Chapter 2:
Preemptive risk management strategies

As the human population grows, so do pressures on land use and the risks to which that land is exposed.

Advance recovery and the development of resilient organisations and societies

Herman B. "Dutch" Leonard, Arnold M. Howitt[1] – Societies face a wide array of significant hazards – ranging from the possibility of natural disasters to industrial accidents to large-scale terrorist incidents. These hazards vary in scale and in frequency, and by their nature we are generally uncertain not only about exactly when and where they might occur, but also about how likely they are to arise. The resilience of societies to natural and human catastrophes is the outcome generated by developing an effective overall strategy for social risk management. This will include both efforts at prevention and mitigation (which increases resilience by reducing the damage from which society has to recover), preparation of response capability (which increases resilience by improving the response when disaster strikes, thus reducing the bad effects of the emergency) and recovery (which embodies resilience by helping society to come back to a functioning equilibrium state from which it can continue its development and social progress). In the discussion that follows, we outline a framework within which we can develop and view a societal strategy to increase resilience and we point out an important component of such strategies – which we call "advance recovery". Because advance recovery has generally received little attention, we believe there are significant unexplored, underdeveloped and unexploited opportunities in that domain for building more effective and complete strategies for social resilience.

Developing a comprehensive framework for examining social risks

Disaster relief tends to be focused on the immediate aftermath of the event…

A conspicuous focus of attention in how societies tend to deal with large-scale hazards is the direct response in the immediate aftermath of a breaking event.[2] The salience of emergencies once in progress – the needs of injured people and of people in peril – compels our focus and consideration. Repeated emergency events, and the obvious need for capabilities to respond as they unfold, leads to a parallel focus on organising and preparing response capabilities. Thus, the centrepiece of thinking about emergencies – the usual domain of "emergency management" or "crisis management" – tends to be the preparation and execution of response capabilities and actions that focus on emergency events themselves – on their short-run evolution and more-or-less immediate aftermath.

…however, disasters can have a long-term effect on social welfare…

From the perspective of overall risk management, however, this focus covers only a small portion of what societies can do to take account of – that is, to manage – the hazards that confront them. We take it as axiomatic that society's goal in facing landscape-scale hazards should be to minimise the total expected loss of social welfare from such events (taking into account any resources used to manage them).[3]

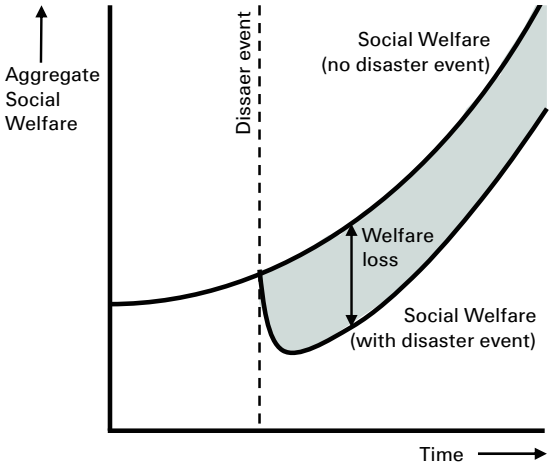
[1] We are indebted to Doug Ahlers, Arrietta Chakos, and David Giles for research support, comments, and suggestions. This research was generously supported by Swiss Re. Any remaining errors, alas, were always and still are our own.

[2] The argument in this section follows the reasoning in Herman B. Leonard and Arnold M. Howitt, Chapter 2 in Howard Kunreuther and Michael Useem (eds), *Learning from Catastrophes: Strategies for Reaction and Response* (Pennsylvania: Wharton School Publishing, 2010).

[3] More precisely, we presume that society's objective is to minimise the net present value of the probabilistically expected social losses associated with hazards, taking into account all resources associated with them. By referring to "present value", we take account of the "discounting" of events that take place farther off in the future; because we can make investments with positive returns between now and the future, the value of resources consumed in the future (or of losses experienced in the future) is less than if the same consumption or loss were to take place today.

The losses are associated with the damage from the event, which reduces overall social welfare, and from the fact that social welfare does not recover immediately after the event.[4] Figure 1 illustrates these losses, showing the (hopefully, generally rising) trajectory across time of overall social welfare before a disaster event and the trajectory of social welfare that would have obtained if the event had not taken place. Because of the event, social welfare falls as people are injured or killed and as valuable social assets are damaged. Eventually, as the destruction ends and recovery begins, the trajectory begins to rise again. In the notional example given in Figure 1, social welfare rises back towards what it would have been in the absence of the event, but does not again achieve the level that it would have had if the event had never taken place. There are, of course, other possibilities – a full recovery from a disaster event may be possible, bringing social welfare back to the level that it would have had without the event. Indeed, it is possible that welfare may eventually exceed what would have been possible in the absence of the event – as, for example, when socially obsolete assets are destroyed by an event, and society is able to replace them with assets better suited to current lifestyles.[5]

Figure 1:
Time path of social welfare with and without a disaster event



Source: Herman B. Leonard and Arnold M. Howittt, Chapter 2 in Howard Kunreuther and Michael Useem (eds) *Learning from Catastrophes: Strategies for Reaction and Response* (Wharton School Publishing, 2010).

