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Land Use Planning for Disaster Recovery in the Bay Area: A Strategy Report

SPUR REPORT

This paper is generously supported by the Bay Area Urban Areas Security Initiative (UASI).

The SPUR Board of Directors reviewed, debated, and adopted this report as official policy on November 14, 2012.

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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. Estimates of the cost to rebuild damaged housing, businesses and infrastructure following a major earthquake on the Hayward Fault would exceed $100 billion — and those costs would exceed $150 billion if the earthquake occurs 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.

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 heights or 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 — such as liquefaction (where strong earthquake shaking causes the ground to act like a liquid), flooding and sea level rise — that they are unsafe to inhabit.

Bay Area jurisdictions will face many questions as they seeking 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 be thinking about planning for growth in areas of earthquake-related hazards such as liquefaction and landslides? 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?

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 what a recovery vision will look like. 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.

To approach this topic comprehensively, we have organized this report into five sections:

I. **Developing a Recovery Vision: "Gearing Up and Sorting Out" Versus "Ready, Fire, Aim"**
   In the post-disaster period, local jurisdictions will need to develop processes to facilitate recovery in emotionally charged environments while relying on incomplete information.

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

The Bay Area is subject to liquefaction, landslides, faulting, flooding and other hazards. How should these hazards be addressed before the disaster and in the post-disaster period?

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

Regulatory challenges related to the California Environmental Quality Act, the National Environmental Policy Act, redevelopment, affordable housing and historic preservation will all play a role in recovery.

IV. Financing: The Fuel for Disaster Recovery

Financing largely determines what actually gets rebuilt in a disaster. The best-laid plans can be made, but without adequate funding they are extremely unlikely to be implemented.

V. Information: The Data Needed to Inform Decision-Making

What information should jurisdictions collect and store now to help aid recovery after an earthquake? How will information such as the location and extent of damage be collected after a major disaster, and how will that information be communicated to the public?

Each section provides recommendations for work to be done before the next major earthquake occurs and as well as important steps to take after the disaster to help facilitate recovery. A summary table containing all these recommendations may be found on page 92.

INTRODUCTION

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 thirty 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 would exceed $100 billion — and $150 billion if it occurs 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 (i.e., the immediate days and weeks following an earthquake), most have not developed comprehensive recovery and rebuilding plans for the months and years after an earthquake. 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 having the primary role of planning and managing all activities to restore, redevelop and revitalize their communities and build a more resilient nation.[1]

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

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. After a disaster, local governments will be responsible for developing a vision for their recoveries, determining what will be rebuilt 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 meaningfully involve the public to help determine how to rebuild areas characterized by severe damage. They 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.

Phases of Disaster Planning

Before the Disaster

In the time period before 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 focus on public health and safety, evacuation, ensuring the safety of responders, restoration of 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. What planning processes will we need to determine what to rebuild as it was before the disaster and what to rebuild differently? How do we restore our major pieces of infrastructure?

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 help aid recovery? How should we be thinking 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 be looking for 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 to taking certain actions now— before the next major disaster strikes — to 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 what a recovery vision will look like. 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 that will need to take place 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.

Figure 1: The Importance of Advance Planning: Lessons Learned From Recent Disasters

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

Disaster	What Happened	Pre-Disaster Planning Actions	Post-Disaster Planning Actions
Loma Prieta Earthquake Santa Cruz County, CA 1989 *See page 23 for complete case study*	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	Inventory of unreinforced masonry buildings in downtown Santa Cruz and limited occupancy of some upper floors of unreinforced masonry buildings	Existing general plan and downtown plan in Santa Cruz were replaced by a Downtown Recovery Plan adopted as a Specific Plan in 1991 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 areas of the city. In addition the city and stakeholders set up temporary pavilions for businesses in downtown Santa Cruz.
Northridge Earthquake Los Angeles, CA 1994 *See page 78 for complete case study*	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.	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 LA, a reconstruction effort launched after the 1992 LA Riots, was actively underway.	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.
Kobe Earthquake Kobe, Japan 1995 *See page 27 for complete case study*	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 land.	Studies of areas susceptible to fire and flooding risk led to new fire standards and a plan for replacing wooden structures. The plan did not propose specific actions. Just prior to the disaster, the city completed a major update to its general plan.	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 consensus building.

