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University of Colorado
482 UCB
Boulder, CO 80309-0482

Quick Response Report #143

Multi-organizational Coordination During the Response to the March 28, 2000, Fort Worth Tornado: An Assessment of Constraining and Contributing Factors

David A. McEntire
Emergency Administration and Planning
Department of Public Administration
University of North Texas
P.O. Box 310617
Denton, TX 76203-0617
(940) 565-2996
E-mail: Dmcentir@scs.cmm.unt.edu

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INTRODUCTION

Social and behavioral research indicates that coordination is a major challenge among the individuals, groups, and agencies that respond to disaster (Carter 1979; Tierney 1985; Auf der Heide 1989). In fact, studies have repeatedly illustrated that coordination is often insufficient among government agencies, volunteers, businesses, and humanitarian organizations (Mileti 1975; Wenger *et al.* 1980; Quarantelli 1984; Portsea 1992; McEntire 1997). Even the most recent research validates prior findings about the problems of coordination during the emergency phase of disaster. For example, Mileti's recent and well-known assessment of the literature reaffirms the challenges of coordinating multi-organizational operations (see Chapter 7, 1999). The need for more "collaborative problem solving" is therefore underscored at the conclusion of *Disasters by Design* (Mileti 1999, 269). Thus, it is evident that coordination has been and remains a significant barrier in emergency management.

With the above in mind, the following paper has the goal of examining the factors that inhibit and facilitate coordination among disaster response organizations. The case to be used in this Quick Response Report is the tornado that struck Fort Worth, Texas, on March 28, 2000. Before proceeding with the analysis, the paper will highlight the methodological approach for this study and provide background information about the Fort Worth tornado. The paper concludes with implications for practitioners and scholars.

METHODOLOGY

Several strategies were used to collect information for this study about the tornado and subsequent emergency response. Two days after the tornado the author traveled to downtown Fort Worth to view first-hand the resulting damage and scope of the event. While at the disaster site, the author observed the plethora of ongoing activities relating to the emergency response to obtain an initial impression about the incident. Over the next few weeks, the author collected various newspaper and Internet articles. These articles covered several topics including the magnitude and path of the tornado; the impact of the disaster; safety concerns; and response activities such as warning and public information dissemination, search and rescue, traffic control, sheltering, disaster declaration, utility restoration, debris removal, etc. After reflecting upon the site visit and perusing the newspaper and Internet articles, the author identified potential interviewees and preliminary questions to be asked about multi-organizational coordination. The specified informants were drawn from various sectors, and represented a wide variety of government departments and other agencies. The initial inquiries addressed several key issues: 1) What is your overall impression about the extent of the disaster?, 2) What responsibilities do you and your organization have in the response to the event?, 3) What functions had to be coordinated during the emergency phase?, 4) What factors hindered or facilitated multi-organizational coordination?, and 5) What lessons or recommendations can be extracted from this tornado to improve coordination in future disasters?

Interviews were then scheduled and conducted on August 4 and August 23, with other sessions arranged at different dates to accommodate respondent preferences and to follow up with the research as needed. While participating in the interviews, informants were asked to identify other important actors involved in the emergency response. Thus, the practice of "snowball sampling" was utilized to reach additional individuals and organizations with roles in the disaster. Those interviewed for the research included:

- City Emergency Management Officials
- The American Red Cross Emergency Services Director
- The Director of the Engineering Department
- An Assistant City Manager
- The Acting Director of the Development Department
- The Senior Assistant to the City Manager
- An Assistant Building Official from the Development Department
- A Deputy Chief from the Police Department
- The Director of the Water Department
- The Director of the Transportation and Public Works Department
- The Assistant Superintendent of the Water Department
- The Public Education Coordinator of the Water Department
- The Assistant Director of the Water Department
- The Director of the Department of Parks and Recreation
- The Fire Chief from the Fire Department

Once the interviews were completed, recorded conversations were transcribed, read, and evaluated. Where needed, informant responses were clarified and additional material was sought through phone conversations and e-mail exchanges. Finally, findings were compiled in this paper, which was then distributed to a number of respondents in Fort Worth to verify accuracy and comment on the manuscript. Thus, a site visit, newspaper and Internet articles, personal interviews, phone conversations and respondent feedback were used to amass information for this study.

