Management Agency, “National Situation Update: Sunday, May 6, 2007,” <<https://coop.fema.gov/emergency/reports/2007/nat050607.shtm>>, accessed on April 18, 2012.
- 52 State of Kansas, EOC. 2007a.
- 53 Stegman, telephone interview, August 17, 2012.
- 54 State of Kansas, EOC. 2007b.
- 55 Federal Emergency Management Agency, “National Situation Update: Sunday, May 6, 2007.”
- 56 State of Kansas, EOC. 2007a.
- 57 Ibid.
- 58 State of Kansas, EOC. 2007a. and 2007b.
- 59 Brendan Gill, “Target Kansas: Tornado Leaves HAVOC in Wake,” *The Guardian*, <https://www.iaem.com/about/membership/studentchapters/IEMSAChapters/documents/Guardian-Dec2007_000.pdf>, accessed on May 12, 2012.
- 60 Stegman, telephone interview, August 17, 2012.
- 61 Ibid.
- 62 Greensburg/Kiowa County Disaster; State of Kansas, EOC 2007a., 2007b., 2007c., 2007d., 2007e., 2007f., 2007g., 2007h., 2007i., and 2007j.
- 63 National Weather Service, FEMA. 2007a, “Facts about the May 4, 2007 Greensburg Tornado.”
- 64 Greensburg/Kiowa County Disaster, May 15, 2007; May 16, 2007; May 17, 2007.
- 65 Greensburg/Kiowa County Disaster, May 17, 2007; Kiowa County/Greensburg, Kansas, “Kiowa County/Greensburg (KS) Recovery,” <<http://greensburgks.blogspot.com>>, accessed on March 10, 2012.
- 66 Federal Emergency Management Agency, “Tornado Damage Investigation: Greensburg, Kansas 1699 DR-KS.”