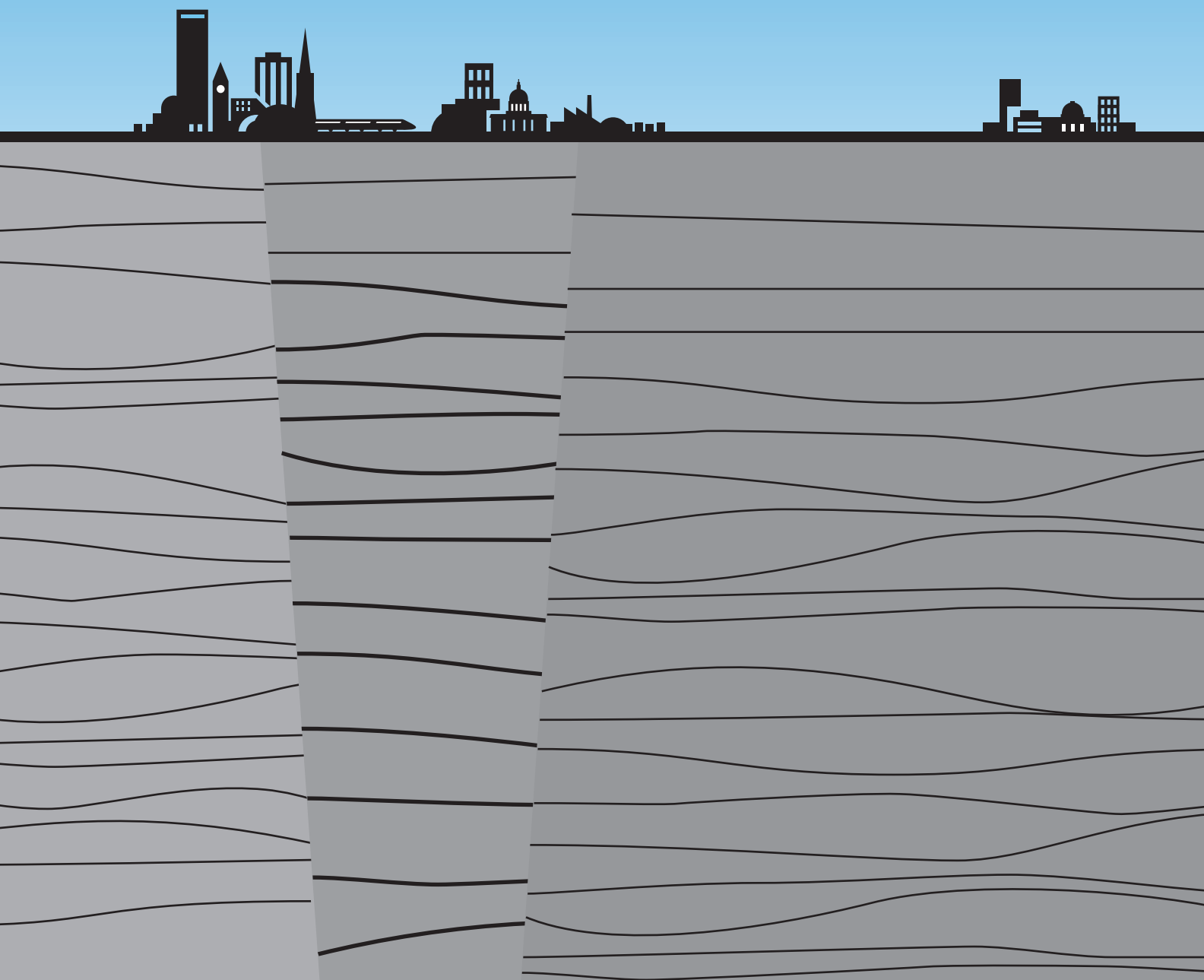
SPUR REPORT 02/2013

On Solid Ground

How Good Land Use Planning Can Prepare the Bay Area for a Strong Disaster Recovery



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Executive Summary

When a major earthquake strikes the Bay Area, the region could face thousands of casualties and hundreds of thousands of displaced households. The lives of Bay Area residents will be enormously disrupted, and it could take months to rebuild and reestablish essential services.

This report deals with one crucial set of long-term disaster recovery activities: those that focus on land use planning and rebuilding. Land use planning decisions determine what gets built where and how. They can include everything from citywide plans that set the vision for growth across a community to zoning decisions that govern allowable uses for a specific property. Land use planning also includes decisions about where not to build: We may decide that certain areas should be left as open space because they are poorly served by existing infrastructure or because they are subject to so many hazards that they are unsafe to inhabit.

Bay Area jurisdictions will face many questions as they seek to rebuild in the months and years following a disaster:

How should local governments balance the need to rebuild quickly with the need to make careful, deliberative decisions that will shape the future of the region?

How should we plan for growth in areas of earthquake-related hazards such as liquefaction and landslides?

How will existing tools and regulations help, or hinder, the rebuilding process?

What state and federal financing will be available after an earthquake, and how should local jurisdictions plan to channel this funding to facilitate their recovery?

What types of information does the public sector need to collect now in order to rebuild after a disaster, and what types of information will businesses and residents be looking for to help make their own rebuilding decisions?

To answer these questions, we have organized this report into five corresponding sections. Each section provides recommendations for work that should be done before the next major earthquake occurs, as well as important steps to take after the disaster to help facilitate recovery. A summary table of all our recommendations may be found on page 68.

If we begin planning now, we will be much more likely to recover quickly following a major earthquake. Local jurisdictions that lay the groundwork for rebuilding — by continuously updating their general plans and zoning codes before a major disaster — will be in a much better place to begin a conversation with residents about a recovery vision.

By understanding local earthquake hazards and addressing them before the next disaster, jurisdictions can reduce the amount of damage their cities will face and the amount of rebuilding that will need to take place in the recovery period. And by making needed regulatory changes now, local jurisdictions will have the tools they need to facilitate recovery.

Introduction

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The United States Geological Survey estimates that there is a 63 percent chance of a large earthquake occurring in the Bay Area sometime in the next 30 years. At the same time, we will be adding more than 2 million new residents to our region in the next 30 years, bringing the Bay Area's total population to more than 9 million. Some of the areas targeted for the highest levels of future development are susceptible to earthquake-related hazards, including liquefaction (when strong shaking causes soils to behave like liquid) and tsunami inundation, as well as other hazards such as sea level rise.

Many of these places currently support regionally important economic hubs and are home to dense communities. The Bay Area's infrastructure and population centers were developed long before these were recognized as high-hazard areas. The region is making strides to protect these investments, but we have more work to do. We need to consider earthquake risks when developing new land use plans. We need to build a culture of preparedness around our planning activities, continuously updating our plans and codes so that when the next earthquake strikes, we will be in a position to rebuild quickly and well. If we fail to do so, we run the risk of undermining the economy of the entire region and losing our residents, perhaps permanently.

When a major earthquake strikes the Bay Area, the region could face thousands of casualties and hundreds of thousands of displaced households. Estimates of the cost to rebuild damaged housing, businesses and infrastructure following a major earthquake on the Hayward Fault exceed $100 billion — and $150 billion for a significant quake on the San Andreas Fault. The lives of Bay Area residents will be enormously disrupted, and it could take months to rebuild and reestablish essential services. Recovery will be slow and will depend on the extent of the building damage, the amount of business lost, the availability of utilities and how quickly communities can repair and rebuild their housing.

While many jurisdictions in the Bay Area have well-defined plans to address disaster response in the immediate days and weeks following an earthquake, most have not developed comprehensive recovery and rebuilding plans for the months and years after a major seismic event. There are many reasons for this. For one, it is difficult to determine before a major earthquake exactly which areas will be damaged. In addition, recovery planning requires cooperation across departments that may not have a history of working together. Moreover, recovery planning is not typically a well-funded activity for local governments.

Following Hurricane Katrina, the United States Congress mandated that federal agencies improve the nation's capacity to plan for and manage post-disaster recovery. In 2011, the Federal Emergency Management Agency (FEMA) released the National Disaster Recovery Framework as a guide to promote a more unified, collaborative and effective recovery, particularly for those incidents that are large-scale or catastrophic. It specifically identifies local governments as the primary players in planning and managing all activities to restore, redevelop and revitalize their communities and build a more resilient nation.[1]

This report deals with one crucial set of disaster recovery activities: those that focus on land use planning and rebuilding. Land use planning refers to the set of decisions that determine what gets built where — and how. This includes the adoption of land use plans that set the vision for growth in a community (such as a city's general plan or a specific plan for a neighborhood), as well as zoning decisions that govern the height, bulk and allowable uses of buildings. It also includes decisions about which seismic codes new buildings will be required to meet following the disaster. Land use planning also includes decisions about where not to build. For example, we may decide that certain areas should be left as open space because they are poorly served by existing infrastructure or because they are subject to so many hazards (including liquefaction, flooding and sea level rise) that they are unsafe to inhabit.

The recommendations of this report are targeted to local governments in the Bay Area. Local governments are responsible for almost all land use decisions within their boundaries. Zoning, general plan amendments and building permitting are done by local government.

1 FEMA (Federal Emergency Management Agency). 2011. "National Disaster Recovery Framework: Strengthening Disaster Recovery for the Nation," www.fema.gov/pdf/recoveryframework/ndrf.pdf

Phases of Disaster Planning

Before the Disaster
In advance of the disaster, we need to focus on hazard-mitigation activities. What do we need to be doing now to make sure that our built environment can recover quickly from a major earthquake? Which existing buildings need to be retrofitted — and to what standard of performance? How do we encourage better performance from new buildings? How do we strengthen our lifelines so that our buildings are served by water, sewer and power after an earthquake?

Disaster Response
In the immediate days and weeks following a catastrophic event, response activities should focus on public health and safety, evacuation, ensuring the safety of responders, restoring vital systems, damage assessment and communication with the public.

After the Disaster
In the months and years following the disaster, we will need to focus on long-term recovery. How will we determine what to rebuild the same as it was before the disaster and what to rebuild differently? How do we restore our major pieces of infrastructure?

After a disaster, local governments will be responsible for developing a vision for their communities' recoveries, determining what will be rebuilt the same as it was before the disaster and what will be rebuilt differently. They will need to develop new planning processes, both to help speed permitting in areas that are being rebuilt according to existing zoning and to create processes that involve the public in deciding how to rebuild areas with severe damage. Local governments will need to find ways to work with regional agencies, utility providers and others to make sure that the infrastructure needed to support recovery is rebuilt quickly and effectively. And they will need to find ways to communicate effectively with residents throughout the recovery process.

Jurisdictions seeking to rebuild in the months and years following a disaster will face difficult questions. How should local governments balance the need to rebuild quickly with the need to create a public process to guide decision-making? What regulatory tools can local governments make use of to aid recovery? How should we think about planning for growth in areas of liquefaction? What state and federal financing will be available to local governments after an earthquake, and how should local governments plan to channel this funding to facilitate their recovery? What types of information does the public sector need to collect now in order to rebuild after a disaster, and what types of information will businesses and residents need to help make their own rebuilding decisions?

There are no easy answers to these questions. However, having a clear understanding of some of the challenges local governments will face in the recovery period can lead these agencies to take certain actions now — before the next major disaster strikes — that will increase the likelihood of success in the post-disaster period.
If we begin planning now, we will be much more likely to recover quickly following a major earthquake. Local jurisdictions that lay the groundwork for rebuilding — by continuously updating their general plans and zoning codes before the disaster — will be in a much better place to begin a conversation with residents about a recovery vision. By understanding local earthquake hazards and addressing them before the disaster, jurisdictions can reduce the amount of damage their cities will face and the amount of rebuilding in the recovery period. And by making needed regulatory changes before the disaster, local governments will have the tools they need to facilitate recovery.

Conversely, if we fail to begin planning before the disaster, we run the risk of undermining our future recovery. Buildings and infrastructure that haven't been planned with earthquake risk in mind could be severely damaged after a major event. Jurisdictions that haven't continuously updated their general plans and zoning codes in the pre-disaster period may be forced to do so in the post-disaster period — when time is short and emotions run high. Without the necessary procedures in place to receive public funding for recovery, local governments could lose out on the resources they will need to rebuild their cities.

The good news is that there are many steps we can take in advance of the next earthquake to ensure a successful recovery. This report provides recommendations for what local jurisdictions can do now — before the next disaster — to help support recovery, as well as recommendations for what should be done after the disaster during the recovery period.

Lessons Learned From Recent Disasters

USGS

See page 16 for complete case study

Loma Prieta Earthquake (1989), Santa Cruz County, CA

Magnitude 6.9 earthquake caused 63 deaths and 3,757 injuries and displaced 3,000–12,000 people. Damage throughout Northern California, with major destruction of downtowns of Santa Cruz and Watsonville.

Pre-Disaster Planning Actions

Inventory of downtown unreinforced masonry buildings and limited occupancy of some upper floors of unreinforced masonry buildings.

Post-Disaster Planning Actions

Existing general plan and downtown plan were replaced by a Downtown Recovery Plan adopted after an 18-month effort orchestrated by Vision Santa Cruz, an organization formed to plan the recovery. The Santa Cruz Redevelopment Agency created new redevelopment areas and expanded redevelopment activities to nearly all commercial districts of the city. Stakeholders and volunteers set up temporary pavilions for downtown retail businesses.

Flickr user standardpixel (CC BY-2.0)

See page 57 for complete case study

Northridge Earthquake (1994), Los Angeles, CA

Magnitude 6.7 earthquake caused 57 deaths, disrupted region's freeways and infrastructure systems, damaged 25,000 businesses, 100,000 housing units and left 22,000 people homeless.

Pre-Disaster Planning Actions

City of Los Angeles staff had completed a pre-event recovery plan that was awaiting City Council approval at the time of earthquake. Existing community plans, specific plans and zoning were up to date. Rebuild L.A., a reconstruction effort launched after the 1992 L.A. Riots, was actively underway.

Post-Disaster Planning Actions

Existing plans and zoning were used as the blueprint for recovery. The Community Redevelopment Agency surveyed damage and conducted community meetings to determine the viability of establishing new redevelopment areas in damaged locations to facilitate recovery. Four areas were ultimately adopted. A pre-existing redevelopment area, Hollywood, was also well-positioned to leverage post-disaster resources for recovery.

Degenkolb Engineers

See page 20 for complete case study

Kobe Earthquake (1995), Kobe, Japan

Magnitude 6.9 earthquake caused 6,400 deaths, damaged all urban lifelines and transportation systems, destroyed 100,000 buildings and displaced 100,000 people. Fire consumed 203 acres of urban land.

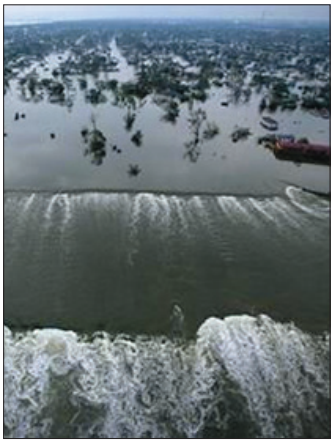
Pre-Disaster Planning Actions

Studies of areas susceptible to fire and flooding risk lead to the development of a plan for replacing wooden structures and promoting new fire standards. The plan did not propose specific actions. Just prior to the earthquake, the city completed a major update to its general plan.

Post-Disaster Planning Actions

Planners built on the work done as part of the general plan update to rapidly develop a recovery plan (i.e., just five months to develop a high-level vision of recovery and identify priority recovery areas). A second phase of planning in each of the priority recovery areas took longer to complete and focused on more detailed land use decisions and involved neighborhood deliberation and consensus building.

In many recent disasters around the world, governments took steps before the disaster to aid recovery. Those jurisdictions that did not do advance planning work had a much harder time rebuilding quickly after a disaster.



Flickr user www.nola.com

See page 44 for complete case study

Hurricane Katrina (2005), New Orleans, LA

A massive hurricane overwhelmed New Orleans levees and flooded the city, affecting 80 percent of its land area and almost 230,000 homes. More than 1,400 deaths occurred in Louisiana; most in New Orleans. Population dropped from 455,000 pre-storm to 200,000 in the months following the storm.

Pre-Disaster Planning Actions

The City Planning Commission had been working on a long-overdue master plan update for several years and had approved some sections of the plan. The city's zoning was inconsistent with the land use component of the master plan, and the master plan lacked authority to enforce compliance. The city was working on a hazard mitigation plan in 2005.

Post-Disaster Planning Actions

The first two post-disaster citywide planning efforts, the Bring New Orleans Back Commission (BNOB) and the New Orleans Neighborhood Rebuilding Plans, were controversial and lacked the necessary political support to be implemented. Some neighborhoods organized their own recovery plans. Finally, in late 2006, various public entities agreed to support the development of a Unified New Orleans Plan (UNOP). UNOP included a significant public outreach component and proposed policies that would incentivize the recovery of repopulating areas and the clustering of residents in areas that were slow to repopulate. Ultimately, it took nearly two years for New Orleans to develop a recovery plan.

Mary Comerio

See page 31 for complete case study

Christchurch Earthquakes (2010 and 2011), Christchurch, New Zealand

Two earthquakes (magnitude 7.1 in 2010 and magnitude 6.3 in 2011) led to 180 deaths, the decimation of the central business district, damage to 65,000 residential properties and damage to roads, water, waste water and storm-water systems.

Pre-Disaster Planning Actions

New Zealand's national Earthquake Commission (EQC) offers natural disaster insurance coverage for residential properties; these policies also include funds to repair earthquake-caused land damage.

Post-Disaster Planning Actions

As part of claims process, EQC conducted land damage assessments. These allowed the national government to understand where risks of future damage could occur. Properties were classed in four zones. Green zones were deemed suitable for rebuilding, red zones were not; others required further investigation. Repair and reconstruction standards were tied to the level of risk in different areas. In red zones, the national government is conducting buyouts.

Source: Charles Eadie and Laurie Johnson

Land Use Planning Challenges That Affect Recovery

After a major earthquake, local governments will face many challenges. Some will be informed by the economic and social trends that were happening before the disaster occurred. Others will be lessened — or exacerbated — by the regulatory and political environment in which recovery takes place.

Negative trends already occurring before the disaster will only be exacerbated after the disaster.
If the disaster occurs in a region (or part of a region) that was already experiencing an economic downturn, the downturn will worsen as a result of the disaster. Similarly, if a region or part of a region is experiencing population stagnation or loss, that trend will also grow.

Planning challenges that impacted city building before the disaster will hamper recovery after the disaster.
The lack of consensus around a planning agenda, the length of time it takes to conduct a neighborhood plan and complete environmental review of that plan, and the difficulty of getting such plans adopted present challenges under normal circumstances. In the complex and emotionally charged time period after a disaster, these issues will only prove more daunting.

The codes and plans that exist at the time of the disaster are likely to be the ones that govern how the vast majority of rebuilding occurs.
Unfortunately, some local codes and plans may have been developed decades earlier and could be outdated. In some cases, local general plans and zoning do not conform to one another. Given that funding for long-range planning in local jurisdictions has dwindled, this problem is likely to get worse as time passes.

After a disaster there will be enormous pressure to rebuild quickly, and the tension between rebuilding quickly and rebuilding deliberately will be heightened.
In large part, the key activities of urban development also happen in disaster recovery — but now they need to happen much faster. Development and construction that typically take years must occur in a matter of weeks or months. In the processes associated with normal city building, there is always a tension between moving quickly and taking time to make careful, well-thought-out decisions. In the post-disaster period, this tension increases as timelines compress and speed becomes an essential measure of recovery. However, local governments must rebuild well (not just quickly), must ensure that building repairs are done correctly and must consider opportunities to improve earthquake safety — or make the community better in other ways.

Damage happens at many different scales, so rebuilding must also take place at different scales.
Disasters come in all sizes and may affect various parts of the region differently. Disasters can create heavy damage at the site level, the neighborhood level, the citywide level or the regional level. Cities need to determine which areas to rebuild according to the codes and plans that were in place in advance of the disaster, as well as which areas to re-plan. (See Figure 1 on page 14.)

The first plan is often the most powerful plan, but it may not be the best plan.
After a disaster, local governments will face enormous pressure to rebuild what previously existed. This can be thought of as the "first plan" because it is the plan that many people will have in their minds as their desired recovery vision. Yet the first plan may not be the best plan for any number of reasons. It may not take liquefaction and other hazards into account; it may not be feasible financially or physically; it may not make the most of opportunities for improving infrastructure. Many residents may have a hard time contemplating any changes to their neighborhoods or cities in the heightened emotional environment after a disaster.

Currently there are many federal and state programs dedicated to recovery, but they may not always provide the resources that communities want and need.
Are programs structured to allow funding to flow quickly to the specific needs of the region? Do they require local matching funds? Do they create unnecessary bureaucracy? Conversely, do they allow time for careful, strategic deliberation regarding the best way to target public investment?

Good information may not be readily available.
After a disaster, local authorities need information to make good decisions, but the most important data may not be readily available. It will be critical for jurisdictions to quickly complete comprehensive post-disaster damage-and-loss assessments for public facilities and infrastructure, private housing and commercial buildings, and economic and social needs. Yet jurisdictions will likely face large hurdles in quickly gathering the information needed to make decisions.

Section 1

Developing a Recovery Vision:
"Gearing Up and Sorting Out" Versus "Ready, Fire, Aim"

After first responders (police, firefighters and the like) cope with the immediate challenges of disaster response, questions related to long-term recovery will quickly arise. How will damaged areas be rebuilt? When will utility services be back on line? Which areas are safe to return to and which are not? What financing is available to assist in rebuilding?

Local governments will need to find ways to answer these questions and many others in the months following a disaster. Without a clear process in place for deliberative decision-making, the tendency will be to act now and think later. Some have described this phenomenon as "ready, fire, aim." While this approach can satisfy the desire to act quickly to facilitate recovery, it can lead to missteps and missed opportunities. It can also cause upset and confusion later if earlier decisions need to be rethought in order to support a better outcome.

Instead of "ready, fire, aim," SPUR recommends a process of "gearing up and sorting out." This involves working through the series of steps and questions outlined below. The answers to the questions will differ from jurisdiction to jurisdiction based on the nature of the damage, the type of recovery that is needed and the jurisdiction's capacity to undertake recovery activities.

STEP 1

Assess the damage.

Questions to consider: What happened and how bad is it? What additional information do we need to understand the situation?

Confusion, uncertainty and incomplete or inaccurate information are endemic to an emergency. It's easy to get lost in the details, and it's difficult to step back and reflect on the bigger picture. Recovery starts with damage assessment and then follows with an analysis of how that damage defines what must be done to emerge whole again.

STEP 2

Define the recovery end state.

Questions to consider: What does recovery look like? What is the desired end state?

Each community's recovery has to be self-defined, for the community as a whole and for its individual neighborhoods. Any community affected by an earthquake will likely grapple with many simultaneous recoveries: of neighborhoods and business districts, port facilities, infrastructure and more. This will call for coordinated thinking at both the neighborhood and citywide level. Ideally, each community will develop and articulate a vision that captures what it is seeking to become and how the pieces will fit together.

But that vision should be grounded in reality, not just wishful thinking. The viability of a plan depends on making sure its ideas are in sync with larger forces, such as market forces and demographic trends, and that it's technically feasible. Outside expertise can be invaluable in helping to define the recovery vision.

STEP 3

Assess the level of difficulty of different recovery activities.

Questions to consider: Given the damage and the recovery goals, what parts of the recovery can occur with a limited degree of difficulty? What looks difficult or infeasible for any reason? What additional information do we need to understand feasibility?

Making priorities is difficult, but in the recovery period it is simply impossible to put the appropriate time, money and energy into everything that's needed. Triage is a useful concept. The community will need to focus on identifying and then doing those things that are both critical and feasible.

STEP 4

Explore new opportunities to make things better.

Question to consider: Are there new opportunities to be explored in light of steps 1, 2 and 3?

After a disaster, many community members may have an initial impulse to put things back the way they were, but recovery efforts must shift from looking back at the past to imagining a different but achievable future. This is an opportunity to consider changes that could be transformative and to determine whether they are viable.

STEP 5

Sort out the interventions and/or planning necessary to address each element of recovery.

Question to consider: Which recovery efforts need extensive attention or intervention and which can be accomplished with minimal attention?

Each intervention will need to have a well-conceived and appropriate planning approach.

STEP 6

Decide who decides.

Questions to consider: Who should design the planning process? Who are the key leaders/stakeholders for each element of recovery planning?

In this step, outcomes begin to meet strategies and processes. A community must determine the appropriate path and process for each of the many recovery tasks; this will require defining the leaders and stakeholders and specifying the community involvement. This is also an area that may require outside expertise and experience.

STEP 7

Determine administrative and policy-making roles.

Questions to consider: Who can and will do what, and what are the appropriate matches of functional capacities and recovery components? How capable is each player to carry out planning activities? How does that affect decisions about the planning process?

The local government usually takes the lead in implementing the recovery vision, which will likely require organizational adaptations and additional resources. Political and administrative leaders may need to redefine their level of oversight and control; organizations in turn may require reinvention or reorganization.

STEP 8

Define the processes.

Questions to consider: How does each process start, and who leads? What are the roles of the public and private sectors? What roles do nonprofits play? What is an appropriate and/or necessary time frame for various planning interventions?

Recovery planning entails defining detailed timelines and benchmarks that will move a general recovery vision toward the specific decisions, policies and implementing mechanisms. The process must be fully understood by all parties involved in implementing it. False starts and backtracking, which can result from overly bureaucratic processes or poor political leadership, can severely undermine recovery efforts and should be avoided.

STEP 9

Figure out what additional information is needed.

Questions to consider: What additional information is needed for each element of recovery planning? How will that information be obtained? What information is absolutely critical in light of time and capacity limitations?

The need for information (e.g., information about what has been damaged, how much it will cost to rebuild, when utility service will be restored, etc.) is a constant throughout the recovery process. Because there will never be enough information at any given moment, each step will involve discomfort and uncertainty. Mistakes are inevitable but can be minimized if we make sure that even where information is incomplete or unavailable, we know enough to have a reasonable basis for any particular course of action.

STEP 10

Determine who is responsible for carrying out the answers to questions in steps 1–9.

Question to consider: Who is leading, and who is involved in the overall effort of gearing up and sorting out?

Rebuilding to Current Plans Versus Re-Planning

In the process of gearing up and sorting out, local governments will need to decide what to rebuild and repair according to current plans and codes versus what to re-plan after a disaster.

Rebuilding and repairing according to current plans means building structures to conform with the zoning, general plans, specific area plans and other adopted area plans that were in place before the disaster. It also means repairing structures to conform with the requirements of the California Building Code and any existing local interpretations of the code. For areas that are being rebuilt according to existing plans and codes, local jurisdictions need to develop permitting processes to enable private individuals to rapidly rebuild their properties.