THE FORT WORTH TORNADO

In the late afternoon on Tuesday, March 28, 2000, an atmospheric disturbance developed over Western Tarrant County, prompting a tornado watch for much of North Central Texas. As the severe storm system moved East the sky darkened and produced heavy lightning, large hail, and copious amounts of rain. At 6:10 p.m. rotation was spotted outside of Mecham airfield and a tornado warning was issued followed by the sounding of emergency sirens. The funnel cloud then touched down in River Oaks, a city neighboring Fort Worth, at 6:18 p.m. The upper-end F2 tornado damaged over 50 homes in the area and then moved Southeast heading towards the city. Along the way it damaged a 7-Eleven, ripped the roof off of a barbershop, and obliterated a paint store. As the tornado approached downtown Fort Worth it picked up and moved several tractor-trailers at the Montgomery Ward warehouse and then knocked down a brick wall at a graphics company. By 6:25 p.m. the tornado neared the Fort Worth central business district with peak winds up to 152 miles per hour. It inflicted heavy damage on the Cash America International building and the Calvary Cathedral church across the street. The twister proceeded to move East and damaged the Summit Building, Mallick Tower, the Tandy Technology Center, and the Fort Worth Public Library. Prior to its dissipation at 6:28 p.m., the tornado knocked out a great number of the glass panes from the Bank One Tower and the Union Pacific Resource Plaza. According to meteorologists at the National Weather Service in Fort Worth, the tornado traveled 5 miles in 10 minutes and covered a width of 100 to 125 yards.

By the time the tornado finished its rampage, at least eight buildings were destroyed and approximately 52 businesses and high-rises were significantly damaged. The city of Fort Worth was also left with power outages, overturned cars, and significant amounts of debris littering the streets. Many individuals were astonished by the amount of devastation and described the scene as a "war zone." Estimated costs owing to the tornado are expected to top $450 million.

But the severe weather did not have physical and financial impacts only. The thunderstorm and tornado wounded at least 48 people and killed 5 others. Many of the victims requiring medical attention had superficial cuts, bumps, and bruises that resulted from flying debris. Of the 5 deaths, 1 was owing to a semi-truck that fell on top of an individual in the Montgomery Wards parking lot, another was the result of a wall that collapsed onto a homeless man, 2 occurred when a vehicle was swept away by a rising creek (which drowned the occupants), and the last transpired when a young man was struck in the head by softball-sized hail.

In spite of the significant losses, the toll in terms of property losses, injuries, or lost life could have been much worse. For instance, the tornado was of moderate magnitude only and did not generate the destructive winds associated with larger storms. Also, the tornado occurred in the evening instead of during the late morning or early afternoon hours when more people are present in the city. In addition, many individuals left work early that day because of the severe-weather watch issued by meteorologists. Finally, those remaining in the downtown area took steps to protect themselves when the siren was sounded or when they saw the tornado approaching. More than one respondent was amazed that there were not more deaths. Thus, the general consensus is that Fort Worth was fortunate that the losses were not more substantial than they were.

THE NEED FOR COORDINATION

The size and severity of the tornado necessitated the involvement of numerous public, private and non-profit agencies. Consequently, both intra- and inter-organizational coordination were crucial for the immediate emergency and long-term recovery periods. Some of the functions requiring coordination included: warning, evacuation, emergency medical care, incident management, search and rescue, damage assessment, declaration of the disaster, public safety, perimeter control, debris removal, sheltering, donations management, disaster assistance, utility restoration, public information, and business resumption.

Warning and Evacuation

As the storm system approached Fort Worth, the emergency management staff monitored the weather reports provided by the media to determine what steps should be taken to protect life and property. In addition, the emergency management staff received pages from the National Weather Service in Fort Worth and maintained contact with the Radio Amateur Civil Emergency Services (RACES) personnel to obtain information about the severity of the storm and receive confirmation of any possible tornado sightings. RACES personnel were located in both the National Weather Service Offices and the city's emergency operations center which facilitated communication among the organizations. When meteorologists and those in the field reported that the tornado had been spotted outside of Mecham airfield, the emergency operations center immediately sounded the sirens in Tarrant County indicating that people should go inside and seek shelter in an interior room or other safe location. While this was taking place, the Fire Chief and others began to arrive voluntarily at city hall knowing that the situation would require the full activation of the emergency operations center. Those who were not present were subsequently notified through a pager system that their expertise and services would be required. As the heads of various departments were being assembled, the leaders had to determine if they should evacuate the city's emergency dispatch center, which was regarded to be in the projected path of the tornado. After quick deliberation, it was decided that the dispatch personnel should shelter-in-place rather than expose themselves to the elements and risk a dangerous relocation. This proved later to be a wise decision in that dispatch employees were able to find protection from the severe weather by locating in the center of the building. Thus, a number of agencies and

individuals interacted to issue a warning and determine what type of evacuation measures were necessary.