...as can be graphically demonstrated.

The total loss associated with the event, viewed in social welfare terms, is the area between the trajectory that welfare would have followed if not for the event and the trajectory that it actually follows once the event takes place. It is this area (plus any costs of avoidance, response or recovery) – the total accumulated losses over time plus costs of risk management – that society should be seeking to minimise.[6]

[4] By "social welfare", we mean the general well-being of the society, taking into account its economic product, the consumption that this allows its citizens, its political liberties, and its social "capital" or connections and relationships.

[5] An example might be the ability to redesign a transportation system that had been heavily damaged, or to develop bike paths and a more environmentally friendly city in the aftermath of a major disaster. It might not have made sense before the disaster to demolish the old assets, but once the event has demolished them we may have a degree of design freedom that will allow a better optimised collection of social capital facilities.

[6] Technically, the criterion society is trying to optimise, viewed probabilistically from a perspective before the event, is the expected present value (discounted for time) of the total social loss (given by the difference over time between the two trajectories in Figure 1) plus any costs spent on avoiding, responding to and recovering from the event.

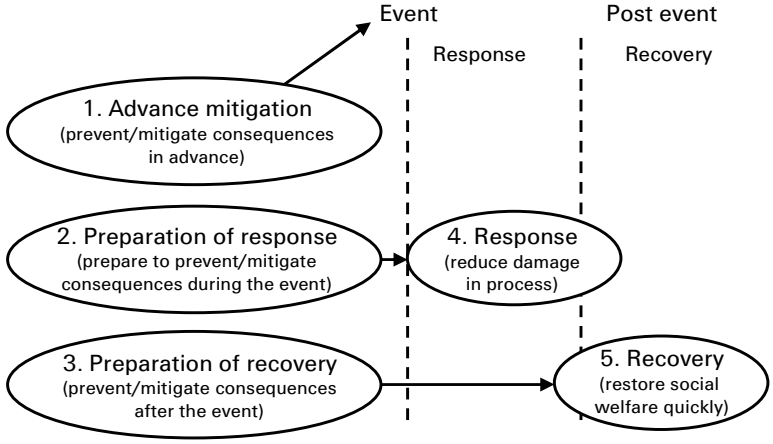
Societies can invest to reduce risk vulnerability…

How can society reduce the (probabilistic) social cost of such risks? Logically, an emergency event taking place at a given time divides history into three segments – the time leading up to the event, the time of the event (while it is actively evolving), and the time following the event. Societies can and do take action associated with managing large-scale risks in all of these time frames. Emergency management focuses on two activities, in two of these time periods: the preparation for response during the pre-event time period, and conducting the response itself during the period of the active emergency. However, societies can also make investments seeking to change the nature of the hazardous events, either by preventing them altogether, by reducing their frequency, or by working to change their consequences if they do take place (for example, by making valuable assets more robust and harder to damage or by moving people and assets out of harm's way).[7] The largest expenditures associated with large-scale hazards, however, are often those spent on recovery; once the response is carried out, there may still be (potentially large) amounts of damage that must be taken care of, and doing so will involve correspondingly large amounts of resources. This, in turn, implies that there is a fifth possible form of expenditure of resources to reduce overall social loss: activities can be undertaken that will prepare in advance for a recovery, making the recovery swifter, more efficient, more reliable and less expensive.

…which can be organised through the use of an overarching risk management framework.

Figure 2 shows these five different opportunities for investments that can contribute to reducing the overall cost of social hazards. We call this framework the "Comprehensive Risk Management Framework" (CRMF) because, collectively, these five areas of investment include all of the possible forms of action that societies can take to manage social risks.[8] The framework thus provides a way of thinking about the level and composition of investments and activities across these different points of intervention – so that we can consider whether the investments we are making constitute the best possible portfolio of actions that society can take in the face of the risks it confronts.

Figure 2:
The Comprehensive Risk Management Framework



Source: Herman B. Leonard and Arnold M. Howittt, Chapter 2 in Howard Kunreuther and Michael Useem (eds) *Learning from Catastrophes: Strategies for Reaction and Response* (Wharton School Publishing, 2010).

[7] For example, the World Bank's Global Facility for Disaster Reduction and Recovery is reassessing its development policies to better address disaster resilience and to realign assets towards pre-event risk reduction.

