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*Social Studies of Science* 2007; 37; 119

DOI: 10.1177/0306312706069433

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## Distributing Risks and Responsibilities: Flood Hazard Mitigation in New Orleans

*Jameson M. Wetmore*

**Keywords** Hurricane Katrina, responsibility, socio-technical systems

Coordinated responses to flooding in the New Orleans area date back to at least the early 18th century when the Company of the Indies built a mile-long bulwark on a natural levee (Colten, 2005). Since that early project, corporations, non-governmental organizations (NGOs), and local, state, and federal governments have taken numerous steps to limit the risk of flooding, including building extensive levee systems, redirecting rivers, and developing evacuation plans. Like many risks that have been perceived and dealt with for centuries – including crime, disease, and other natural disasters – modern science and engineering have worked in concert with other institutions to address the problem through the development of large socio-technical systems.

As with most large socio-technical systems, there was no single group or organization charged with overseeing all facets of the system to limit the risks of flooding in New Orleans. While some parts of the strategy to address the risks were meticulously planned, tightly coupled, and carefully coordinated, other components and institutions were only loosely connected.<sup>1</sup> There was a general sense of who was responsible for what and a few systems were set up to assess specific tasks, but the complex socio-technical systems were too enormous to be centrally coordinated. The components of these systems were developed for a myriad of reasons and their role in any particular mitigation system or strategy was sometimes ancillary to their primary purpose. Thus the methods by which responsibilities were distributed among the various components were negotiated in an unsystematic and often unspoken way.

Despite the fact that the mitigation efforts were not meticulously coordinated, there was some general agreement about the overall strategy for New Orleans. By tracing how tasks were distributed, one can begin to understand how ideas of responsibility hold together complex systems and perhaps why these systems sometimes fail (Wetmore, 2004). Widely distributed responsibilities can have distinct advantages, but pose certain dangers as well.

*Social Studies of Science* 37/1 (February 2007) 119–126

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ISSN 0306-3127 DOI: 10.1177/0306312706069433

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## A System of Mitigation

To begin, it is important to define the objective of flood hazard mitigation in the USA. While there are often competing definitions of the specific problems that any large system is meant to solve, as the name ‘flood hazard mitigation’ implies, the field is not explicitly dedicated to flood prevention or even flood hazard prevention. Instead, it presumes that there will always be an inherent risk of flooding and that the goal is to reduce losses of life and property. Thus floodplains are ‘managed’, not eliminated; and the damage caused by floods is ‘mitigated’, not entirely prevented.<sup>2</sup>

To achieve these goals the New Orleans system of flood mitigation was comprised of a wide variety of activities to be carried out by a diverse array of people and institutions. The system can be broken down into three component subsystems that required constant preparation, but which were ultimately focused on different time periods. First, there was a physical infrastructure built for the long haul. It included designing buildings to resist flood damage; building flood-control levees and reservoirs; and *not* building important structures in vulnerable areas. It was generally acknowledged that these measures would never eliminate the danger, and so a second component was designed to get people out of harm’s way prior to a flood: weather forecasting monitored the threat of rising rivers, hurricanes, and other sources of flooding; government officials issued warnings to residents; and agencies prepared evacuation and emergency response plans. A third component consisted of a post-flood response system that deals would deal cleaning up, repairing, and rebuilding the flooded area.<sup>3</sup> Using these three subsystems as a framework, I will briefly analyze what happened in New Orleans.

## The New Orleans System

The first subsystem was the extensive physical infrastructure built over the past several hundred years through the efforts of a number of different actors. The oldest part of New Orleans – the French Quarter – was strategically built on some of the highest land at the mouth of one of North America’s most commercially important rivers. Despite its relative elevation, however, the French Quarter is not immune to flooding. To make matters worse, as the city grew it expanded into areas that experienced habitual flooding. In order to keep floodwaters out of inhabited areas, the US Army Corps of Engineers and the Federal Emergency Management Agency (FEMA) developed models of the likelihood that particular areas would experience flooding. These models were then used by state and local governments to determine where public works projects should be built and to set flood protection levels for new development.