Medical Response and Incident Management

As the tornado proceeded to wreak havoc in the downtown area, the dispatch center began receiving numerous calls requesting emergency assistance. Fire department companies in the nearby area were called out to take care of life-hazard situations owing to the disaster. While the medical and other emergency needs of victims were being met, the fire chief monitored the weather in the emergency operations center. He was concerned that another storm cell might produce additional tornados and therefore communicated with dispatch to ensure that all of the resources were not committed to one area. Once the threat of additional tornados passed and information was collected from field commanders about the extent of the damage, the battalion chiefs worked with one another to divide the city into eight sectors to manage the operation. By this time, the fire chief had committed most of his resources so he called up all off-duty fire personnel. As he did this, he also established the central fire station as a staging area because it was large enough to accommodate incoming fire personnel and their equipment. When they arrived, the personnel were divided into strike teams and sent into the field. The dispatch center, emergency operations center, and fire department thus worked within and across organizations to meet the immediate demands of the situation.

Search and Rescue

While performing emergency medical care, the fire department became aware of the large number of damaged buildings in the city and near the Montgomery Wards distribution center. Consequently, the fire department recognized the need to search the edifices for trapped victims. Because of the potential scope of the task the fire chief felt it was necessary to contact the State District Disaster Committee, the Department of Public Safety, and the State Emergency Operations Center to activate the Texas Task Force Urban Search and Rescue Team (USAR). The city did not wait for the Texas USAR team to arrive however. Search and rescue operations began immediately and fire department personnel were organized into two 12-hour shifts for the first few days. Special K-9 teams arrived from the Dallas/Fort Worth Metroplex to assist in the effort. Help was also offered by fire departments in Oklahoma, Memphis, Miami, and Phoenix but was not needed. In fact, the fire chief reported an overabundance of staffing for this particular emergency function. Nonetheless, mutual aid agreements with neighboring communities were implemented to ensure that each station was adequately covered. Hence, the fire department organized itself and worked with outside agencies to perform search and rescue operations.

Damage Assessment and Disaster Declaration

Within hours of the incident, members of the Texas Division of Emergency Management arrived at the Fort Worth emergency operations center requesting information about the damages. Because it was dark by this time, a full assessment of the devastation was not possible until the next day. On Wednesday, the Red Cross conducted the damage assessment for residential areas while the city Development Department and Risk Management tallied destroyed buildings in the

commercial district. At the same time, state and Federal Emergency Management Agency (FEMA) officials were collecting their own information about the extent of the disaster. The numbers from these parties were then compared and discrepancies were resolved (a particular area of disagreement arose regarding some duplexes which were miscounted by one agency). Once consensus about damages was reached, the city and county sought the assistance of the federal government. Local emergency managers contacted the regional liaison officer to request the help of the governor. The governor then spoke to officials at FEMA's Region VI headquarters. These leaders then worked through FEMA's national headquarters to obtain President Clinton's approval for federal funding. Many agencies therefore worked together to assess damages and seek a formal declaration of the disaster.

Public Safety and Perimeter Control

One of the major challenges evident during the response was the dangerous condition of the downtown area. As emergency workers entered the disaster site they notified the emergency operations center that the tornado had broken a substantial number of windowpanes. Because many of these panes were hanging precariously from offices in high-rise buildings, a large portion of responding personnel were asked to pull back and suspend non-essential operations until the safety of workers could be ensured. A no-fly zone was also established with the help of airport officials so that the loose windowpanes were not disturbed further by overhead aircraft.

A short time later, the police department was asked to set up a perimeter around the downtown area. The police chief therefore recalled all off-duty neighborhood patrol officers to deal with traffic and other safety issues. Officials in the police department also worked with the city Geographic Information Systems Division of the Information Technology Solutions Department, Water Department, and the Department of Transportation to set up barricades on city streets and determine the best ways to route traffic. In addition, police and county sheriffs determined which individuals and agencies had legitimate reasons for entering the disaster site. In some locations, all city workers with identification cards were allowed access. In other areas, police refused to let anyone into the area in accordance with their orders from superiors. As a result of the confusion, the police contacted various departments to determine who should be let in. A system of permits was then established and issued by the police to control access.

