EXTREME EVENTS AND COMMUNITY RECOVERY[1]

Daniel J. Alesch, Lucy A. Arendt, and James N. Holly[2]

ABSTRACT

Based on longitudinal analysis of more than two dozen communities that experienced natural disasters, the authors draw conclusions about the consequences of extreme events for community systems and what constitutes community recovery. They conclude that community recovery does not proceed along some predefined timeline, that there is not simple recipe for recovery, and that recovery is not inevitable. They see communities as complex self-organizing systems susceptible to cascading adverse consequences stemming from initial damage generated by extreme events, with important implications for understanding recovery processes.

Introduction

Over the past two decades, we, the authors, conducted longitudinal research in more than two dozen American communities that experienced one or more extreme events. That work led us to think seriously about the relationships between extreme events, communities, consequences, and community recovery.

Why do some communities do well while others languish or decline following an extreme event? Some economists have said that disasters actually stimulate the local economy because transfer payments from government and insurance companies, as well as the economic activity generated by rebuilding, largely offset losses from the event (Wolk, 2005). We weren't convinced. We studied communities where a significant share of the insurance payments and federal aid went to out-of-town and out-of-state contractors, and where the tumultuous effects on individual local firms were masked when one looked only at aggregate numbers in the metropolitan area. We saw whole communities divide their history into "before" and "after" the flood, hurricane, earthquake, or other extreme event. We saw businesses fold as a direct result of the event even five or six years afterward, when the owner had finally exhausted his or her savings, credit, energy, and hope. We saw one city on the verge of insolvency more than a decade after a hurricane had demolished it, despite having received many tens of millions of dollars in state and federal aid and investments intended to enable recovery. We talked with individuals and couples whose lives were changed forever following a natural disaster, with one or both of them still getting psychiatric help and taking medication for long-term, clinical depression almost a decade later. They had lost loved ones or businesses built from the ground up to fulfill lifelong passions; their dreams had been shattered.

---

[1] This paper draws heavily from *Long-Term Recovery in the Aftermath of Disaster* by Daniel J. Alesch, Lucy A. Arendt, and James N. Holly and published by the Public Entity Risk Institute in 2009,

[2] The authors are, respectively, professor emeritus, assistant professor, and senior adjunct instructor, University of Wisconsin-Green Bay, Green Bay, Wisconsin, USA.

Some disaster researchers have suggested that recovery is pretty straightforward: one repairs, restores, rebuilds, or replaces the built environment and, before long, the community essentially returns to where it was before (Haas, Kates, & Bowden, 1977). Again, we weren't convinced. We came to believe that recovery, if it means restoring things to what they were before the event, almost never happens. We came to appreciate that recovery comes about unevenly among sectors within the community. Local government sometimes recovers more quickly than the economy and vice versa. Some individuals recover quickly while others suffer intense anguish and depression for years. We have spent much of the last decade trying to understand why recovery is more difficult in some places than in others.

We concluded that recovery doesn't come about on a predefined timetable; it doesn't happen automatically; and it isn't guaranteed. Some communities, no matter how hard they try, never regain what they had before the event. Other communities, seemingly without much effort and sometimes in spite of themselves, become revitalized in short order. This is our attempt to advance our collective understanding of extreme events, adverse consequences, and community recovery.

An Extreme Event May or May Not Result in a Disaster

An extreme event in and of itself is not a disaster. An extreme event results in a disaster when it has adverse consequences for one or more systems and those consequences are sufficiently significant to threaten the continued viability and functional characteristics of those systems. For our purposes here, the affected systems must be salient to society even though the consequences may not manifest themselves or be recognized until sometime after the event.

Communities as Complex, Adaptive, Self-Organizing Open Systems

The word *community* is used by many and can refer to any of several concepts. According to Morris Freilich, "since a requisite of science is specificity of terminology, we must conclude . . . that at this time 'community' is a non-scientific term unless separately defined in every paper which uses it (cited in Hamman, 1997)." Robin Hamman employed George Hillery's analysis of ninety-four definitions of community, upon which we have based our use of the term (Hamman, 1997). According to Hillery (1955), "The sociological term community should be understood here as meaning (1) a group of people (2) who share social interaction (3) and some common ties between themselves and the other members of the group (4) and who share an area for at least some of the time."