Re-planning occurs when a jurisdiction adopts new zoning regulations and new general plan updates and specific area plans after a disaster. Re-planning can also include building code upgrades that require greater strengthening or other measures to increase seismic performance. For areas that need to be re-planned, local jurisdictions need to develop planning processes that are inclusive, clear and transparent. Efforts must be made to ensure that those who have been displaced by the disaster are able to participate in the re-planning process.

Of course there are gray areas between these two categories of action. Interpreting the requirements of the current building code to assure that post-earthquake repair and retrofit standards can be met could fit in either category. And actions from both categories will occur in different parts of a local jurisdiction at various times during the recovery period. In addition, local governments will likely take steps to allow for interim or temporary rebuilding activities to help facilitate recovery. These interim steps could potentially precede a re-planning process.

The decision to rebuild and repair to current plans and codes or to rebuild according to new plans and codes will be informed by a variety of factors, including:

The scale and severity of the damage
If an area is severely damaged and/or if the damage covers a wide area, a jurisdiction may engage in a re-planning process. If an area is not very damaged, or if the damage is limited to just a few sites, a re-planning process may not be necessary.

Whether or not the damage is located in an area that is likely to experience more damage in the future, such as a liquefaction zone or a flood plain
If a heavily damaged area is located in a liquefaction zone or another

hazardous area, local jurisdictions may develop mitigation measures to alleviate the hazardous conditions and/or create new standards for development. Local jurisdictions may want to consider rezoning areas that pose serious risks for major damage in the future. This issue is explored in more detail in Section 2 of this report. (See "Earthquake Hazards in the Bay Area" on page 23.)

The degree to which the existing plans and codes are both current and consistent with one another
Many jurisdictions engage in planning activities on an ongoing basis, developing new area plans and updating zoning. The creation of a new area plan is often the result of a community planning effort involving a variety of stakeholders. If a disaster strikes an area that has recently undergone a major planning effort, it is helpful to have a vision for recovery that residents have recently agreed upon, such as a newly adopted area plan. Some jurisdictions, on the other hand, have outdated general plans and zoning for portions of their cities. Sometimes zoning may not be consistent with the general plan. Local planning departments should keep their general plans and zoning current so that decisions to change plans and zoning in the post-disaster period can be kept to a minimum.

Whether or not the damage impacts publicly owned land or infrastructure
It is politically difficult for jurisdictions to tell private property owners that they cannot rebuild their homes and businesses as they were before the disaster. It may be somewhat easier to make changes to publicly owned land and infrastructure. For example, San Francisco replaced the Embarcadero Freeway with a surface boulevard after the Loma Prieta Earthquake. This radical change in public infrastructure opened up the city to the bay and allowed for the development of a new neighborhood (South Beach) and the AT&T Ballpark.

The economic condition and potential of the affected area
If an area heavily impacted by a disaster is unlikely to receive the private investment necessary to recover, a re-planning process — coupled with tools to help stoke investment interest — may be necessary to jumpstart recovery. Local jurisdictions may also engage in re-planning to capitalize on economic development opportunities in the wake of a disaster.

The complexity of ownership and land tenure
Land and property ownership structures can complicate recovery. An individual owner of a single-family home who has access to the resources necessary for repair may be more likely to rebuild after a disaster than the owner of a condominium in a multiunit building who has to engage in decision-making with many people through a condo association. Additionally, residents who live in rental apartments will not be able to make decisions about whether or not their units are rebuilt — the building owners will make those decisions. Owners' decisions regarding rental properties will have a substantial impact on recovery, especially in cities with high renter populations, such as San Francisco.

The jurisdiction's capacity to engage in a re-planning process
After a disaster, some jurisdictions, especially small ones with very few planning staffers, may lack the capacity to engage in a re-planning process, in which case they would require outside resources.

Government action is not the only driver of recovery efforts. Private individuals, financial institutions and investors will also be making decisions about recovery in response to a separate but related series of factors. If private individuals do not "tip in," i.e., seek to stay in their community and participate in rebuilding, recovery may not occur.

SPUR's Recommendations for Developing a Recovery Vision

BEFORE THE DISASTER

1. Update codes and plans now to build a culture of preparedness and help facilitate post-disaster recovery.

Local jurisdictions take on planning activities for a variety of reasons: in response to the development of new infrastructure such as BART or high-speed rail, to increase housing and jobs near transit and to manage growth that results from a booming economy or intensified demand for housing. Local jurisdictions in the Bay Area should also be continuously striving to complete planning activities, because these plans will serve as a road map for recovery. It is much more difficult to update plans and codes in the post-disaster period. The more these plans and codes can be kept current, the more likely it is that the rules for what can be rebuilt after a disaster will be clarified quickly.

In addition, local jurisdictions should incorporate recovery planning into the community-safety element of their local general plans. This will provide an opportunity for planning departments to begin thinking now about what steps they will need to take in the post-disaster period.

Responsible Parties: Planning and building departments

2. Answer the question of "who decides who decides" in the post-disaster period.

A clear governance structure is critical to a successful recovery. While most jurisdictions have a very clear line of command during the response period (the days and weeks immediately following a disaster), the governing structure during the recovery period can be much less clear. If this structure is unclear, it will be impossible for a local jurisdiction to develop a unified vision for recovery and communicate it to private citizens, the business community and other levels of government.

One option is to create a recovery task force with powers to develop and implement the recovery plan. Such a task force should have high-level representation from the agencies responsible for carrying out recovery activities; the planning director and the director of the building department must participate.

The National Incident Management System (NIMS) has established a comprehensive, nationwide, systematic approach to managing incidents such as natural disasters and terrorist attacks, enabling public and private organizations to coordinate their efforts. Most state and local emergency management organizations operate in accordance with NIMS. The emphasis of this system is on emergency response and short-term recovery operations.[2] However, some communities have also structured their recovery plans to complement and work in tandem with the NIMS-based organizational structure, extending that structure beyond the emergency response period to cover short-term recovery actions and help local governments transition into recovery. If a local recovery-management organization also follows a NIMS-based organizational structure, then staff from agencies and departments with key recovery responsibilities, such as city planning and building, could replace emergency responders as the transition from response to recovery occurs, and hourly and daily planning sessions could evolve into weekly or biweekly sessions as recovery progresses.

Responsible Parties: Mayors, city councils and city managers in consultation with planning, building and emergency management departments

3. Draft a recovery and reconstruction ordinance that can be modified and adopted in the post-disaster period.

A recovery and reconstruction ordinance is critical for laying out the rules that guide recovery. Such an ordinance should cover topics such as the governance structure that will guide recovery, how the recovery plan will be coordinated with regional plans and federal agencies, what temporary regulations will be in place during the emergency period, how moratoriums on development might be enacted and how non-conforming uses will be handled, among other topics.

Developing an ordinance before the disaster that can be modified to address a jurisdiction's specific recovery needs during the post-disaster period will be very helpful. The American Planning Association has drafted a sample ordinance that local jurisdictions can use as a template.[3]

Responsible Parties: Planning departments in coordination with city managers and departments of emergency management

4. Develop a state-level recovery plan.

Many actions need to happen at the state level to help facilitate local recovery; for examples, see Section 3 of this report on page 34. Additionally, the new National Disaster Recovery Framework (NDRF) calls for each state to create the position of state recovery coordinator. The California Emergency Management Agency should develop a state-level recovery plan that identifies the role that any future state recovery coordinator will play in the post-disaster period and lays out steps to be taken after the disaster to facilitate recovery, including any enabling legislation that will need to be enacted.

Responsible Parties: California Emergency Management Agency

AFTER THE DISASTER

5. Put in place a clear structure of governance to oversee recovery. Those in charge will be responsible for "gearing up and sorting out."

This step can include activating a recovery task force soon after a disaster occurs. The NDRF recommends appointing a local disaster recovery manager. This person would lead in the creation of a local recovery organization and initiatives, including any post-disaster recovery planning efforts. The recovery manager would also work with state and federal recovery partners to conduct damage and impact assessments, prioritize recovery needs, identify recovery funding sources, measure recovery progress and ensure effective and consistent communication with stakeholders and the public. It is important that the recovery task force and recovery managers help ensure that decisions made during the response period help, rather than harm, recovery.

Responsible Parties: Mayors, city councils and city managers in consultation with planning, building and emergency management departments

6. Determine which areas will be rebuilt according to existing plans and codes and which will be re-planned.

Deciding which areas will be rebuilt according to existing plans and codes and which will be re-planned will be one of the most difficult tasks local governments face. There will be enormous pressure to rebuild what existed before the disaster and to do so quickly.

2 DHS (U.S. Department of Homeland Security). 2008. "National Incident Management System," www.fema.gov/pdf/emergency/nims/NIMS_core.pdf

3 Schwab, Jim et al. 1998. "Planning for Post-Disaster Recovery and Reconstruction," American Planning Association and Federal Emergency Management Agency. Report Number 483/484, page 1,947.

Figure 1: Rebuild or Re-Plan?

Rebuilding takes place on many scales: at the individual site and at the neighborhood, city and regional levels. If damage is modest, individual buildings are likely to be rebuilt to existing plans and codes. If damage is more severe and covers most of a city or region, re-planning may be necessary.

	Low-Impact Event Low to moderate damage, loss of life, and population and economic dislocation; primarily requires repair or restoration of homes and facilities	→ High-Impact Event Extensive destruction, loss of life, population and economic dislocation; requires re-planning and major reconstruction
 **Site**	If only a few buildings within a neighborhood are damaged, they will likely be rebuilt according to existing plans and codes.	If damage extends across many buildings or is located in an area characterized by substantial hazards, it may be necessary to replan some parts of a neighborhood.
 **Neighborhood**	If small pockets of a neighborhood are damaged and infrastructure is minimally disrupted, it is likely to be rebuilt to exisiting plans and codes.	If many buildings are damaged and lifelines like power and water are disrupted, or if damage is located in an area characterized by substantial hazards, the neighborhood may need to be replanned.
 **City**	Those areas that have not experienced much damage are likely to be rebuilt according to existing plans and codes. Areas with more concentrated damage may need to be replanned.	If many neighborhoods have been severely damaged, lifelines have been disrupted and/or substantial hazards have been identified, a city may choose to engage in a large-scale replanning process.
 **Region**	If damage has occurred to infrastructure crossing jurisdictional boundaries, improvements to such infrastructure may be needed.	If damage has occurred to multiple pieces of infrastructure crossing jurisdictional boundaries, many areas across the region have experienced major damage and/or substantial hazards have been identified, a large-scale re-planning effort may be necessary.

Range of appropriate response

Rebuild — Re-plan

Source: Adapted from a table developed by Ken Topping.

Nevertheless, local governments need to take the time to determine which areas, if any, require re-planning efforts.

Responsible Parties: Recovery task force or other group overseeing recovery

7. For areas that will be rebuilt according to existing plans and codes, take steps to create a clear and rapid process for private individuals to obtain the necessary permits to rebuild.

It is critical to develop processes that are fair, clear and transparent, in which decisions can be made and permits issued rapidly. Local jurisdictions must determine how to handle the enormous number of permitting requests that will occur in a compressed period of time. Local governments must also decide how they will handle thorny issues, such as the rebuilding of structures that could not meet current building and planning codes.

Responsible Parties: Planning and building departments

8. For areas that will be re-planned, ensure that a community planning process is put in place to allow for meaningful and genuine participation from a variety of stakeholders.

After a disaster, there may be areas that are severely damaged. The people who lived and worked in those areas before the disaster may move to other parts of the city or region — or even to another state — in the weeks and months following the disaster. Those who remain will likely be very upset or even traumatized by the effects of the disaster itself. They will also be very concerned about what their neighborhood will look like and who will be living there once the rebuilding process is complete. Even in normal times, neighborhood planning efforts and the possibility of change can be enormously unsettling for some. Those feelings can be magnified after a disaster.

It is critical that any re-planning process involve neighborhood representatives, community groups and key stakeholders such as property owners and financial institutions. Planning will require a strong effort to contact those who have been displaced by the disaster so that they can also participate in the process. While local government officials may feel a strong desire to develop a new plan quickly, that urge needs to be balanced against the importance of community involvement.

If local governments decide to engage in re-planning within their jurisdictions, it will be critical to ensure that any community planning process is supported by good information. Participants need to be informed about what real opportunities and challenges exist, including financial challenges. They need to understand the risks of rebuilding, including the danger of another disaster. Without information, a thoughtful and successful plan for recovery cannot be developed.

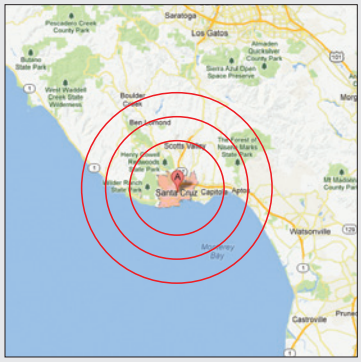
Responsible Parties: Planning departments

9. Plan for interim uses that help support recovery.

It is critical to develop processes that are fair, clear and transparent, in which decisions can be made and permits issued rapidly. Local jurisdictions must determine how to handle the enormous number of permitting requests that will occur in a compressed period of time. Local governments must also decide how they will handle thorny issues, such as the rebuilding of structures that could not meet current building and planning codes.

Responsible Parties: Planning departments in coordination with the recovery task force or other group overseeing recovery

Case Study: Santa Cruz, CA
Out of Contentious Politics, a Successful Community Process



map ©2013 Google

The epicenter of the 1989 Loma Prieta Earthquake was in the Santa Cruz Mountains, about 9 miles southeast of the City of Santa Cruz. While the initial publicity about the earthquake focused around the Marina District in San Francisco and the Cypress Freeway and Bay Bridge failures in Oakland, it soon became apparent that Santa Cruz and Watsonville were the areas that experienced the greatest destruction.

Damage in Santa Cruz was widespread throughout they city's urbanized areas and in the mountains. Transportation was severely disrupted, with blockages on Highways 1 and 17. Liquefaction occurred in the beach area of downtown Santa Cruz. Residential structures suffered from major failures of foundations and internal damage, and the area saw an epidemic of downed chimneys. Many buildings on the University of California, Santa Cruz campus were impacted, some heavily.

While the damage was extensive, remarkably the human casualties were limited to a small number of deaths and injuries. Nonetheless, the community and region were immediately traumatized as people shared the unsettling reality that solid ground could behave like a rolling sea. Individuals and families grappled with the recovery of homes and neighborhoods, but the primary focus of public attention and recovery planning in Santa Cruz was the historic downtown business district.

The retail center, civic life and culture of Santa Cruz were anchored by the Pacific Garden Mall and the adjacent nine-square-block area. Pacific Avenue had been enhanced in the late 1960s as a meandering street with widened sidewalks featuring raised brick planters, street trees and flowers, and benches defining cozy sitting areas. The retail environment was a mix of traditional downtown merchants: a department store, a Woolworth's, and men's and women's clothing stores, as well as eclectic specialty retail, artisan galleries, music venues and eateries.
Pacific Avenue and some adjacent streets were designated as a historic district, and there were dozens of beloved old structures. Most of the older structures were constructed of unreinforced masonry, rebuilt for safety after a major fire in the late 1800s that claimed most of the wooden structures — which, ironically, would have fared well in the earthquake.

The damage on Pacific Avenue seemed almost random. Parapets collapsed; one toppled into an adjacent coffee house, killing three people. Some buildings looked as if a giant's hand had punched a hole straight through them. Of the 1 million square feet of downtown space, one-third was damaged beyond repair, one-third was damaged but repairable and one-third had no damage or only minor damage.

Initially, the area was declared completely off-limits as damage was assessed and stabilized. But as the days went by, merchants, residents and property owners exerted increasing and intense pressure to get access to the area to begin their own salvaging and recovery. The conflict between those advocating for complete safety and others who were willing to take on some risk resulted in difficult times for officials and downtown stakeholders.

Ultimately, a massive short-term effort involving a new ad hoc city organization and hundreds of volunteers accomplished several goals:
- Evaluating damage and demolishing dangerous buildings to create safe conditions
- Allowing local merchants, property owners and residents to take acceptable risk in order to salvage records, merchandise, personal belongings, medicine, etc.
- Establishing a makeshift retail district in time to salvage the Christmas shopping season by reopening some buildings and setting up temporary pavilions on parking lots to house displaced merchants

By 10 p.m. on the night before Thanksgiving — just five weeks after the quake struck — the last of the paving, cleanup and setup was completed, and a patchwork downtown triumphantly opened to widespread community support. The effort united the community in ways not seen in decades. The love for downtown Santa Cruz transcended a long-festering animus among various factions that had defined the local political scene during the previous decade.
This positive momentum and newfound sense of community proved a necessary foundation as the community struggled over

the ensuing two years to decide on how to proceed, eventually creating a Downtown Recovery Plan shepherded by Vision Santa Cruz, a 36-member advisory committee created by the Santa Cruz City Council to formulate a recovery plan. In order to assure that all perspectives had a voice, the business community chose 18 of the committee members (who included bankers, property owners, merchants and business associations), and the City Council chose the other 18, who were drawn from environmental, nonprofit, advocacy, arts, neighborhood and other community-based groups.

A panel from the Urban Land Institute (ULI) was invited to Santa Cruz to analyze and articulate some possible options for rebuilding. The ULI panelists interviewed dozens of people, then sequestered. Typically, a panel will prepare concepts and plans and then present them, but ULI's advice to Santa Cruz was stunning and direct: There was no point in preparing concept plans at all because the problem in Santa Cruz was political and social. No recovery would take place unless the community learned to work together and overcome divisive political habits. The community would need to shift its paradigm from fearing and obstructing new development to embracing it. In short, Santa Cruz needed new levels of engagement and collaboration.

An external panel's advice to Santa Cruz was stunning and direct: There was no point in preparing concept plans because the problem in Santa Cruz was political and social. No recovery would take place unless the community learned to work together and overcome divisive political habits.

Recognizing the need to move with both speed and deliberation, Vision Santa Cruz designed its planning process to give adequate time for examining the issues while avoiding backtracking and rehashing issues. This required discipline, intense work and community engagement. It meant that the plan had to have sufficient detail. It also meant that the key leaders had to fully participate from the beginning and not withhold their decision-making to the end. Policies were decided incrementally and cumulatively so that the final approval by the City Council was a happy formality.

The planning was done in two phases. First, Vision Santa Cruz created a set of first principles to articulate values, aspirations and goals. The second phase was the Downtown Recovery Plan itself, which actualized the aspirations with specific details, including design standards and actual designs for streets and public spaces.

Over the course of the 18-month process, more than 50 people were members of Vision Santa Cruz. Public outreach was extensive and included a downtown information center with a scale model built by

Photos by Charles Eadie

After the Loma Prieta Earthquake, Santa Cruz created an advisory body to develop a recovery plan. Known as Vision Santa Cruz, the group worked to include broad representation from all sectors, engaging the public through workshops, an information center (top right) and a scale model of downtown built by community members (bottom).

Charles Eadie

Flickr user ©Theatre Historical Society

Charles Eadie

©Blake Gumprecht

The rebuilding of downtown Santa Cruz went through many stages, including the creation of temporary pavilions to house retail (top left), the reconstruction of buildings and infrastructure (bottom left), and the rehabilitation of historic resources such as the Del Mar Theatre (top right). The city used the recovery process as an opportunity to widen sidewalks and add public seating and retail kiosks, improvements that have allowed the district to thrive as a retail and entertainment destination (bottom right).

community members with oversight from a local furniture craftsman, who helped people make replicas of the buildings.

Reaching agreement on the recovery plan was an arduous process, given the range of issues and the strongly held ideas that people had. Multiple subcommittees and task forces took on particular details, working from a vision statement that was drafted and agreed upon early in the process.

Ultimately, the size of the committee, while challenging and unwieldy in many ways, provided the critical mass needed for a consensus to form in the middle while giving a voice to the most ardent advocates on the edges.Key to all of this was the forging of new relationships and the learning that came from hearing multiple perspectives, even in heated and contentious discussions.

A fundamental reality also helped force action: The status quo was not an option. Urban design became a common ground for community engagement. It also provided an opportunity to understand why the downtown could not be built back the way it was and what needed to change in order to make the retail environment work. An economic analysis indicated that the downtown would need to do 35 percent more business than it had before the quake. These economics did not support a return of the department stores, so the downtown also had to shift from more traditional retail toward entertainment and cultural venues, offices, and specialty retail catering to the growing student population and tourists.

After a monumental effort involving public feedback, workshops, subcommittees, consultants and staff work, the Downtown Recovery Plan was approved in June 1991 and formally adopted by the City Council in the fall of 1991 after an environmental impact report (EIR) was completed. Although the demolition of old buildings meant that the downtown lost its historic district designation, the new design guidelines in the Downtown Recovery Plan successfully carried forward details that captured many of the qualities the community wanted.

One of the most important features of the plan was that it allowed administrative approval for projects that were consistent with the design guidelines and accounted for in the EIR, thereby minimizing

entitlement risk to builders. The recovery plan was adopted as a specific plan under state law and therefore was both a general plan and a zoning document. Because of the high level of detail in the plan, subsequent projects could be approved administratively (as opposed to requiring a discretionary permit that would need to go to the planning commission), and the plan EIR could be used for more than a decade, minimizing risk to builders of new development. Ultimately, the community trusted the plan and was comfortable that the high level of detail would ensure that projects would reflect what people had agreed upon. At the same time, the quality standards provided assurance to investors, property owners and merchants that the commitments and investments they made would not be undercut by projects that did not uphold the image and standards of the plan. Santa Cruz also benefitted from the fact that many downtown properties and businesses were locally owned by people with deep roots in the community. Local lenders also provided early financing when others were reticent. Thus, decisions and commitments to rebuilding were made not just with concern for the bottom line but with a sense of civic obligation and respect for community.

After the adoption of the Downtown Recovery Plan, a complete rebuilding of Pacific Avenue began. The public space was landscaped, became more pedestrian-friendly and featured improved visibility for the retail stores.

With the streetscape in place, the recovery then proceeded on a project-by-project basis, with many of the early projects involving financial support from the Santa Cruz Redevelopment Agency and other outside sources, including state and federal recovery funding and targeted development grants, Red Cross donations that the agency had agreed to designate for local recovery (after a strong political push), a temporary local sales tax measure dedicated for recovery, private donations and locally based risk capital. The city established new redevelopment districts following the earthquake to finance public investment and support private projects. Tax increment financing was a cornerstone of the recovery. Also key was the passage of a six-year county-wide half-cent sales tax that was distributed by formula among the cities and county. This money was limited to earthquake recovery only, but local authorities had great flexibility and discretion in deciding how to use it.

Recovery started as a sprint but soon became a marathon. Many of the first projects required public-private partnering to share financial risk and were critical in setting momentum. The city also worked to apply building codes in ways that supported the rehabilitation of some key buildings. The city's redevelopment department encouraged property owners and investors, shepherded projects and made judicious use of public funding.

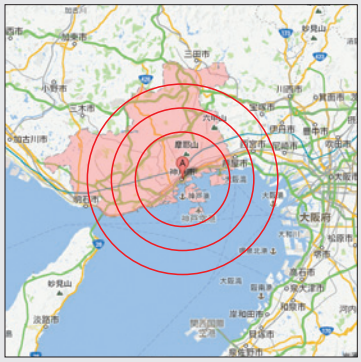
Gradually, the temporary pavilions came down as permanent space opened up or reopened. Some merchants who had set up in other locations in the county returned. Still, others did not survive for various reasons. The recession of the early 1990s added difficulty. Yet Santa Cruz was fortunate to have two fundamental economic drivers that supported downtown recovery. One was the growth of UC Santa Cruz, whose enrollment rose from 7,500 students at the time of the earthquake to more than 16,000 today. The growth in the student population fueled the vibrancy of the downtown and led to a strong restaurant, entertainment and specialty retail environment. Secondly, Santa Cruz benefited from the growth of the Silicon Valley computer industry in the late 1990s, which prompted tech companies to look for space in downtown Santa Cruz, thereby leading to the development of new office space in that area.

Although the demolition of old buildings meant that the downtown lost its historic district designation, new design guidelines carried forward details that captured many of the qualities the community wanted.

Six years after the earthquake, the turning point came when a new nine-screen cineplex project filled in the space previously occupied by Gottschalks department store. That brought new life to the evening scene and new people into the downtown. Over time the redevelopment agency shifted its financial support toward enhancing the physical appearance of the downtown (e.g., by improving pedestrian alleyways) and stepped away from direct involvement in building projects. One key exception was the resurrection of the historic Del Mar Theatre, which was restored to its former grandeur through a financial partnership involving the redevelopment agency, a private developer and a local theater operator. Today the beautiful marquee is a highlight of the street.

One of the key variables for successful recovery is the quality and commitment of community leadership. Political logic often can be at odds with planning or administrative logic, but Santa Cruz was able to bend and blend the forces to make recovery work. The city succeeded by delegating authority, allowing for real community engagement and trusting the process to produce a good outcome. The community in turn was spectacularly willing to volunteer time and effort — and persist through some very difficult and controversial times. People maintained strongly held views and had many areas of disagreement, but collectively the community was able to place the big picture and their love of place ahead of factionalism.

Case Study: Kobe, Japan
Pre-Disaster Planning Supports Recovery



map ©2013 Google

On January 17, 1995, a magnitude 6.9 earthquake struck the Kansai region of Japan's main island of Honshu. The region comprises seven prefectures and has three of Japan's six major cities, including the international port city of Kobe (1.5 million people in 1995), where the impact was the strongest. The earthquake caused more than 6,400 deaths, damaged all urban lifelines and transportation systems and destroyed 100,000 buildings; nearly 100,000 people were homeless or displaced by the disaster.[4] Widespread liquefaction occurred around the margins of Osaka Bay, and fires consumed 203 acres of urban land. In all, economic losses exceeded $150 billion, with more than $100 billion in property damage.[5]

Kobe's greatest previous disaster in the 20th century was World War II, when about 60 percent of the city's urban area was destroyed by bombing.[6] Kobe used land readjustment and redevelopment powers to rebuild following the war, which provided a baseline of experience for the 1995 recovery. Land readjustment involves modifying property boundaries such that each landowner loses some land area. The resulting new parcels are typically used for public projects, such as road widening, open spaces and other public facilities.