Hurricane Katrina New Orleans, LA 2005 *See page 61 for complete case study*	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 in the state of Louisiana; most in New Orleans. Population dropped from 455,000 pre-storm to 200,000 in the months following the storm.	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.	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 recovery 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.
Christchurch Earthquakes Christchurch, New Zealand 2010 and 2011 *See page 41 for complete case study*	Two earthquakes (magnitude 7.1 in 2010 and magnitude 6.3 in 2011) lead to 180 deaths, the decimation of the central business district, damage to 65,000 residential properties and damage to roads, water, waste water and stormwater systems.	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.	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 in place before the disaster occurred. Others will be lessened — or exacerbated — by the regulatory and political environment in which recovery takes place.

1. 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 function of the disaster. Similarly, if a region or part of a region is experiencing population stagnation or loss, that trend will also be exacerbated.

2. Planning challenges that impact 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 on that plan, and the difficulty of getting such plans adopted are challenging under normal circumstances. In the complex and emotionally charged time period after a disaster, these issues will only prove more daunting.

3. The codes and plans that are in existence 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.

4. After a disaster there is enormous pressure to rebuild quickly, and the tension between rebuilding quickly and rebuilding deliberately is heightened. In large part, the key activities of urban development also happen in recovery — but now they need to happen much faster. Development and construction that typically take years must happen 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 is seen as an essential measure of recovery and rebuilding. However, the pressures on local government are not just to rebuild quickly but to rebuild well, ensuring that building repairs are done correctly and that opportunities to improve earthquake safety — or make the community better in other ways — are also considered.

5. 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 what to rebuild according to the codes and plans that were in place in advance of the disaster and which areas to re-plan. (See Figure 2, “Scale and the Planning Process.”)

6. The first plan is often the most powerful plan, but it may not be the best plan. After a disaster, there will be enormous pressure on local government 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 appropriately take into account issues related to liquefaction and other hazards; it may be financially or physically infeasible; it may not make the most of opportunities

for improving infrastructure. For many residents, it may be difficult or impossible to contemplate any changes to their neighborhoods or cities in the heightened emotional environment after a disaster.

7. 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? What is the appropriate relationship between federal, state and local funding allocations?

8. Good information may not be readily available. After a disaster, information is needed 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, the economy, and social needs. Yet jurisdictions most likely will not be in the position to quickly gather the information needed to make decisions.

I. DEVELOPING A RECOVERY VISION: "GEARING UP AND SORTING OUT" VERSUS "READY, FIRE, AIM"

After first responders such as police, fire fighters and others cope with the immediate challenges of disaster response, questions related to long-term recovery will quickly begin to 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 government will need to find ways to answer these questions and the many others that will arise 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 a desire to act quickly to facilitate recovery, it can lead to missteps and missed opportunities. It can also cause upset and confusion 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 capacity of the jurisdiction to undertake recovery activities.

Step 1: Assess the damage
Questions to consider: What happened and how bad is it? What additional information is needed to understand the situation?

Confusion, uncertainty and incomplete and/or inaccurate information are endemic to an emergency and recovery. It is easy to get lost and sidetracked in detail and difficult to step back, reflect on and understand and define the bigger picture. The recovery problem starts with damage assessment, and then follows with analytic examination of how that 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. Many recoveries must occur simultaneously: the recovery of neighborhoods and business districts, port facilities, infrastructure and more. Thinking must be done at both the neighborhood and citywide level, and the relationship between the two must be considered. Ideally each community will develop and articulate a vision that captures what it is seeking to become and how the pieces will fit together.

Care must be taken to make sure that visioning is grounded in reality and 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, as well as ensuring that it is 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 damage and the recovery goals, what elements of recovery

can be expected to occur with a limited degree of difficulty? Conversely, what looks difficult or infeasible for any reason? What additional information is needed to understand feasibility?