Since most New Orleans flooding problems had been with the Mississippi, the local government sought levees to protect against what the Corps of Engineers defined as an ‘800-year’ Mississippi flood (Grunwald & Glasser, 2005; Suhayda, 2005). These were designed to protect against all floods except those deemed so rare that the probability was they would only occur

once every 800 years. Since flooding due to hurricanes had not been a major problem (at least compared to river flooding), the local government agencies placed lower demands on the levees built to hold back water from Lake Pontchartrain. The US Army Corps of Engineers estimated that those levees could handle a category 1 or 2 hurricane, as well as a category 3 hurricane, provided that it did not settle over New Orleans and continuously dump water on the lake (US Army Corps of Engineers, 2000). The levees were built to resist something between a 200- and 300-year flood (Schleifstein & McQuaid, 2002; Grunwald & Glasser, 2005; Suhayda, 2005).

Once the local government decided upon basic specifications, local contractors were hired to build the levees. Of course, huge earthen, concrete, and metal structures deteriorate over time. In New Orleans, therefore, they were maintained by the Orleans Levee District, a special local government organization that has authority over levee-related issues in a geographic area that includes parts of several parishes.<sup>4</sup> And finally, to ensure that the levees are built and continue to offer their stated levels of protection, the Army Corps of Engineers was charged by federal regulation with monitoring the status of levees built with federal monies.

Exactly what happened to the levees in the wake of Hurricane Katrina is still not fully known. Many of them held, but others did not and the resulting breaches allowed large sections of New Orleans to be submerged under several feet of water. There is speculation that some levees were overtopped and eroded from the backside and that at least a few failed because they were built on soil that weakened when saturated with water, causing them to collapse (Seed, 2005; Warrick & Grunwald, 2005).

Who should be blamed for the collapsing levees has been a matter of significant debate. Fingers have been pointed in numerous directions: the original contractors were criticized for lousy workmanship; the levee board was blamed for poor maintenance; the Corps of Engineers was denounced for not taking into account the underlying sandy soils; the local government has been accused of not building the levees high enough and/or diverting funds needed for building levees; and the federal government has been blamed for not meeting requests by the Corps of Engineers and others for funds to build and maintain levees.

The second major subsystem of the New Orleans approach to mitigation was the pre-catastrophe response – the system set up to warn residents and evacuate them from the city.<sup>5</sup> In the week leading up to landfall, the National Hurricane Center tracked Katrina as it developed into a threatening storm. The warnings generated by the Hurricane Center compelled Louisiana Governor Blanco to declare a state of emergency on Friday 26 August, which should have mobilized emergency management workers (Blanco, 2005). The next day, President Bush declared a state of emergency, which enabled a joint field office to open that would enable local officials to request resources from the federal government (Bush, 2005). Later that same day, Governor Blanco initiated the area's evacuation plan by advising people to evacuate the city and reversing the major highway lanes going into New Orleans to make it easier for people to get out. On

Sunday morning, New Orleans Mayor Nagin upgraded the warning and called for a mandatory evacuation. The strategy developed by the city to assist residents without access to vehicles was also put into action – the doors of the Superdome (a covered football stadium) were opened to people not able to evacuate.

There has been a lot of criticism about the timeliness of these announcements, and of the plans for residents who were unable to leave the city, but despite the small amount of time available, statistically the evacuation was a remarkable success. After reviewing the statistics, Governor Blanco and the FEMA coordinators for Louisiana estimated that more than 1.2 million people (or 90% of the New Orleans area's residents) evacuated to safer ground (Wells, 2005).<sup>6</sup> For comparison, three weeks later when Hurricane Rita threatened Key West (an island with practically no hurricane protection), only 50% of the residents evacuated (Tan & Johnson, 2005).<sup>7</sup> And while the plan to use the Superdome as housing rather than provide city buses was rightfully criticized long before Katrina hit (McQuaid & Schleifstein, 2002), the stadium did provide protection from the hurricane winds.