Several planning studies that began in the 1960s helped define Kobe's recovery framework. In 1967, Kobe University completed a built environment inventory for the city that included several interpretive maps of risks such as fire and flooding, which correctly identified some of the areas that later burned in 1995.[7] Several maps focused on existing building density, street widths, housing size and housing age. These studies led to an urban redevelopment plan for replacing wooden structures and promoting new fire prevention standards. This plan identified the most problematic areas, but it did not propose specific actions, nor did it prioritize areas most in need of redevelopment.[8] In the three years prior to the earthquake, the city had worked to update its general plan. Planners responsible for post-disaster recovery planning credit this general plan update, as well as the community network that had been cultivated during that effort, for their ability to efficiently craft a recovery plan that also had broad public support.[9] It also gave city officials confidence to move quickly on post-earthquake restoration planning.[10]

In the three years prior to the earthquake, the city had worked to update its general plan. Planners credit this effort, and the community network it cultivated, for their ability to efficiently craft a recovery plan that had broad public support.

On the day after the earthquake, Kobe's mayor implemented a two-year moratorium on rebuilding in the city's hardest-hit areas. Eight days later, the city established a recovery headquarters that took the lead in recovery planning efforts. A 27-member recovery planning review committee was also established to help guide the planning process. Its members included city administrators and outside experts in economics, law, social welfare, social psychology, disaster prevention, engineering and the environment. After a few months, the committee expanded into a 100-member recovery planning council that also included representatives from the City Council, citizens' organizations, the business community, labor unions, and national and prefectural government representatives.[11]

The City of Kobe developed a citywide restoration plan in just five months after the 1995 earthquake.[12] This first phase of the plan established a high-level vision for the city's recovery and identified

4 City of Kobe, Japan. 1995. "Kobe City Restoration Plan (Abridged Version)."

5 Olshansky, Robert B., Laurie A. Johnson, and Kenneth C. Topping. 2005. "Opportunity in Chaos: Rebuilding After the 1994 Northridge and 1995 Kobe Earthquakes," www.urban.illinois.edu/faculty/olshansky/chaos/Opportunity-in-Chaos-March2011.pdf

6 *Ibid.*

7 *Ibid*

8 *Ibid*

9 Ota, Toshikazu, Norio Maki, and Haruo Hayashi. 2009. "Evaluating Planning Process of the Kobe Recovery Plan Based on Project Management Framework." *Journal of Disaster Research* 4 (3): 271–281.

10 *Ibid*

11 *Ibid*

12 City of Kobe, Japan. 1995. "Kobe City Restoration Plan (Abridged Version)."

Ikuo Kobayashi

Laurie Johnson

After the Kobe Earthquake, the city was able to use a recent update to its general plan to facilitate rapid rebuilding, developing a citywide restoration plan in just five months. Top, the Takatori neighborhood weeks after the 1995 earthquake and fire. Below, the neighborhood rebuilt with widened streets and new parks added for future fire protection.

Ikuo Kobayashi

Laurie Johnson

Top, the Rokkomichi neighborhood weeks after the 1995 earthquake and fire. Below, the area rebuilt with a community center, park and auxiliary water supply for fire fighting.

the priority recovery areas (called restoration promotion districts), the implementation approach for each district (e.g., redevelopment, land readjustment or housing reconstruction policies), and the basic citywide design for arterial streets and major parks. The guidelines from the June 1995 plan were then fleshed out into more specific plans for each restoration promotion district. These second-phase plans took longer to complete, involved neighborhood deliberation and consensus building and focused on internal street systems, land parcel layouts, park locations and other design elements.[13]

Many of the previous planning activities strongly influenced the planning policies and the delineation of boundaries for the restoration promotion districts.[14] For example, land readjustment areas were based on the maps of hazardous and obsolete areas from the planning efforts in the 1960s and 1970s. It was no coincidence that the areas of heaviest damage were those areas that had not been damaged and readjusted following World War II. Two large-scale redevelopment projects underway prior to the earthquake were also

13 Ota, Toshikazu, Norio Maki, and Haruo Hayashi. 2009. "Evaluating Planning Process of the Kobe Recovery Plan Based on Project Management Framework." 4 (3): 271–281.

14 Olshansky, Robert B., Laurie A. Johnson, and Kenneth C. Topping. 2005. "Opportunity in Chaos: Rebuilding After the 1994 Northridge and 1995 Kobe Earthquakes," www.urban.illinois.edu/faculty/olshansky/chaos/Opportunity-in-Chaos-March2011.pdf

expanded and accelerated afterward to help provide new housing and stimulate economic recovery.[15]

Shortly after the earthquake, the governor of Hyogo Prefecture identified specific recovery targets: to rebuild all damaged housing units in three years, remove all temporary housing within five years and complete physical recovery in 10 years.[16] Each month, the City of Kobe and the Hyogo Prefecture published information on the web and in the media, charting their progress toward these and other recovery goals. Both the city and prefecture also convened panels of international and domestic experts and community members to assess the progress made on these targets and other recovery issues and to recommend any needed changes to existing policies.[17] These goals were critical in informing the national government's recovery funding decisions and in coordinating the wide range of participants involved in the recovery.[18]

Today, Kobe is a thriving city, mostly recovered from the 1995 earthquake.[19] The infrastructure and downtown were rebuilt within a few years, and the earthquake also created many opportunities for improvement, including additional parks, greater safety, new development and road widening. By 2005, Kobe's population had rebounded and begun to surpass pre-earthquake levels. But the social environment of some neighborhoods was significantly altered after the earthquake. High-rise residential buildings replaced the smaller wooden housing and poorly built postwar structures that had been destroyed by the earthquake. Land readjustment, redevelopment processes and density bonuses all contributed to significant changes in the urban environment.

15 *Ibid*

16 GAO (Government Accountability Office). 2008. "Disaster Recovery: Past Experiences Offer Insights for Recovering from Hurricanes Ike and Gustav and Other Recent Natural Disasters," Report to the Committee on Homeland Security and Governmental Affairs, U.S. Senate, www.gao.gov

17 *Ibid*

18 Hayashi, Haruo. 2007. "Long-term Recovery from Recent Disasters in Japan and the United States." *Journal of Disaster Research* 2 (6): 413–418.

19 Olshansky, Robert B., Laurie A. Johnson, and Kenneth C. Topping. 2005. "Opportunity in Chaos: Rebuilding After the 1994 Northridge and 1995 Kobe Earthquakes," www.urban.illinois.edu/faculty/olshansky/chaos/Opportunity-in-Chaos-March2011.pdf

Section 2

Earthquake Hazards in the Bay Area: Understanding and Addressing Our Risks

In every future earthquake, some locations in the Bay Area can be expected to experience heavier damage than neighboring areas, unless we take steps to develop these areas in ways that minimize the risk. Earthquake hazards — including liquefaction, lateral spreading, landslides, surface fault rupture and tsunami (see sidebar) — are all phenomena caused by strong ground shaking, but they are separate and distinct processes that occur in predictable locations. Because we know where earthquake hazards are likely to occur, it makes sense to address these risks through our codes and land use plans.

Different earthquake hazards affect low-lying areas and hillside areas. Low-lying areas near the San Francisco Bay and in inland valleys face the threat of liquefaction and tsunamis. Many of these low-lying areas are also subject to flooding and sea level rise. Although these last two risks are not triggered by earthquakes, they provide extra incentive to manage development in these areas with building codes, zoning codes and land use plans that recognize the hazards.

Hillside areas face their own set of earthquake hazards, including earthquake-induced landslides and surface fault rupture. (Surface fault rupture can also occur in some low-lying locations.) Most notably, the Hayward Fault crosses through heavily developed areas in East Bay cities at the base of the foothills. Hillside areas are also prone to hazards not triggered by earthquakes, including wildfire and rainfall-induced landslides.

The bulk of the region's earthquake-related risk lies in the low-lying plains near the bay, where liquefaction will occur. These areas ringing the bay are home to our major urban centers: San Francisco, Oakland and San Jose. Densely occupied, these zones contain most of the region's job centers and the bulk of its multifamily housing. The proliferation of high-tech companies in Silicon Valley has furthered this trend. Downtown San Francisco, with the greatest concentration of tall buildings in the region, sits on poor soils. Between 1850 and 1960, filling the bay was one way to provide more land for ports, industrial uses, airport runways and housing. The region's garbage was conveniently used to fill this land, and nobody realized then that this technique created land with very high liquefaction risk.[20] We can expect to see devastating and widespread damage from liquefaction in future Bay Area earthquakes. The scale and location of the damage will depend upon the size and epicenter of the earthquake, but we should expect areas close to the bay to be hit hard.

Inland valleys were largely developed after World War II with newer single-family homes and commercial buildings and fewer multiunit

20 See www.bcdc.ca.gov/history.shtml

Earthquake Hazards

The strong shaking of an earthquake can trigger additional hazards:

Liquefaction — Strong earthquake shaking can cause soil to lose strength and behave as a liquid, displacing the ground that supports building foundations. Structures can settle, tip or be otherwise damaged. Areas most susceptible to liquefaction have loose, granular soils that are saturated by groundwater. Older artificially filled areas, like many around the margin of the bay, are particularly susceptible to liquefaction because they were created when the Bay Area was first developed, when no one understood the dangers. Liquefaction can cause other serious hazards such as:

Lateral Spreading: The ground overlying liquefied materials can move freely down a slope, riding on the liquefied material. This process can displace the ground surface for large distances, causing major destruction of structures and lifelines.

Settlement: This liquefaction-related phenomenon occurs when different parts of structures settle different amounts, causing greater distress to those buildings.

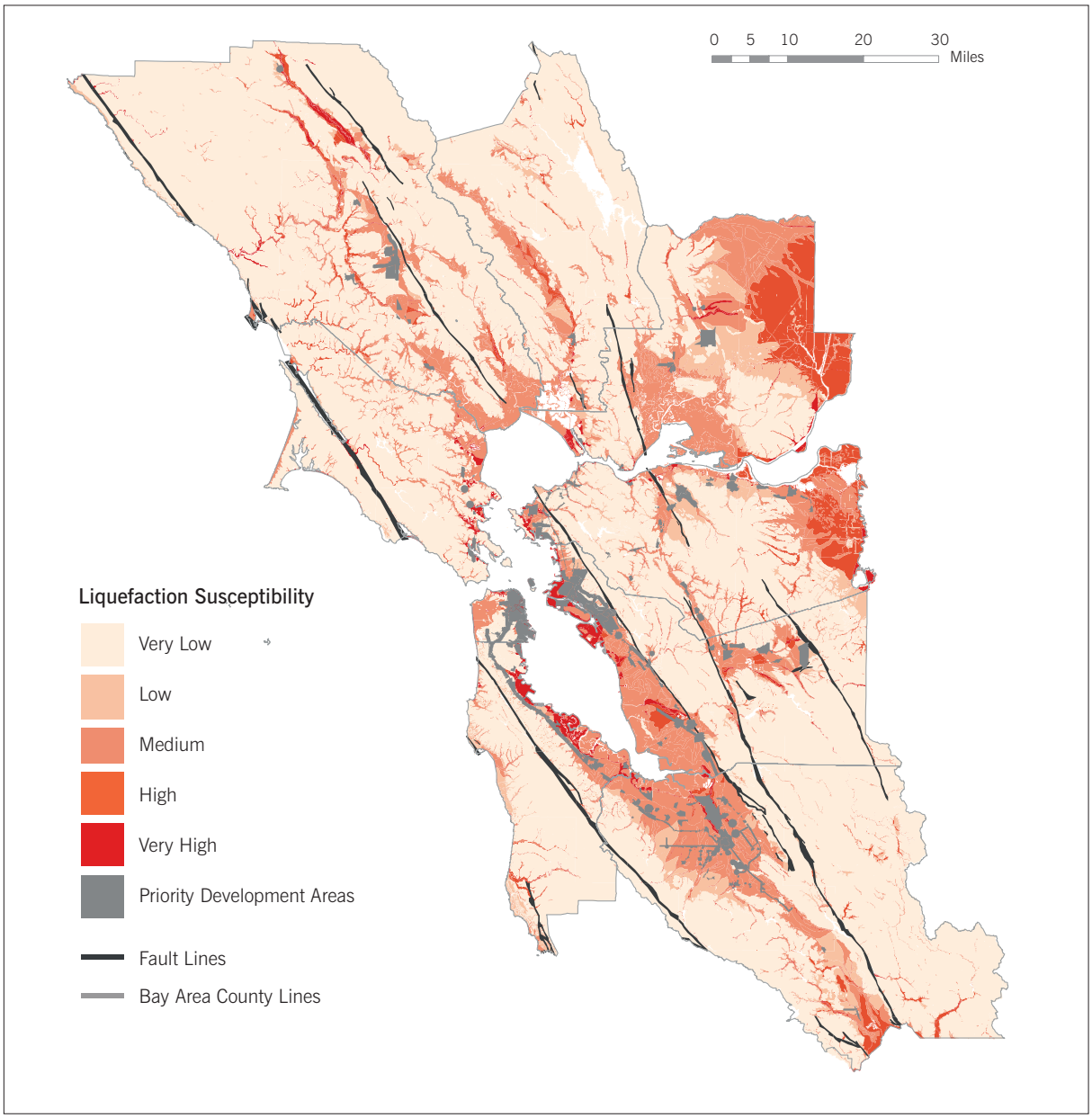
Liquefaction can cause significant damage to buildings and buried lifelines, such as water and power lines. Structures affected by liquefaction often need to be reconstructed. Areas expected to liquefy in future earthquakes have been identified in a number of hazard maps.

Tsunami — In a body of water, a rapid disturbance such as an underwater landslide or an earthquake on an underwater fault can generate a series of waves that vertically displaces the water. Tsunamis affecting the Bay Area are rare but could be caused by nearby offshore earthquakes or distant events.

Landslides — Earthquake shaking can trigger landslides that damage or destroy entire hillside developments. These landslides may displace the ground surface only a few centimeters, or they may cause slope failures, where entire hillsides slide in rapidly moving masses. A variety of landslide hazard maps have been produced for parts of the Bay Area, and these maps can be used to plan for slope failure.

Surface Fault Rupture — Faults are fractures along which blocks of the earth's crust slide past each other. Earthquakes occur when forces underground cause the faults beneath us to rupture and suddenly slip. If the rupture extends to the surface, part of the ground shifts, ripping apart any structures on the rupture line. Fault rupture damage is rare and confined to a small zone. According to state law, construction near mapped fault lines must verify the fault location through digging trenches and conducting other geologic studies.

Figure 2: Liquefaction Susceptibility in the Bay Area



Sources:
Association of Bay Area Governments: http://gis.abag.ca.gov/, files accessed December 14, 2012
United States Geological Survey: http://earthquake.usgs.gov/regional/nca/qmap/, files accessed December 14, 2012

Many parts of the Bay Area facing risk from earthquake-related hazards (including liquefaction) will continue to be developed in the coming years as the region figures out how to accommodate more than 2 million expected new residents in the coming 30 years. The region has committed itself to reducing sprawl by placing new housing and jobs near transit within existing urban areas, which SPUR strongly supports. However, some of the areas well served by transit are also subject to liquefaction, tsunamis, sea level rise and flooding, putting more people at risk from a variety of hazards. Good planning is needed to address risks in those high-hazard areas that have been designated priority development areas for future growth.

apartments. Many of these are built to newer codes and should better resist shaking damage. Development on the region's hillsides mainly consists of single-family homes that range in age and vulnerability to earthquakes. Because the housing on hillsides is developed less densely, the scope of damage from secondary hazards is likely to be smaller. But both hillsides and valleys will likely face significant problems in localized areas.

Critical infrastructure crosses all of these hazard zones. Major transportation corridors (Highways 101, 80, 580, 880 and 680) run north and south and parallel to the region's valleys and low-lying areas. These corridors are connected by roads, tunnels and bridges running east and west, some of which cross faults. Major transmission infrastructure bringing water and power to our region also crosses this system of faults as it travels westward. Many of our ports, airports and sewer-treatment facilities are located adjacent to the bay on weak soils.

Reducing Earthquake Hazards

There are three key approaches to reduce the potential damage from earthquake hazards:

1. Make improvements or changes to the land to reduce the hazards.
2. Build in special ways in the hazard zones to reduce damage when earthquakes occur.
3. Develop land use plans that avoid concentrating dense uses in earthquake hazard areas.

There are a number of technical approaches that can significantly reduce the likelihood of liquefaction occurring during an earthquake. These involve "densifying," i.e., extracting water from the soil or injecting material into it so that it will not liquefy. However, these techniques are expensive, time-consuming and generally only feasible for large undeveloped lots. Liquefaction remediation can make sense for significant new developments, such as the redevelopment of Treasure Island. This project plans to spend two years and $130 million (2010 dollars) to stabilize the island prior to construction work.[21] (See case study on page 27.) Land remediation is typically not an option for existing structures in liquefaction zones or development on small lots in a densely occupied area.

In many locations, it is not feasible to alter the land enough to eliminate the risk of liquefaction. Instead, new buildings can use specially designed foundations, which will reduce the risk and typically add less than 10 percent of the total building cost to a project. The real challenge is to address the liquefaction risk for existing buildings with inadequate foundations. Retrofits to foundations are difficult, expensive and often not feasible. Typical above-ground retrofit techniques help increase the resilience of structures in liquefaction zones, but they may not be adequate to avoid heavy damage.

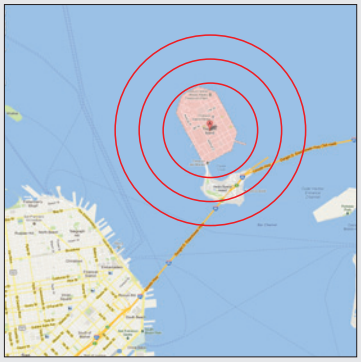
The most effective way to reduce damage from secondary hazards is not to build where they occur. This is currently not an option in many parts of the Bay Area, although it may become feasible if large areas experience heavy damage in a future earthquake. As an example of this approach, the plan to redevelop Treasure Island leaves the northeast corner of the island as parkland. There are a number of reasons for this choice, including the fact that liquefaction risk is highest on that part of the island.

The period that follows an earthquake is an opportunity to repair and rebuild better and to reduce the likelihood of damage in future earthquakes. It is important to remember that the Bay Area has more than one large earthquake in its future. The key thing to recognize is that an excellent time to build resilience into our community's secondary hazard zones is immediately following a damaging event. It is cost-effective to make seismic improvements to structures when they are already undergoing repairs or reconstruction. This is also the time when a community might best find the political will to make significant land use or building regulation changes in a high-risk neighborhood.

A plethora of complex regulations govern post-earthquake building repair and reconstruction. The application of regular codes — typically the California Building Code with some local amendments — will generally form the technical basis for repair and reconstruction, but a host of special regulations offer challenges and opportunities. It will be difficult for an individual building owner or design professional to become familiar with so many regulations, and a lack of clarity may result in extensive delays or in repairs or reconstruction that do not fulfill an owner's or jurisdiction's goals or requirements. Cities and regions can accelerate post-disaster recovery by adopting clear policies and procedures on post-earthquake building evaluation, repair and reconstruction.

21 Michael Tymoff, Treasure Island Development Authority, discussion on October 29, 2012.

Case Study: Treasure Island, San Francisco, CA
Planning for Liquefaction



map ©2013 Google

Treasure Island, a manmade island in the San Francisco Bay, is part of the City of San Francisco. The island was created in the 1930s by placing landfill — mostly sand dredged from various parts of the bay — onto an existing sand shoal. The island was originally used for the 1939 World's Fair and then served as a naval base. It will be turned over to the City of San Francisco as soon as the Navy finishes environmental cleanup efforts.

San Francisco has ambitious plans to redevelop Treasure Island, including constructing up to 8,000 new homes, restaurant and retail space, and parkland. However, like most older areas of manmade fill, Treasure Island has a very high liquefaction risk. The island experienced liquefaction in the 1989 Loma Prieta Earthquake, with differential settlement around much of the island perimeter and major foundation damage to a handful of buildings. Without remediation, liquefaction damage in future earthquakes that are larger and closer could be extreme, with the ground settling as much as 2 feet in some areas. This would make buildings unsalvageable and would extensively damage roads and underground utilities.

Redevelopment plans include significant work to reduce liquefaction risk. A variety of techniques will be used to stabilize the island's soils before construction, such as deep dynamic compaction (where heavy weights are dropped on soil to densify it) and vibrocompaction (where a vibrating probe is inserted into the soil to densify the surrounding soil). This work is easiest in open spaces and more challenging near existing buildings. Special techniques will be used in a handful of areas adjacent to some of the existing buildings that are not slated for demolition. The remediation techniques will consolidate the island's soils, lowering the ground level. To compensate, new fill will be brought in, and the island will be raised, which will also protect against future sea level rise.

Mitigating liquefaction risk is costly and time-consuming. One of the compaction techniques, surcharging, requires up to two years to complete before building construction can begin. The cost of geotechnical remediation measures is estimated at $130 million (in 2010 dollars), or approximately 10 percent of all infrastructure costs, which includes preparing roads and utility systems. Total estimated costs for the entire development are approximately $5 billion to $6 billion. In addition to impacting costs, the island's liquefaction risk has played a role in shaping the design of the future built environment. The northwestern corner of the island, which has some of the worst liquefaction risk on the island, is slated to become parkland.

To reduce liquefaction risk, a variety of techniques will be used to stabilize the island's soils before construction begins. These processes will lower the ground level, so to compensate, new fill will be brought in and the island will be raised, which will also protect against future sea level rise.

Ultimately, this project will result in a new San Francisco neighborhood with world-class views and significantly lower liquefaction risk than the island has at present, helping San Francisco to meet its housing needs while ensuring a tolerable level of risk. The costs of making this land safer, while significant, are a fraction of the total project costs.

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The plan for Treasure Island clusters development to avoid placing buildings in the areas most vulnerable to liquefaction.

SPUR's Recommendations for Addressing Earthquake Hazards in the Bay Area

BEFORE THE DISASTER

10. Complete liquefaction and landslide mapping for the high-risk parts of the Bay Area and ensure that necessary geological investigations are completed in damaged areas following the next earthquake.

The Seismic Hazards Mapping Act is California's key law that regulates new construction and repair/renovation in liquefaction and landslide zones. As part of this act, the state developed maps for some densely occupied areas of California, identifying zones with a high risk of liquefaction and earthquake-induced landslides. Within these zones, new construction projects and major renovations (those with costs exceeding 50 percent of the value of the structure) must conduct a detailed geologic study of their site. The study must be submitted to the local planning or building department, along with a description of any mitigation actions that will be taken to reduce the likelihood of damage due to these hazards. Local jurisdictions must have knowledgeable individuals review these reports for adequacy. In addition, when property is sold, the seller is required to disclose whether a property is located in one of the mapped seismic hazard zones, ensuring that new property owners are informed of their risks from the outset. It is clear that this act has significantly increased the public's knowledge of liquefaction and landslide hazards and has provided a tool that enables communities to require mitigation measures in high-risk zones.

In the Bay Area, the California Geological Survey (CGS) has mapped "zones of required investigation," as defined by the Seismic Hazards Mapping Act covering San Francisco and parts of Alameda, San Mateo and Santa Clara counties. However, the rest of the Bay Area has not yet been mapped. SPUR recommends that the California State Legislature fund CGS to complete the mapping of landslide and liquefaction zones in the high-risk parts of the Bay Area.

In addition, after the next damaging Bay Area earthquake, local jurisdictions should make use of the provisions of the Seismic Hazards Mapping Act to ensure that adequate studies identify the hazard to redeveloped properties. In the past, some owners who have suffered damage to their properties have been exempted from laws like the Seismic Hazards Mapping Act in order to ease their burden and expedite redevelopment. But exempting owners from conducting appropriate studies to characterize the risks of liquefaction, landslide and surface rupture creates a missed opportunity to help jurisdictions plan for the next earthquake and mitigate against the effects of future disasters.

Responsible Parties: California State Legislature to fund the California Geological Survey and local jurisdictions to implement provisions of the Seismic Hazards Mapping Act

11. Address liquefaction risk in undeveloped areas.

There are a number of large undeveloped or underdeveloped tracts of land in the Bay Area with high liquefaction risk. Communities should take steps to make sure these lands are developed in ways that minimize the likelihood of future damage from earthquakes. SPUR recommends taking the three approaches discussed previously in order to address this risk:
a. Require developers to stabilize the soil prior to building so that it is resistant to liquefaction.
b. Require all builders on sites with high liquefaction risk to construct robust foundations or incorporate other structural solutions to minimize damage in the event of liquefaction.
c. Designate high hazard areas as parks or other low-occupancy uses.

Responsible Parties: Planning and building departments working with developers and private homeowners; structural engineers working with project sponsors to communicate benefits, costs and savings

12. Encourage private owners to purchase earthquake insurance.

Few homeowners purchase earthquake insurance because of high annual premiums and deductibles that may never be realized in an earthquake. Homeowners located in areas susceptible to ground failures such as landslide and liquefaction, however, may suffer extensive damage to their homes in an earthquake, making earthquake insurance a better financial decision. In addition to structural damage, homes may suffer ground displacement that will have to be addressed before the home can be reoccupied. Some of this land remediation work is covered by an earthquake policy.[22]

In California, earthquake insurance underwritten by the state through the California Earthquake Authority (CEA) is available to owners of single-family homes, condominiums, mobile homes and apartment buildings with four or fewer units, and to renters to cover the costs of damage to belongings and temporary relocation. Homes damaged by liquefaction will be covered for structural damage above the deductible and up to the limit. Ground remediation up to $10,000 is covered, but upgrades and strengthening for future earthquakes — such as installation of a mat foundation — are not covered. Currently, only 10 to 15 percent of Bay Area residences are covered by earthquake insurance. In San Francisco, where residents disproportionally rent, only about 6 percent of renters take out earthquake insurance policies.

CEA-backed earthquake insurance is not available to owners of commercial structures and larger residential buildings. These owners can be covered by earthquake insurance, business interruption policies and other policies issued by private carriers. While insurance and other types of financial mitigation do not prevent damage, they do allow property owners to avoid financial catastrophe if their buildings are impacted, enabling them to repair and rebuild.

Responsible Parties: Building and emergency management departments working with realtors, insurance brokers and others to increase awareness of the benefits of homeowner and renters' insurance

13. Assemble, review and provide critical local interpretations of regulations governing post-earthquake building repair and reconstruction, including requirements in multi-hazard areas.

The current California Building Code (2010 CBC) contains triggers for post-earthquake repair and retrofit that require some damaged buildings to be seismically retrofitted rather than just repaired if they meet a certain damage threshold. Those buildings that experience minimal damage under the defined threshold[23] can be returned to exactly the way they were before the quake. Those that experience damage above the defined threshold need to be seismically improved, in addition to being repaired, to make sure they are prepared for future seismic events. Local jurisdictions can develop interpretive documents to aid in these analyses and determinations, which will help avoid substantial delays in reconstruction. Jurisdictions should consider whether they want different standards in liquefaction risk zones or other multi-hazard areas that are likely to see repeat damage in aftershocks and future earthquakes. Additionally, local governments should provide clear repair standards for buildings that have been damaged but don't trigger the damage thresholds under the CBC.