Over the next few days, the fire department worked with building owners and contractors to knock out glass that was at risk of falling. At the same time, a plan involving roofed scaffolding was being devised to protect the people that would soon be entering the city to return to work. The fire chief, public works director, and others from the city manager's office assembled twice a day for more than a week to determine where to build these structures over the sidewalks.

These decisions and protective measures proved to be very wise in that pieces of glass fell to the ground hours and even days after the disaster. In one particular situation, an estimated 200-pound piece of glass fell out of an upper floor on the west side of the UPR Building and traveled like a Frisbee around the edifice and landed on the roof of another to the east. The activities undertaken for public safety and perimeter control were therefore valuable and involved the collaborative participation of several departments and businesses.

Debris Removal and Clean up

The magnitude and scope of the Fort Worth tornado produced a significant amount of debris including broken tree limbs, glass, bricks, wood, fiberglass insulation, furniture, office equipment, overturned cars, and even classified FBI documents. It is estimated that the debris was in the tens of thousands of cubic yards. Because this debris was causing flat tires (which were fixed by the city's Equipment Services) and other traffic/safety concerns in the affected neighborhoods and in the city, it had to be dealt with immediately. In the attempt to remove the debris in an orderly fashion, city officials divided the disaster scene into three areas: the Linwood neighborhood, the Monticello neighborhood and the central business district. The city also enlisted the efforts of waste management, public works, parks and community service, the Water Department, contractors, and various trucking firms to cut down trees and collect, transport, and dispose of other debris from the tornado. The police and businesses worked with wrecking companies to tow damaged vehicles or locate owners. One of the major challenges during the debris removal was the clean up of glass. Not only was the process of cleaning up glass time consuming, but it also required special equipment to vacuum shards from the park lawn and the city sewer system. Careful scheduling had to be completed to make sure that the larger pieces of debris were removed before the sweepers were called in. Businesses affected by the disaster also had to communicate with the city to access their offices and begin the process of cleaning up. Emergency management officials likewise worked with local libraries to collect papers that were extracted by the tornado and carried miles away from high-rise buildings. Many important documents were then returned by the branch libraries to individuals and businesses. Therefore, a plethora of agencies and firms in the private sector interacted to take care of debris removal and clean-up functions.

Sheltering

Another important function that required coordination was sheltering. Only a modest number of disaster victims required sheltering after the tornado and most of these came from Hunter Plaza, a subsidized high-rise building with a number of elderly and disabled people. However, there was a need to house for three days up to 200 members of the Texas Task Force Urban Search and Rescue Team that arrived by request of the fire chief. In order to accomplish this task the emergency managers gave responsibility to Public Events Department and the Parks and Community Services Department. These departments, in turn, opened the Will Rogers Convention Center and sought the assistance of other organizations. For instance, the Salvation Army was contacted to acquire 500 mats and bedding from Dallas, Texas. Mass care and food service was also rendered by the American Red Cross, Baptist Men, and the Lutheran Aid Association. The police and fire department training centers also played a role in sheltering. Sheltering was thus the result of the combined efforts of a variety of departments and organizations.

Donations Management and Disaster Assistance

The magnitude of the disaster resulted in a massive outpouring of relief and the appearance of emergent behavior. Pizza, hamburgers, fruit, and other food was delivered by local restaurants and grocery stores to the emergency operations center. Home improvement stores distributed

stacks of plywood to victims and owners who needed to make quick repairs to protect homes and office buildings. Cash was donated to the American Red Cross tornado fund. And calls from around the world were made to see what could be done to help the city of Fort Worth and its citizens. One case involved an architectural engineering firm that volunteered to do building integrity inspections.