[8] For a more detailed description of the Comprehensive Risk Management Framework, see Herman B. Leonard and Arnold M. Howitt, *op cit.)*

Risk-reducing investments are often distributed sub optimally…

In general, do societies make the right level – and have the right composition – of investments in avoiding social loss from risk? We believe that the distribution of effort across different opportunities to manage social hazards is conspicuously different from what would be optimal. Societies generally concentrate on some and under-invest in others. In the midst of a major event, there tends to be an often-appropriate instinct to provide "all available" resources to aid the injured and the imperilled – so spending on response tends often to be formidable. In addition, once the event has stopped unfolding, there is usually little choice but to spend the (very large) amounts of resources that may be necessary to at least partially rebuild and recover. Once the event is taking or has taken place, it is no longer probabilistic, off in the future, and avoidable; it is here now and it demands resources and attention. By contrast, spending in the first three categories shown in Figure 1 must take place in advance of the event, when it is only a possibility and is potentially far off in the future (so that we may assume that we will still have time to mitigate or prepare later even if we attend to other priorities first). Given human (and institutional) myopia and proclivities to not always to think rationally or effectively about low probability events or about events that are potentially far off in time, it seems likely that too little effort is made in this area in general.[9] This may be all the more so because people dislike thinking about events that may have horrible consequences, preferring to contemplate and plan for such circumstances tomorrow.[10] This suggests that the overall level of spending on the three areas of pre-event investment may be comparatively too low and the spending on response and recovery comparatively too high. Among the three pre-event areas of spending, however, the most salient is generally the preparation of response – in the aftermath of an event, we never seem to have been able to respond quite fast enough, and thus we tend to emphasise spending on building response capacity – so the areas that are likely to be most underrepresented in our thinking and action in advance are the areas of prevention and mitigation, on the one hand, and preparation for recovery, on the other.

...despite relatively low opportunity costs...

Where, then, are the greatest opportunities for improving the composition of and balance among our expenditures in the five investment areas identified by the CRMF? In our view, prevention and mitigation of large-scale social hazards probably does not get enough attention within the portfolio of investments. Societies frequently regret, in the aftermath of major events, that they did not undertake better prevention and mitigation in advance.[11] The levee failures that drowned New Orleans in the aftermath of Hurricane Katrina are a prime example where relatively small amounts of additional spending in advance could have produced dramatic savings in the face of the storm. Storms of this magnitude occur regularly, and engineering studies clearly indicated that the levees might fail in the face of a Category III hurricane. That is not a rare event in New Orleans, occurring about once per generation. (Indeed, Katrina was actually only a Category II storm by the time it came ashore in Louisiana, so society had purchased even less protection than it thought.)

[9] A Pew Research Center for the People and the Press poll released on October 22, 2009 (reported on National Public Radio the following day) showed that 57% of American surveyed in October 2009 thought there is "solid evidence that the earth is warming," down 14 percentage points from an April 2008 poll and apparently indicating a significant reduction in concerns about the environment. (Poll results accessed at: *http://people-press.org/report/556/global-warming*, November 2, 2009.)

[10] New York Times' writer Nicholas Kristof writes about typical human avoidance to consider imminent hazards in his column "When Our Brains Short-Circuit", *The New York Times,* July 2, 2009.

[11] For evidence of the efficacy of predisaster mitigation efforts, see: Multihazard Mitigation Council, *Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities* (National Institute of Building Sciences, 2005).

Thus, it seems clear that we do not have the optimal portfolio of overall investments, and that we are under investing in prevention and mitigation. Nonetheless, these areas do at least get some attention, and there are significant examples of effective mitigation – the dykes in the Netherlands, for example, and the cyclone shelters in Bangladesh are frequently-noted examples of successful efforts to cope with hazards by shaping their consequences through action in advance.

…and with insufficent regard to advance recovery.

By contrast, we note that the area of advance recovery – thinking carefully in advance about how to accelerate recovery after the fact – is virtually undiscussed and unpopulated by examples of effective strategies for action. As a result, in this discussion, we will focus on the management of recovery – particularly in the form of "advance recovery".

Recovery and advance recovery as parts of the comprehensive risk strategy for social risks

Measures to encourage post-event recovery can be enacted pre-event…

Far and away, the largest expenditures associated with addressing large-scale social risks occur in the aftermath of events that were not successfully prevented or mitigated in advance. As Figure 1 illustrates, social losses occur in two forms: first, in the damage and destruction of the event itself (which, in the case of large events, significantly reduce social welfare as the event unfolds); and, second, through the often quite long-term accumulation of losses in the form of social welfare remaining below the value it would otherwise have had until recovery is successful and complete. The longer recovery takes, the more these losses accumulate. Thus, actions that we can take during recovery or before the event that will accelerate the recovery process, make it more reliable or make it less expensive may have very large net social returns. If we could find actions in advance of the event that were relatively inexpensive but that could help to accelerate recovery in a variety of after-event circumstances, these might be particularly high-value investments. In effect, advance recovery activities amount to prevention or mitigation of recovery spending that might otherwise take place. Rather than shaping the event or the response to the event, the intention of these activities is to shape the recovery that will take place after the event.