Responsible Parties: Professional associations of architects, engineers and planners working closely with local building and planning departments; interpretations could be developed or shared at the local, regional or state level

14. Organize and train teams of professionals to provide expert assistance to property owners and their consultants in post-earthquake technical and procedural issues.

After the disaster, the regulations governing rebuilding may be very unclear to property owners. How should buildings be shored? When can buildings be demolished? What are the requirements for increased seismic performance for buildings? Are requirements different in secondary hazard zones? Planning and building departments will need to work with professional design associations, such as the American Institute of Architects, Structural Engineers Association of Northern California and others to communicate these rules to the public as clearly and efficiently as possible.

Responsible Parties: Professional associations of planners, architects, engineers and historic preservation professionals working closely with local building and planning departments; model programs for local implementation could be developed at the regional or state level

AFTER THE DISASTER

15. Determine whether rebuilding should not be allowed in some high-risk areas.

In some cases, a community may feel that the risk of future liquefaction or other hazards is too high and that the neighborhood should be abandoned, at least temporarily, while remediation work is done. This would require a moratorium on rebuilding. This type of decision is by nature emotionally and politically charged, with enormous social implications that juxtapose residents' fear of a repeat event with their desire to recover the home they had before the earthquake. The decision to impose a moratorium on rebuilding would need to take into account the severity and geographic extent of damage, the desires of neighborhood residents, and the financial and social costs of either delaying the return of residents or permanently displacing them.

The decision not to rebuild certain neighborhoods was made in Christchurch, New Zealand, after a large earthquake and multiple aftershocks caused repeated major damage from liquefaction. (See case study on page 31.) As seen in New Zealand, liquefaction, landslides and other earthquake hazards damage not only buildings but also roads, underground pipelines and conduits, and the many other types of publicly funded infrastructure that make a neighborhood function. Communities must decide whether it is a wise use of public resources to repeatedly repair such infrastructure in a zone that is likely to see more damage.

Responsible Parties: Planning departments in consultation with building departments, earthquake professionals and impacted communities; ultimately mayors, city councils or a combination of the two will make the final call

22 Source: Janiele Maffei, CEA.
23 The threshold for retrofit after an earthquake in Chapter 34 of the California Building Code is "substantial structural damage," which generally means that a building's capacity has been reduced more than 20 percent from pre-damage condition. However, the code doesn't say how to determine if that percentage has been met, leading to confusion when this provision of the code is applied.

16. Encourage and/or require buildings that are rebuilt after an earthquake to be more likely to withstand the effects of future earthquakes.

As mentioned earlier, the California Building Code requires structural upgrades, rather than simple repairs, when damage reaches certain thresholds. This applies to all buildings and occupancies, including housing, if such damaged buildings are considered to have become "substandard" due to structural damage. Local building departments, working in coordination with professional groups, should make sure that the requirements of the CBC are followed when buildings are being repaired.

At the same time, if buildings are being rebuilt in liquefaction zones or other hazardous areas, the post-disaster period is an opportunity to complete ground remediation or other hazard abatements, or require higher performance of buildings located in these areas. This could include mandating that buildings in liquefaction zones have stronger foundations. Local authorities should strongly consider such opportunities to rebuild in ways that increase resilience. After significant liquefaction damage in the Christchurch Earthquakes, authorities there developed zones with different kinds of foundation requirements.

We should also consider requiring buildings that support disaster response to be rebuilt or retrofitted in preparation for the next event. Such buildings include essential facilities such as hospitals, emergency shelters and residential structures.

Responsible Parties: Building departments in coordination with planning departments and professional associations

Placing a Moratorium on New Buildings

Following the 1964 Alaska Earthquake, the Federal Reconstruction and Development Planning Commission formed a scientific and engineering task force composed of structural engineers, engineering geologists and seismologists.[24] The task force was charged with evaluating the hazard, making a determination about the appropriateness of rebuilding in the affected area and advising on needed investments to facilitate rebuilding.

Similarly, the City of San Jose established a geologic review panel in 1994 to evaluate rebuilding decisions related to landslides in the hillside portions of the city.[25] While the report was being developed, the city placed a moratorium on rebuilding in the areas of the city under study. The panel consisted of three engineering geologists and two geotechnical engineers. San Jose expects to convene a similar expert panel to guide future redevelopment decisions in post-disaster situations.

24 William Spangle and Associates, Inc. 1980. *Land Use Planning After Earthquakes*.

25 City of San Jose, East Foothills Moratorium Area Geologic Review Panel Report, March 1994.

Case Study: Christchurch, New Zealand
Choosing Whether to Rebuild in the Face of Ongoing Hazards

map ©2013 Google

In late 2010 and early 2011, the City of Christchurch and the Canterbury region of New Zealand experienced a series of severe earthquakes that caused repeated and heavy damage from liquefaction. With close to 475,000 people, the Canterbury region is the second-largest metropolitan area in New Zealand and the major economic center of the country's South Island. The first in this string of earthquakes occurred on September 4, 2010, when a magnitude 7.1 earthquake struck 25 miles west of the city center and only 6 miles underground.[26] Around 25,000 residential properties experienced liquefaction, rockfalls and other significant land movements that also damaged neighborhood streets and portions of the water, wastewater and storm-water drainage systems.[27] Local and regional planning agencies had previously mapped many of the affected areas, predicting moderate to high liquefaction potential. The extent of the liquefaction, therefore, didn't come as a surprise, given the degree of the ground shaking.

On February 22, 2011, the city was struck by a magnitude 6.3 earthquake on a previously unmapped fault that was only 4 miles from the city center and 3 miles underground.[28] Though smaller in magnitude, this earthquake caused far greater damage than the September earthquake. More than 180 people were killed, Christchurch's business district suffered two dramatic building collapses and nearly half of the district's buildings were deemed uninhabitable. This time, nearly 65,000 residential properties experienced liquefaction, rockfalls and other significant land movements.[29]

Surrounding roads, water and wastewater pipes, electric lines and storm-water drainage systems were also heavily damaged. The aftershocks continued, with another damaging quake on June 13, 2011, causing additional liquefaction and building damage and raising serious concerns about the future viability of the many residential neighborhoods that experienced repetitive land and building damages.

New Zealand's national government, through its Earthquake Commission (EQC), offers natural disaster insurance coverage for residential properties, similar to our National Flood Insurance Program (NFIP) and California Earthquake Authority (CEA) policies. But unlike a CEA policy, an EQC policy covers costs for land damage due to earthquakes, landslides and several other natural hazards. Thus, the EQC conducts land damage assessments of insured properties as part of its claims process. Due to the scale and extent of land movements after the September 4 and February 22 earthquakes, the EQC commissioned a three-step process to understand the severity of land damages both on the plains and in the hills: first, broad-scale regional mapping; second, rapid property-by-property mapping of land damage patterns; and third, more detailed land damage assessments for insurance claim settlements on individual properties.[30] Aerial photography and LIDAR (light detection and ranging technology) were combined with borehole drilling, core-pressure testing and other subsurface investigations to characterize the regional issues, while a team of 400 engineers conducted the detailed land damage assessments.[31]

These studies, combined with the building damage inspection data, formed the basis of the national government's decision to zone all residential properties in the Canterbury region as either suitable or unsuitable for rebuilding. On June 23, 2011 — 10 days after the June 13 aftershock and just four months after the most damaging earthquake — a new national cabinet known as the Canterbury Earthquake Recovery Authority (CERA) released detailed maps classifying residential properties in the Canterbury region into four zones: green, red, orange and white.[32]

26 EERI (Earthquake Engineering Research Institute). "The Mw7.1 Darfield (Canterbury), New Zealand Earthquake of September 4, 2010." *EERI Special Earthquake Report*, insert to *EERI Newsletter*, vol. 44, no. 11, November 2010.

27 EQC. "Canterbury Earthquakes 2010 and 2011," Land Report, February 29, 2012.

28 EERI. "The M 6.3 Christchurch, New Zealand Earthquake of February 22, 2011," *EERI Special Earthquake Report*, insert to *EERI Newsletter*, vol. 45, no. 5, May 2011

29 EEQC. "Canterbury Earthquakes 2010 and 2011," Land Report, February 29, 2012.

30 *Ibid*

31 *Ibid*

32 CERA. "Greater Christchurch Recovery Update," *Newsletter of Canterbury Earthquake Recovery Authority*, no. 15, November 2012.

- **Green zones** were deemed suitable for rebuilding, although these zones were further subdivided into three technical categories with varying foundation and building standards for repair and reconstruction of housing (see below).
- **Red zones** were deemed unsuitable for reconstruction because land repair would be "prolonged and uneconomic."
- **Orange and white zones** required further assessments.

At the same time, the national government also announced a package to buy insured residential properties in the red zones, offering two options: 1) the government buys the property at a price based on the most recent tax valuation for the land and improvements and takes over all insurance claims for the property; or 2) the government buys the property at a price based on the most recent rating valuation for the land only and takes over the EQC claim for land damage only while the owner retains the benefit of all insurance claims for building damage.[33]

The red zone offer is voluntary, and owners of properties are under no obligation to accept it, but it is not yet clear what will happen if property owners choose not to sell.[34] No decisions have been made on the future of the land in the residential red zone, although the national government has stated that local governments will not be installing new utility services in these zones. There are added uncertainties about the availability of insurance and reconstruction financing and about future resale values for those who do not sell. Under the Canterbury Earthquake Recovery Act 2011, the national government could at a future time require property owners to sell their property for its market value, which could be lower than the current offers.

The national government decided to zone all residential properties in the Canterbury region as either suitable or unsuitable for rebuilding, then offered a package to buy properties in the "red zones," where rebuilding would not be allowed.

As of October 29, 2012, 7,860 properties have been zoned red.[35] Additional studies conducted since June 2011 have reclassified all of the orange and most of the white zone properties as either red or green. Fewer than 200 homeowners await a reclassification from white to either red or green. More than 6,180 residential red zone properties (about 79 percent of the total) have accepted the government's buyout offer.[36] On September 13, 2012, the national government also extended offers to purchase vacant land and insured commercial properties inside some of the residential red zones. The national government estimates that the total costs over the next two years to buy and manage the residential red zone lands will be NZ$678 million (US$556 million).[37] It expects to recover some of these costs from the benefits paid on the land and buildings by the EQC and other insurers. Authorities are also still considering how to value the residential red zone land that the government has bought and what will be done with the land.

For the green zone areas, New Zealand's Department of Building and Housing is setting the standards for repairs and reconstruction:

- **Technical Category 1** (TC 1) areas are those locations where future land damage from liquefaction is unlikely and ground settlements are expected to be within normally accepted tolerances. For new construction, standard foundations are acceptable subject to shallow geotechnical investigations. The TC 1 zones are generally in the far western areas of the regions, where ground elevations are higher and water tables are lower.

- **Technical Category 2** (TC 2) areas are those locations where minor to moderate land damage is possible in future earthquakes. In TC2 areas, all new housing construction and all foundation repairs to existing housing must be built in accordance with one of three standard foundation designs developed by a group of design professionals and adopted by the local jurisdiction. There may be added construction costs for these foundation designs compared to pre-earthquake design requirements, but the process is relatively straightforward and does not require additional geologic investigations, which can add substantial time and costs to both repairs and new construction.

- **Technical Category 3** (TC 3) areas are those locations where moderate to significant land damage from liquefaction, including lateral spreading, is possible in future large earthquakes. Foundation solutions must be based on site-specific geotechnical investigations and specific engineering foundation design. These areas are generally closer to the river or in areas that experienced extensive land damage in the recent earthquakes. In addition, the roads and utility systems servicing the TC 3 areas require special configuration and design.

The national government issued its zone decisions to "provide certainty for homeowners and their insurers" about whether properties could be rebuilt, allowing buildings owners to make decisions and move forward with their recovery.[38] Similarly, the

33 New Zealand Office of the Auditor General. "Roles, Responsibilities, and Funding of Public Entities After the Canterbury Earthquakes," Parliamentary Paper, October 2012.

34 *Ibid*

35 CERA. "Greater Christchurch Recovery Update," *Newsletter of Canterbury Earthquake Recovery Authority*, no. 15, November 2012.

36 *Ibid*

37 New Zealand Office of the Auditor General. "Roles, Responsibilities, and Funding of Public Entities After the Canterbury Earthquakes," Parliamentary Paper, October 2012.

38 CERA. Briefing for the Incoming Minister, December 2011.

Tao Lai

Sri Sritharan

Downtown Christchurch was decimated by the second of two major earthquakes to hit the region in less than a year (above right). Many parts of the region experienced very severe land damage (above left), raising questions about which areas were safe to rebuild and which were not.

Department of Building and Housing stated that the technical categories helped reduce uncertainty and enabled roughly 80 percent of property owners to conduct repairs without detailed geotechnical investigations that would have caused further delay to the rebuilding process.[39]

Christchurch offers many lessons for Bay Area communities. First of all, by charging a lead agency with investigating land damage, the government was able to assemble a comprehensive and consistent view of the liquefaction and ground failures relatively quickly. Because New Zealand's national government underwrites insurance and also funds repairs to damaged public facilities and infrastructure, it faced a hefty bill to repair damage while still assuming the risk of additional losses from future earthquakes. In the Bay Area, our governments may be left with a similarly high bill because so few of our property owners carry any insurance, and local governments — together with insurers, the state and FEMA's Public Assistance Program — also fund repairs to damaged public facilities and infrastructure. Due to the potential for repeated losses from aftershocks or other hazards, it may be more cost-effective to restrict rebuilding in some areas and offer buyouts to damaged property owners.

While the risk of future hazards has been significantly reduced for New Zealand's government and residents, some new risks and uncertainties arise from these policy actions. While most owners have accepted the government's buyout offer, some have not. For those who choose to stay in their homes, the government has not yet confirmed whether infrastructure and community services will continue in their neighborhoods. Lawsuits challenging specific aspects of the government's decisions are making their way through the courts. Red zone residents are having trouble finding comparably priced homes with the money they expect to receive from the government buyout. The area's population is shifting, and urban planning has not had a chance to keep up. Some areas are seeing significant population growth without the adequate road systems and utility networks to serve the new communities. Other long-populated areas are now vacant, creating crime and vandalism concerns. The required geotechnical investigations and foundation designs in the TC 3 areas are expensive, but resale values are unclear. All of which means that there is a risk of neighborhood decline and added blight in TC 3 areas.

Over the long term, Christchurch will need to decide what happens to its red zones. Can they ever be reoccupied, or should they become permanent open space? Engineers suggest that once the red zones are cleared of all houses, liquefaction mitigation could be implemented over the entire area to make it suitable for housing again. Such mitigation techniques, which include grouting and soil consolidation, can only be applied effectively to large areas of vacant land. Similarly, Bay Area communities may need to take the lead in decreasing the risk of liquefaction before allowing rebuilding, or they may decide to convert vulnerable areas to permanent open space.[40]

39 New Zealand Department of Building and Housing. 2012. "What Do the Technical Categories Mean for You?" Transcript of Dave Kelly, director of the Canterbury Rebuild of the Building and Housing Group, www.dbh.govt.nz/canterbury-earthquake-technical-categories-video

40 Other references for this case study include the following:
- Laurie Johnson, AICP, personal communication, July 30, 2012.
- Markham, Simon. "The Christchurch Earthquakes, 2010–12, Disaster Recovery and Land Use Planning: An Urban Edge Perspective," PowerPoint presentation at SPUR, San Francisco, CA, April 11, 2012.
- "Brownlee 'Stepped Outside Legal Limits,'" The Press, July 24, 2012, press.co.nz
- Chris Poland interview with Mike Jacka of Tonkon and Tailor in August 2012.

Section 3

Implementing Recovery: How Regulations and Land Use Tools Can Help, or Hinder, Rebuilding

35 Environmental Review

38 Redevelopment

40 Non-Conforming Uses

41 Historic Preservation

42 Affordable Housing

After a disaster, local governments will work to develop a vision for recovery that includes making decisions about which areas to rebuild according to existing plans and codes, which ones to re-plan and how to do it.

To carry out this recovery vision, private property owners will need to know the rules that govern rebuilding, such as whether or not rebuilding their property requires environmental review, whether or not they will be allowed to rebuild structures that do not meet current codes and whether or not they can substantially alter historic buildings. Local governments will have to answer the same questions when considering the rebuilding of public property and infrastructure. To do so, they must be aware of existing state and federal regulations that impact these types of decisions and must consider how these regulations might change in the post-disaster period.

Certain types of regulations, such as those laid out in the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA), contain specific exemptions that apply in a post-disaster period. Others, like those protections specified in historic preservation law, offer guidance for how to deal with historic resources after an earthquake. Still other parts of state law, such as the section that allows for the creation of reconstruction authorities in the wake of a major earthquake, provide tools that can be used only following a disaster.

At the same time, complex planning challenges will have to be addressed. What tools will we need in the post-disaster period to aid the recovery of areas that have been severely damaged? What role might reconstruction authorities play now that California has eliminated its state redevelopment agencies? How do we preserve affordable housing to prevent permanent economic displacement after a disaster?

This section addresses the following regulatory and planning issues:

- Environmental review
- Redevelopment
- Non-conforming uses and structures
- Historic preservation
- Affordable housing

The regulations and planning issues outlined in this section are enormously complex. Books can be written on all these topics (and have been). Our list is not exhaustive, as the number of regulatory challenges that local governments will face is enormous. What we have attempted to do is to identify the core issues that most jurisdictions are likely to face and to briefly describe each issue and the way it could impact recovery in the post-disaster period. We then make recommendations for what should be done now, before the disaster, as well as steps jurisdictions should take after the disaster to effectively manage each issue.

ENVIRONMENTAL REVIEW

Most planning actions in the Bay Area require environmental review. There are two umbrella regulations that could affect Bay Area jurisdictions: the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). We use the term "umbrella" because NEPA and CEQA review often encompasses review of other environmental regulations that may apply to the project.[41] These include requirements under the Clean Water Act, the Clean Air Act, the Endangered Species Act and the National Historic Preservation Act.[42]

Both NEPA and CEQA pose challenges in the recovery period. The environmental review procedures of these acts can often take a long time and thus may not work well in post-disaster recovery, when improvements need to happen quickly. For large projects — including new neighborhood plans and infrastructure replacement plans that do not simply replicate what existed before the disaster — the preparation of full environmental impact statements (EISs) under NEPA or environmental impact reports (EIRs) under CEQA could be required. Preparing and adopting an EIR or EIS can take years, even under non-disaster conditions. Such a lengthy process could pose substantial problems after a major disaster.

However, both NEPA and CEQA contain statutory and categorical exemptions that local jurisdictions may be able to use to support disaster mitigation, response and recovery activities in the wake of a natural disaster such as a major earthquake:

Statutory exemptions/exclusions are reserved for those actions that are exempted by law (statute) from environmental review. They are generally more difficult to challenge than categorical exemptions because a reviewing court will typically only need to determine whether the project actually qualifies for the exemption based on substantial evidence in the public record.

Categorical exemptions/exclusions differ from statutory exemptions/exclusions because they are created by regulation, not by statute. They cover classes of actions that generally do not have a significant impact upon the environment. Unlike statutory exemptions, categorical exemptions may not be invoked if certain exceptions apply. For example, categorical exemptions/exclusions may not be used if there is a reasonable possibility that the project could result in a significant impact on the environment due to "unusual" or "extraordinary" circumstances.

41 Luther, Linda. "Implementing the National Environmental Policy Act (NEPA) for Disaster Response, Recovery and Mitigation Projects," Congressional Research Service, 7-5700, February 3, 2010.

42 The National Historic Preservation Act requires federal agencies to consider the effects of proposed federal undertakings on historic properties. This is known as a Section 106 review.

NEPA

NEPA is a federal law that applies only when an activity involves federal money or a federal agency action, regardless of whether it was undertaken by the federal, state or local government or by private individuals. There are two key ways that NEPA review may be required in the disaster recovery context. First, NEPA can be triggered when federal funds help cover the costs of preparing for a disaster or making repairs to disaster-damaged buildings and infrastructure. Examples include FEMA funding for disaster planning efforts and Department of Transportation funding for state and local highway repairs after an earthquake. Second, NEPA can be triggered by the need for a permit or approval from a federal agency. For example, the U.S. Army Corps of Engineers must issue permits for repairs that occur in bodies of water, and the U.S. Fish and Wildlife Service must approve the reconstruction of damaged buildings in areas with federally listed threatened or endangered species or vegetation.

In an emergency, NEPA review can be avoided or expedited so that funds can be spent and approvals issued without lengthy delay. The Stafford Act (the legislation that authorizes disaster assistance) creates several statutory exclusions from NEPA for emergency actions, which include providing assistance to individuals and families for food and housing, and restoring roads and other infrastructure to their pre-disaster condition.[43] Emergency life-saving actions are also covered under a statutory exclusion. If an action is statutorily excluded, the project is not subject to NEPA review.

Federal regulations[44] require that each federal agency create its own NEPA-implementing procedures that are unique to that agency's purpose. Accordingly, in addition to the statutory exclusions authorized by the Stafford Act, FEMA has adopted several "categorical exclusions" for actions that FEMA has determined have no significant effect on the environment. If an action is categorically excluded, environmental review may still be required if "extraordinary circumstances" are found to exist. The following is a list of extraordinary circumstances identified by FEMA:

- Greater scope or size than normally experienced for a particular category of action
- Actions with a high level of public controversy
- Potential for degradation, even if slight, of already-existing poor environmental conditions
- Presence of endangered or threatened species or their critical habitat or of archaeological, cultural, historical or other protected resources
- Presence of hazardous or toxic substances at levels that exceed federal, state or local regulations or standards requiring action or attention
- Actions with the potential to adversely affect special status areas or other critical resources such as wetlands, coastal zones, wildlife refuge and wilderness areas, wild and scenic rivers, sole or principal drinking water aquifers
- Potential for adverse effects on health or safety
- Potential for significant cumulative impact when the proposed action is combined with other past, present and reasonably foreseeable future actions, even though the impacts of the proposed action may not be significant by themselves[45]

The regional administrator of FEMA decides whether a FEMA action is subject to NEPA review or whether it receives a categorical or statutory exemption. Sometimes such determinations (or at least a process for making such determinations) can be made in advance of a major disaster, which reduces confusion and delay in the post-disaster period. Agreeing to a plan ahead of time is particularly important when different federal agencies have different interests and provide conflicting NEPA guidance.

Fortunately, we've seen some examples of successful interagency cooperation, including the programmatic agreement executed by FEMA, the California State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP), which created a streamlined post-disaster review process for FEMA activities that might impact historic resources.

CEQA

If NEPA does not apply to a project, environmental review may nonetheless be required under CEQA. CEQA is a California state law that applies to a public agency's decision to carry out, authorize or approve a project that could have a negative impact on the environment. The following is a summary of several statutory exemptions from environmental review under CEQA[46] that could apply after a natural disaster such as a major earthquake.[47]

The rationale behind CEQA's emergency statutory exemptions is similar to the rationale behind NEPA's statutory exclusions: In a disaster situation, it may be justifiable to authorize a project that responds to an emergency without completing a potentially lengthy environmental review process.

The so-called disaster exemption applies to projects to repair, restore, demolish or replace buildings or facilities damaged or destroyed in a major disaster, as long as a state of emergency has been declared by

43 See 44 Code of Federal Regulations (CFR) § 10.8(c)(1)-(2). See also www.fema.gov/environmental-planning-and-historic-preservation-program/femas-statutory-exclusions, accessed on October 25, 2012.

44 40 C.F.R. Parts 1500–1508.

45 List of "extraordinary circumstances," www.fema.gov/environmental-planning-and-historic-preservation-program/femas-categorical-exclusions, accessed October 25, 2012.

46 The statutory exemptions under CEQA Guidelines Section 15269 should be reviewed carefully by legal counsel on a case-by-case basis, along with any other potentially applicable statutory or categorical exemptions.

47 Please see CEQA Guidelines Section 15300 et seq. for information about potentially applicable categorical exemptions.

the governor under the Emergency Services Act.[48] If the project being considered by the public agency is a comprehensive community recovery plan that encompasses more than the repair or replacement of property or facilities damaged in a disaster (e.g., general infrastructure improvements and economic revitalization measures), this exemption may not apply.

The disaster exemption is also limited under state historic resource preservation law.[49] If the project involves the demolition or significant alteration of a building that is a designated historic resource — i.e., it is listed on a national, state or local historic register — the exemption may only be used if the building poses an imminent threat[50] of bodily harm or damage to adjacent property or, possibly, if the demolition or significant alteration is authorized by the State Office of Historic Preservation.

There are other statutory exemptions that could apply in an emergency situation, including those covering emergency repairs to facilities necessary to maintain services essential to public health, safety or welfare; seismic work on certain highways and bridges; and actions necessary to prevent or mitigate an emergency before it happens.[51] Notably, long-term projects to prevent or mitigate a situation that has little chance of occurring in the short term are not exempt under CEQA. There must be a true emergency — i.e., a sudden, unexpected event involving a clear and imminent danger and a need for immediate action.[52] There is also an exemption for repair of certain critical state levees, which will sunset in 2016 unless that date is extended.[53]

SPUR's Recommendations for Environmental Review

BEFORE THE DISASTER

17. Review execution of intergovernmental/inter-agency agreements such as the one between FEMA and the SHPO for issues specific to the Bay Area to ensure that environmental review occurs as efficiently as possible.

Responsible Parties: Planning departments in consultation with the California Emergency Management Agency and FEMA

18. Amend the CEQA guidelines to clarify that the definition of "imminent threat" is the same as or similar to the definition in the California Historical Building Code.

Applying the CEQA emergency exemption to projects that propose the demolition of significant alteration of listed historic resources (see also the "Historic Preservation" section on page 41) will require a clear definition of "imminent threat." The definition in the California Historical Building Code (or a similar definition) would be appropriate for this purpose.

Responsible Parties: Governor's Office of Planning and Research and secretary for the California Natural Resources Agency

19. Amend CEQA to allow for a delayed review of plans adopted within the boundary of major disaster areas under the jurisdiction of local reconstruction authorities.

The Community Redevelopment Disaster Project Law provided that CEQA review may be delayed until after the adoption of a redevelopment plan following a disaster, as long as the redevelopment plan qualifies under the law and other enumerated requirements are met. This same CEQA relief should be provided in areas under the jurisdiction of reconstruction authorities. As discussed in the "Redevelopment" section on page 38, enacting this recommendation may also require amending the Disaster Recovery Reconstruction Act of 1986.

Responsible Parties: California State Legislature in coordination with the governor

20. Create a CEQA exemption for seismic mitigation projects for buildings.

This exemption is currently limited to certain highways and bridges. SPUR recommends that it be expanded to cover buildings seeking to do mitigation as well.