The final component of the hazard mitigation system was the post-flood response. Government officials at the local, state, and national level, with the help of the American Red Cross and other NGOs, were expected to deal with the immediate aftermath of the catastrophe. They were charged with the task of quickly and safely returning New Orleans to a state of normalcy and safety.<sup>8</sup>

This, as we now know, was the weakest part of the overall system. It is a monumental task to run a city without phone lines, cell phone towers, an electric grid, potable water, drivable roads, or a coherent police force (Sims, 2007). The plans in place to deal with the aftermath of the catastrophe were simply inadequate.<sup>9</sup> The emergency management workers mobilized by the state and the joint field office opened by the federal government during the pre-landfall preparations were not very effective without the usual infrastructure.

## **A Problem of Communication**

The failure to adequately contain the problems generated by Hurricane Katrina sparked an international debate over who should be blamed for the tragedy. Fingers were pointed by nearly everyone involved at nearly everyone else involved in the process of constructing and implementing New Orleans' mitigation projects. Officials at all levels of government were implicated as key parts, if not primary causes, of the problem. The media criticized many of the groups and individuals involved as being incompetent and lacking leadership.

But while many of these criticisms had some validity, there were also more systemic problems. Despite (or even because of) their size and importance, large unplanned socio-technical systems can be very fragile. Communication between all the constituent parts is vital if they are to work in concert.<sup>10</sup> Without a system of centralized planning or monitoring, this only happens when the groups involved actively engage with one another.

Certainly in the New Orleans' system of flood hazard mitigation the different groups communicated in many different ways, but few systems of communication are perfect and even small misconceptions can be dangerous. For instance, problems may have arisen simply because the focus on the levee and evacuation system distracted people from spending more time preparing for what would happen if the city actually filled with water. The levees – which could be seen throughout the New Orleans landscape – may have offered a false sense of security, and officials may have found it difficult to imagine the whole system failing and the various ways in which it could fail.<sup>11</sup>

In a similar vein, FEMA's mapping standards may have generated misunderstanding. FEMA flood maps use lines and shading to denote whether a property is either in or out of the 100-year floodplain; a determination that assumes the levee system will behave as designed. This black and white delineation does not include shades of gray. Thus, when homeowners (or potential homeowners) on one side of the line want a mortgage or home improvement loan, the bank will warn them of the potential for flooding in the area and that they are required to purchase flood insurance first. Homeowners on the other side are not required to purchase such insurance and will likely not be notified. Of course if the levee fails or they are hit with a flood that is more severe than a 100-year flood, both houses will have a significant problem. Communicating the subtleties of any situation can be very difficult, and there are great pressures to simplify messages sent to people with different backgrounds and expertise, but such simplification can obscure what are later revealed to be very important ideas.

To further complicate matters, even if communication within the system of flood hazard mitigation had gone smoothly, the various individuals and institutions in that system would have had a difficult task because they were struggling with a moving target. The risk of New Orleans flooding was continually increasing because of a variety of systems that affected the city and its natural systems of protection. For instance, the construction of the levees along the Mississippi prevented the river from replenishing the ground with sediment. This, coupled with the constant pumping necessary to keep the levee-protected lands dry, meant that much of New Orleans was (and is) actually sinking. Other traditional flood barriers – such as the surrounding wetlands – were indirectly eroded and deliberately cut up to put in canals, pipelines, and other structures (Fischetti, 2006). Such projects weakened the city's defenses. Consequently, flood hazard mitigation required more than effective communication between those directly involved, it also required that they reach out to the various groups and projects that affected and reshaped the city's protection.

## Conclusion

When a system successfully addresses the problem it is meant to handle, the loose system of distributed responsibilities that is often associated with large socio-technical systems can work well. It allows different groups with

different visions to participate without forcing them to strictly adhere to predefined roles for which they may not be suitable. The differences can lead to conflicts, which must then be negotiated, but such flexibility often allows differing opinions of what the system should look like to coexist. Thus, different groups may end up attacking the same problem from different directions, making the system more robust and ultimately increasing its effectiveness.

This was certainly the case with the New Orleans system of flood hazard mitigation. There were at least three overlapping systems that sought to address potential problems at different phases of a catastrophe. If one failed, there was a chance that another component designed by another group of people might be able to take up some of the slack.