In most cases, these donations occurred spontaneously and did not involve much consultation or communication. For instance, the emergency operations center almost had too much food and the distribution of building supplies was not always conveyed to city officials. There were several aspects of donations management and the provision of relief that were well-coordinated however. Emergency management officials requested that the Water Department track donations (and offers of donations) because of the familiarity that its employees had with call taking and the abundance of phone lines in the organization's facility. The purpose of this call taking was to match donations with needs. The Water Department also set up a tent in the Linwood neighborhood where the Housing Department, American Red Cross, and Salvation Army were located. As these organizations provided services to the disaster victims, the need for translators became apparent. Consequently, a city-wide inquiry of departments was initiated to determine who on their staff was bilingual. Several of the Spanish-speaking employees (including fire fighters and police officers) then went into the affected neighborhoods to help with minor and temporary repairs. The police Neighborhood Patrol Officer, in particular, played an important role in assuring the Spanish-speakers that they were there to help. Emergent groups, which were often comprised of local church congregations and other concerned citizens, also showed up in the affected neighborhoods to participate in the effort. Because of the vast number of volunteers, a staging area was established so that they could be checked in and given assignments. Besides coordinating the donations and emergent group activity, city officials also worked with FEMA and the Small Business Administration (SBA) to find a suitable site for the Disaster Field Office. Local and Federal emergency management agencies also agreed to locate the Disaster Recovery Center in the fire and police training building after other possible locations were already in use. Congressional representatives met with FEMA, the SBA, and city officials to discuss the disaster assistance process. Finally, emergency managers advised each of the responding departments to have workers sign-in and track the use of resources in order to have a record of expenses incurred from the recovery operation. Various departments, non-profit organizations, emergent groups and different levels of government interacted to manage donations, volunteer services and disaster assistance activities.

Utility Restoration

Traffic, phone, and power systems received a significant amount of damage from the tornado. Therefore, utility restoration was a major priority after the incident. Some of the entities involved in these recovery activities did not interact extensively with other organizations. For instance, the Public Works acted alone to secure streetlights and traffic signals throughout the city. In other cases, however, businesses and public departments coordinated one with another to resume utility services. Southwestern Bell put up a temporary mobile cell tower to make up for lost phone lines and increasing demands for service after the disaster. This company also supplied 30 cell phones with extra batteries and chargers for emergency worker use. Per the request of the Water Department, TXU Electric checked the status of power lines at the water treatment plant.

TXU also worked in the neighborhoods that were affected by the tornado, but did require the services of Zeig Electric to repair meter boxes before electric service could be restored. The Development Department likewise worked with contractors to speed up and inspect the work that was being performed in this area. Utility restoration thus required the collaboration of public agencies and corporations from the private sector.

Public Information and Business Resumption

Two final areas that required coordination were public information and business resumption. Because of the extent of the disaster, the city public information officer had to work closely with the emergency operations center and with the media to ensure that accurate information was being relayed to the citizens of Fort Worth on a daily basis. Department heads and other city employees were also invited to attend press briefings and give out situation reports of their activities. A particular challenge was to provide updates of street closures that expanded and contracted for several weeks while recovery operations were taking place. The public information officer also provided the media with maps describing the location of street closures and the Disaster Recovery Center.

Over the next several weeks, city officials held meetings with or talked to 20 building owners so that they would know what to expect during the recovery phase of disaster. The public information officer was also involved in publicizing the strategy of getting businesses up and running as quick as possible. Furthermore, the Chamber of Commerce set up a web site to provide businesses with further details about recovery and held a symposium to better match government services with corporate needs. In order to ensure the safety of business employees, the city coordinated with building occupants so that they could retrieve belongings as early as Saturday. The fire department also allowed sub-standard fire escape routes from some buildings (due to the location of safety scaffolding) to get businesses re-opened sooner rather than later. A host of agencies and corporate actors were therefore responsible for providing information to the public and helping businesses resume normal activities in the most expeditious way possible.

FACTORS CONSTRAINING A COORDINATED RESPONSE

While the response to this disaster exhibited a significant degree of coordination, it was not without minor challenges. Several factors inhibited the coordination of certain functions. These included information challenges, a lack of communication between the field and emergency operations center, equipment failures, language barriers, and a command and control mentality.

1. The response to the Fort Worth tornado illustrated many of the typical information problems exhibited in other disasters (see Auf der Heide 1989). In some cases, there was not enough information, which hindered the ability of agencies to work together. In other instances, there was too much information, which created processing delays. Furthermore, the information that was relayed to parties was at times incomplete or

inaccurate. One particular challenge related to the perimeter. On a few occasions individuals could not enter the disaster area even though they had legitimate reasons for being there. Also, because the perimeter expanded and contracted on a daily basis, there was difficulty communicating to the public what streets were open and how the downtown area could be accessed.

