Role of the Natural Hazards and Disaster Field in the Aftermath of September 11

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On September 11, 2001, four passenger airplanes were hijacked from three airports on the east coast. Two of these planes collided into the 110-story twin towers of the World Trade Center (WTC) in New York City, ultimately causing the collapse of both towers and several surrounding buildings. Another plane crashed into the Pentagon office building outside Washington, D.C. A fourth plane, whose intended mission is unknown, crashed in a rural area of Pennsylvania. Thousands of lives were lost in these various incidents, including passengers, building occupants, and emergency response personnel.

This is a disaster unlike any other in U.S. history, and the intended and unintended consequences of this catastrophic event are only beginning to be understood. In the aftermath of the event, many turned to experts in the natural hazards and disaster field for answers. We contend that there is much to be learned from the existing body of natural hazards and disaster research, and given the unique nature of this event, many new questions to be explored. First, we discuss knowledge that can be applied from the field of natural hazards, and then we examine avenues for new exploration, both from a social science and an engineering perspective.

For over 50 years, researchers, practitioners, and policy makers have worked to better understand the causes and consequences of natural and technological risks. While there has been less work in the field related to terrorist disasters, primarily due to our lack of experience with such events, much of the knowledge gained from a half century of disaster research is relevant in studying the events of September 11.

In the social and behavioral sciences, we have learned to observe and document individual and group preparation for and response to ‘‘environmental jolts.’’ This documentation has led to a greater understanding of pre- and postdisaster risk and vulnerability, as well as human and organizational response. For example, we know that following a disaster, people tend to set aside individual identities and focus on the impacted community. The collective priority takes precedence over individual goals.

Social and behavioral scientists possess the methodological know-how and have the research experience to enter the field and document human behavior following disastrous events. The events of September 11 provided a similar opportunity. In fact, the National Science Foundation and the Natural Hazards Center at the University of Colorado sent over 20 social and behavioral scientists into the field to gather perishable data in the days and weeks following the attacks. Moreover, social and behavioral scientists can help to examine the complex contexts that not only lead up to catastrophic events, but also frame individual and community response in the aftermath.

From an engineering perspective, civil and structural engineers have the knowledge of building design, material behavior, and performance of structural systems needed to explain why and how structures fail. Engineers know that natural and technological hazards cause disasters when those hazards apply loads or actions to structures for which they are not explicitly designed. For example, after a detailed study of the Alfred P. Murrah Building following the bombing in Oklahoma City on April 19, 1995, it was concluded that the losses would have been reduced by as much as 80% if the building had been designed for earthquakes using a Special Moment Frame (FEMA 1996). In this case, the forces the explosion applied to elements of the structure were similar to earthquake loads, and knowledge gained from earthquake engineering research could have been applied to help save lives in that event.

Immediately following the attacks of September 11, engineers from around the world were called on to help explain how and why the WTC towers collapsed. The National Science Foundation funded engineering teams from universities across the nation to collect data and analyze the event. In addition, two engineering study teams were formally appointed by ASCE to evaluate the collapse of the WTC and damage to the Pentagon. This was the fifth time the ASCE disaster response procedure was used to establish study teams in 2001. Earlier in 2001, teams were dispatched to study and document the devastation from earthquakes in El Salvador, India, Peru, and the Seattle area. Civil and structural engineers have the knowledge of building design, material behavior, and performance of structural systems needed to explain why structures fail. This information proved valuable for search and rescue operations in the hours and days following the collapse of the WTC towers and surrounding buildings.

While we recognize the importance of applying our already existing knowledge in the natural hazards and disaster field to the events of September 11, new questions also need to be examined. Some have argued that it didn’t matter what made the WTC buildings collapse, be it an airplane crashing into them, a bomb, an earthquake, or a hurricane; the end result was that they failed structurally, causing death and destruction. We maintain that the context and many of the consequences of this event are different, however, from a natural disaster. Thus, while we believe there is much to be learned from our natural disaster scholarship, there are also many new avenues for exploration.

In a natural disaster, people often blame ‘‘Mother Nature’’ or attribute damage to an ‘‘act of God.’’ The attacks of September 11 were different, as a group of individuals were directly responsible for the damage and destruction. Following the attacks, people from particular ethnic and religious groups were, and continue to be, targeted for blame. Thus, there are many new areas for social scientists to examine as related to blame and ‘‘in group’’ and ‘‘out

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group'' behavior. In addition, the reaction of survivors may be a direct function of the cause of the event.

This disaster event is also distinct because of the ongoing nature of the problem and the complexity of the situation. This is a disaster, overlaid with a search and rescue operation, overlaid with a crime scene, overlaid with threats to public health. Our nation has never experienced such an unending and multifaceted crisis. How this incident will impact local businesses, as well as the national economy, is an important area for exploration. New learning about the role of faith based organizations and volunteerism in the ongoing crisis is also called for. A detailed analysis of the ensuing policy decisions that have been and continue to be made very quickly also merit investigation.

In the future, engineers will face a number of challenges in deciding how to design buildings for such extraordinary events. For example, a major challenge raised by the WTC collapse was the role that fire and intense heat played in the physical destruction of the towers and surrounding buildings. Perhaps the larger philosophical question relates to how we should treat this type of event. Should engineers design high-rise buildings with the threat of terrorism in mind? It seems illogical, impractical, and simply impossible to account for all of the potential scenarios without turning to some type of risk-cost-benefit analysis. This then also raises the question of the usability of our existing tools and models to analyze this type of scenario.

In conclusion, we want to make clear that this editorial is not meant to serve as an exhaustive list for what natural disaster scholars can, have, or will contribute to studies of terrorism. Rather, our intent is to open a dialogue and encourage our readers to think about how they can contribute new knowledge to hazards and disaster research and practice. Readers of the *Natural Hazards Review* are familiar with disasters and the human suffering, physical damage, and economic losses they cause. Now, we must begin to consider what our role is in the future of disaster research, policy implementation, and application and how it might change in the aftermath of September 11.

References

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