…and should be distinguised from immediate disaster relief.

Historically, recovery has been thought of as a set of activities that begin as the response phase of a disaster event comes to an end.[12] To the extent to which there is active consideration of how to make recovery faster or easier or less expensive, it is generally through the approach of reducing the damage (either by preventing the event in the first place or through attempting to protect valuable assets by hardening them to prospective damage). Nearly universally, it is assumed that recovery cannot be planned, nor significantly prepared for, in advance. Recovery is treated as something that simply has to be invented after the fact.[13]

[12] For an exploration of traditional approaches to planning for and managing recovery, see: Brenda D. Phillips and David M. Neal, "Recovery", in William L. Waugh and Kathleen Tierney (eds.), *Emergency Management: Principles and Practice for Local Government, 2nd Edition* (Washington DC: ICMA Press, 2007).

[13] One exception to this almost-universal practice is a set of recently released disaster recovery plans from jurisdictions on the east coast of Florida in the US. State law now requires such plans from every coastal community, though few cities are yet in full compliance with this mandate.

Unique events negate having specific planning measures…

The reasons for this are not difficult to see. Every disaster event – and especially every large-scale event – is indeed unique. Large events are highly complex, and generally highly variable. The specifics of damage and injuries, the details of human needs, the requirements for reassembling a functioning economy and social ecology – all of these are difficult to plan for in any detail across the physical terrain in which a disaster might strike. Even after the event, it is difficult to discern what has happened and determine the kinds, location and sequence of needed recovery activities, as can readily be seen by looking at the aftermath of historical events. Thus, relatively little *specific* planning or preparation for recovery, done in advance of the event, is likely to prove very useful.

…but general planning measures can still be effective.

More general planning and preparation, however, could prove very useful in accelerating recovery – and is therefore both much more valuable and easier to carry out. In spite of this fact, most countries have no systematic method for identifying and investing in advance planning to make recovery from hazardous events more rapid, more reliable and less expensive. To see what kinds of general preparation might be useful, it is instructive to examine the (still ongoing) recovery of New Orleans in the aftermath of Hurricane Katrina, and it is to this that we now turn.

Hurricane Katrina and the (highly variable) recovery in New Orleans

Too much stress is placed on external and centrally planned assistance…

In most large-scale post-disaster situations, there is a widespread presumption that external (and, generally, centrally-driven) assistance will be needed. There is also often a general belief that the process of recovering does not depend very much on the source of the damage. If schools and housing have been destroyed, they need to be rebuilt whether they were destroyed by a flood or by an earthquake. In this sense, recovery often seems to be viewed as a form of general economic, social and neighbourhood development.

Centralised action in recovery often focuses initially on community planning, and this was a major feature of the activities conducted by government in New Orleans after Katrina. Wave after wave of planning efforts were undertaken with relatively few effects. (The fact that there were multiple central planning efforts is itself testimony to the fact that they were generally of little use.)

…whereas community action is often more effective, as shown in certain New Orleans neighbourhoods.

New Orleans provides an instructive example for recovery (and advance recovery), precisely because the pace of recovery in different neighbourhoods has been highly variable. Some heavily damaged communities have recovered much faster than others, in spite of having similar pre-storm socioeconomic circumstances and similar levels of damage in the storm. Our project team has worked extensively with and documented the progress of one community in particular, known as the Broadmoor neighbourhood.[14] After an initial period in which neighbourhood residents waited hopefully for external assistance, neighbourhood leaders emerged and helped the community self-organise.

[14] See Esther Scott, *"Broadmoor Lives": A New Orleans Neighborhood's Battle to Recover from Hurricane Katrina (A, B, and Epilogue),* John F. Kennedy School of Government, Harvard University (2008) for a detailed examination of the Broadmoor recovery experience; a good discussion of post-Katrina recovery can also be found in Craig E. Colten, Robert W. Kates, and Shirley B. Laska, "Three Years after Katrina: Lessons for Community Resilience", *Environment,* 50(5) (2007): 36–47.

Over the ensuing four years, the Broadmoor Improvement Association – importantly, a pre-existing organisation with leaders who had begun work before the storm on neighbourhood issues (crime, housing abandonment, and so on) – first organised a repopulation effort to locate former residents and encourage them to return; then organised efforts to help residents secure access to housing reconstruction and other assistance programmes; then organised the development of a charter school and the rebuilding of the local elementary school; and, finally, led the community in the development of a new library and community centre that is part of a technology corridor that promises to transform the public space in the community.[15] Meanwhile, some other communities in New Orleans – in no worse physical condition before the storm, and with a similar socio-demographic mix before the event, and no more heavily damaged by the storm – have recovered much less extensively and much more slowly.