2. Another problem evident during the response was a lack of initial communication between field personnel and emergency managers in the operations center. After the tornado dissipated, the emergency operations center sent city crews into the downtown area to start the process of debris removal. Unfortunately, the emergency operations center was not aware of the dangerous condition owing to the hanging glass from the high-rise buildings. Nevertheless, when the situation was relayed to the emergency operations center, the decision makers quickly asked the debris removal teams to leave until it was safe for them to re-enter.
3. Equipment issues also posed a challenge for coordination. During the tornado, the emergency operations center lost its television antenna. Later on, the police's 40 channel 800 MHz system was down for 15 to 20 minutes because of overuse. Cell phones became inoperable for a short period of time as well. Respondents felt that the loss or failure of these communication systems therefore discouraged intra- and inter-organizational coordination. Individuals and agencies had some difficulty contacting one another and knowing what was going on.
4. Language barriers contributed, in a less significant way, to the challenges of coordination. Most of the victims in the Linwood neighborhood speak Spanish and were unable to communicate with emergency workers during the initial phases of the response. Therefore, there was a delay in the relaying of needs and the implementation of strategies to meet them.
5. A few of those interviewed felt that some of the responding agencies were taking too much charge of the situation. In other words, some organizations were viewed as controlling or domineering because they did not allow others to participate in the response. Therefore, this case supports the findings of prior research that command and control perspectives may limit coordination (see Dynes 1994).

FACTORS CONTRIBUTING TO A COORDINATED RESPONSE

In spite of minor problems, the response to the Fort Worth tornado was well-coordinated. Interviewees suggested a number of reasons why the emergency operations went so smoothly. These included political support for emergency management, preparedness measures, networking and cooperative relationships, technology, and the nature and use of the emergency operations center.

1. By all appearances, the city of Fort Worth is very progressive in regards to emergency management. Respondents felt that the political leadership of the city is very supportive of the agencies and functions related to disasters. In fact, more than one of the city

employees interviewed suggested that the assistant city managers have no problem conveying the message "You *will* do it!" However, the vast majority of the department heads recognize the value of emergency management and are cognizant of their role in disaster situations. Fort Worth seems to have overcome much of the apathy that typically confronts emergency managers (see Auf der Heide 1989). This was believed to have helped coordination in that outside departments regard emergency management as a legitimate profession, which requires multi-organizational collaboration and a team approach.

2. Steps taken to prepare for disaster were viewed as another major reason why the response was effectively coordinated. Over the past several years, the city has held a number of emergency preparedness meetings, which have been well attended. Prior to Y2K (Year 2000), for example, city departments met at least 5 times to discuss the important question: "What if?" The emergency operations center user group (which is made up of the representatives of over 40 agencies from the public, private and non-profit sectors) also meets quarterly to increase awareness of the city's emergency operations plan and clarify roles in disaster. In addition, various agencies and departments have met to prepare for potential weapons of mass destruction terrorism incidents. Furthermore, the city has conducted a number of training sessions to build response capacity. In early March, the city held Incident Command System training to help the emergency operations staff and other department leaders understand field operations. Approximately one week before the tornado, the American Red Cross taught employees in the Water Department about call taking and donations management procedures. The emergency operations center likewise held an exercise on damage assessment a few days before the disaster occurred. This allowed the city to divide up beforehand "who does state buildings, who does federal buildings and city buildings … [and] who does commercial and … residential [buildings]." One respondent commented on the value of this experience in that the person who proposed these training activities must have "foreseen the future." Besides planning, training, and exercises, Fort Worth has also developed mutual aid agreements and comprehensive lists of resources to be utilized in case of disaster. Each of these steps has had a positive impact upon coordination during the Fort Worth tornado. One respondent replied "Coordination ahead of time is what pays dividends."
3. Networking and cooperation were other important variables for coordination. During the interviews, it became apparent that the key players in emergency management are familiar with each other's personal lives and have a high level of respect for their professional responsibilities. One respondent stated that he knew the other directors by name and could talk to them about "fishing, deer hunting and that kind of stuff." He also added, "this makes all the difference in the world … when you walk in [to the EOC] and have a pretty good idea of who they are." Others affirmed that they interact quite frequently with the different department leaders "who are wonderful to work with." Respondents were also well aware of the resources and contributions of different departments as "people assumed their roles and fulfilled them beautifully." Moreover, it was reported that the various agencies were willing to work together: "It was so nice to pick up the phone and … say 'I need 500 mats' and they say 'when and where do you want them?'" It was also noted that there were also "no egos involved … [to say it is] not my job."