Responsible Parties: California State Legislature in coordination with the governor

48 See Government Code Section 8550 et seq. See CEQA Guidelines Section 15269(a).

49 Codified in Public Resources Code Section 5028.

50 While this term is not defined under CEQA, "imminent threat" is defined in the California Historical Building Code as "any condition within or affecting a qualified historical building or property which, in the opinion of the authority having jurisdiction, would qualify a building or property as dangerous to the extent that the life, health, property or safety of the public, its occupants or those performing necessary repair, stabilization or shoring work are in immediate peril due to conditions affecting the building or property."

51 See CEQA Guidelines Section 15269 for a more detailed discussion of these and other statutory exemptions.

52 See the definition of "emergency" under CEQA Section 21060.3.

53 See CEQA Section 21080.12.

AFTER THE DISASTER

21. Assess whether recovery actions are statutorily or categorically excluded under NEPA.

If an action may be categorically excluded, planning departments should confirm with FEMA that undertaking the action would not be accompanied by "extraordinary circumstances" subjecting the action to NEPA review.

Responsible Parties: Planning departments in consultation with FEMA

22. Make use of the emergency exemptions under CEQA for covered projects.

Applicable CEQA emergency exemptions are described above.

Responsible Parties: Planning departments

23. Seek funding to rapidly complete neighborhood plan program-level EIRs (if such plans are developed) so that individual projects can work under that broader, program-level EIR (or possibly qualify for a community plan exemption).

Responsible Parties: Planning departments

54 See California Health and Safety Code Section 34000 et seq.
55 See Government Code Section 8877.1–8877.6.
56 See Government Code Section 8180–8194.

REDEVELOPMENT

In previous disasters in California, redevelopment agencies played a role in facilitating recovery. Now that California redevelopment agencies have been dissolved, the state has lost the capacity to create new redevelopment areas and to expedite the adoption of redevelopment plans in the wake of a disaster. California's community redevelopment law previously enabled local governments to create post-disaster redevelopment agencies with the power to use tax increment financing to rebuild infrastructure and spur private development and with the power to assemble parcels, sometimes by invoking eminent domain. The Community Redevelopment Disaster Project Law expedited this process in the wake of a disaster.[54]

This disaster law allowed local governments to quickly establish a redevelopment agency and adopt a redevelopment plan under two conditions:

1. The governor declared that the plan area was in need of assistance.
2. The plan area was within a presidentially declared major disaster area.

The Community Redevelopment Disaster Project Law also provided that CEQA review could be delayed until after the adoption of a redevelopment plan following a disaster, as long as certain requirements were met. This streamlined process has also been lost now that redevelopment agencies no longer exist.

The Powers of Redevelopment

Under California's now-defunct redevelopment law, redevelopment agencies had certain land use and taxation powers. These powers could be very helpful in aiding recovery of areas hard hit by a major earthquake. They included:

Tax Increment Financing — A method of public financing that uses future growth in the assessed valuation of property, and the resulting increases in property taxes, to pay for current improvements that are projected to lead to such increases in assessed valuation. Prior to the state's decision to eliminate community redevelopment agencies in 2011, tax increment financing funded a wide variety of public/private redevelopment and infrastructure projects.

Parcel Assembly — The process of acquiring several small, contiguous lots to make one larger parcel of developable land.

Eminent Domain — The power to take private property for public use following the payment of just compensation to the owner of that property.

Fortunately, a separate provision of state law[55] allows for the creation of reconstruction authorities "with powers parallel to those of a community redevelopment agency, except that the reconstruction authority would be authorized to operate beyond the confines of designated redevelopment areas and would have financing sources other than tax increment sources." This section is known as the Disaster Recovery and Reconstruction Act of 1986.

But it is unclear what powers these reconstruction authorities would have, if any, since community redevelopment agencies no longer exist. Would they have the authority that redevelopment agencies used to have? Or would they have no powers, since community redevelopment agencies have been dissolved and successor agencies are reduced to winding down the affairs of the former redevelopment agencies?

This law needs to be amended to be more explicit about the powers available to reconstruction authorities now that redevelopment agencies have been dissolved. One option is to model reconstruction authorities on the Capitol Area Development Authority (CADA) legislation.[56] CADA is an existing joint powers authority with the same powers that community redevelopment agencies used to have, including the ability to utilize tax increment financing. CADA was not struck down with the rest of redevelopment law and could serve as a reference point for clarifying the specific powers of reconstruction authorities.

Additionally, the Disaster Recovery and Reconstruction Act empowers local authorities to create recovery and reconstruction plans (prior to a disaster) that would enable:

1. Evaluations of the vulnerability of specific areas to damage from a potential disaster
2. Streamlined procedures for modifying existing general plans or zoning ordinances affecting vulnerable areas after a disaster
3. Contingency plans of action and organization for recovery after a disaster, including reconstruction

SPUR's Recommendations for Redevelopment

BEFORE THE DISASTER

24. Amend the Disaster Recovery and Reconstruction Act to clarify the powers, including public and private financing tools, that a recovery authority would have in the post-disaster period.

Now that redevelopment agencies have been dissolved, no new redevelopment areas can be created in the wake of a major disaster. The California State Legislature should amend the Disaster Recovery and Reconstruction Act to provide reconstruction agencies with some of the same powers that redevelopment agencies used to have, including the power to use tax increment financing in reconstruction areas.

Responsible Parties: The California State Legislature in coordination with the governor

25. Prepare a recovery plan that includes a streamlined procedure for modifying general plans and zoning ordinances, as well as any other local authorizations needed for the activities referenced in the recovery plan.

This recovery plan can be codified in the recovery and reconstruction ordinance drafted in advance of the disaster.

Responsible Parties: Planning departments

AFTER THE DISASTER

26. Where needed, create new reconstruction authorities and adopt disaster recovery plans to aid areas suffering from major damage.

Jurisdictions should determine appropriate ways to finance the activities of the reconstruction authority, including public and private funding sources. If tax increment financing is needed, cities will need to establish a reconstruction authority with powers to generate tax increment financing.

Responsible Parties: Planning departments; city councils and boards of supervisors to establish reconstruction authorities

NON-CONFORMING USES

Often, a previously allowable use of property continues to exist in an area where the zoning has changed. For example, sometimes industrial operations persist in a neighborhood now zoned only for residential use. These are known as "non-conforming uses." In other cases zoning changes and code upgrades can create certain rules for new development that existing development does not meet (such as requirements to provide a certain amount of parking per unit, a certain building setback, a certain bedroom size, etc.). The pre-existing buildings are called "non-complying structures."

After the disaster, if the existing codes do not already specify, planners and building officials will need to decide whether to allow owners to rebuild non-conforming uses and non-complying structures or whether to require owners to meet current zoning and building codes. Most likely, they will have to make these decisions in the face of enormous pressure to let owners rebuild what existed before the disaster and to waive planning and building requirements to the extent allowed by state law.

Dealing with non-conforming uses and non-complying structures is going to be one of the key challenges in the post-disaster period. Requiring owners to build to current standards will likely increase the seismic resilience of the entire city. However, funding for the repair and replacement of private structures may not be sufficient to cover the entire cost of upgrading a structure to current standards. This may lead private owners to choose not to reinvest in their properties.

San Francisco's Approach to Non-Conforming Uses

In San Francisco, non-conforming uses destroyed by an "act of God" may be rebuilt, subject to certain restrictions. The rebuilt structure must be permitted by the building department, and construction must commence within 18 months and thereafter be "diligently prosecuted to completion." Generally, such rebuilt structures must meet current building and fire codes. They may also include an intensification of use (such as more housing units or more commercial space built on the same site), as long as that intensification is allowed under the current planning code and does not increase the non-compliance of the structure.

As mentioned in Section II of this report, the California Building Code requires seismic improvement, rather than simple repair to pre-earthquake condition, for buildings that have been substantially damaged. San Francisco has adopted regulations that clarify those requirements.

SPUR's Recommendations for Non-Conforming Uses

BEFORE THE DISASTER

27. Develop a policy to determine when non-conforming and non-complying uses can be rebuilt.

One possibility is to follow San Francisco's example and allow the reconstruction of non-conforming and non-complying uses as long as construction complies with building code requirements and commences within a certain period of time.

Responsible Parties: Planning and building departments

28. Develop local procedures to assure that the post-earthquake repair and retrofit requirements of the California Building Code are met, including the appropriate collection of building damage information.

Responsible Parties: Building departments

AFTER THE DISASTER

29. Implement local procedures to assure that the post-earthquake repair and retrofit requirements of the California Building Code are met.

Responsible Parties: Building departments

HISTORIC PRESERVATION

After a disaster, many historic buildings may be damaged, as may buildings that are not listed as historic resources but that add to community character. In the post-disaster period, it will be difficult to sort out which buildings are critical to preserve even if they have sustained substantial damage. Policy-makers will need to weigh the importance of the resource against the degree of the damage and consider the impact of aftershocks, which may harm the resource even more and pose additional safety concerns.

If policy-makers are too quick to issue demolition permits, valuable historic resources could be lost. The good bones and fine character that many historic buildings provide can serve as anchors for re-planning neighborhoods that experience major damage after an earthquake. In instances where too many historic resources are destroyed in favor of new development, the character of neighborhoods can erode. At the same time, delaying demolition can lead to potential safety hazards, especially if aftershocks occur. Denying demolition permits without providing resources for historic rehabilitation can delay recovery if buildings are boarded up for long periods of time.

Emergency Repair or Demolition?

After an earthquake, local building departments will evaluate properties and tag buildings based on their level of damage. A green tag means no unsafe conditions have been found. A yellow tag indicates restricted use, meaning a building either requires further evaluation or is okay to occupy except for designated areas. A red tag means a building is currently not safe to occupy.

Local jurisdictions will have to make a decision about red-tagged buildings. They can require emergency shoring, barricading or emergency demolition, or they can mandate that the building be repaired or demolished following adopted permit procedures. If a building is a designated historic resource (e.g., it is listed on a national, state or local historic register) or a potential historic resource (e.g., it is determined to be eligible for the national or state register), then, unless the project is exempt, the building may only be demolished or significantly altered if the impact is evaluated. Typically, demolition or significant alteration would result in a significant unavoidable environmental impact under CEQA, in which case the decision-making body would have to adopt a finding that the benefits of the project outweigh the impact (referred to as a "statement of overriding considerations") in order to authorize the project.[57]

As discussed in more detail in the "Environmental Review" section, a disaster exemption could apply in the wake of a natural disaster, in which case even a listed historic resource could be demolished without CEQA review if the building poses an imminent threat of bodily harm or damage to adjacent property (or, possibly, if the SHPO authorizes the demolition or significant alteration).[58] As explained in the "Environmental Review" section, "imminent threat" should be clearly defined. Many historic preservation battles in the post-disaster period have focused on the interpretation of this term.

SPUR's Recommendations for Historic Preservation

BEFORE THE DISASTER

30. Complete survey work to help clarify which buildings are historic resources and which are not. Complete the process of designating individual historic resources and historic districts before a disaster occurs.

Local jurisdictions should complete the planning work needed to determine which buildings are most valuable from a historic perspective prior to a major earthquake. It will be much harder to make such decisions in a deliberative manner after an earthquake has occurred.

Responsible Parties: Planning departments

31. Encourage the retrofit of historic structures so that they will be able to withstand an earthquake.

Responsible Parties: Planning and building departments in coordination with historic preservation groups

32. Work with local historic preservation groups or plan to assemble a team of historic preservation professionals to survey damaged buildings and provide advice to local governments and property owners about which buildings must be preserved and which can be altered or demolished.

Responsible Parties: Planning and building departments in coordination with historic preservation groups

33. Compile information on financial incentives for retrofitting historic resources before the disaster and financing the repair of historic resources after the disaster.

Responsible Parties: Planning departments

57 See CEQA Guidelines Section 15043.

58 See California Public Resources Code Section 5028. Note that if FEMA is involved in funding the demolition, FEMA would need to ensure compliance with NHPA before the demolition, regardless of whether there is a CEQA exemption.

AFTER THE DISASTER

34. Ensure that building departments coordinate with planning departments and historic preservation professionals when determining which damaged historic buildings present an imminent threat to public safety.

Planning departments and historic preservation professionals may have input regarding such buildings that would lead building departments to consider recommending that a building be shored until it could be rebuilt, as opposed to demolished.

Responsible Parties: Building departments in coordination with planning departments

35. Work with local historic preservation groups and historic preservation professionals to survey damaged historic buildings and advise owners about how to shore up damaged buildings.

After the Northridge Earthquake, historic preservation groups (including the Historic Resources Group, the Los Angeles Conservancy, Hollywood Heritage and the American Institute of Architects Historic Resources Committee) worked with city officials to help cross-reference a list of damaged buildings with listed historic resources. Historic preservation groups attempted to identify the owners of damaged historic buildings and provide them with information on how to shore up and stabilize those buildings in the near term, as well as how to repair the buildings in the longer term.

Responsible Parties: Historic preservation groups in coordination with planning and building departments

36. Clarify to the public that a red tag is not an order to demolish a property.

Responsible Parties: Building departments

37. Identify funds for shoring up buildings until a determination regarding demolition and alteration can be made.

FEMA may reimburse cities for the temporary shoring and stabilization of damaged buildings and for demolition that might be required if there is an immediate threat to life, public health and safety.

Responsible Parties: Planning departments in coordination with historic preservation groups

38. Identify sources of funds and provide other incentives to help private owners rehabilitate their historic properties after an earthquake.

Responsible Parties: Planning departments in coordination with historic preservation groups

AFFORDABLE HOUSING

Housing is linked to every aspect of a city's recovery: Businesses, neighborhood districts, schools and cultural institutions all rely on residents being able to stay in their jurisdiction after a disaster. If people can remain in their homes, they will be better able to put their energy and resources into rebuilding their neighborhoods. If they leave the city, they may not return, and recovery may be substantially delayed.

Low-income households are disproportionately impacted by disaster. While wealthier households can relocate for awhile and make use of private resources to rebuild their homes, low-income families may need to rely more heavily on public resources during the period immediately following a disaster, and they may require additional help with long-term recovery.

Exacerbating the discrepancy, in some areas low-income households are more likely to live in housing that's vulnerable to earthquake damage, including units that are rent-controlled or "naturally affordable" because they have not been well maintained, they're located in low-income neighborhoods or they're small (e.g., single-room occupancy units). In San Francisco, some rent-controlled housing lies in liquefaction areas. Many rent-controlled buildings have not been properly retrofitted, partly because rent control law prevents landlords from passing on the cost of certain types of retrofits to tenants.

In other parts of the region, such as the "flats" of the East Bay, low-income households live in areas susceptible to liquefaction and in housing that may not withstand an earthquake. If large swaths of low-lying liquefaction-prone areas experience significant damage after a major earthquake, it may be difficult to encourage private owners, particularly owners of multifamily housing, to rebuild. Even if housing is rebuilt, there is no guarantee that the people who lived there before will return.

Permanently affordable subsidized housing is much more likely to fare well after a disaster. Typically, this type of affordable housing is owned by a socially motivated nonprofit that is trying to both preserve the building and serve low-income households over time. Providers of affordable housing often invest in strengthening their buildings through rehabilitation projects. After a disaster, they will continue to serve low-income populations. However, many affordable housing

providers don't have sufficient earthquake insurance due to the expense and the fact that this type of insurance does not provide substantial coverage. After a disaster, affordable housing providers may need additional assistance to repair and rebuild.

Much of the region's public housing (housing owned and managed by the federal government through local housing authorities) was built quickly and inexpensively in the 1950s and '60s. Governmental authorities have repeatedly cut funding over the past several decades, which has significantly delayed the upkeep and maintenance of these buildings. It is unclear how this housing will perform in a major earthquake.

SPUR's Recommendations for Affordable Housing

BEFORE THE DISASTER

39. Develop programs to make seismic upgrades to dangerous building types that house low-income people so that low-income households can stay in their homes after an earthquake.

Building types to focus on include multifamily soft-story buildings (i.e., those with garage doors or other large openings on the ground floor), unreinforced masonry buildings and other types of structurally unsound housing. Funding will be needed to support these efforts.

Responsible Parties: Planning and building departments

40. Rebuild public housing through federal programs such as Hope VI or local programs such as San Francisco's HOPE SF Program.

Cities should find ways to rehabilitate public housing that is not being rebuilt through HOPE VI or other programs.

Responsible Parties: Mayor's offices of housing or community development departments in coordination with affordable housing developers

41. Convert private multifamily housing that houses low-income people to nonprofit ownership through acquisition/rehabilitation strategies.

Responsible Parties: Mayor's offices of housing or community development departments in coordination with affordable housing developers

42. Work with developers and managers of affordable housing nationally to determine the viability of establishing a private insurance pool to capitalize or purchase less expensive hazard insurance.

Responsible Parties: Local governments in coordination with developers and managers of affordable housing and California Housing Finance Agency

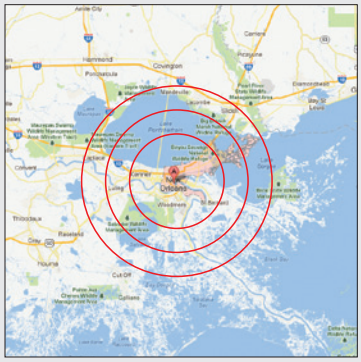
AFTER THE DISASTER

43. Include affordable housing as part of any post-disaster damage assessment, and ensure that areas that are being re-planned after a disaster include affordable housing.

When determining what resources will be needed to rebuild after a disaster, jurisdictions should be sure to include affordable housing as part of the request for federal recovery funding. At the same time, if new reconstruction authorities are established with the power to raise tax increment financing, some of that financing should pay for affordable housing uses. Under California's previous redevelopment legislation, 20 percent of tax increment financing went to affordable housing uses.

Responsible Parties: Building, planning, finance and community development departments, mayor's offices of housing

Case Study: New Orleans, LA
Post-Disaster Planning to Manage Risk



map ©2013 Google

On August 29, 2005, Hurricane Katrina overwhelmed New Orleans' levees and flooded the city, affecting 80 percent of its land area and almost 230,000 homes and reducing its pre-disaster population of 455,000 to less than 200,000 in subsequent months.[59] In the storm's immediate aftermath, there was a widespread recognition that ambitious, long-range planning was necessary to address both the post-disaster recovery needs and the myriad, seemingly intractable problems that had plagued the city prior to the storm.[60]

New Orleans' mayor responded by convening an ad hoc commission, the Bring New Orleans Back (BNOB) Commission, that devised a series of high-level plans in January 2006 to address a full spectrum of recovery and community improvement issues.[61] By far the most controversial of these was the Urban Planning Committee report, which endorsed the idea of shrinking the city's footprint and replacing certain low-lying neighborhoods with green space.[62] The report also recommended that more detailed neighborhood-based planning be conducted to evaluate the long-term viability of heavily damaged neighborhoods. This next phase of the BNOB process did not materialize, as funding and political support for the controversial document faltered, but the concept of neighborhood-based planning endured.

In the spring of 2006, the New Orleans City Council stepped into the post-BNOB planning void and funded a neighborhood-based effort, called the New Orleans Neighborhoods Rebuilding Plan, through the end of the summer of 2006.[63] This process focused on the immediate needs of the hardest-hit neighborhoods — those in low-lying areas — which made up slightly more than half of the city's officially recognized 73 neighborhoods. Essential to the plan's recommendations was an assumption that 100-year flood protection would be provided expeditiously to the entire city and future flood risk would be reduced to a more acceptable level. In contrast to the BNOB plans, the New Orleans Neighborhoods Rebuilding Plan contained few recommendations for hazard mitigation and flood-risk management and focused instead on restoring the neighborhood housing, infrastructure and quality of life lost in Katrina.

By early summer 2006, it became clear that these and other previous planning efforts lacked either the political support or the comprehensiveness of other parish recovery plans that were being submitted to the Louisiana Recovery Authority.[64] BNOB had produced a high-level (albeit controversial) framework for rebuilding, and the Neighborhoods Rebuilding Plan provided a more detailed set of recovery plans for a portion of the city's neighborhoods. In addition, many neighborhoods were continuing to organize and undertake planning efforts of their own, with the assistance of universities and consultants throughout the country.

Finally, in late August 2006, New Orleans' mayor, City Council and City Planning Commission (CPC) and the Louisiana Recovery Authority signed a memorandum of understanding to support the development of a new plan, the Unified New Orleans Plan (UNOP). Funding for UNOP came mainly from the philanthropic community. New Orleans' CPC staff helped design the five-month UNOP process, which took a two-tiered approach to planning from the start.[65] A citywide planning team had two key charges: to assess the more systemic citywide recovery needs, such as infrastructure recovery, and to unify the previous and ongoing planning efforts into one

59 Olshansky, Robert B., and Laurie A. Johnson. 2010. *Clear as Mud: Planning for the Rebuilding of New Orleans*. Chicago, IL and Washington, DC: American Planning Association.

60 Johnson, Laurie A., and Raphael Rabalais. "Planning for Post-Disaster Rebuilding: An Update from New Orleans — An Invited Comment." *Natural Hazards Observer*, May 2007.

61 Nagin, Ray, and Bring New Orleans Back Commission. 2006. "Rebuilding New Orleans, Final Summary," www.bringneworleansback.org

62 Olshansky, Robert B., and Laurie A. Johnson. 2010. *Clear as Mud: Planning for the Rebuilding of New Orleans*. Chicago, IL and Washington, DC: American Planning Association.

63 Lambert Advisory LLC and Shedo LLC. 2006. "City of New Orleans Neighborhoods Rebuilding Plan, Summary."

64 Johnson, Laurie A., and Raphael Rabalais. "Planning for Post-Disaster Rebuilding: An Update from New Orleans — An Invited Comment." *Natural Hazards Observer*, May 2007.

65 UNOP (Unified New Orleans Plan). 2007. "Citywide Strategic Recovery and Rebuilding Plan, Final Draft."

Laurie Johnson

To effectively represent the demographics of pre-Katrina New Orleans, the UNOP simulcast its second community congress (pictured) in other cities, reaching displaced residents living in Dallas, Houston, Atlanta and Baton Rouge.

comprehensive Citywide Strategic Recovery and Rebuilding Plan. Another group of planning consultants worked at the district level, constructing recovery plans for each of the city's 13 planning districts (administrative areas delineated by the CPC during the 1980s). Consultants were selected through a national "request for qualifications" process overseen by a panel of national planning experts. Citizens and neighborhood groups also had input into the selection of the district planning consultant teams.

Both the citywide and district teams followed a similar three-phase process: First, they conducted a comprehensive recovery assessment; second, they developed and selected their recovery scenario preferences; and third, they constructed recovery plans and a prioritized list of recovery projects.[66] Appendix 2 provides a list of sectors analyzed on a citywide basis, as well as the neighborhood assessment guidelines used by the district teams.

Community congresses were simulcast in New Orleans, Houston, Dallas and Atlanta to include residents displaced by the storm. Residents shared their views on what was best for the city as a whole and voted on priorities for flood protection, neighborhood stabilization, housing, infrastructure, public facilities and public services.

The UNOP process also had an extensive communications component, including newsletters, media relations, neighborhood meetings and other innovative strategies to address the unique conditions of the project. District planners held four rounds of meetings in each planning district during four designated weekends.

Three citywide community congresses brought together between 300 and 2,500 New Orleanians (both those living locally and those still displaced by the storm) to provide input into the citywide planning process. The second and third community congresses were conducted as simulcast meetings in New Orleans, Houston, Dallas and Atlanta, with many others linked via the Internet at libraries and other meeting sites across the country. In these congresses, residents from a variety of neighborhoods shared their views on what was best for the city as a whole and voted on priorities for flood protection, neighborhood stabilization, housing, infrastructure, public facilities and public services. Throughout the process, the planning teams maintained a top-down and bottom-up interaction that, coupled with the broad citizen input, helped establish recovery scenario preferences and principles for the plans.[67]

The UNOP plans focus on a strategic recovery framework and work to balance citizens' preferences with two key risks that could undermine the city's future and any recovery investments: the pace of repopulation and the risk of future flooding.[68] As of January 2007, only half of New Orleans' pre-Katrina population had returned, but forcibly shrinking the city's footprint to respond to a smaller population was not a politically palatable option. The plan proposed that the phasing of infrastructure and public facilities investment reflect post-Katrina population shifts. Through public investment decisions and direct financial assistance to residents and businesses, the plan aimed to boost the recovery of repopulating areas and to promote the clustering of residents who reside in areas slow to repopulate. In all, the citywide plan identified 95 priority recovery projects totaling more than $14.3 billion to be completed over a 10-year period.[69] These projects represented the gaps in both the public and private funds already allocated toward New Orleans' recovery. As of January 2007, roughly $40 billion in public and private funds had either been obligated or already spent in New Orleans. But the vast majority of this funding was directed toward emergency assistance and the short-term needs of individuals and property owners; a relatively small portion of federal assistance went to longer-term rebuilding activities such as housing and infrastructure restoration.[70]

66 *Ibid*

67 Johnson, Laurie A., and Raphael Rabalais. "Planning for Post-Disaster Rebuilding: An Update from New Orleans — An Invited Comment." *Natural Hazards Observer*, May 2007.

68 UNOP (Unified New Orleans Plan). 2007. "Citywide Strategic Recovery and Rebuilding Plan, Final Draft."

69 *Ibid*

70 *Ibid*

In December 2006, New Orleans' mayor created an Office of Recovery Management (ORM) to coordinate and direct recovery efforts. While the UNOP review was underway, the ORM developed a recovery planning implementation vision, which it released on March 29, 2007.[71] The City of New Orleans' Target Area Plan identified 17 recovery zones in business corridors around the city where public recovery funds would be used to fund repair and reconstruction of key public facilities and infrastructure in an effort to spur redevelopment and private investments in these areas and also enhance quality of life.[72] The target areas were determined by the ORM and CPC staff and based on previous planning efforts, most notably the neighborhood stabilization and clustering programs and policies recommended in the UNOP citywide and district plans.[73]

As of January 2007, only half of New Orleans' pre-Katrina population had returned, but forcibly shrinking the city's footprint to respond to a smaller population was not a politically palatable option.

The ORM and CPC staff packaged the Target Area Plan and the UNOP plans into the New Orleans Strategic Recovery and Redevelopment Plan, which the City Council approved on June 21, 2007.[74] Then, on June 25, the Louisiana Recovery Authority approved the same plan as the official recovery plan for the parish of Orleans and also officially received UNOP as the foundation for the Orleans Parish recovery plan and characterized it as "representing a citizen-driven recovery vision for the entire city of New Orleans."[75]

In October 2007, the ORM merged with other city agencies to become the Office of Recovery Development and Administration (ORDA). It continued its focus on developing and bundling recovery programs and funding until it was dissolved in 2010. The New Orleans Redevelopment Authority also has had a major role in post-disaster recovery, leading a comprehensive blight-reduction strategy for the city and working with the state's recovery authority to receive, manage, package and resell properties sold to the state as part of Louisiana's post-Katrina housing repair program.[76] The city also instituted many governmental reforms recommended by UNOP and other recovery planning efforts, including the preparation and adoption of a new master plan and comprehensive zoning ordinance, which are now guiding recovery and revitalization.