What seems to have made the difference in communities like Broadmoor that have been able to mobilise relatively rapid recoveries?

Our research suggests that five factors were particularly important:

1. Successful communities were highly self-reliant – they did not wait (or did not wait long) for external "others" to come and help them organise, develop plans and get projects underway. Instead, they developed strategies and processes to identify and deal with the sequence of challenges confronting them – and got started working on them.
2. Local leaders emerged who had some prior experience in working on neighbourhood issues (and, thus, credibility with residents).
3. Successful efforts more often resembled community organising (understood as the internally-driven mobilisation of community residents to engage a sequence of community challenges) than community planning (understood as an outside-expert-led process of "consultation" with neighbourhood residents). When planning was carried out as an external process, it generally failed; when it was organised by the community, it generally succeeded.
4. Local leaders and organisations were highly adaptive – they were able to master, in sequence, a series of very different challenges (starting with repopulation, moving on to dealing with government bureaucracies to get utilities reconnected, developing capacities to help residents access government aid programs, and moving on to organising planning, development and longer term community improvement efforts).
5. Local leaders proved able to identify and establish effective working relationships with outside agencies (in the governmental, non-profit, foundation and corporate sectors), through which they were able to mobilise resources that included training and advice and assistance in planning and organising, in addition to funding.

These observations from New Orleans frame an important lesson about recovery: all disasters are ultimately local (that is, large disasters are actually best viewed as a collection of smaller community disasters) – and, therefore, all recoveries are ultimately local. What implications does this have for recovery in general – and advance recovery in particular?

[15] The Broadmoor community provides an excellent example of a phenomenon of resilience examined by Rebecca Solnit. Solnit explores the transformative qualities of disasters in her works, "The Uses of Disaster" *Harper's Magazine,* September, 2005 and in the recently published, *A Paradise Built in Hell: The Extraordinary Communities That Arise in Disaster* (New York: Viking Publishing, 2009). The "Solnit Effect" as it might be called refers to the naturally-occurring resilience that social groups often demonstrate in the aftermath of disaster.

Advance recovery: some key elements for accelerating recovery

In post-disaster areas, displaced persons must be enticed back…

Large-scale disasters result in the displacement of significant numbers of people, so a first-order challenge in recovery is bringing displaced persons back. More specifically, this means securing the interest of community residents in undertaking the enormous amount of personal and community effort necessary to rebuild and recover. Former residents generally have a high degree of attachment to their homes and communities; but in the aftermath of an event that has visibly destroyed their former lives, many will ponder whether (or, at least, how soon) to return and reinvest. Many will have location alternatives. Indeed, those whom the community might be the most interested in retaining will often be the ones with the best alternatives. Moreover, the likelihood that people will decide to return and reinvest is likely to depend in significant measure on what they think others will do. Will their neighbours clean up and help bring the community back? Or will they find themselves the only committed family on their block, now surrounded by dark and damaged structures?

…a process which requires sufficient momentum to reach a "tipping point".

Thus, there is a "tipping" phenomenon that will begin in the immediate aftermath of a major disruption, and it will continue for some time. If people believe that most others are likely to return, they will be more likely to return; if they believe many will hesitate, they are also likely to hesitate. Obviously, such prophesies are self-fulfilling, and they are largely based in subjective estimates about the future behaviour of others. Since tipping will begin soon after the event stops unfolding, little objective data will be available about the rate of recovery. The community as a whole, therefore, has a very large interest in influencing how residents assessing whether to return interpret the likelihood that they will be joined by many others. Creating the (self-fulfilling) perception that the recovery will be rapid and robust is an important element of mobilising a rapid recovery process. Devices that allow early demonstration of community leadership competence and the availability of resources to enable and enhance recovery can thus potentially have a powerful impact on the rate of recovery. They will influence the degree to which former residents mobilise their own resources and efforts. An important part of rapid recovery, therefore, will be taking actions to encourage former residents to "tip in" to the recovery effort.

What can be done in advance to influence the tipping process positively and, more generally, to mobilise a swift and effective recovery?

Several elements appear important:

1. **High-quality community-based leadership:** If people are going to be encouraged to tip in, they will need to see and believe in their local leadership – and they will need to see early demonstrations of its engagement and competence. Efforts to build community leadership – valuable in its own right for dealing with ongoing challenges – are thus an important asset for advance recovery.
2. **Demonstrated government capabilities and resources:** Government activities will be a key component of any major recovery, so clear indications, early in the recovery period, that government is effective – and has access to the resources that it will need – is a key asset in building confidence in the pace of recovery.