We are generally comfortable with this definition, mostly because it is compatible with our own sense of a community as an open system, comprising individuals and institutions with patterned relationships among themselves and with the external environment. Although we acknowledge the use of the word *community* to refer to groups, such as a "community of disaster scholars," that may exist without the members living or working in physical proximity to one another but nevertheless communicating through a variety of means, our focus is on communities within a generally defined geographic space. Yet, we also acknowledge that not every place that is called a community is actually a community, even by our generous definition.

We see human settlements (cities, villages, small towns, and rural communities) as complex systems comprising members with social, economic, and political patterns and interrelationships in a space occupied, at least in part, by a built environment. The built environment facilitates but does not constitute either the system or the functioning of the system. Systems are often defined as a set of elements interrelated in such a way that the whole is more than the sum of the parts. Each person or organization is an element within the system. A disturbance to any one or more elements will have implications for other elements that make up the system.

Open systems interact with their external environment. In simple terms, they import information and "things" from the outside world, and export information and "things" to it. In a community, at least some people and organizations will have extensive relationships with the outside world. Local firms buy and sell in other communities, resources needed in the community come from other places, and the community provides needed goods and services to other communities.

The interrelationships between and among elements are generally patterned and persistent, producing a basic stability that helps define the community. At the same time, they are continually changing—although usually slowly and at the margins—as community members and institutions come and go and adapt to cues and changes from both within the community and outside it. Communities maintain their stability through continuing and collective adaptations, while, with each adaptation, the nature of the community as a whole changes slightly. Comparing and contrasting snapshots of a community from year to year helps to demonstrate such change, not just in terms of buildings, streets, and parks, but in also in terms of who lives there, what they do, how they do it, and where and when they do it. Because the changes are primarily evolutionary rather than revolutionary, they may not seem obvious to those who are fully immersed in the community, much as parents may not see major changes in their children that are apparent to outsiders.

We have come to believe that communities are largely self-organizing systems—that is, they are systems that adapt to change and increase in complexity through time without being guided or managed by either an internal or external directive force. Individual and organizational behaviors can and usually do change over time. Those changes can take any of several directions and create any of several new trajectories for the community. A community system may survive an extreme event, but it will change to adapt to new realities. It might, for example, become smaller than the pre-event community or have significantly different demographic characteristics. Or the community system that emerges in place of the old one may actually be "bigger and better." Change following disaster is not always for the better. The new community may be inferior to the old one in any number of ways. The economy may not be as strong, a historical district might be destroyed, or the post-disaster population may have fewer marketable skills that the pre-event population.

A disaster is a big jolt to a community system, one that punctuates the equilibrium (dynamic homeostasis) that the community has achieved. A community that suffers such a jolt often finds itself in serious trouble, facing an uncertain future. If the consequences of the extreme event are sufficiently disruptive, individuals, organizations, and institutions may find it difficult, even impossible, to perform critical functions and maintain important relationships in the

aftermath. This has significant, but not easily anticipated, effects on relationships among the various elements in the community, as well as on their relationships with the outside world. New relationships emerge as individual elements of the system change behavior in an attempt to stabilize themselves in the new, post-event environment. These elements, in their struggle to establish or reestablish relationships with other elements within or outside of the damaged system, usually begin by trying to do what they did before the event, assuming that the disaster was "just a bump in the road." Some adapt to the new realties and survive, and some do not. Being able to cope successfully with the consequences of an extreme event is not a given.

If one looks at the community from this perspective, it becomes easier to understand how the system as a whole can suffer consequences from an extreme event even when parts of it do not sustain direct physical damage from the event.