The city has continued to face fiscal challenges in managing its operating expenses while also raising the necessary capital to fund recovery.[77] Meanwhile, the 2010 census confirmed that New Orleans' population was still nearly 30 percent below its 2000 level. However, rebuilding may have helped the city maintain a relatively low unemployment rate throughout the nationwide recession and oil spill crisis.[78] New Orleans continues to face tremendous uncertainty about safer long-term rebuilding. Billions of dollars must be invested in wetlands restoration, systematic levee rebuilding, home elevation and other forms of hazard mitigation to make New Orleans safer in the long run. Massive blight and significant flood risk remain the region's major challenges.[79]

71 City of New Orleans. 2007. "Office of Recovery Management Target Areas."

72 *Ibid*

73 CPC (City Planning Commission). 2007. "Consideration of the Citywide Strategic Recovery & Rebuilding Plan," Final City Planning Commission Report.

74 Olshansky, Robert B., and Laurie A. Johnson. 2010. Clear as Mud: Planning for the Rebuilding of New Orleans. Chicago, IL and Washington, DC: American Planning Association

75 LRA (Louisiana Recovery Authority). 2007. "A Resolution to Approve Orleans Parish Community Recovery Planning."

76 City of New Orleans. 2010. "Blight Strategy."

77 City of New Orleans. 2010. "2011 Annual Budget."

78 Brookings Institution. 2011. Resilience and Opportunity Lessons from the U.S. Gulf Coast After Katrina and Rita. Washington, DC: Brookings Institution.

79 *Ibid*

Section 4

Financing:
The Fuel for Disaster Recovery

Money is the fuel for disaster recovery: It largely determines what gets rebuilt and when. Even if communities engage in rigorous efforts to develop comprehensive recovery and rebuilding plans before a disaster strikes, implementing the plans is always contingent on funding.

Some of the potentially significant financing challenges that Bay Area communities are likely to face after a disaster include:

- Determining rebuilding policies and finding the necessary funds to remediate ground failure areas, particularly areas impacted by liquefaction and slope failures
- Managing blight in areas with heavy commercial or residential damage, particularly areas that are still heavily impacted by the foreclosure crisis and older commercial centers that were already in decline
- Funding any significant reconstruction and redevelopment efforts, including infrastructure, government centers, medical and educational facilities, and private development

Financing disaster recovery is particularly challenging when a community aspires to rebuild in ways that do not conform to pre-disaster conditions. Insurance policies and federal disaster recovery assistance programs, such as FEMA's Public Assistance Program insurance, are not always flexible enough to allow for alternatives or improvements that meet a community's desires. If a community decides to use the post-disaster window of opportunity to implement improvements or rebuild in a more resilient way, it will need to engage a wide range of public and private stakeholders and resources — and then package and apply those resources in new and creative ways.

The Bay Area's Disaster Financing Problem

In the wake of a major earthquake in the Bay Area, disaster-impacted cities will face major long-term challenges in obtaining recovery funding. Studies show that the cost to rebuild damaged housing, businesses and infrastructure following a magnitude 7 earthquake on the Hayward Fault (similar to the one that occurred in 1868) would likely exceed $100 billion; following an event similar to the magnitude 7.9 earthquake that occurred on the San Andreas Fault in 1906, this cost would likely exceed $150 billion.[80]

California's most recent significant earthquakes — specifically, the 1989 magnitude 6.9 Loma Prieta and 1994 magnitude 6.7 Northridge earthquakes — had far smaller impacts than the earthquakes described above and are not good models for evaluating whether we have the resources to rebuild.

Losses from the 1989 Loma Prieta Earthquake have been estimated at more than $6 billion in property damages and $960 million in insured losses (in 1989 dollars).[81] Although Santa Cruz and Watsonville were devastated, the urban core of the Bay Area was largely spared, with heavy damage in San Francisco and Oakland limited to pockets where the effects of amplified ground shaking and liquefaction were particularly pronounced. Current estimates suggest that a repeat of the 1989 earthquake would cost $38 billion in economic losses and $3.6 billion in insured losses.[82] This loss is still far less than the projected costs of the most likely ruptures on the Hayward or San Andreas faults.

The Northridge Earthquake, which struck Los Angeles in 1994, damaged more than 100,000 housing units and left 20,000 people homeless. Residential losses totaled $20 billion and accounted for nearly half of the total property damages and associated losses of $41 billion.[83] Private insurance also paid for half of all residential losses.[84] In the San Fernando Valley, where the earthquake was centered, approximately 60 percent of all homeowners had earthquake insurance.[85] As described below, this level of earthquake insurance coverage far exceeds current levels in California.

Availability of Financial Resources for Recovery

Planning for post-disaster recovery may involve land use changes and new building standards that improve on pre-disaster conditions. Implementing such decisions requires a good working knowledge of the financial resources that stakeholders can offer, as well as their willingness to stay in the jurisdiction and contribute to the community recovery. If funding is not available or if it cannot be readily accessed and used to meet individual and community needs, the recovery may stall and people and businesses may decide to move elsewhere. A sustainable community recovery calls for a mix of private and public financing sources.

Private-Sector Resources

Private-sector resources include the contributions of individuals and businesses, insurance payments, donations and funding available from private nonprofit and charitable organizations.

In most areas of the United States, insurance is a foundational element of a community's disaster recovery. However, Californians are significantly underinsured against the risk posed by earthquakes. There are 1.15 million residential earthquake policyholders in California, representing only 11.3 percent of California homeowners (see Figure 3), and most of the policies have high deductibles and other limits and constraints on coverages.[86] Commercial properties, particularly small businesses, are also underinsured. Unless there

Figure 3: How Many Californians Have Earthquake Insurance?

Although it is almost certain that a major earthquake will occur in California in the next 30 years, residents are not purchasing earthquake insurance. In part, this is because earthquake insurance is very expensive and the deductibles are quite high. Absent private insurance, most California homeowners will be looking to the public sector and their own pocketbooks for the resources to rebuild after the next major earthquake.

Total Commercial Lines		**6.87%**	**Percentage of Insurance Policies With Earthquake Peril Coverage**
Total Residential Market	Total Homeowners Market	**11.30%**	
	Total Rental Market	**5.85%**	
	Total Condominium Market	**18.09%**	
	Total Mobile Home Market	**15.07%**	

Source: State of California, Department of Insurance, Earthquake Premium and Policy Count Data Call, 2011.

are major market reforms, insurance will be a limited resource after future Bay Area earthquakes.

Donations are a significant component of post-disaster financial assistance, particularly early on after a disaster, when media attention is high. Nongovernmental organizations, private nonprofit entities, faith-based organizations, foundations and businesses provide both material and financial assistance to individuals, families, community organizations and local governments. Much of this assistance is focused on the immediate needs created by the disaster, but some organizations do provide resources for recovery, ranging from immediate repairs to homes to funding for long-term investments in housing, schools, infrastructure and other critical elements of the community's well-being. Communities are often challenged to manage donations effectively. The volume of donations, particularly immediately after a disaster, can overwhelm the community's systems for receiving the donations and channeling them to meet needs appropriately. In some cases, local governments and other community organizations may not have the authority or means to accept and use donations.

Private investment will ultimately be required for recovery. Residents, property owners, retailers and businesses must decide that it is worth the risk to invest in rebuilding. In addition to contributing their own resources, they must be able to secure financing for their plans, which means that financial institutions must also decide that investment in the community is worth the risk. It is critical that a community develop momentum and foster confidence in recovery so that residents, businesses and financial institutions "tip in" and decide to add their own resources. Often, private investment will wait until public investment occurs — that is, homeowners and others will not take steps to rebuild until repairs to infrastructure and public facilities, such as neighborhood schools, are visibly underway. This may be particularly true in communities that plan to make improvements or rebuild differently. Private entities may be reluctant to support or engage in redevelopment if it appears that the redevelopment will not have adequate funding or will languish in lengthy delays.

80 Kircher, Charles A., Hope A. Seligson, Jawhar Bouabid, and Guy C. Morrow. 2006. "When the Big One Strikes Again: Estimated Losses Due to a Repeat of the 1906 San Francisco Earthquake." *Earthquake Spectra 22* (Special Issue II): S297–S339; RMS (Risk Management Solutions, Inc.). 2008. "1868 Hayward Earthquake: 140-Year Retrospective," www.rms.com/Publications/1868_Hayward_Earthquake_Retrospective.pdf

81 RMS. 2009. "Catastrophe Modeling and California Earthquake Risk: A 20-Year Perspective." RMS Special Report, www.rms.com/publications/LomaPrieta_20Years.pdf

82 *Ibid*

83 Petak, William J., and Shirin Elahi. 2001. "The Northridge Earthquake, USA and Its Economic and Social Impacts." Laxenburg, Austria: International Institute for Applied Systems Analysis (IIASA), www.iiasa.ac.at/Research/RMS/july2000/Papers/Northridge_0401.pdf

84 City of New Orleans. 2007. "Office of Recovery Management Target Areas," www.cityofno.com/portal.aspx?tabid=95

85 Comerio, Mary. 1998. *Disaster Hits Home: New Policy for Urban Housing Recovery*. Berkeley, CA: University of California Press.

86 State of California, Department of Insurance. 2011. "Department of Insurance, Earthquake Premium and Policy Count Data Call."

Local Government Resources

In the most severely affected communities, local governments will be overwhelmed by the disaster. The extraordinary demands of responding to the earthquake will exceed available resources, requiring significant state and federal assistance. The local government's workforce will be disrupted by facility damage, the displacement of workers and a lack of funding to sustain government operations. The earthquake will also impact the local economy, reducing tax receipts and the availability of resources for long-term recovery. Additionally, public coffers may already be limited given the economic downturn of recent years and the loss of some key financing mechanisms, such as redevelopment funds. See "Redevelopment" section on page 38. These factors may prevent our region's local governments from leading a sustainable community recovery and from implementing any improvements to rebuilding.

Some communities create new revenue streams to make up for their post-disaster funding shortfalls and facilitate recovery. For example, following the 1989 Loma Prieta Earthquake, the voters of Santa Cruz County and the county's cities approved a 0.5 to 1 percent transaction and use tax to help finance capital improvements and public projects related to earthquake recovery.[87] However, a community's ability to pass such measures depends heavily on the timing of election cycles and the willingness of two-thirds of the electorate to approve the new taxes.

State and Federal Disaster Assistance

Recovery-related funding from the state and federal governments is primarily intended to supplement community resources to repair damaged public infrastructure and facilities. State and federal funds that go directly to the private sector have traditionally provided assistance in the form of loans for small businesses and funds for temporary housing and replacing damaged contents and goods. The massive impact of a major Bay Area earthquake will require a significant level of state and federal government assistance. This also means that these levels of government will play a central role in the Bay Area's recovery. The sheer volume of local governments, public districts, nonprofits and other qualifying agencies applying for these funds will cause delays in the timing and delivery of assistance.

In the event of a major Bay Area earthquake, the governor would declare a state of emergency and also request, and almost immediately receive, a presidential disaster declaration. This triggers assistance under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, our nation's primary legislation for disaster assistance. Under this authority, the federal government can mobilize federal resources to assist with response and recovery, provide funding to reimburse public agencies for the cost of emergency response and to repair publicly owned buildings and infrastructure (FEMA Public Assistance Program) and assist individuals and households with housing and immediate needs (FEMA Individual and Household Assistance Program). Other federal and state assistance programs would also likely kick in, such as programs to repair damaged highways and provide low-interest loans to homeowners and small businesses. Figure 4 shows typical assistance programs that are available following a major disaster and the more common direct and indirect recipients of these different resources.

Existing state and federal government assistance programs do not always provide resources that are required or desired. Often the funding doesn't come quickly enough and requires extensive application processes. Simply put, most of this money doesn't just flow; it has to be granted, which means that jurisdictions have to file project worksheets for Public Assistance, applications for FEMA Hazard Mitigation Grant Program funds and action plans for U.S. Department of Housing and Urban Development funding. Some programs require significant state and local matching funds and have other conditions and requirements that must be met. As a result, there will be bottlenecks at the state and federal levels in both processing and managing these program streams.

Working with state and federal government assistance programs may be particularly challenging when community recovery means more than simply restoring buildings and infrastructure to pre-disaster conditions. Communities may raise many questions in designing and implementing recovery strategies. Is it really cost-effective to repair public infrastructure just as it was? Should certain pieces of infrastructure be rebuilt differently? Are there opportunities to improve or replace existing buildings or systems that are aging or obsolete? Are there private-sector buildings and infrastructure for which the public sector should provide funding? Many assistance programs are not sufficiently flexible to accommodate these considerations. It is possible that the earthquake would have such a severe and widespread impact that it would trigger state and federal legislation approving supplemental funding to meet the longer-term challenges of rebuilding housing, infrastructure and local economies. But getting this legislation passed — and ensuring that it provides enough funding — is not guaranteed.

Ultimately, the Bay Area's communities will need to work collaboratively and creatively with each other, state and federal partners, local residents and businesses, and other investors and philanthropic organizations to craft a sustainable recovery vision and assemble the necessary funding to achieve it.

We make the following recommendations to help ensure that the region's constituents are in the best position to receive available disaster recovery resources and obtain new resources to assist in the rebuilding effort following a major disaster.

87 Santa Cruz Public Libraries. 2012. "1990 November General Election, Local Ballot Measures," www2.santacruzpl.org/ref/measures/index.php?PID=36&PHPSESSID=7fe20c8c6b91977412085e9e54774038&sr=15&pp=5&cp=4

Figure 4: How Recovery Funding Is Distributed

Funding for recovery comes from a variety of sources, including the federal government through the Stafford Act, the country's primary program for disaster assistance. Some funding is distributed directly to businesses and residents. Some goes to state and local governments for repairing public facilities and infrastructure, mitigating future disaster risk and other community improvements. Other sources flow to state and local governments for distribution to recipients further down the funding chain.[88]

		State Governments	Local Governments	Businesses and Residents
Federal Stafford Act Programs	FEMA* individual assistance programs	●→		○
	FEMA public assistance grants	●→	○	
	FEMA hazard mitigation grants	●→	○	
Other Federal Programs	FEMA community disaster loans		●	
	HUD** community development disaster recovery block grants	●→	○	
			●→	○
	HUD housing vouchers			●
	Small Business Administration loans			●
	Economic Development Administration grants		●	
	Department of Transportation grants	●→	○	
Non-Federal Sources	State assistance		●	●
	Local government assistance			●
	Private insurance		●	●
	Nonprofit assistance		●	●

* Federal Emergency Management Agency

** Department of Housing and Urban Development

●→ Distributor

● Direct recipient

○ Indirect recipient

88 Johnson, Laurie A. 2009. "Developing a Management Framework for Local Disaster Recovery: A Study of the U.S. Disaster Recovery Management System and the Management Processes and Outcomes of Disaster Recovery in 3 U.S. Cities," dissertation submitted in partial fulfillment of the doctoral degree, School of Informatics, Kyoto University.

SPUR's Recommendations for Financing

BEFORE THE DISASTER

44. Develop a comprehensive disaster recovery financing plan.

As described above, the federal government has a wide range of programs to provide disaster assistance to individuals, families, state and local governments, and private nonprofit entities. These programs supplement assistance that is available from the state. Additionally, state and federal legislation may provide supplemental funding to meet disaster-specific needs that are not readily addressed by existing programs. Local governments should:

- Assess the likely impacts of an earthquake, including how local government income streams would be affected by a disaster[89]
- Evaluate what assistance is and isn't available for key areas of recovery
- Develop a plan and mechanism for taking the steps necessary to maximize opportunities for assistance, and implement training for staff who would be responsible for plan implementation

Plans need to ensure in advance that the community has adequate resources to fund likely repairs and rebuilding, as well as the increased capacity necessary to meet the demands and pace of post-disaster recovery. This assessment should take into account those elements of recovery that require changes in land use, represent significant or long-term improvements to facilities or systems and do not readily fit within existing state and federal government assistance programs. Local governments should identify ways to address these elements (e.g., by integrating disaster recovery needs into local capital improvement programs and working with state disaster assistance program managers to determine the flexibility of grant programs to meet these needs.)

Responsible Parties: Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices, departments of emergency management, planning departments and other key local agencies

45. Develop and sustain procedures and staff skilled in applying for and receiving FEMA Public Assistance Program funds.

Local and regional government agencies and other governmental entities can use Public Assistance Program funds to repair or replace earthquake-damaged buildings and infrastructure. FEMA has produced detailed guidance for this program. In order to maximize the benefits of the program, it is imperative that local governments and other qualifying public and nonprofit agencies identify the procedures for applying for assistance, know the steps to adapt the program to community-specific needs, understand how much (or how little) flexibility there is to meet those needs and develop a plan for executing reconstruction work using grant funds. In general, the program pays to restore facilities to pre-disaster condition; however, there are options that allow local governments and other qualifying agencies to modify facilities to meet post-disaster circumstances. Local agencies should understand how program requirements and limitations can affect funding for planned improvements or new facilities; the program may not provide funding for elements of a community-wide recovery plan or changes that are driven by land use planning if they are not related to repairing damaged facilities. Additionally, grants for facility and infrastructure restoration require that local governments and federal agencies provide up to 25 percent of the funding for the project themselves. Local governments and qualifying agencies must develop plans to provide their part of the funding.

Responsible Parties: Finance departments (or the lead local agencies responsible for municipal finance) in coordination with city manager's offices, departments of emergency management and other key local agencies

46. Develop and adopt mechanisms to receive monetary and material donations. Actively seek resources from state and federal funders, the philanthropic community and private investors.

The Bay Area Urban Areas Security Initiative (UASI) has developed a regional donations management plan that leverages public-private partnerships for post-disaster donations management on both the regional and local levels. Under the plan, a local foundation acts as the fiscal agent to receive monetary donations, which are then disbursed to qualified service providers by a donations coordination team comprised of nonprofit and faith-based organizations. Local governments should be familiar with and adopt the UASI donations management plan and facilitate a collaborative effort among foundations, nonprofits and faith-based organizations in their communities. Local governments should also invest in systems such as AidMatrix, which manages material donations and connects them with donors, or should establish agreements with foundations that already have similar tools.

The City and County of San Francisco has launched a disaster recovery fund that enables it to accept tax-deductible monetary

89 Hazus — a GIS-based loss estimation software that is publicly available from FEMA — has been used by agencies to estimate likely damage levels to buildings, lifelines and other components of the built environment. It is also used to estimate social and economic losses resulting from selected scenario earthquakes, hurricanes or floods that most closely represent the event that just occurred. It can also be a very useful planning tool for considering the local damages and costs of various scenario earthquakes.

90 Wallace Bajjali, Development Partners. "Redevelopment Project Update: Joplin City Council Presentation," presented at the Joplin City Council, October 15, 2012, www.joplinmo.org/DocumentCenter/View/1298

Public-Private Partnerships (P3s)

P3 arrangements can provide private capital and operational resources to the recovery process. In the United States, P3 arrangements are becoming more prevalent as state and local governments seek ways to address infrastructure challenges when public funding resources are increasingly scarce. The replacement of San Francisco's Doyle Drive with the Presidio Parkway illustrates how a P3 arrangement can accelerate a critical infrastructure project considerably. The project involves up-front private investment, which has allowed the state to leverage its available funding. The management structure has reduced the state's risks of cost overruns and schedule delays, and it provides a guaranteed plan for maintenance for a certain period of time.

The City of Joplin, Missouri, has entered into a P3 arrangement, hiring a master developer to help rebuild its convention center complex, performing arts complex, clusters of affordable housing and other portions of the city that were destroyed by a tornado on May 22, 2011. The agreement includes a dozen potential projects, valued at nearly $800 million, with financing plans that involve a mix of federal and state disaster programs, tax increment financing from the city's redevelopment district, other government tax credits, private investment and long-term debt.[90]

donations online. The fund, established under the San Francisco Administrative Code, has received legal and legislative review and contains strict provisions for its use, enabling San Francisco to quickly access funds following a disaster while other sources of assistance trickle in.

Responsible Parties: Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices, departments of emergency management, community foundations and other key local nonprofit agencies

47. Develop strategies for economic recovery as part of ongoing economic development efforts.

If San Francisco had known prior to the 1989 Loma Prieta Earthquake that the Embarcadero Freeway might be damaged and there could be an opportunity for major redevelopment along the waterfront, would it have been possible to plan ahead to fund that project? Communities should make advance plans to finance potential land use changes that may result from a disaster. In many cases, such land use changes (e.g., removing elevated freeways or redeveloping shuttered industrial sites or closed military installations) can help stimulate economic development after a disaster.

Economic development planners should understand which government assistance programs are available and how they might be used to foster community economic development goals after a disaster. In particular, it is important to know what projects different programs will and will not cover. For example, in 1989, federal government assistance programs would not have paid to replace the Embarcadero Freeway with the surface street and public transit features that were eventually built in its place without significant waivers. But federal post-disaster hazard mitigation funds could be used to reinforce damaged civic buildings in San Francisco and Oakland and help stimulate renewal in surrounding neighborhoods.

Communities often have plans to rehabilitate aging or obsolete features or to replace vulnerable buildings or infrastructure with more resilient facilities; these plans should address how these activities could be implemented or accelerated in the event of an earthquake.

Responsible Parties: Economic development departments (or lead local agencies responsible for economic development) in coordination with planning and public works departments and other key local agencies

48. Incorporate seismic hazards and upgrade needs into capital improvement plans.

Cash-strapped local governments are increasingly pressured to delay major capital upgrades, and any available funds for capital improvement are more likely to pay for routine maintenance. Given the high likelihood of a major earthquake striking the region in the next 30 years, local capital improvement plans should give high priority to seismic reviews, retrofit and upgrades. These projects may be eligible for different and separate financing schemes.

Responsible Parties: Capital planning and public works departments (or lead local agencies responsible for capital improvements planning) in coordination with planning departments and other key local agencies

49. Work with regional and state entities to address known gaps in local recovery resources.

Regional agencies, such as the Association of Bay Area Governments (ABAG), should work with local governments and state agencies, such as the California Earthquake Authority (CEA), to promote catastrophe insurance or other financial resources to key groups to help fill known resource gaps (e.g., renter's earthquake insurance and funds for land remediation). In particular, local governments need to work to ensure that adequate funds will be available for all community residents and businesses to help them with their immediate post-disaster needs.

Responsible Parties: ABAG in collaboration with the region's local governments and with relevant state agencies, including the California Emergency Management Agency and the CEA

50. Conduct a state-level assessment of the fiscal and economic impacts of a major Bay Area earthquake.

State authorities should assess the fiscal impacts of a major Bay Area earthquake and then make recommendations about how to better prepare for and mitigate this potential statewide risk. Also, they should develop additional risk financing options (e.g., insurance) and make them available and accessible to the region's residents and businesses.

Responsible Parties: State treasurer and the California Emergency Management Agency in coordination with other state and regional agencies, including the CEA and ABAG, and with local governments

AFTER THE DISASTER

51. Conduct a comprehensive post-disaster economic loss assessment, and update or develop a comprehensive disaster recovery financing plan.

Once disaster strikes, in addition to assessing building and infrastructure damage, local governments need to consider social and economic impacts, including ripple effects such as lost wages and decreases in tax revenue. The information should be integrated into a disaster recovery financing plan that identifies the known available resources (both public and private) for recovery, the gaps and funding shortfalls and strategies for addressing those gaps.

Local staffing plans need to recognize that managing the recovery process will require additional resources. Staffing for specialized post-disaster procedures, such as expedited plan reviews and approval processes, sometimes does not qualify for FEMA Public Assistance Program funding.

If local governments have developed a pre-disaster recovery financing plan, they should reassess it and amend it as necessary once the disaster landscape is revealed. Also, local governments need procedures to identify and address the additional recovery needs that unfold over time, such as business closings and consequent unemployment. These consequences can dramatically complicate and even undermine recovery plans and initial investments.

A solid, defensible set of data is essential to making a case for post-disaster funding and resource needs. Without a thorough understanding of what will be needed, it will be time-consuming and difficult to develop ad hoc programs and implement new and creative financing schemes. Comprehensive and transparent post-disaster loss estimates can also ensure a fair distribution of resources unaffected by politics.

Regional agencies can provide guidance for undertaking these assessments and plans, for integrating the information into the regional picture and for communicating the region's recovery financing needs.

Responsible Parties: Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices and economic development, emergency management, building, public works and planning departments

52. Incorporate a realistic financing element into post-disaster community recovery planning processes and local government recovery plans.

Communities should develop a financing framework that accompanies local recovery plans and appropriately channels resources to support the community's vision. Recovery plans must include realistic options for obtaining the resources necessary to achieve their objectives. In particular, plans should recognize the limits of federal and state assistance programs and identify other sources of funding and investment. (For example, the FEMA Public Assistance Program may provide funding to restore damaged public buildings to pre-disaster condition but may not provide funding for significant changes.)

Responsible Parties: Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices and emergency management and planning departments

53. Develop and maintain proactive communications with capital markets and credit agencies.

Efforts to build local reserves and strong credit ratings can be erased in an instant when a major disaster strikes. After a disaster, communities often face dramatic declines in tax revenues and reductions in their credit ratings, impeding their ability to issue bonds — all at a time when additional staff and funds are needed to continue normal public services and finance recovery-related work. In the initial months and years following a major disaster, communities should proactively initiate and maintain good communication with credit agencies and major banks about local recovery plans, finances and budgets. For example, in New Orleans, after both the City Council and state recovery authority approved the city's post-Katrina recovery plan, elected officials and key city staff went on a post-disaster road show to New York and Washington, D.C., to share the recovery vision and help raise much-needed capital to finance the city's needs.

Responsible Parties: Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices and economic development, emergency

management, building inspection, public works and planning departments

54. Seek innovative ways to finance recovery projects.

A variety of mechanisms can finance recovery projects. These include public private partnerships (often called P3s; see page 53) and special districts established for specific development activities, such as infrastructure financing districts and community-based economic development districts. Geologic hazard abatement districts (GHADs) can also allow communities to reduce hazard-related vulnerabilities. (For more on GHADs, see sidebar at right).

Local government staffs need to know about innovative financing mechanisms, grant writing and fund raising in order to sustain recovery. They should also understand how to tap into other funding resources such as social-network donors, community banks, angel donors and socially conscious venture capital or investment funds.