3. **Pre-existing relationships with outside organisations:** During recovery, the ability to connect to and mobilise resources of various kinds – technical expertise, advice, assistance in planning, funding, and so on – from outside agencies is a key determinant of the rate of progress. Such relationships are important, among other reasons, because they allow the community to draw on resources from outside the impact zone that were not damaged or consumed by the disaster. Building these relationships in advance and maintaining them in early recovery is highly important. Early demonstrations of the existence and effectiveness of these relationships can enhance confidence that recovery will be swift and sure.
4. **Ready availability of discretionary funds:** Whatever else recovery from a major disaster may require, it will require prodigious amounts of resources. The demonstration that funds are available, liquid, and under local discretion can significantly enhance confidence that recovery activities will begin rapidly and will reflect local community interests and values. Particularly important are devices that provide funds quickly and without major restrictions or entanglements with agencies not familiar with and responsive to the community that is trying to rebuild.
5. **Availability of credit:** Closely related to the availability of funds is the availability of credit. After a major event, individuals and jurisdictions in the impact zone will suddenly find that they have become conspicuously less creditworthy than they were before the event. If they seek to borrow money after the event, they will find it at best difficult and often impossible. Thus, devices that would provide credit after an event must be arranged before an event. In effect, such devices would amount to the purchase of a credit guarantee – assurance that individuals and institutions would be allowed to borrow even in the aftermath of a major disaster.

These advance recovery elements do not by themselves guarantee a rapid recovery, and there will be many other elements that may prove relevant to recovery from specific kinds of disasters or in a particular community. These elements, however, can be viewed as components of a "platform for accelerated recovery" – a set of conditions and actions put in place in advance that will help communities mobilise swifter, more effective and more reliable recovery efforts.

An example: advance recovery from the next San Francisco earthquake

San Francisco is highly vulnerable to earthquakes…

The San Francisco Bay Area (like parts of Southern California) notoriously faces with high likelihood a major seismic event in the next 20 to 50 years. The continuously shifting tectonic plates along the fault lines that run under the Bay Area create a flow of energy into the fault system; episodically, it must break. Exactly when this will occur is not predictable with current science and technology. What is known is that major events must occur on occasion to relieve accumulating stress in the system; recurrent small events do not release enough energy to allow the system to stay in equilibrium. The Hayward fault, for example, which runs under the city of Oakland, across the Bay Bridge from San Francisco, has (according to current interpretations of the historical geologic record) experienced major events on average every 140 years – and last experienced a major event 142 years ago.

…prompting substantial risk mitigtaion measures from local authorities…

Awareness of these hazards has prompted considerable work in the Bay Area, principally in the form of preparation for response to a seismic event (area 2 in Figure 2) and in the form of mitigation measures (area 1 in Figure 2), such as retrofitting public facilities like hospitals and government offices, establishing building codes for seismic protection, and removing or retrofitting "unreinforced masonry buildings" (which are subject to collapse in the event of earthquakes). Significant preparation has also been made to ensure that utilities (gas, electric and water systems) disrupted by an event can be quickly restored.[16] In general, Bay Area regional investment in pre-disaster risk reduction is considerably above the norm for comparable metropolitan areas. Particularly since the 1989 Loma Prieta earthquake struck the area, local, state and federal initiatives have funded substantial hazard mitigation in infrastructure systems and the built environment.

…including a shift in priorities to take account of advance recovery.

Though the Bay Area has generally been quite active in noting seismic hazards and making at least some preparatory investments to reduce the risks, it has not fully addressed the larger agenda of trying to improve the rate, reliability and effectiveness of recovery. Recognising, in effect, that it had an unbalanced portfolio of investments across the areas of preparation noted in Figure 2 – and, therefore, faced the prospect of greater damage and a longer- and more expensive-than-necessary recovery, the City and County of San Francisco have recently undertaken an ambitious program directed at identifying and activating key opportunities for advance recovery.[17] Organised by the City Administrator's office (which oversees the day to day functions of the government), this effort has engaged government agencies ranging from the Comptroller's Office (in charge of finances and borrowing for the city and county) to the Department of Emergency Management (which handles response planning and which would direct the response to the event). Teams within these agencies are working to identify key issues that might arise in the aftermath of a major event and are thinking through the existing legal, policy and financial constraints to see where changes might be made now in order to significantly improve the rate of recovery after an event.

By way of illustration, the projects currently underway include:

a) **Efforts to develop templates for a post-event budget:** In the aftermath of an event, the municipal budget will necessarily be considerably reshaped, as both priorities and available funding shift. Contemplating in advance what that might look like – and building budget templates that would frame the questions and issues for those trying to develop a recovery strategy – could considerably reduce the time needed to articulate new priorities and develop a meaningful and realistic plan for recovery.

[16] To the extent that restoration of utilities is viewed as part of recovery, these preparations for quick reconnection constitute a form of advance recovery; if restoration is viewed as a part of the response to the disaster, then these preparations qualify as part of preparation for response. Regardless of how we choose to classify them, they are potentially important investments, and they have been successfully identified as opportunities and actually carried out.