Cascading Community Consequences

After the extreme event generates initial consequences, disasters continue to unfold episodically in fits and spurts when those initial consequences trigger subsequent consequences. The initial consequences include injuries and death to some inhabitants of the stricken area, damage to some features of the natural environment, and damage to the built environment. Other things being equal, we think that the greater the initial damage to the natural and built environments and the more deaths and injuries that occur (in proportion to the pre-disaster population), the more likely it is that cascading consequences will result from the event and recovery will become more difficult.

As we studied diverse community experiences following extreme events, two points were hammered home. The first is the importance of the consequences that ripple out from the initial event on recovery processes and outcomes. The second is that it is difficult for anyone to anticipate the full array of outcomes from the event. Some might say that what happens in the aftermath is a simple matter of cause and effect and, as such, should be predictable, but we are not convinced of that. Such thinking presumes a linear chronology of discrete events in which one cause leads to another with more or less predictable effects. Our observations suggest something different: multiple causes generate multiple effects along varying timelines. Consequently, the set of post-disaster consequences is less of a chain reaction and more of a cascade of sometimes seemingly disparate events, many of which may be interrelated. Consequences interact with one another, unanticipated relationships appear, individuals make choices that may or may not be surprising, and some phenomena appear to simply proceed randomly. We believe that it is virtually impossible to reliably predict before an event all the major consequences of that event. One can anticipate some of the consequences and prepare accordingly, but no matter how well prepared a community may be, some consequences will arise that no one will have anticipated.

Some observers have suggested that extreme events simply accelerate existing trends in a community (Haas et al., 1997). We concluded that statement is a most likely an overgeneralization. For example, perhaps 20,000 older middle-class people who had depended on the defense industry left the Northridge, California, area after the 1994 earthquake. Some were already planning to leave before the earthquake struck; the event may have simply hastened the exodus. In other examples, such as Montezuma, Georgia, and Grand Forks, North Dakota,

the central business district was declining because retail development was occurring at the edge of the city and/or because larger cities nearby were drawing a greater share of business. After extreme events in 1994 and 1997, respectively, left these cities flooded, the decline in downtown businesses apparently accelerated. We agree that extreme events often accelerate preexisting trends, but we are inclined to believe that they can also produce discontinuities and altered trends. While it is generally possible to sketch out the broad picture of what is likely to happen in or to a community following an extreme event, it can be difficult to predict the outcomes of most extreme events reliably.

Even as consequences continue to unfold, attempts at recovery are made at many levels in the community. Individuals and households struggle to regain some approximation of what they perceive as normal; so, too, do businesses, not-for-profit organizations, and governments. Their collective efforts constitute their attempts at community recovery. Eventually, a "new normal" develops for each element in the community. The community system, if it survives, changes and moves on.

Engineers use terms like *cascading failures, progressive collapse,* and *sequential collapse* to describe phenomena associated with the failure of certain kinds of infrastructure, such as buildings, bridges, or complex machines. In some cases, failure of one structural element leads to the failure of other elements. Sometimes the linked, sequential failures end only when the structure fails completely, such as when a bridge collapses into a river. Other times, the sequence of failures is attenuated for some reason, such as when the structure includes "fuses" that limit sequential failure; in those cases, some of the structure remains intact or at least minimally functional after the dust settles. Essentially the same thing happens in communities, except that communities are much more complex systems than are bridges, buildings, or machines. Moreover, while bridges and buildings may be "dynamic" in terms of motion and response within limited ranges, they do not change through time to alter the nature of those dynamics and the relationships among the parts. Communities do. Nonetheless, the notion of cascading or progressive damage is useful in illustrating what happens in communities after an extreme event.

Sequential consequences of an extreme event are affected greatly by phenomena both within and outside the community. Sometimes those consequences seem to radiate out almost seamlessly, like the ripples in a pond when a stone is dropped into it. Other times, it is difficult to distinguish them from the immediate effects of the event itself. Was the collapse of the twin towers of the World Trade Center the immediate result of the impact and explosion when the airplanes flew into them, or was it an outcome of a long chain of events, starting with the towers' design and construction? For most of us, it doesn't matter because the sequence of the most salient events occurred within a short period, and we think of it as a single, continuous event.