Making priorities is difficult, but in the timeline-compressed recovery period it is simply impossible to put the appropriate time, money and energy into everything that is 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?

While the initial community impulse tends toward wanting to put things back the way they were, the reality is that the focus of recovery has to shift from looking back to imagining a different but achievable future. This is an opportunity to consider what steps could be taken to make changes that could be transformative and to determine whether those transformative changes are viable.

Step 5: Sort out the interventions and/or planning necessary to address each element of recovery
Question to consider: At a specific level, what needs extensive attention or intervention and what 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, and who are the key leaders/stakeholders for each element of recovery planning?

This step is where outcomes begin to be linked to strategies and processes. The many community recovery tasks must each find their own appropriate path and process, including questions of leadership, stakeholders and community involvement. This is also an area where expertise and experience can be brought in.

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? What is the capacity of each of the players to carry out planning activities? How does that affect decisions about the planning process?

Recovery is centered in the local government, and in all likelihood it will require organizational adaptations and additional resources to implement the recovery vision. Political and administrative leaders may need to re-define their level of oversight and control; organizations in turn may require re-invention or re-organization.

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 involves iterations to move from the general to the specific. Eventually each process must define detailed timelines and benchmarks to get to the specific decisions, policies and implementing mechanisms. The process must be fully understood by all parties involved in carrying out implementation. False starts and backtracking can severely undermine recovery and should be avoided. They can result from closed or bureaucratically dominated processes, or from poor political leadership.

Step 9: Figure out what additional information is needed
Questions to consider: What additional information is needed as part of each element of recovery planning? What needs to happen to get that information? What information is absolutely critical in light of time and capacity limitations?

The need for information (i.e., what has been damaged, how much it will cost to rebuild, when utility service will be restored) is a constant throughout the recovery process. There will never be enough information at any given moment, so there will be discomfort and uncertainty at each step. Mistakes are inevitable but can be minimized by making sure that even where information is incomplete or not available, there is enough known to have a reasonable basis for a 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?

There is no easy or neat way to sort out who does what. Decisions will be organic and circumstantial, and it is not unusual for people to emerge with roles or responsibilities they never previously expected or anticipated. Recovery processes and structures must adapt and respond in new and unexpected ways under pressure. No matter how well a community has anticipated and planned for recovery, it is a process that will demand improvisation. This can be especially difficult for government organizations that in normal times tend to be risk averse and reward caution and routine. Success will be more likely where departments and individuals are adept at self assessment, meaning they understand their strengths and the limits of their capabilities and can therefore better define and seek guidance and expertise.

Rebuilding to Current Plans Versus Re-Planning

In going through the process of gearing up and sorting out, local governments will need to make decisions about what to rebuild and repair according to current plans and codes versus what to replan after a disaster.

Rebuilding and repairing 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. This also applies to building codes, which 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 as part of a re-planning process after the disaster. Re-planning can also include building code upgrades that require greater strengthening or other new requirements for increased seismic performance that local jurisdictions adopt in the wake of the disaster. 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 grey 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 occur 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 seek to 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 wish to consider developing 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 II of this report. (See “Earthquake Hazards in the Bay Area” on page 30.)

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 recently adopted area plan. Some jurisdictions have outdated general plans and zoning for portions of their cities. In some locations, 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. However, it may be somewhat easier to make changes to publicly owned land and infrastructure. One example of this is the replacement of the Embarcadero Freeway in San Francisco 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 wish to engage in re-planning in order to make use of opportunities created by a disaster to further economic development aims.

The complexity of ownership and land tenure
Land and property ownership structures can complicate recovery. Individuals who own single family homes (and have 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 jurisdictions with very few planning staffers, may lack the capacity to engage in a re-planning process, in which case they would require outside resources in order to engage in a re-planning process.

Figure 2: Scale and the Planning Process

Rebuilding occurs on many scales: at the individual site and at the level of the neighborhood, the city and the region. If damage is severe and covers the majority of a city or region, re-planning will be necessary. If damage is more modest, buildings can be rebuilt to existing plans and codes.