[17] Our programme has been closely involved in San Francisco's advance recovery planning efforts through the Harvard Kennedy School's Acting in Time Disaster Recovery Action Research Project, a component of the multidisciplinary *Acting in Time* research initiative developed by Kennedy School Dean David Ellwood. This initiative seeks to address a set of major public issues by exploring both the challenges of and possible paths forward for mobilising action and effecting policy in a timely manner. For more on *Acting in Time* see *http://www.hks.harvard.edu/about/admin/offices/dean/acting-in-time.*

b) **Contemplating a post-event recovery period organisational structure:** Because the demands of recovery will be front and centre once an event takes place, the existing organisational structure – the pre-event, "peacetime" structure, as it were – may not be suited to orchestrating the most rapid possible recovery. Clarifying post-event lines of authority, priority and precedence among municipal agencies could take a considerable amount of time in the post-event period. Thinking through some of these issues in advance – and putting in place a new organisational template (and, possibly, the legislative authorisation to reorganise along the new lines in the aftermath of a major event) could significantly increase the city and county's ability to move to an effective "wartime" recovery footing.

c) **Negotiating emergency recovery period "work rule" variances that could be activated after an event:** In ordinary times, city employees operate under collective bargaining and/or civil service work rules that constrain the extent to which they can be reassigned to other duties. In the aftermath of a major event, when city and county priorities would have to shift markedly to confront the new challenges, the existing rules could prevent the effective employee deployment to the locations and purposes for which they are most needed to enhance recovery. Negotiating in advance the authority to suspend some rules or even creating a whole new set of rules that would apply in a post-event recovery period might significantly improve the ability of government agencies to adjust manpower resources to meet sudden new demands.

d) **Providing emergency purchasing and financial powers:** When the city and county are confronting a wide array of sudden new demands, the existing "peacetime" structure of purchasing and financial transfer rules, regulations about credit relationships, and borrowing procedures may be significant obstacles to moving quickly to mobilise recovery actions. Creating a suite of emergency powers for purchasing and for financial transactions could remove some of these obstacles and enhance the likelihood of a swifter mobilisation for recovery.

e) **Creating "earthquake proof" credit instruments:** The financial capacity of Bay Area governments to carry debt burdens will be significantly altered by a major seismic event. They will face increased demands but significantly reduced revenues from taxes on economic activity and from property taxes assessed on now-damaged buildings. Property values will have fallen as a result of damage, and building owners (especially businesses) may suffer economic losses that make it impossible for them to meet their tax obligations.[18] Government debt-carrying capacity, as assessed by rating agencies and bond buyers, is likely to be considerably reduced as compared with pre-event levels. If Bay Area governments try to borrow after the event to meet sudden new investment demands, they are likely to find that they have poor (or no) credit. Consequently, as a part of an advance recovery strategy, San Francisco is trying to devise innovative credit devices. These instruments would be executed in advance with a view to establish credit facilities that would guarantee the city's capacity to borrow up to pre-designated amounts in the aftermath of an event. Several forms are being examined, ranging from cross-guarantees of credit by other city and county governments (not all of which would be likely to be affected by the same event, even if it were large-scale), to private sector agreements in tax exempt bond markets to establish an "earthquake proof" line of credit on which Bay Area governments could draw in the aftermath of a major event.

[18] The prospect of the Bay Area governments foreclosing on damaged buildings for non-payment of taxes is hardly one that would enhance confidence in the pace of recovery.

Mutual insurance arrangements can probably be executed without current budgetary impact (and probably should be). By contrast, purchasing guarantees of access to a credit facility would require some form of annual payment; since this is a form of insurance, there would be a premium associated with it.

f) **Creating pools of available assets that can be drawn on in case of an event:** Cities generally have reserves that give them the capacity to adapt to small fluctuations in economic activity (and their associated revenue flows) or to variations in the rate at which expenditures are made. However, these reserves are typically limited to a fraction of one year's expenditures. By contrast, extraordinary demands for spending during disaster recovery could involve multiples of the entire annual budget. Of course, some of these expenditures might eventually be reimbursed through national or state aid programmes for the disaster-struck region – but it would nonetheless seem wise, as a matter of advance recovery, to demonstrate financial stability by arranging for significant pools of funds that would become available in an emergency. One form of this that the City and County of San Francisco are contemplating is the development of an endowment fund – financed either through diversion of current revenues or through the issuance of taxable bonds. The funds in the endowment would be invested, so that the endowment would grow over time, and the funds in the endowment would be available for use in a major emergency. A particularly powerful form of such an endowment would be to construct it on a mutual basis, with other cities and counties (some, hopefully, from areas outside the likely impact zone for a Bay Area event) contributing funds and allowing those funds potentially to be drawn against by a member of the mutual endowment that experienced a pre-defined devastating event.[19]