Still other times, the consequences are not as readily apparent as ripples in the pond. The fact that thousands of small businesses went out of business in the immediate area of the World Trade Center because their customer bases collapsed along with the towers was also a consequence of the attacks, although not as visible or visually dramatic. Similarly, some workers and volunteers who descended on the site to help in the recovery and cleanup effort were exposed to the dust and smoke left by the explosions, fire, and collapse and now appear to be suffering with chronic illnesses from that exposure (Lite, 2007). We therefore think it useful to

distinguish among different kinds of post-event effects in order to facilitate the development of more effective mitigation and recovery strategies.

We have devised a straightforward classification scheme to clarify the differences in consequences. In the schema shown in Figure 1, an extreme event triggers both immediate and immediately following consequences for the community. Buildings crumble or are flooded. People are injured or killed. Then, those immediate effects result in consequent events. Building contents become water soaked because an earthquake triggered the water sprinklers originally put in place to protect against fire. Or, as in the San Francisco Earthquake of 1906, fire ravages the city because the water pipes have been broken by the temblor and firefighters are thus unable to fight the flames. After that, the initial consequences then lead, almost inexorably, to systemic consequences for the community. With jobs gone and housing unavailable, at least temporarily, people relocate—either temporarily or permanently. Pre-event relationships are damaged or destroyed, so the community, to a greater or lesser extent, cannot function as it did before. Depending on the extent of those disruptions, a critical mass of relationships may remain or be reestablished to help put the system back together in short order so that it can approximate the pre-event community, but that is not guaranteed. Recovery may require establishing a new working set of relationships in the aftermath of the disaster.

Figure 1. Relationships Among the Consequences of Extreme Events.
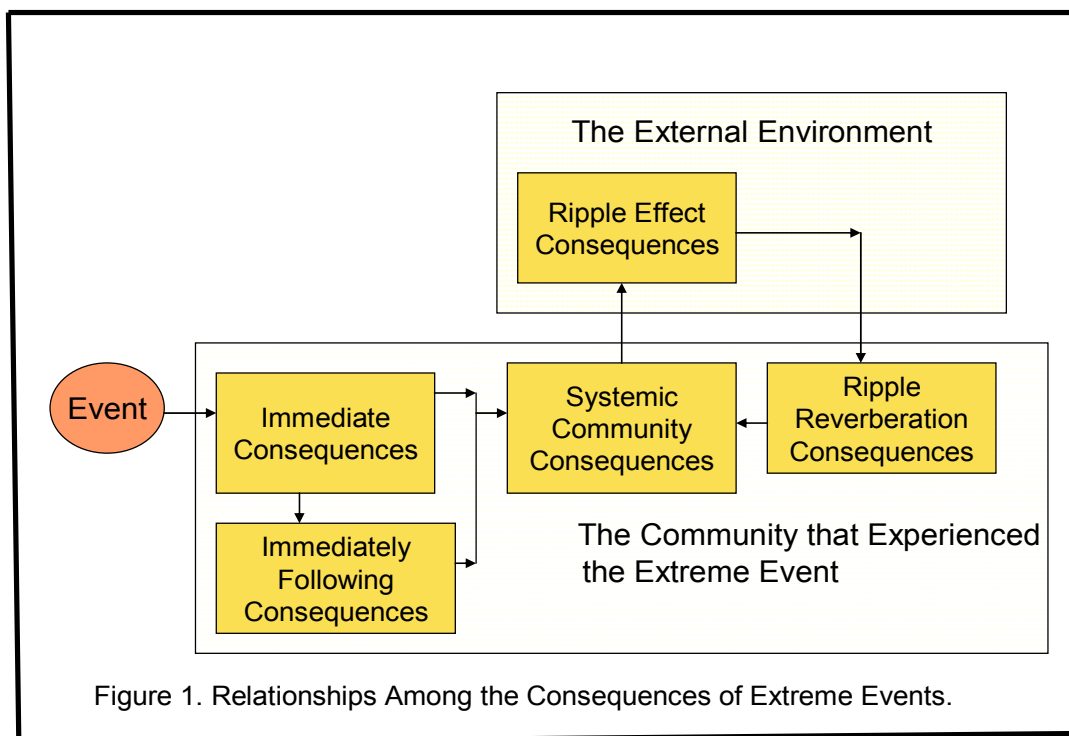
We also identify ripple effects and ripple reverberation effects. Following Katrina, Baton Rouge became Louisiana's biggest city overnight, as thousands of individuals and dozens of businesses rushed to make it their home, at least temporarily. Locals were heard to say that