Responsible Parties: Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices and emergency management and planning departments

55. Engage the private sector in planning for investment in recovery.

As described above, public funding will provide only part of the necessary recovery resources. But private entities may be reluctant to risk their resources if they are not confident that the recovery will be sustained. Local governments should engage financial institutions in recovery planning processes — in particular, those institutions that are based in the community or that have significant investments in the community. Local governments should work with investors to determine conditions that would encourage private investment, identify financial instruments that could be used to support recovery and develop ways to combine public funding and assistance programs with private investment to spur development.

Responsible Parties: Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices and economic development, emergency management and planning departments

Geological Hazard Abatement Districts (GHADs)

A GHAD is a local assessment district formed to prevent, mitigate, abate or control geologic hazards such as landslides, land subsidence or soil erosion. GHADs are governed by an elected board and offer a variety of financing tools, including landowner assessments collected through a property tax subject to approval by property owners within the district. GHADs allow communities to focus on mitigation and damage prevention and to react to unexpected events quickly. They also allow for an efficient way of collecting funds. Improvements undertaken by GHADs are exempt from CEQA review and provide a degree of immunity from liability for actions taken to reduce geologic risks.

56. Create a community recovery finance hub.

Local governments may need to assist residents, small businesses and local organizations in obtaining financial resources for recovery, particularly for post-disaster retrofits and land use mitigation efforts. We encourage local governments to create a recovery financing clearing house for the entire community — possibly with physical offices as well as a web presence — to centralize information on disaster assistance programs that might be available from federal, state and private sources. This clearing house should ensure that every person and organization in the community understands what programs exist, as well as their eligibility requirements, their basic rules and regulations, and how to maximize success in applying for funds. Local governments could partner with financial institutions to facilitate this process. Hub offices could be co-located with federal and state disaster assistance centers, or they could be located within community facilities such as libraries, neighborhood community centers and schools.

Responsible Parties: Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices, emergency management and planning departments, local financial institutions and federal and state disaster assistance partners

57. Secure resources for land use relocations and buyouts.

Communities have often funded either the relocation or the purchase and demolition of structures located in hazardous areas, in order to convert the property to open space or some other use that would reduce future vulnerability. In the United States, relocations and buyouts are frequently used to remove structures from areas that are flood-prone, often financed by FEMA Hazard Mitigation Grant Program funds. Similarly, FEMA Public Assistance Program funding can be used to relocate public facilities from hazardous areas, or to fund a share of an alternate project in lieu of restoring a facility in

a hazardous area. Such mechanisms could help remove structures from areas that are prone to liquefaction or earthquake-generated landslides. FEMA grants for relocations and buyouts may be limited because the activities don't meet program eligibility requirements or because they're not cost-effective. But in areas that are prone to multiple hazards, such as liquefaction zones that are also subject to flooding, the combined risk to structures may increase the cost-effectiveness of removing them. In the post-disaster environment, local governments should pursue opportunities to use grant funds for these purposes, work with state grant managers to fit relocation and buyout projects into recovery and mitigation programs and lobby to use disaster-specific funding programs to remove structures from hazardous areas.

Responsible Parties: Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices, emergency management and planning departments, and federal and state disaster assistance partners

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Case Study: Los Angeles, CA
Redevelopment for Recovery After the Northridge Earthquake

map ©2013 Google

The magnitude 6.7 Northridge Earthquake struck Southern California on the morning of January 17, 1994, causing 57 deaths, disrupting many of the region's freeways and infrastructure systems, damaging more than 25,000 businesses and 100,000 housing units and leaving 22,000 people homeless.[91] At the time, the Northridge Earthquake was the costliest disaster in U.S. history, with total direct economic losses exceeding $40 billion (1995 dollars), with $25 billion in property damage. Insured losses amounted to $14 billion.[92]

With a population of more than 3.5 million at the time, the City of Los Angeles sustained the majority of the region's damage, which was concentrated within the relatively suburban areas of the San Fernando Valley north of downtown. The city estimated its total losses at $790 million in damage to public facilities and infrastructure, as well as related emergency response costs, and $66 million in revenue losses.[93]

Prior to the 1994 earthquake, L.A. city staff had completed a draft of the first known example of a pre-disaster recovery plan. The final draft of L.A.'s recovery and reconstruction plan was awaiting City Council approval at the time of the Northridge Earthquake.[94] The draft plan established decision-making and administrative procedures for various city departments in the recovery period after a disaster.[95] A post-event analysis indicated that the recovery planning process gave department heads an opportunity to work through roles and responsibilities and to specify actions and programs that they then applied in the aftermath of the earthquake.[96] However, the organizational structure recommended by the plan was never applied. City leaders argued that the damage wasn't extensive enough and could be handled by existing agencies and departmental teams.[97]

Existing community plans, specific plans and zoning — which were up-to-date and described the status quo before the earthquake — were the primary guides for most of the city's post-earthquake decisions on land use, building heights, floor area ratios, setbacks, parking and sign control.[98] For four years, the city planning department grandfathered pre-existing zoning or nonconforming circumstances. Additionally, the planning department prepared, and the city council adopted, a new safety element on the basis of hazard and risk information derived from the earthquake. A reconstruction effort known as Rebuild L.A. had been launched following the 1992 South Central Los Angeles riots; it was actively underway at the time of the Northridge Earthquake and also provided a model for many initiatives the city took after the earthquake.[99]

After the Northridge Earthquake, the Los Angeles City Council directed the community redevelopment agency (CRA) to survey damage and conduct community meetings to explore creating emergency redevelopment districts as a tool for economic recovery.[100] The state Community Redevelopment Disaster Project Law, then in place, allowed cities to streamline the process of establishing redevelopment project areas to repair damage following a federally declared disaster.

To determine whether redevelopment was a viable approach, the CRA monitored damage information and used measurable criteria, such as percent of damage, job loss and housing loss within a census tract; the process took a few months and much political discussion.[101] The CRA identified six study areas for recovery-related redevelopment projects and conducted a fast-tracked process of property surveys, environmental assessments, citizen committee meetings and a financial feasibility study.[102] In November and December 1994, the L.A. City Council and CRA jointly adopted five earthquake disaster assistance projects (EDAPs). They were initially approved for five to 10 years, but these time frames could be extended in five-year increments.[103] One of the original six study areas, in central Los Angeles, was dropped when both studies and council district leaders determined that a more targeted revitalization effort — which combined community-based, technical assistance with individual economic and housing project funding — would be effective.[104]

One study area, in Sherman Oaks, met with local opposition, and in February 1996 the City Council voted to abolish the project.[105] The city ultimately adopted four EDAPs, with an estimated tax

increment revenue of $33 million: three in the San Fernando Valley — Reseda/Canoga Park, Laurel Canyon and Pacoima/Panorama City — and a fourth in East Hollywood/Beverly Normandie.[106]

The CRA prepared a redevelopment plan for each area, most of which had similar goals: "to aid in the repair, restoration and/or demolition of earthquake-damaged residential and commercial buildings, support the reconstruction and reoccupancy of the damaged commercial centers and encourage the return of consumer and resident confidence within these areas."[107] All of the projects gave the CRA the power of eminent domain to acquire abandoned property, but it was only used a few times.[108] Hindered by post-earthquake declines in property values, tax increment financing returns were negligible in the first five years. Under state redevelopment law at the time, the city was also required to set aside 20 percent of tax increment funds for housing projects, but this also was negligible in the first five years.[109]

City staffers in Hollywood, where a substantial number of buildings were damaged, saw the earthquake as an opportunity to advance critical projects that lacked funding. They targeted historic structures and other key buildings for rehabilitation and linked building owners with post-disaster funding opportunities. In the decade that followed, Hollywood underwent a phenomenal transformation.

The CRA elected not to issue any bonds for the four EDAPs because it had sufficient reserve funds to initiate projects.[110] Instead, the agency pieced together an array of funding sources — including post-disaster federal Community Development Block Grant (CDBG) funds, funds from other redevelopment projects and bank lines of credit — to finance the projects.[111] In each area, the CRA undertook a major economic revitalization effort, and financing improved as real estate prices increased after 1999. All four of the EDAP areas experienced substantial growth and revitalization as the Southern California economy and real estate market soared in the 2000s.

The CRA also invested post-Northridge funding resources, particularly federal CDBG and Economic Development Administration funds, in pre-existing redevelopment areas, particularly the Hollywood redevelopment project.[112] The Northridge Earthquake significantly damaged a substantial number of unreinforced masonry and reinforced concrete buildings in Hollywood, including several key historic commercial structures, and residential buildings in surrounding neighborhoods.[114] The staffs of the Hollywood CRA office and City Council District 13, in particular, saw the earthquake as an opportunity to advance several critical projects that had

Laurie Johnson

Flickr user jpellgen (CC BY-NC-ND 2.0)

The Hollywood Community Redevelopment Agency used recovery assistance after the 1994 Northridge Earthquake as an opportunity to fund redevelopment projects that had previously stalled. Opened in 2001, the Hollywood and Highland Center (shown under construction, top, and after completion, bottom) has since become a hub of the newly revitalized neighborhood.

been planned for many years but lacked funding.[114] They targeted historically significant and key commercial and residential buildings for rehabilitation and tried to link building owners with post-disaster funding opportunities.[115] The CRA had insured all of its agency-owned properties citywide and elected to use most of its $3 million earthquake-related settlement to fund repairs and other recovery programs in Hollywood. As one official stated, "Hollywood was the most organized, so they got the lion's share of the money. They also had other funding sources that they could mix and match."[116] Hollywood underwent a phenomenal transformation in the decade after the Northridge Earthquake.

The Los Angeles Housing Department managed more than $300 million in federal funds earmarked for housing recovery.[117] The department developed and administered several multifamily rental housing repair programs and provided loans of up to $35,000 per unit, with various low (or no) interest rates and payment-deferral terms, to repair damage; the repairs had to meet the latest building code standards, and loans of more than $525,000 per building were subject to approval by the mayor and City Council.[118] By January 1998, 98 percent of the damaged units in 17 city neighborhoods that had seen a lot of damage to multifamily housing — termed "ghost towns" after the earthquake — were either under construction or repaired and reoccupied; loan repayments were also beginning.[119]

In the months following the earthquake, the planning department led a plan revision process aimed at incorporating lessons learned from the event.[120] On the first anniversary of the earthquake, L.A.'s City Council adopted the updated recovery and reconstruction plan to prepare the city for future events.[121]

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Section 5

Information: The Data Needed to Inform Decision-Making

Following a disaster, communities will need meaningful, up-to-date information to complete comprehensive damage and loss assessments for public facilities and infrastructure, private housing and commercial buildings.

Information about occupancy, business continuity, employment and the availability of utilities and transportation will help inform both short-term and long-term recovery policies. Yet in the post-disaster period, good data may not be readily available. Without this data, communities will plan to rebuild based on intuition and improvisation, potentially making decisions that will not allow for a speedy and effective recovery.

Why Land Use Data Is Critical for Disaster Recovery Planning

Many local jurisdictions may not have good planning and land use data (such as zoning, property titles, location of utilities and building types) available to the public in a readily usable format. Important data is collected and controlled by hundreds of public-sector agencies and departments. Some data may be digital, and some may exist only on paper. Geographic information systems (GIS) data can assist in analyzing patterns affecting land use issues. The majority of counties and municipalities share some of their GIS data, typically street names and locations, layouts of property parcels, and locations of public facilities such as parks, schools and libraries. But access to related information, such as county assessor parcel data (e.g., names of owners, site addresses and dates of construction), is often guarded due to privacy or other proprietary concerns. In addition, some information, such as data on soil conditions and planned public and private investments, may not be readily available in GIS formats.

The lack of easily sharable and usable data is problematic for two reasons. First, such data is going to be critical in the post-disaster period in order to conduct even rudimentary planning efforts. Some areas are likely to be so damaged that existing markers such as street signs, property line markers and even buildings themselves will no longer exist. Having an available bank of data will help planners determine what property has been lost, where streets used to be and who used to live where. Without such information, it will be nearly impossible to begin planning for recovery.

The second problem posed by this lack of data is that decision-makers could be using it in the pre-disaster period to craft mitigation policies that would help position cities to recover more efficiently after a disaster. Clear information about liquefaction and landslide risks and the seismic performance of existing building types can shape mitigation policies. For example, San Francisco and Berkeley have compiled GIS information identifying the characteristics and locations of their most vulnerable buildings, such as unreinforced masonry buildings, soft-story buildings, tilt-up concrete structures and weak concrete structures. Such data can empower planners to develop targeted programs to strengthen buildings prior to a disaster.

After a disaster, collecting data quickly and accurately is vital to the recovery planning process. Planners and decision-makers need to know what level of damage has been sustained by infrastructure and public and private buildings in order to predict the social and economic consequences. Post-disaster data informs the recovery planning process in several ways:

Understanding the level of damage to residences and privately owned buildings

- Areas of extensive housing loss that may require demolition, rebuilding and reimagining
- Percentage of housing units that are unsuitable for occupancy, which can be used to quantify temporary and new housing needs
- Facilities vital to recovery that may have suffered extensive damage and are not operational
- Number of businesses that cannot occupy their buildings and may leave the region
- Number of residents — both renters and owners — who have been impacted and have different recovery needs
- Estimated costs of rebuilding by the private sector

Identifying failed infrastructure and its consequences

- Roads or bridges that have failed and will prevent people and goods from moving around the jurisdiction or the region, disrupting spatial patterns and travel times
- Power outages or lack of water or wastewater services, which will prevent people from full occupancy of their homes even if homes are minimally damaged

Considering future land use

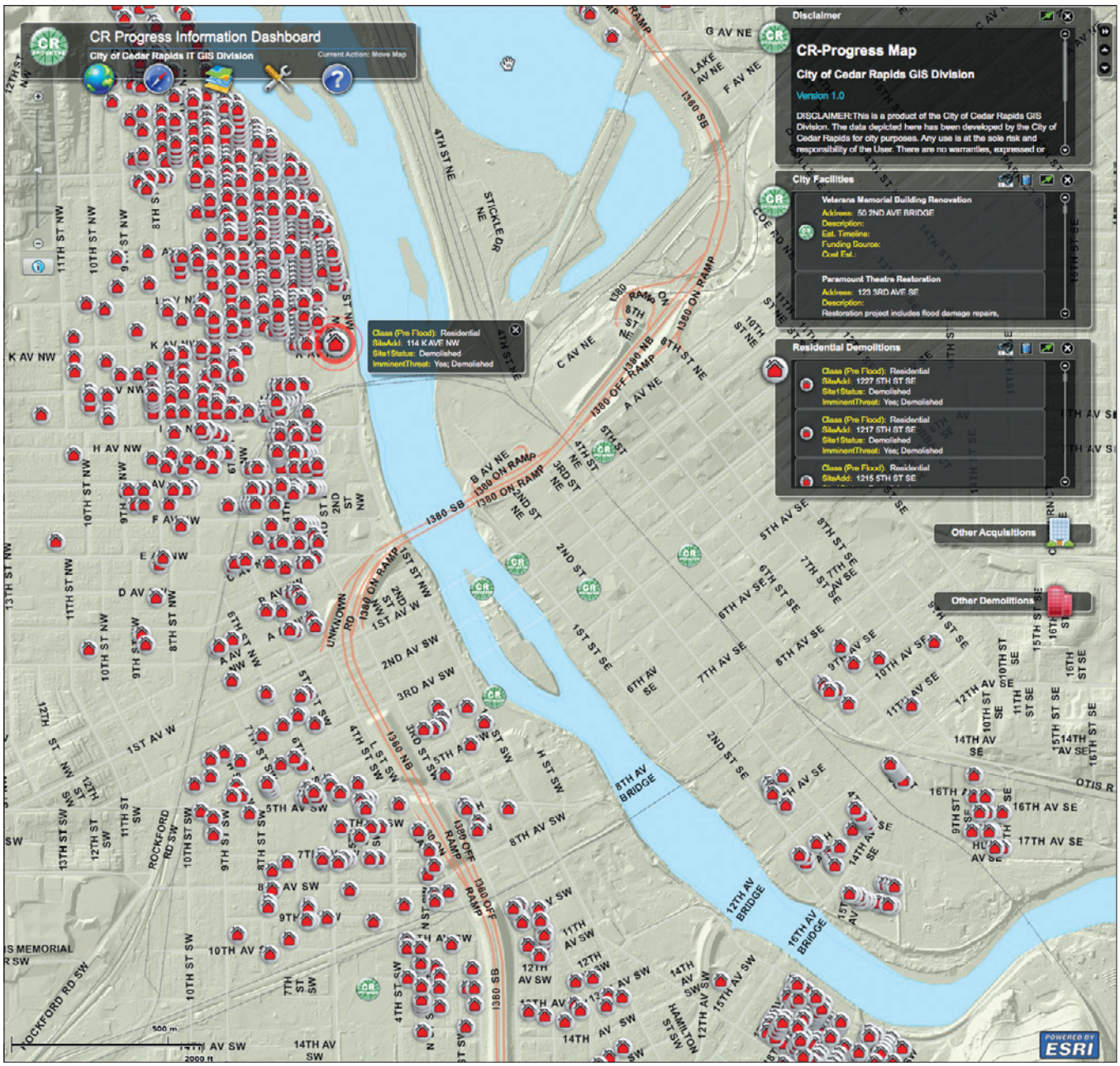
- Opportunities to rebuild infrastructure in a more suitable location, in a way that better supports residents or is more sustainable or seismically safe
- Land damage data, including liquefaction, landslides or areas of intense ground shaking, that can inform how and what to rebuild
- Potential for residential buyout programs

Types of Data That Inform Recovery

Numerous types of mapped data help to inform recovery efforts. These include data about the existing built environment (such as political and geographical boundaries, land use and zoning, listed historical resources, streets and street names, railroads and public

Figure 5: Cedar Rapids' Post-Flood Recovery Project Database

Cedar Rapids' interactive GIS database contains project timelines and up-to-date information on all the flood recovery and other community development projects planned following the 2008 floods. This map shows several kind of projects that are either planned or underway in downtown Cedar Rapids near the Iowa River: recovery and rebuilding projects for city facilities, residential demolitions and land use acquisition projects to mitigate future flood risk.



Source: City of Cedar Rapids, http://crgis.cedar-rapids.org/CR-Progress/FlexViewer/index.html

transit), data identifying areas of vulnerability (such as fault lines, liquefaction zones, landslide zones, locations of soft-story and unreinforced masonry buildings and areas occupied by low-income households, the elderly and other socially vulnerable groups) and data outlining the extent of damage after a disaster, where the damage is located and what has been affected (such as the number and locations of destroyed structures; the number and locations of red-, yellow- and green-tagged buildings; use and occupancy; the status of damaged historic buildings; and locations of shelters and temporary housing). Appendix 3 on page 78 provides greater detail on all these types of data and where they can be found.

For regional response efforts, the private sector has introduced cloud-based computing tools to provide a common dataset that crosses all geographical boundaries. Google and Microsoft have powerful maps that show aerial photos, topography, streets, major arterials, highways, parcels, water bodies and even building footprints. Local governments can learn how to use these tools and partner with the private sector to find ways to make them even more usable. Cloud-based mapping can be a powerful way to help communities and residents understand the implications of damages and adapt to new changes. For example, following devastating floods in 2008, the GIS division of the City of Cedar Rapids, Iowa, developed a web-based interactive map of the city, reporting project details on repairs to city facilities and on residential and other demolitions and acquisitions.[122] The map (see Figure 5) is publicly available so that residents, funders and other stakeholders can see the specific projects planned and track the progress of the city's recovery.

SPUR's Recommendations for Information

BEFORE THE DISASTER

58. Identify stakeholders who will need data to make decisions, what level of detail they will need and at what scale they will need the information.

After a major earthquake, everyone in the Bay Area will be searching for data to inform recovery decisions. Residents will want very fine-grained information on the status of their own home and their neighbor's homes to make decisions about whether to return and rebuild. Business owners will want specific information on their buildings, as well as larger-picture data about where their employees are and what condition their homes are in. They will also need to know the level of damage in the neighborhoods that serve as their main markets and supply sources. Elected officials and other decision-makers will require much broader data highlighting major issues in order to make high-level decisions about their jurisdictions.

122 See http://crgis.cedar-rapids.org/CR-Progress/FlexViewer/index.html

Information will also need to roll up to the regional and national levels in order to inform the federal response and national news.

Responsible Parties: For regional issues, ABAG in coordination with local governments and utility providers; for local issues, planning departments in coordination with technology departments and other departments that collect information, such as assessor's offices

59. Conduct vulnerability analyses to inform mitigation and anticipate post-disaster damage patterns.

Many Bay Area communities have begun to inventory unreinforced masonry and soft-story buildings, but every jurisdiction should have a comprehensive inventory of all vulnerable buildings. This can help jurisdictions anticipate where the heaviest concentrations of damage may occur and where residents will need the greatest amount of assistance. Anticipating damage patterns may also inform pre-disaster land planning decisions, such as deciding where buyout programs may occur or where land use may change. A comprehensive vulnerability picture should include:

- Vulnerable building types and locations, such as unreinforced masonry, soft-story conditions and buildings built before current building codes, as well as the status of any seismic retrofits
- Location and status of key pieces of infrastructure, including age, retrofit status and any anticipated repairs or alterations
- Social vulnerability indicators, such as income and education levels and language spoken at home; this data helps communities better understand which residents may be more likely to need assistance in recovery
- Geological maps that characterize known ground vulnerabilities, particularly areas susceptible to liquefaction or landslide

Responsible Parties: Planning and building departments

60. Understand general economic and population trends before the next disaster to help anticipate the consequences afterward.

As mentioned in the introduction to this report, a major challenge that affects recovery is that disasters tend to exacerbate negative trends, such as a stagnant economy or declining populations. Similarly, a young, highly mobile population with few ties to the region will be more likely to relocate, while families with many ties who own their homes may be more likely to remain in place after a disaster.

Responsible Parties: Planning departments and mayor's offices

61. Develop and sustain standardized, transferrable procedures for collecting and managing data, as well as staff skilled in information management.

Jurisdictions need to have a robust and standardized set of data that can provide an accurate picture of the built environment and land use prior to the disaster and can be readily accessed after a disaster. To achieve this, jurisdictions should set standards for basic data sets and formats, ensure that data sets are gathered and organized in a central database and protect data from earthquake damage by designating several backup storage locations, such as an off-site location in a building that has been retrofitted to high seismic standards or on a cloud-based computer network.

At a minimum, land use data should include up-to-date information on parcel ownership, land use and zoning, as well as any future plans for growth in the form of general or comprehensive plans, area-specific redevelopment plans, regional plans such as priority development areas identified as a part of ABAG's Sustainable Communities Strategy, local economic development plans and long-range transportation and infrastructure plans.

Jurisdictions also need to ensure that they have adequate staff skilled in information management and GIS mapping who can coordinate across departments. Not only do these staff members need to have traditional mapping skills, but they should also understand how to use innovative forms of data and communication, such as social media. While larger jurisdictions like San Francisco have the means to hire devoted staff, many smaller jurisdictions may be able to pool their resources and employ a small staff or consultants that serve multiple jurisdictions.

Responsible Parties: Planning and building departments

62. Establish a regional working group to examine the feasibility of a centralized information management system that integrates multiple data sets and different types of data across multiple scales.

Transparent, transferrable data that is widely accessible throughout the region can assist the recovery process in many ways; however, feasibility issues have prevented the development of a centralized system. A working group could further research how to execute this idea, set boundaries about the types of data that should be part of the system and determine what value the data would bring. The system should collect, integrate and disseminate disaster recovery information — such as data on the geological, structural, institutional and socioeconomic impacts of earthquakes — and allow meaningful information to be shared more quickly.

Responsible Parties: ABAG

63. Plan for ways to make information more sharable and open to the public in the post-disaster period.

Making information more accessible after an earthquake requires a prior commitment to releasing information without extensive quality control over the data. In order to share data quickly, agencies and departments must know how to work with data from a wide variety of users and formats. Hands-on use of GIS tools will be vital to successful response, policy development and efficient resource allocation.

A local example of a tool that collects and standardizes data and makes it easily accessible to the public is the San Francisco Property Information Map.[123] Developed by the San Francisco Planning Department, this online mapping tool presents property information (such as zoning, historic preservation status and building permit status) in an easy-to-understand format. The tool not only maps the property but also provides detailed online reports with data points that normally would require painstaking research at the planning department to find. While this tool is already available now, it has the potential to be a powerful tool after a disaster as well.

Responsible Parties: Planning departments

AFTER THE DISASTER

64. Create and implement a data management strategy to compile and manage data at a regional level.

The flow of data after a disaster is immense and can be overwhelming if there is not a larger plan to orchestrate the flow, craft it into useful pieces, prioritize who needs what data when and make it accessible to many users. This type of management needs to happen at a high level and should begin at data collection and compilation and end at the final transmission of data to the groups that need it.

A large part of this management strategy will be analyzing many raw data sets to extract usable pieces of information. Points of data that may be particularly revealing include areas that experienced a high degree of shaking or liquefaction, which can point to larger land damage patterns, or jurisdictions with disproportionate damage and greater fiscal needs. As part of their analysis, communities can create maps from GIS data and organize data into larger databases to produce charts that indicate trends. These larger conclusions can begin to inform land use changes and the rebuilding process — for example, they may help officials decide to impose a temporary building moratorium in areas that have suffered extreme land damage. Characterizing land damage and liquefaction patterns can also help us prepare for future earthquakes.

Analyzed data can then be crafted into targeted messages for multiple audiences. For example, policy-makers need data to make decisions

about repairing infrastructure, while residents want information on whether their home is safe, whether their neighbors are still around or whether recovery will be fast or prolonged. Communicating this information will involve prioritizing what data is critical to analyze and distribute first, and to whom. A data management plan can also address how to distribute information using existing networks and groups.

In New Orleans after Hurricane Katrina, the dozens of professionals working on the Unified New Orleans Plan all followed a data management strategy that outlined standards for collecting and managing data, provided a centralized website for data storage and sharing and compiled master lists of sources for key data sets. These procedures helped planners and other decision-makers access all available data easily and provided the basis for further analysis to inform planning.

Responsible Parties: ABAG

65. Use smart tools to collect damage assessment information that can be used to make planning decisions.

The scope of assessment after a disaster will vary according to the type of damage and its magnitude. Initially, transportation resources and public buildings need to be evaluated for their structural integrity. These evaluations may take hours per property, depending upon their building classification: Public structures (from bridges to schools) require a higher level of scrutiny, and such assessments may be delayed until trained people and equipment are available.

During previous responses to Bay Area disasters, damages were evaluated with paper maps or paper forms. Studies have shown that the use of tablet computers or smartphones reduces data collection efforts by up to 75 percent and eliminates the need to transfer notes on paper to spreadsheets or databases, thereby speeding up the sharing of information. When data is collected directly into a GIS format that codes locations by latitude and longitude, such data becomes highly useful for planning activities.