Geographic Scale	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	Likely to rebuild according to current plans and codes.	If damage extends across many sites or is located in an area characterized by substantial hazards, jurisdiction may seek to re-plan area.
Neighborhood	Likely to rebuild according to current plans and codes.	If damage is located in an area characterized by substantial hazards, jurisdiction may seek to re-plan area.
City	May seek to re-plan a few areas based on extent of damage, location of substantial hazards, economic factors, potential for making improvements. May seek to upgrade local infrastructure. Lower likelihood of re-planning than under high impact scenario.	May seek to re-plan various areas based on extent of damage, location of substantial hazards, economic factors, potential for making improvements. May seek to upgrade local infrastructure. Greater likelihood of re-planning than under low impact scenario.
Region	May seek to re-plan a few areas for reasons outlined above. May seek to strengthen infrastructure due to location of substantial hazards, potential for making improvements. Lower likelihood of re-planning than under high impact scenario.	May seek to re-plan various areas for reasons outlined above. May seek to re-plan major pieces of infrastructure due to location of substantial hazards, potential for making improvements. Greater likelihood of re-planning than under low impact scenario.

Source: Adapted from a table developed by Ken Topping

Recovery does not simply occur as a result of government action. 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 intensify housing and jobs uses near transit, and to manage growth that may be occurring due to a booming economy or intensified demand for housing. Local jurisdictions in the Bay Area should also be continuously looking to take on and complete planning activities, because these plans will serve as a roadmap 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 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 will need to be taken in the post-disaster period.

Responsible Parties: Planning departments 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 following a disaster), the structure of governance during the recovery period can be much less clear. If the structure of governance 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. It is critical that the planning director and the director of the building department participate in the recovery task force.

The National Incident Management System (NIMS) has established a comprehensive, nationwide, systematic approach to managing incidents such as natural disasters and terrorist attacks. The system enables public and private organizations to respond in a coordinated manner. 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 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 as the transition from response to recovery occurs, staff from agencies and departments with key recovery responsibilities, such as city planning and building, could replace emergency responders within the former emergency management-focused organizational structure, and hourly and daily planning sessions could evolve into weekly or biweekly sessions as recovery progresses.
Responsible Parties: Mayors, city councils, city managers in consultation with planning departments, buildings departments and departments of emergency management

2 DHS, U.S. Department of Homeland Security. 2008. "National Incident Management System". Washington D.C.: Department of Homeland Security. http://www.fema.gov/pdf/emergency/nims/NIMS_core.pdf.

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 development moratoria 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 would 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.

There are many actions that need to be taken at the state level to help facilitate local recovery, many of which are outlined in Section III of this report. (See page 46.) Additionally the new National Disaster Recovery Framework (NDRF) calls for the creation of state recovery coordinator positions. The California Emergency Management Agency should develop a state-level recovery plan that both identifies the role that any future state recovery coordinator will play in the post-disaster period and also 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 in order to begin planning for recovery. The National Disaster Recovery Framework recommends appointing a local disaster recovery manager. This person would have post-disaster responsibilities to 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 issues and 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, city managers in consultation with planning departments, buildings departments and departments of emergency management

3 Schwab, Jim et al, "Planning for Post-Disaster Recovery and Reconstruction", American Planning Association and Federal Emergency Management Agency. Report Number 483/484, 1998, page 1947

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

Determining 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. 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.

For areas that will be rebuilt according to existing plans and codes, it is critical to develop processes that are fair, clear and transparent, where decisions can be made and permits issued rapidly. Local jurisdictions will need to determine how to handle the enormous number of permitting requests that will be made in a compressed period of time. Local governments will also need to 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 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 and all that has transpired since. 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 non-disaster times, neighborhood planning efforts and the contemplation 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 may be displaced by the disaster so that they can also participate in the process. There may be a strong desire to develop a new plan quickly, but that desire needs to be balanced against the importance of community involvement.

If local governments decide to engage in a re-planning effort within their jurisdictions, it is critical that any community planning process is supported by good information. Participants need to be informed about what real opportunities and challenges exist to facilitate rebuilding, including financial challenges. They need to understand the risks to rebuilding,

including the risk 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.