4. Experience in recent disasters was also suggested as a factor that facilitated coordination after the tornado. Fort Worth has been involved in major disasters and emergencies before (including the 1995 hailstorm and the Wedgwood Church shooting) so responding agencies were fully aware of the functions that needed to be performed and the importance of working with others in times of crisis.
5. Interviewees also stated that technology played an important role in coordinating the disaster response. In spite of periodic interruption, cell phones and trunked radios were believed to play an important role in helping emergency responders communicate with one another. Ham radio equipment likewise proved to a valuable asset in both the warning and damage assessment activities. The Red Cross also noted that the Disaster Services Human Resources computer program was key in mobilizing personnel to Texas from Georgia, South Carolina and other states. Moreover, the Internet was also seen as a valuable tool in the relaying of information to both citizens and businesses in order to speed up the recovery process. The Public Information Officer relied upon a city outgoing voice-mail system to deliver information to the media in a rapid manner. However, at least one respondent declared that success was not necessarily a result of technology alone, but required the correct application of that equipment. The availability and proper use of cell phones, radios, computers, etc. accordingly improved coordination of the response to the disaster.
6. The emergency operations center and management of the disaster were also viewed as factors that enhanced coordination. Fort Worth has an excellent emergency operations center that is well equipped and large enough to accommodate the number of representatives of organizations and departments that are involved in disasters. This site is an important location where decision makers can meet to collect, act upon and distribute information. But it was not only the facility itself that fostered improved coordination. Respondents felt that management of the disaster and the emergency operations center staff were instrumental in efforts to coordinate. As a case in point, every two hours during the response the Assistant City Manager would request that all activities be halted in the emergency operations center so that each department or agency could give an update of what they were doing and what they needed help with. Key leaders would also hold planning meetings each afternoon for 45 minutes to 2 hours to review department reports and assign tasks. This was reported to be extremely beneficial in that it promoted a "big picture" perspective rather than covering individual department issues only.

CONCLUSIONS AND IMPLICATIONS

This study of the Fort Worth tornado and subsequent response illustrates that a wide variety of functions had to be performed by multiple agencies, businesses, and departments. Among the activities taking place in the response were warning, evacuation, emergency medical care, incident management, search, and rescue, damage assessment, declaration of the disaster, public safety, perimeter control, debris removal, sheltering, donations management, disaster assistance, utility restoration, public information, and business resumption. These functions were not addressed by any single organization, but involved the collaborative effort of individuals and

organizations in the public, private, and non-profit sectors. Consequently, this examination reiterates that disaster responses are complex and require the coordination of many actors involved in emergency and recovery activities.

In general, the city of Fort Worth should be commended for the degree to which the response was coordinated. While small problems associated with coordination were evident, this is to be expected as disasters pose significant demands on societies and the individuals and organizations within them. Nonetheless, the agencies responding to the Fort Worth tornado exhibited a great ability to work harmoniously to meet the demands of the tornado.

Emergency managers and others involved in disasters should learn from the positive lessons from Fort Worth. Political support, preparedness activities, networking and cooperation, the availability and use of technology, and a well-equipped and well-managed emergency operations center are several factors that facilitated coordination after this event. Other communities and actors may also benefit from the negative lessons exhibited in the Fort Worth tornado. In particular, information challenges, a lack of communication between the field and emergency operations center, equipment failures, language barriers, and a command and control mentality should be addressed to improve coordination.

Finally, this paper would be incomplete if it failed to note that additional research should be conducted on coordination issues in emergency management. Not only is there a lack of information about constraining and contributing factors in disaster response, but the lessons generated from the preparedness, emergency, and recovery phases may also prove valuable in that they may promote mitigation through collaborative efforts. For example, political support, urban planning, increased regulations on construction, and a willingness to work together may have a significant impact upon our ability to reduce future disasters. For these reasons, it is hoped that this paper has provided additional information about multi-organizational coordination in emergency management. To the extent that it has not, additional work should be conducted on how the public, private, and non-profit agencies may cooperate to prevent and respond to disasters.

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hazctr@colorado.edu