Developing tools and technologies is only useful if the new technologies keep up with rapidly changing hardware, are low-cost and easily accessible, and offer alternatives if they fail (e.g., if smartphones and tablets cannot be charged due to power loss). Applications and programs should be available for a wide variety of hardware and updated regularly. This allows first responders to use their own smartphones or tablets, if they have them, or those issued to them by their employer, minimizing the cost to jurisdictions. Any hardware or low-tech backup systems (such as paper maps and forms) must be stored off-site or in safe buildings to ensure that they are available and accessible after a disaster.

Responsible Parties: Building departments

66. Create an information platform that compiles data from different sources and allows for open-source data collection to create more robust data sets and open participation by all stakeholders.

Local jurisdictions will not be the only stakeholders compiling data: Everyone affected will have some knowledge about the status of their assets. These different data sets should be made available to jurisdictions to create a more robust data set and help everyone understand the nature of the damage. Assessments may come from:

- Private utilities
- Special districts
- Neighborhood or community associations
- Residents
- Businesses

In addition, much of the detailed data on damage and recovery status over time would be incredibly time-consuming for local governments to collect using existing staff. While New Orleans effectively used interns and college students for data collection after Hurricane Katrina, during recovery the best source of the most up-to-date and detailed information on individual parcels is often property owners themselves. Providing the opportunity for property owners to contribute data on their parcels can help jurisdictions obtain large data sets quickly and with minimal resources. Cities could help develop custom applications for all smartphone types, similar to those suggested in the previous recommendation but geared toward a less technical audience, so that residents could post their own damage reports on structures or infrastructure components.

Following the 2011 Christchurch Earthquake, the New Zealand Department of Building and Housing issued guidance that aimed for a more efficient approach to repair and reconstruction by allowing all stakeholders to contribute information to help facilitate rebuilding. As described earlier, areas authorized for rebuilding were assigned to one of three technical categories specifying appropriate foundation designs and geotechnical investigation requirements for each property. The technical category and other information specific to each site is available online in a searchable database.[124]

New Zealand's national government has also worked to establish an online recovery database where insurers, project management offices, building code enforcement and permitting agencies, designers and builders are able to access site-specific geotechnical and foundation design information and contribute new data as it is collected. At the permit application and approval stage, applicants much furnish information on the liquefaction and lateral spreading observed on the building site during the earthquakes. At later stages in the approval process, applicants must perform more site-specific geotechnical

123 See http://ec2-50-17-237-182.compute-1.amazonaws.com/PIM//?dept=planning

124 See http://cera.govt.nz/my-property

investigations and provide information on land remediation and foundation design parameters. These data points are integrated into the recovery database and then used to generate up-to-date maps that provide a larger picture of land characteristics in the region. Owners who are planning repairs and rebuilding are able to review updates to the maps online.

Responsible Parties: Mayor's offices and planning and building departments

67. Share information with the public in real time, even if that information may change as more information becomes available.

Whether residents decide to stay in the area or leave depends on information about the extent of damage and their confidence in the speed and efficiency of recovery. If the public suspects that information is being withheld, their trust in the recovery process and the decision-makers will wane. Residents need to believe that their best interests are at the forefront of the recovery process and that they will be able to return to functioning lives — their homes, their jobs and schools for their children — within a reasonable time period, or they will seek these things elsewhere. It is vitally important that decision-makers and information-gatherers operate with a high level of transparency and communicate early and often with the public. Many decision-makers want to wait until information has been verified and a careful message has been crafted, but this delay may harm the public's trust. Sharing information that is as accurate as possible given the circumstances, even if it needs to be updated as more or better information is collected, can mean the difference between residents who leave, stalling the economy and recovery, and residents who stay and reinvest in the Bay Area. Tagging buildings as red, yellow or green based on their damage status is one tool that provides transparency in the rebuilding process and can prove particularly useful to building owners if they are updated as the status of a building changes.

Responsible Parties: Mayor's offices

68. Continue to collect, analyze and distribute information on the recovery process to identify trends, instill confidence in residents and businesses and maintain the recovery vision.

Indicators must be tracked and analyzed to measure recovery progress. To ensure that communities are meeting their recovery goals in a timely manner, officials should follow recovery indicators for several years after the disaster and widely distribute these to all stakeholders, from decision-makers to the general public to the national media. Such measures can signal to residents and businesses that it is safe to return, can show investors that the economy is stable enough for new ventures and can tell large business owners that there are sufficient employees for their businesses. These signals can also boost social and political support for the recovery process.

The Greater New Orleans Data Center[125] began collecting, analyzing and reporting key indicators on New Orleans almost a decade before Hurricane Katrina, but the storm refocused many of the center's efforts on tracking recovery progress in the metropolitan region. Since 2005, the center has published six annual reports examining 20 indicators that cover the economy, inclusion and affordability, quality of life and environmental sustainability. The reports have provided invaluable insights and will continue to do so as recovery transitions into a "new normal" for the City of New Orleans.

Responsible Parties: ABAG, planning departments and nonprofit organizations

Conclusion

The Bay Area is known for its exciting cities, its strong economy, its diversity and its access to unparalleled natural beauty. But it is also a region at substantial risk for a major earthquake. Large portions of the population live in close proximity to the San Andreas and Hayward faults. And those faults have a 63 percent chance of rupturing sometime in the next 30 years.

If we do nothing to plan for our recovery, we run the risk of losing our major businesses and our economic base. Those with the opportunity to invest in other parts of the country or the world could choose to do so. Residents with resources could decide to move away. At the same time, vulnerable populations, such as low-income households and seniors, could be permanently displaced. Simply put, the Bay Area could cease to be the great region that it is today.

Fortunately, there are steps we can take to plan for recovery. We can update our general plans and codes now so that we have an agreed-upon vision of how to rebuild after the disaster. We can change our land use regulations to better facilitate recovery. We can consider geological risks when crafting future land use plans. And we can collect the information we will need to facilitate rebuilding.

The steps we propose in this report require an investment of time, energy and political capital. Given the financial circumstances many local jurisdictions are facing, it may be difficult to devote resources to planning activities that will support long-term recovery. But the cost of doing nothing is enormous. If we begin planning now, we can create the solid groundwork for a successful recovery.

125 See www.gnocdc.org

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Appendix 1
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Developing a Recovery Vision

BEFORE THE DISASTER

Action	Responsible Party
1. Update codes and plans now to build a culture of preparedness and help facilitate post-disaster recovery.	Planning and building departments
2. Answer the question of "who decides who decides" in the post-disaster period.	Mayors, city councils and city managers in consultation with planning, building and emergency management departments
3. Draft a recovery and reconstruction ordinance that can be modified and adopted in the post-disaster period.	Planning departments in coordination with city managers and departments of emergency management
4. Develop a state-level recovery plan.	California Emergency Management Agency

AFTER THE DISASTER

Action	Responsible Party
5. Put in place a clear structure of governance to oversee recovery. Those in charge will be responsible for "gearing up and sorting out."	Mayors, city councils and city managers in consultation with planning, building and emergency management departments
6. Determine which areas will be rebuilt according to existing plans and codes and which will be re-planned.	Recovery task force or other group overseeing recovery
7. For areas that will be rebuilt according to existing plans and codes, take steps to create a clear and rapid process for private individuals to obtain the necessary permits to rebuild.	Planning and building departments
8. For areas that will be re-planned, ensure that a community planning process is put in place to allow for meaningful and genuine participation from a variety of stakeholders.	Planning departments
9. Plan for interim uses that help support recovery.	Planning departments in coordination with the recovery task force or other group overseeing recovery

Earthquake Hazards in the Bay Area

BEFORE THE DISASTER

Action	Responsible Party
10. Complete liquefaction and landslide mapping for the high-risk parts of the Bay Area and ensure that necessary geological investigations are completed in damaged areas following the next earthquake.	California State Legislature to fund the California Geological Survey and local jurisdictions to implement provisions of the Seismic Hazards Mapping Act
11. Address liquefaction risks in undeveloped areas.	Planning and building departments working with developers and private homeowners; structural engineers working with project sponsors to communicate benefits, costs and savings

12. Encourage private owners to purchase earthquake insurance.	Building and emergency management departments working with realtors, insurance brokers and others to increase awareness of the benefits of homeowner and renters' insurance
13. Assemble, review and provide critical local interpretations of regulations governing post-earthquake building repair and reconstruction, including requirements in multi-hazard areas.	Professional associations of architects, engineers and planners working closely with local building and planning departments; interpretations could be developed or shared at the local, regional or state level
14. Organize and train teams of professionals to provide expert assistance to property owners and their consultants in post-earthquake technical and procedural issues.	Professional associations of planners, architects, engineers and historic preservation professionals working closely with local building and planning departments; model programs for local implementation could be developed at the regional or state level

AFTER THE DISASTER

Action	Responsible Party
15. Determine whether rebuilding should not be allowed in some high-risk areas.	Planning departments in consultation with building departments, earthquake professionals and impacted communities; ultimately mayors, city councils or a combination of the two will make the final call
16. Encourage and/or require buildings that are rebuilt after an earthquake to be more likely to withstand the effects of future earthquakes.	Building departments in coordination with planning departments and professional associations

Implementing Recovery

A. Environmental Review

BEFORE THE DISASTER

Action	Responsible Party
17. Review execution of intergovernmental/inter-agency agreements such as the one between FEMA and the SHPO for issues specific to the Bay Area to ensure that environmental review occurs as efficiently as possible.	Planning departments in consultation with the California Emergency Management Agency and FEMA
18. Amend the CEQA guidelines to clarify that the definition of "imminent threat" is the same as or similar to the definition in the California Historical Building Code.	Governor's Office of Planning and Research and secretary for the California Natural Resources Agency
19. Amend CEQA to allow for a delayed review of plans adopted within the boundary of major disaster areas under the jurisdiction of local reconstruction authorities.	California State Legislature in coordination with the governor
20. Create a CEQA exemption for seismic mitigation projects for buildings.	California State Legislature in coordination with the governor

AFTER THE DISASTER	
Action	Responsible Party
21. Assess whether recovery actions are statutorily or categorically excluded under NEPA.	Planning departments in consultation with FEMA
22. Make use of the emergency exemptions under CEQA for covered projects.	Planning departments
23. Seek funding to rapidly complete neighborhood plan program-level EIRs (if such plans are developed) so that individual projects can work under that broader, program-level EIR (or possibly qualify for a community plan exemption).	Planning departments
B. Redevelopment	
BEFORE THE DISASTER	
Action	Responsible Party
24. Amend the Disaster Recovery and Reconstruction Act to clarify the powers, including public and private financing tools, that a recovery authority would have in the post-disaster period.	The California State Legislature in coordination with the governor
25. Prepare a recovery plan that includes a streamlined procedure for modifying general plans and zoning ordinances, as well as any other local authorizations needed for the activities referenced in the recovery plan.	Planning departments
AFTER THE DISASTER	
Action	Responsible Party
26. Where needed, create new reconstruction authorities and adopt disaster recovery plans to aid areas suffering from major damage.	Planning departments; city councils and boards of supervisors to establish reconstruction authorities
25. Prepare a recovery plan that includes a streamlined procedure for modifying general plans and zoning ordinances, as well as any other local authorizations needed for the activities referenced in the recovery plan.	Planning departments
C. Non-Conforming Uses	
BEFORE THE DISASTER	
Action	Responsible Party
27. Develop a policy to determine when non-conforming and non-complying uses can be rebuilt.	Planning and building departments
28. Develop local procedures to assure that the post-earthquake repair and retrofit requirements of the California Building Code are met, including the appropriate collection of building damage information.	Building departments

AFTER THE DISASTER	
Action	Responsible Party
29. Implement local procedures to assure that the post-earthquake repair and retrofit requirements of the California Building Code are met.	Building departments
D. Historic Preservation	
BEFORE THE DISASTER	
Action	Responsible Party
30. Complete survey work to help clarify which buildings are historic resources and which are not. Complete the process of designating individual historic resources and historic districts before a disaster occurs.	Planning departments
31. Encourage the retrofit of historic structures so that they will be able to withstand an earthquake.	Planning and building departments in coordination with historic preservation groups
32. Work with local historic preservation groups or plan to assemble a team of historic preservation professionals to survey damaged buildings and provide advice to local governments and property owners about which buildings must preserved and which can be altered or demolished.	Planning and building departments in coordination with historic preservation groups
33. Compile information on financial incentives for retrofitting historic resources before the disaster and financing the repair of historic resources after the disaster.	Planning departments
AFTER THE DISASTER	
Action	Responsible Party
34. Ensure that building departments coordinate with planning departments and historic preservation professionals when determining which damaged historic buildings present an imminent threat to public safety.	Building departments in coordination with planning departments
35. Work with local historic preservation groups and historic preservation professionals to survey damaged historic buildings and advise owners about how to shore up damaged buildings.	Historic preservation groups in coordination with planning and building departments
36. Clarify to the public that a red tag is not an order to demolish a property.	Building departments
37. Identify funds for shoring up buildings until a determination regarding demolition and alteration can be made.	Planning departments in coordination with historic preservation groups
38. Identify sources of funds and provide other incentives to help private owners rehabilitate their historic properties after an earthquake.	Planning departments in coordination with historic preservation groups

E. Affordable Housing	
BEFORE THE DISASTER	
Action	Responsible Party
39. Develop programs to make seismic upgrades to dangerous building types that house low-income people so that low-income households can stay in their homes after an earthquake.	Planning and building departments
40. Rebuild public housing through federal programs such as Hope VI or local programs such as San Francisco's HOPE SF program.	Mayor's offices of housing or community development departments in coordination with affordable housing developers
41. Convert private multifamily housing that houses low-income people to nonprofit ownership through acquisition/rehabilitation strategies.	Mayor's offices of housing or community development departments in coordination with affordable housing developers
42. Work with developers and managers of affordable housing nationally to determine the viability of establishing a private insurance pool to capitalize or purchase less expensive hazard insurance.	Local governments in coordination with developers and managers of affordable housing and California Housing Finance Agency
AFTER THE DISASTER	
Action	Responsible Party
43. Include affordable housing as part of any post-disaster damage assessment, and ensure that areas that are being re-planned after a disaster include affordable housing.	Building, planning, finance and community development departments, mayor's offices of housing
Financing	
BEFORE THE DISASTER	
Action	Responsible Party
44. Develop a comprehensive disaster recovery financing plan.	Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices, departments of emergency management, planning departments and other key local agencies
45. Develop and sustain procedures and staff skilled in applying for and receiving FEMA Public Assistance Program funds.	Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices, departments of emergency management, and other key local agencies
46. Develop and adopt mechanisms to receive monetary and material donations. Actively seek resources from state and federal funders, the philanthropic community and private investors.	Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices, departments of emergency management, community foundations and other key local nonprofit agencies
47. Develop strategies for economic recovery as part of ongoing economic development efforts.	Economic development departments (or lead local agencies responsible for economic development) in coordination with planning and public works departments and other key local agencies
48. Incorporate seismic hazards and upgrade needs into capital improvement plans.	Capital planning and public works departments (or lead local agencies responsible for capital improvements planning) in coordination with planning departments and other key local agencies

49. Work with regional and state entities to address known gaps in local recovery resources.	Association of Bay Area Governments (ABAG) in collaboration with the region's local governments and with relevant state agencies, including the California Emergency Management Agency and the California Earthquake Authority (CEA)
50. Conduct a state-level assessment of the fiscal and economic impacts of a major Bay Area earthquake.	State treasurer and the California Emergency Management Agency in coordination with other state and regional agencies, including the CEA and ABAG, and with local governments

AFTER THE DISASTER

Action	Responsible Party
51. Conduct a comprehensive post-disaster economic loss assessment, and update or develop a comprehensive disaster recovery financing plan.	Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices and economic development, emergency management, building, public works and planning departments
52. Incorporate a realistic financing element into post-disaster community recovery planning processes and local government recovery plans.	Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices and emergency management and planning departments
53. Develop and maintain proactive communications with capital markets and credit agencies.	Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices and economic development, emergency management, building inspection, public works and planning departments
54. Seek innovative ways to finance recovery projects.	Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices and emergency management and planning departments
55. Engage the private sector in planning for investment in recovery.	Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices and economic development, emergency management and planning departments
56. Create a community recovery refinance hub.	Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices, emergency management and planning departments, local financial institutions and federal and state disaster assistance partners
57. Secure resources for land use relocations and buyouts.	Finance departments (or lead local agencies responsible for municipal finance) in coordination with city manager's offices, emergency management and planning departments, and federal and state disaster assistance partners

Information

BEFORE THE DISASTER

Action	Responsible Party
58. Identify stakeholders who will need data to make decisions, what level of detail they will need and at what scale they will need information.	For regional issues, ABAG in coordination with local governments and utility providers; for local issues, planning departments in coordination with technology departments and other departments that collect information, such as assessor's offices
59. Conduct vulnerability analyses to inform mitigation and anticipate post-disaster damage patterns.	Planning and building departments
60. Understand general economic and population trends before the next disaster to help anticipate the consequences afterward.	Planning departments and mayor's offices
61. Develop and sustain standardized, transferrable procedures for collecting and managing data, as well as staff skilled in information management.	Planning and building departments
62. Establish a regional working group to examine the feasibility of a centralized information management system that integrates multiple data sets and different types of data across multiple scales.	ABAG
63. Plan for ways to make information more sharable and open to the public in the post-disaster period.	Planning departments

AFTER THE DISASTER

Action	Responsible Party
64. Create and implement a data management strategy to compile and manage data at a regional level.	ABAG
65. Use smart tools to collect damage assessment information that can be used to make planning decisions.	Building departments
66. Create an information platform that compiles data from different sources and allows for open-source data collection to create more robust data sets and open participation by all stakeholders.	Mayor's offices and planning and building departments
67. Share information with the public in real time, even if that information may change as more information becomes available.	Mayor's offices
68. Continue to collect, analyze and distribute information on the recovery process to identify trends, instill confidence in residents and businesses and maintain the recovery vision.	ABAG, planning departments and nonprofit organizations

Appendix 2
Recovery Assessment in New Orleans

The Unified New Orleans Plan (UNOP) process launched in August 2006 took a two-tiered approach to planning. A citywide planning team had two key charges: 1) assess the more systemic, citywide needs such as infrastructure recovery and 2) unify the previous and ongoing planning efforts into one comprehensive citywide strategic recovery and rebuilding plan. Another group of planning consultants worked at the district level, constructing recovery plans for each of the city's 13 planning districts. Both the citywide and district teams followed a similar three-phase structure: 1) conduct a comprehensive recovery assessment, 2) develop and select recovery scenario preferences and 3) construct recovery plans and a prioritized list of recovery projects. Figure 6, below, provides a list of sectors analyzed on a citywide basis as part of the recovery assessment. Figure 7, on the following page, shows the neighborhood recovery assessment guidelines. The city- and district-level recovery assessments then informed the next stages in recovery planning: scenario development, specific recovery projects and planning policy.

Figure 6: Categories for Citywide Recovery Assessment

The team of planners who assessed systematic, citywide needs as part of the UNOP process used the following categories to guide their assessments.

Hurricane/Flood Risk Assessment and Management
Population
Housing
Economic Development
Public and Private Utilities: water, storm-water drainage, sewage, electricity, gas, telephone (land lines and cellular), cable and Internet
Transportation: highways and bridges, city streets and bridges, public transit, ferries, airport and port facilities
Community Services: law enforcement and the criminal justice system, fire protection, emergency medical services, health care (state and local), sanitation, education (public and private), recreational facilities and programs, libraries, city-owned community-serving facilities
Environmental Issues
Historic Preservation
City Restoration Management and Funding: including status of city's Chief Administrative Office, City Planning Commission, Department of Safety and Permits and the Office of Public Works

Figure 7: Guidance for Neighborhood-Level Assessments

The following questions guided the team of planners who conducted local district assessments as part of the UNOP process.

Housing Conditions
What was Katrina's impact on the housing stock?
To what extent has the population returned?
What is the level of building permit activity?
What is the observed level of renovation activity?
Are there any "intent to return" data from previously conducted surveys?
Prior to Katrina, was the neighborhood experiencing reinvestment activity?
Historic Preservation Issues
What is the level of demolition activity within local and/or National Register historic districts?
What were the pressures upon historic districts prior to Katrina?
What was Katrina's impact upon historic areas?
Has new or proposed development been sympathetic to the aesthetic characteristics of historic districts?
Economic Development/Business Activity
What was Katrina's impact on major employers and commercial hubs within the district?
What is the present condition of major employers in the district? Key commercial nodes?
Are commercial services (drug stores, grocery stores) readily available?
Based on outreach, has business recovered for district retailers and restaurants?
Has there been major development activity or development interest in the district?
Transportation/Transit Conditions
To what extent has transit service been restored to the district? Is it widely utilized?
What is the condition of major thoroughfares? To the extent that this information can be readily collected, what is the condition of minor arterials and local streets?
What is the condition of ancillary transportation infrastructure such as street signs and traffic signals?
What is the current status of the pedestrian realm?
Are alternate (i.e., non-automobile) forms of transportation readily available and accommodated?

Infrastructure, Public Works and Debris Removal Conditions
Have all essential city services (trash pickup, water, sewer, power) been restored in the district? If not, what is the timetable for their return?
What is the quality of city services in the district, such as water pressure and frequency of brownouts?
Is there still visible debris in the district? How effective and reliable is garbage pickup?
Flood Protection
How much flooding did the district experience from Katrina? Which areas or neighborhoods were particularly hard hit?
Based on information in the Citywide Baseline Recovery Assessment, what is the status of pump facilities serving the district?
What is the condition of storm drains? Are they in need of repairs?
Based on information in the Citywide Baseline Recovery Assessment, is the district at risk for flooding due to the construction of flood gates at the mouths of drainage canals?
Has the area experienced subsidence through the years?
How well suited is the architectural stock to withstand flooding (e.g., slab or pier construction, height of standard building elevation)?
Did the district experience flooding prior to Katrina, such as during the May 8, 1995, flood?
Public Safety
Have key public safety facilities such as police stations and fire stations been restored to the area? If not, what is the timetable for their return?
Was the district plagued by crime before Katrina? Has crime — and violent crime in particular — returned since Katrina?
Education and Health Care Facilities
Have schools and health care facilities reopened since Katrina?
Based on the Citywide Recovery Assessment, are any other educational or health facilities scheduled to be reopened in the future?
What is the present condition of these facilities? What was their condition prior to Katrina?
Are educational and health facilities conveniently located for those without access to an automobile?
Other Community Facilities
Have other community facilities such as libraries and community centers been reopened since Katrina?
What is the status of the district's green infrastructure, such as park and street tree maintenance?
Were parks and community facilities conveniently located and relatively abundant prior to Katrina? What was their pre-Katrina condition?
Based on information in the Citywide Baseline Recovery Assessment, what is the timetable for additional community facilities to be restored?

Appendix 3
Gathering the Necessary Data for Recovery Planning

The following tables represent just some of the most important data that will inform planning for a disaster and the planning process after a disaster. This data can be collected and coded in a way that will allow it to be mapped. With geographic information systems (GIS) software, each data set can be expressed as a "layer" of information and mapped on top of other data sets. For example, public buildings (one layer) can be shown on the same map as zoning information (another layer).

The types of data that are useful to collect include those that characterize the built environment, those that reveal vulnerabilities and those that show post-disaster damage. Two of these can be collected before the disaster: Figure 8 lists data types that characterize the built environment; Figure 9 lists data types that reveal vulnerability, as well as where to find them.

Figure 8: Data That Characterizes the Built Environment

Data on the built environment is typically collected and consolidated at the local level and informs decision-makers on the current status of assets. The following GIS data layers are important for understanding the characteristics of the current built environment.

Political and geographical boundaries, including congressional districts, metropolitan planning areas, cities, council districts, special districts, school districts, ZIP codes and census blocks
Social characteristics of census block groups, including household size, owner-renter occupancy, income, age, ethnicity and language spoken
Power plants, substations and power transmission lines
Land use and zoning
Historical districts, landmarks and buildings
Freeways, interchanges and ramps
Street names and address ranges
Railroads, surface rail lines, stations and other public transit
Airports and ports
Building characteristics, including type of unit (multifamily, mixed-use, single-family, attached or detached, number of floors), type of structure (unreinforced masonry, soft-story, etc.) and age
Existing plans for growth: general plans, specific plans and regional plans (including priority development areas)
Water and wastewater treatment plans and transmission systems
Public buildings
Police and fire stations
Schools
Medical centers and hospitals
Community centers
Bridges

Figure 9: Data That Illustrates Physical Vulnerability

Physical vulnerability during a major earthquake can have many causes, from geological conditions to social factors. This table lists where to find these key GIS data layers for disaster planning purposes.

Data Layer	Source	GIS Provider
Liquefaction	http://gmw.consrv.ca.gov/shmp/MapProcessor.asp?Action=Quad&Location=NoCal *Note: Use Internet Explorer, not compatible with Google Chrome.*	California Geological Survey (CGS)
Faults	http://www.quake.ca.gov/gmaps/ap/ap_maps.htm	CGS
Soils	http://www.dot.ca.gov/hq/tsip/gis/datalibrary/gisdatalibrary.html#soil	CalTrans
Soils	http://datagateway.nrcs.usda.gov/ http://soildatamart.nrcs.usda.gov/Download.aspx?Survey=CA689&UseState=CA	U.S. Department of Agriculture
Landslide zones	http://gmw.consrv.ca.gov/shmp/MapProcessor.asp?Action=Quad&Location=NoCal *Note: Use Internet Explorer, not compatible with Google Chrome. Requires Java.*	CGS
Earthquake shaking hazards	http://gis.abag.ca.gov/gisdata.html	Association of Bay Area Governments
Wells	http://www.conservation.ca.gov/dog/maps/Pages/GISMapping2.aspx or ftp://ftp.consrv.ca.gov/pub/oil/GIS/	CGS
Additional geologic data	http://www.atlas.ca.gov/download.html#casil/geodetic	Cal-Atlas
Tsunami zones	http://www.conservation.ca.gov/cgs/geologic_hazards/Tsunami/Inundation_Maps/SanFrancisco/Pages/SanFrancisco.aspx *In raster, not vector (GIS) format. Routes are described in Tsunami Response Annex by URS.*	California Department of Conservation
Unreinforced masonry buildings	Must be developed by jurisdiction	Local jurisdictions
Soft-story buildings	Must be developed by jurisdiction	Local jurisdictions
Social vulnerability indicators: income, language spoken, age and level of education	factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml	U.S. Census Bureau
Existing blight or other problem properties	Must be developed by jurisdiction	Local jurisdictions

SPUR

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