These examples, currently being contemplated, designed, and/or undertaken by the City and County of San Francisco, illustrate the kind of actions that may be taken in an advance recovery programme. Yet, they are not comprehensive, only suggestive. The project in the City and County of San Francisco has been ongoing for about 18 months, and while there is still much opportunity for inventing new strategies, significant progress has already been made in identifying ways in which current plans and rules (or the lack thereof) would significantly impede rapid recovery – and in developing ways to change those arrangements (or form new ones) to make recovery less expensive, more reliable and shorter.[20]

[19] The event(s) could be defined in advance ("a seismic event of magnitude 7.5 or greater with an epicenter within 20 miles; or 8.0 or greater with an epicenter within 60 miles"), or could be defined by a particular form of disaster declaration ("if both the mayor and the governor designate the emergency as a major disaster").

[20] Other work is also contributing to this effort. In "The Resilient City, Part 1 – Before the Disaster", commentators posit the recovery capacities a post-disaster San Francisco ought to have in place before extreme events strike. This progressive thinking is helping to shape local planning (in "The Urbanist", published by the San Francisco SPUR institute in February 2009).

Innovation in insurance markets to improve advance recovery

Traditional insurance post-disaster is limited by contract conditions…

Traditional insurance plays a major positive role in accelerating recovery by covering damage to insured assets and providing resources for repair and reconstruction. Generally speaking, insurance was limited historically in the types of damage it insures against (for example, excluding acts of war, or covering damage from wind and rain but not from flooding), and thus is not available to aid recovery from some kinds of events. For example, in the wake of Hurricane Katrina many households in New Orleans found that the insurance they had relied on did not cover the damage that they had actually incurred. They were left to seek other post-event aid programs or forced to rely on their own resources for rebuilding. This has significantly slowed the pace of recovery for some households and communities.

…however, catastrophe bonds can have clear triggers…

More recently, new forms of insurance-like instruments in the form of catastrophe bonds have begun to shift this landscape. Commonly issued by insurance companies as a means of reinsurance, catastrophe bonds are standard bond issues in which the principal is forgiven if a defined event takes place. The event can be described either (1) as a specific loss (by a particular company), (2) as an aggregate loss (by an industry from an event), or (3) can be parameterised by the scale of an event (wind speed at designated sensors, magnitude of an earthquake with an epicentre within a specified distance of a given location, and so on).

…providing quick liquidity which can be spent in a discretionary manner.

Bonds of this form have most commonly been issued by (re)insurance companies that have underwritten risks in a given location and that seek investors willing to take on those risks on their behalf, but they can just as easily be issued by jurisdictions in contemplation of the need for liquid funds in the aftermath of an event. In the case of a jurisdiction, it may make sense to issue bonds parameterised by the scale of an event – since this will prevent any delay that might arise from the need to assess the level of damage actually incurred. For example, Mexico recently issued catastrophe bonds that will provide resources in the event of severe earthquake or hurricane damage. Catastrophe bonds might provide one possible avenue for funding the endowment fund described above as a device for demonstrating financial stability and providing liquid funds after a disaster event.

Other innovative forms of insurance could also aid in the construction of advance recovery strategies. For example, as described above, jurisdictions may need to seek guarantees that they will be able to borrow after a major event; developing insurance instruments to guarantee credit availability would be a useful innovation that would facilitate the spread of this component of advance recovery.

Conclusion

Developing an effective advance recovery strategy to reduce the expected long-term costs of recovery will depend on the specific circumstances – both on the hazards faced and on the existing plans and institutional structures – of potentially affected jurisdictions, and will require analysis and ingenuity. An advance recovery strategy in a seismic hazard zone like the San Francisco Bay Area will be very different than in a cyclone-prone area like the Gulf Coast of the US, the Philippines, Bangladesh or Taiwan. Moreover, those areas that are subject to similar hazards will still want to develop different strategies, because their existing systems and institutional structures will have prepared them differentially for recovery and will leave them with different unaddressed recovery challenges that can be mitigated by actions in advance of an event. Simply put, however, our central point is that because most jurisdictions have not focused on advance recovery as a separate area of attention and investment, there are potentially great opportunities for inspired thought and action in this domain. Jurisdictions may achieve very high ratios of returned value by increasing the effectiveness, reducing the cost and shortening the duration of recovery from the next major event that will befall them.

Social resilience in the face of disaster is not, itself, an activity – it is an outcome of effective social risk management activities. Developing the right level of resilience will flow from judicious choices about where society can make the best investments in overall social risk reduction. Effective strategies for resilience, therefore, can be guided by effective search within the domains of risk reduction activities outlined by the Comprehensive Risk Management Framework – and, as we have argued here, some of the best opportunities for enhancing resilience at relatively low cost lie in the area of developing effective advance recovery actions and strategies.

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