Rebuilding will not occur overnight. It may be necessary to devise interim solutions and allow for interim uses during the recovery period. These can include erecting tent pavilions for commercial uses or allowing for the creation of temporary housing structures while permanent housing is being rebuilt.

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

Case Study: Santa Cruz, California

Out of Contentious Politics, a Successful Community Process

The epicenter of the 1989 Loma Prieta Earthquake was in the Santa Cruz Mountains, about nine 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. Damage to residential structures ranged from major failures of foundations to internal damage to an epidemic of downed chimneys. Many buildings on the University of California, Santa Cruz campus were damaged, 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 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, 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 Ave. in some ways 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 complete safety and acceptable risk resulted in some 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:

- Evaluate damage and demolish dangerous buildings to create safe conditions
- Define and allow acceptable risk to be taken in order to gain access to some buildings and some parts of buildings to salvage records, merchandise, personal belongings, medicine, etcetera
- Establish a makeshift retail district in time to salvage the Christmas shopping season by re-opening 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, clean-up and set-up 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 long-festering animus among various factions that had defined the local political scene during the previous decade.

This positive momentum and new-found 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 create a recovery plan. In order to assure balance and representation of all perspectives, 18 of the members were chosen by the business community including banking, property owners, merchants and business associations. The other 18 representatives were chosen by the city council representing 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.

Recognizing the need to move both quickly and with deliberation, the Vision Santa Cruz planning process was designed to give adequate time for examining the issues while avoiding the backtracking and rehashing of 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 engagement was extensive, including a downtown information center with a scale model of the downtown built by 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 for the downtown. 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 to allow a consensus to form in the middle while fully hearing out the perspectives of 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 from multiple perspectives, even in heated and contentious discussions.

A fundamental reality also helped force the action: The status quo was not an option. Urban design became a common ground for community engagement. It also provided an opportunity for understanding 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 the pre-quake condition. These economics did not support a return of the department stores, so the downtown also had to shift from more traditional retail in favor of entertainment, culture, office and specialty retail catering to the growing student population and tourists.

After a monumental effort involving layers of public involvement, 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 completion of an environmental impact report (EIR). Although the extensive and necessary demolition of old buildings resulted in the downtown losing its historic district designation, the new design guidelines in the Downtown Recovery Plan successfully carried forward elements and details that captured many of the qualities the community wanted.

One of the most important features of the plan was minimizing entitlement risk by allowing administrative approval for projects that were consistent with the design guidelines and accounted for in the EIR. 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, and the plan EIR could be used for more than a decade, minimizing soft costs and risk for 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 and wanted to see. 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, its realization was set in motion with a complete rebuilding of Pacific Avenue. The public space was landscaped and pedestrian friendly and had an open feel with 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; donation money that the Red Cross 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 came with great flexibility and local discretion for its use.

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 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 pavilion spaces were reduced, with pavilions coming down incrementally as new permanent space opened up or reopened. Some merchants who had set up in other locations in the county returned. Still others did not successfully survive for various reasons. The recession of the early 1990s also 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 student population fueled the vibrancy of the downtown and allowed for it to develop 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 as tech companies provided tenancies that made possible the development of office space in the downtown.

The turning point for success came five or six years after the earthquake 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 financial support of the redevelopment agency shifted more toward physical enhancement of the downtown, such as improvement of pedestrian alleyways, and away from direct project involvement. 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 oftentimes can be at odds with planning or administrative logic, but Santa Cruz was able to bend and blend the forces to make recovery work. Key to all of this was delegation of authority, allowing for real community engagement, trusting the process to produce a good outcome and empowering by letting go. 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

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. The earthquake's impact was strongest in the international port city of Kobe (1.5 million people in 1995). 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 US $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 Kobe'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 modification of property boundaries such that each landowner loses some land area, and the resulting new land and leaseholder rights are transferred to new parcels that are typically used for public projects such as road widening, open spaces and other public facilities.