"Most towns want to grow, but not like this." The rapid expansion resulted in many problems for the community. This is an example of a ripple effect. Another is that, following the earthquake that destroyed Kobe, Japan's main harbor, other harbors on the Pacific shore of Asia were able to capture much of the shipping that had gone to Kobe. A ripple reverberation consequence is that Kobe has not been able to regain its pre-event preeminence as an Asian seaport.

What, Then, is Community Recovery?

We asked many people from varying backgrounds and from all across the country to tell us what they meant by *community recovery*. We listened as federal, state, and local officials; local business owners and managers; local residents; practicing engineers and professors of engineering; social scientists; and emergency management personnel responded. Their answers revealed a genuine lack of consensus, although almost everyone spoke about recovery as though we all share a common understanding of what it means.

Mostly, people talked about recovery as "getting back to normal," as though the consequences of the event were temporary and, like a cut on your thumb, would soon heal and be forgotten. For many, getting back to normal means restoring the built environment and the services and facilities people came to expect. If the community truly suffers serious consequences, getting back to what used to be is simply not possible. We cannot return to a past that is already over and done with.

If community recovery were simply a matter of restoring utilities and repairing or rebuilding damaged structures, it would be a relatively easy matter to have things back in good order within a relatively short period of time, provided that enough money were pumped into the community. If that were the case, then Homestead, Florida, would not have been nearly insolvent a decade after Hurricane Andrew; Montezuma, Georgia, would have a thriving central business district; Princeville, North Carolina, would be a model community; and the Mississippi Coast and communities in Louisiana hard-hit by Katrina would be "recovered" as soon as someone found the wherewithal to rebuild the buildings that were swept away or flooded and consequently demolished. But communities are more than their buildings and utilities. Buildings and utilities are only a means to an end, not an end in themselves.

When communities are viewed as open, self-organizing systems, as comprising not only structures but also people and organizations and the relationships among them, and when the implications of cascading consequences in the community system are understood, it becomes clear that recovery requires much more than simply restoring the built environment.

As indicated previously, we believe that communities are largely self-organizing systems consisting of many interacting elements. They develop their characteristics largely as a function of continuing interactions between and among the system's components (e.g., schools, employers, local government, and churches). While affected by influences external to them, each self-organizing system is unique in that its structure depends on the nature, frequency, and reaction to the interactions of the internal system. Self-organizing systems are inherently democratic: no all-powerful figure (e.g., government) determines all actions, reactions, and consequences. No one part of a self-organizing system controls the whole system, or even any part of it, without being affected or constrained by other parts of the system.

What happens following the extreme event and consequences that follow is that individual elements within the damage system make "choices" about what to do, when to do it, where to do it, and how to do it. They take those actions (or, if you wish, make those choices) based on information, cues from others, and values that are particularly salient to them individually. This is why community recovery is so difficult to effect. What happens after the disaster is essentially the sum of behaviors by individuals and organizations that remain in the community and of those outside the community whose actions have consequences for those remaining in the community. Following a disaster, those collective behaviors can take several directions and create any of several new trajectories for the community. The pre-event community system may survive, but with changes that are responsive adaptations to new realities. The community might, for example, be smaller or have significantly different demographic characteristics. Or the community system that emerges in the place of the old one may actually be "bigger and better." Change is not always for the better, of course. The new community may be inferior to the old one in any number of ways: socially, economically, politically, and and so on.