Despite such benefits, a loose system of distributed responsibility can create a great deal of confusion and miscommunication. As a socio-technical system slowly evolves, different groups develop different expectations about its components and institutions. Some of these expectations are widely shared, but precise ideas of what they entail often vary. The constant threat of miscommunication can mean that certain areas are inadequately handled.

This loose structure of responsibilities opens up a space for debate over who should carry out what (Hilgartner, 2007). There can be a great deal of pressure to retrospectively define what a proper system should have looked like and then to claim that any variation from this ideal system was a breach of ethical or political responsibility. The media, and to a lesser extent the law, tend to create the idea that the problem can be solved if only a single perpetrator or handful of morally suspect individuals at the center of the system's collapse can be found and punished.

While the media and others certainly deserve some blame for their witch-hunt mentality, they perhaps indicate a more systemic problem. Contemporary societies have not developed a good sense of how to deal with distributed responsibilities that are a necessary part of any complex system. Systems of responsibility are not always clearly marked and they are not always clearly understood by their participants. In the case of Katrina, while some systems worked reasonably well, many groups simply were not prepared.

When systems fail spectacularly, the failure is rarely the responsibility of just one person. This does not mean that people should not be held responsible for the failures that occurred in New Orleans' flood hazard mitigation strategy. At their core, all systems are developed by and consist of individuals. The danger is that individuals who work within large socio-technical systems may be very tempted to think that their role is not critical because, if they fail, their mistakes will be remedied by the actions of others or perhaps never even noticed. Such abdication of responsibility must be resisted, especially when failures have such devastating consequences. An understanding and respect of the other components of a system can facilitate the communication necessary to mitigate the weaknesses inherent in systems of distributed responsibility.

## Notes

I would like to thank French Wetmore for his invaluable assistance on this project; Mike Lynch and Sergio Sismundo for their assistance in editing; and Benjamin Sims for his comments and efforts in coordinating both the special session on Hurricane Katrina at the Society for Social Studies of Science Annual Meeting and the special issue of *Social Studies of Science*.

1. As Charles Perrow (1999) argues, and as will be argued later in this paper, tightly coupled does not necessarily mean more effective.
2. See Bijker (2007) for additional explanation of the US 'mitigation' approach as well as an alternative approach taken by the Dutch.
3. The assumption that flooding will never be completely eliminated in the USA has also led to a nationwide effort to assist those affected by distributing the costs of flood recovery through insurance programs. See the Federal Emergency Management Agency's National Flood Insurance Program: <[www.fema.gov/nfip/](http://www.fema.gov/nfip/)>.
4. For more detail on the Orleans Levee District, see <[www.orleanslevee.com/](http://www.orleanslevee.com/)>.
5. The White House (2006) gives a detailed explanation of the various steps that were taken in the few days leading up to landfall.
6. A survey taken during the summer of 2005 predicted that as many as 60% of south-east Louisiana residents would not evacuate if a category 3 storm approached (Schleifstein, 2005). Shirley Laska, Sociologist and Director of the Center for Hazards Assessment, Response and Technology at the University of New Orleans, argues that the resistance to evacuate was overcome in large part because Hurricane Katrina was classified as a category 5 storm as it approached (Laska, 2005).
7. Tan and Johnson note that the normal percentage of Key West residents that evacuate in response to hurricane warnings is between 20 and 30. The especially high evacuation rate is likely attributable to the increased fears generated by Hurricane Katrina.
8. For just two of the many reasonably accurate pre-Hurricane Katrina predictions of what this would entail, see Schleifstein & McQuaid (2002) and Laska (2004).
9. For an explanation of how the White House later conceptualized the role that numerous organizations would play in the initial response see White House (2006, Chapter Two).
10. Diane Vaughan's work on the Challenger disaster demonstrates how this can occur even between people with the same professional training (Vaughan, 1996).
11. This argument is similar to Donald MacKenzie's (1990: 370–72) idea of a 'certainty trough' – that those committed to a program, but not actively engaged in it, tend to be more certain of the knowledge it produces than those who actually produce the knowledge.

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