One of the considerable challenges to post-disaster community recovery is that people generally dislike ambiguity, and they particularly dislike it when it follows on the heels of a disaster. After one loses a loved one, one's home, one's job, and/or one's sense of security, there is already enough ambivalence. People seek some security in that turmoil, and they often see it in attempting to return to what used to be (at least as they recall it), so they want to return there. Of course, they cannot, but it usually takes months for them to understand that. Sometimes it takes years.

The challenge of community recovery is defined by the nature and extent of the problems generated by the collision between the pre-event community and the extreme event itself. We have come to understand that recovery is relative; there is no fixed point at which recovery can be said to have taken place. Community recovery, to us, occurs as a community becomes capable of developing through time as a generally self-sufficient entity, able to cope with internal and external challenges, and within the generally accepted social, economic, and political standards of its regional and national context. Recovery has happened when the community repairs or develops social, political, and economic processes, institutions, and relationships that enable it to operate and cope in the new context within which it finds itself. The recovered community may closely resemble the pre-event community in many ways, but it need not. The extent of recovery should not be measured by how closely the post-event community resembles the pre-event community

In a sentence, we believe that community recovery means becoming a viable, adaptable system with a new normality in the post event context. The establishment of viability in the present and for the future is the critical variable that defines community recovery. It means that the community has a developmental trajectory projected to result in continued self-sufficiency and that its key institutions are coping with and adapting to changing circumstances. We believe, too, that recovery has not occurred unless the emergent community is generally acceptable to a critical mass of the residents and is congruent with generally accepted standards within the region and the nation.

Implications

We have come to believe that community recovery does not occur on some predefined recovery timetable, that community recovery is never assured, and that there is no simple recipe for community recovery.

It has also become clear to us that pre-event mitigation is the surest way to reduce the consequences of most extreme events – at least those that are not at the extreme end of magnitude, proximity, duration, extensiveness, and intensiveness. If one can keep the immediate consequences to a minimum, the likelihood of cascading, systemic consequences is greatly reduced. The pre-event mitigation is conceptually simple: reduce exposure to extreme events and, to the extent it is not possible to reduce exposure, reduce vulnerability.

A third basic conclusion is that we actually know very little about how communities grow and change and how self-organizing community systems adapt to cope with both internally and externally generated threats to their viability. Thus, it goes almost without saying we know relatively little about community recovery processes or about how to facilitate or help ensure community recovery. Developing that understanding is critically important to understanding how best to use our collective resources to protect against disaster and, should it occur anyway, of recovering from it.

References

Freilich, M. (1963). "Toward an Operational Definition of Community," *Rural Sociology* 28, no. 2 (1963): 117–127.

Haas, J. E., R. W. Kates, & M. J. Bowden. (1977). *Reconstruction following Disaster.* Cambridge: MIT Press.

Hamman, R. (1997). "Introduction to Virtual Communities Research and Cybersociology Magazine Issue Two," *Cybersociology Magazine,* November 20, 1997, http://www.cybersociology.com/files/2_1_hamman.html (accessed November 16, 2008).

Hillery, G. A. (1955). "Definitions of Community: Areas of Agreement," *Rural Sociology* 20 (1955): 111–123, as cited in Hamman, "Introduction to Virtual Communities Research."

Lite, J. (2007). "Workers, ex-N.Y.ers from across the Nation Report WTC Ailments," *Daily News,* April 30, 2007, http://www.nydailynews.com/news/2007/04/30/2007-04-30_50state_ills-4.html (accessed November 30, 2008).

Wolk, M. (2005). "Are Disasters Really Good for the Economy?" MSNBC, September 9, 2005, http://www.msnbc.msn.com/id/9271060/ (accessed November 30, 2008).