Several planning studies undertaken beginning 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 of fire and flooding, which correctly identified some of the areas that later burned in 1995 as having a high fire risk.[7] Several maps focused on issues of existing building density, street widths, housing size and housing age. These studies led to preparation of 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 the 1995–2005 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]

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 on 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,

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. http://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

disaster prevention, engineering, and the environment. After a few months, the committee was 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 the high-level vision for the city's recovery and identified 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, focusing on internal street systems, land parcel layouts, park locations and other design elements, and involved neighborhood deliberation and consensus building.[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 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 to the media, charting their progress toward these and other recovery goals. Both the city and prefecture also convened panels of international and domestic experts as well as 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 helping inform the national government's recovery funding decisions and in coordinating the wide range of participants involved in the recovery.[18]

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11 Ibid

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

13 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.

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

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. Washington D.C.: U.S. Government Accountability Office. 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.

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 community-level opportunities for improvement: 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 post-war structures destroyed by the earthquake. Land readjustment and redevelopment processes, density bonuses and a lack of private resources all contributed to the significant changes in the urban environment.

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

II. 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 steps are taken to develop these areas in ways that minimize the risk. Earthquake hazards — including liquefaction, lateral spreading, landslides, surface fault rupture and tsunami — 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 liquefaction and tsunami risk. 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, their presence provides extra incentive to manage development in these areas with building codes, zoning codes and land use plans that recognize these hazard.

Hillside areas face their own set of earthquake hazards, including earthquake-induced landslides and surface fault rupture. Surface fault rupture risk is predominantly found in hilly areas but 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.

Earthquake Hazards

A number of additional hazards are triggered by the strong ground shaking of an earthquake:

Liquefaction – Liquefaction encompasses several phenomena in which strong earthquake shaking causes 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 of the areas around the margin of the bay, are particularly susceptible to liquefaction because they were put in place during the early development period of the Bay Area, when liquefaction hazard was not understood. Serious liquefaction-related hazards are lateral spreading and settlement:

> **Lateral Spreading –** This occurs when the ground overlying liquefied materials moves freely down a slope or toward a free face, riding on the liquefied material. The ground surface can be displaced for large distances, causing major destruction of structures and lifelines. For example, many of the water pipeline breaks that occurred in the 1906 San Francisco earthquake were caused by lateral spreading, which severely hampered the ability to fight the fires that broke out.

> **Settlement –** Other liquefaction-related phenomena include settlement, flow failure and loss of bearing strength. The latter two of these can cause different parts of structures to settle different amounts, causing distress to structures built over areas that experience this "differential settlement."

Damage resulting from liquefaction does not typically cause collapse of buildings, but it can cause significant damage to buildings and buried lifelines such as water or power lines. Structures affected by liquefaction often need to be reconstructed. Areas expected to liquefy in future earthquakes are predictable and have been identified in a number of hazard maps.

Tsunami – A tsunami is a series of waves generated in a body of water by a rapid disturbance — such as an earthquake on an underwater fault or an underwater landslide — that vertically displaces the water. Tsunamis affecting the Bay Area are rare but could be caused by nearby off-shore earthquakes or by very distant events.

Landslides – Landslides can be triggered by earthquake shaking, and such landslides can damage or destroy entire hillside developments. These landslides may displace the ground surface only a few centimeters, or they may be much more damaging slope failures that can cause entire hillsides to slide downslope 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 and mitigate 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, we see surface rupture, in which part of the ground shifts, ripping apart any structures directly on the rupture line. Fault rupture damage is rare and confined to a small zone, but it is visually striking. According to state law, construction near mapped fault lines must verify the fault location through trenching and geologic studies.

The bulk of the region's hazard-related risk is concentrated in the low-lying plains near the bay, where liquefaction will occur. Low-lying plains ringing the bay are home to our major urban centers: San Francisco, Oakland, and San Jose. These densely occupied areas with significant zones of earthquake hazard-related risk are where most of the region's job centers and multifamily housing are located. The concentration of high-tech companies in Silicon Valley has furthered this trend. Downtown San Francisco, with the greatest concentration of tall buildings in the region, is situated 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 it was unknown at the time 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.

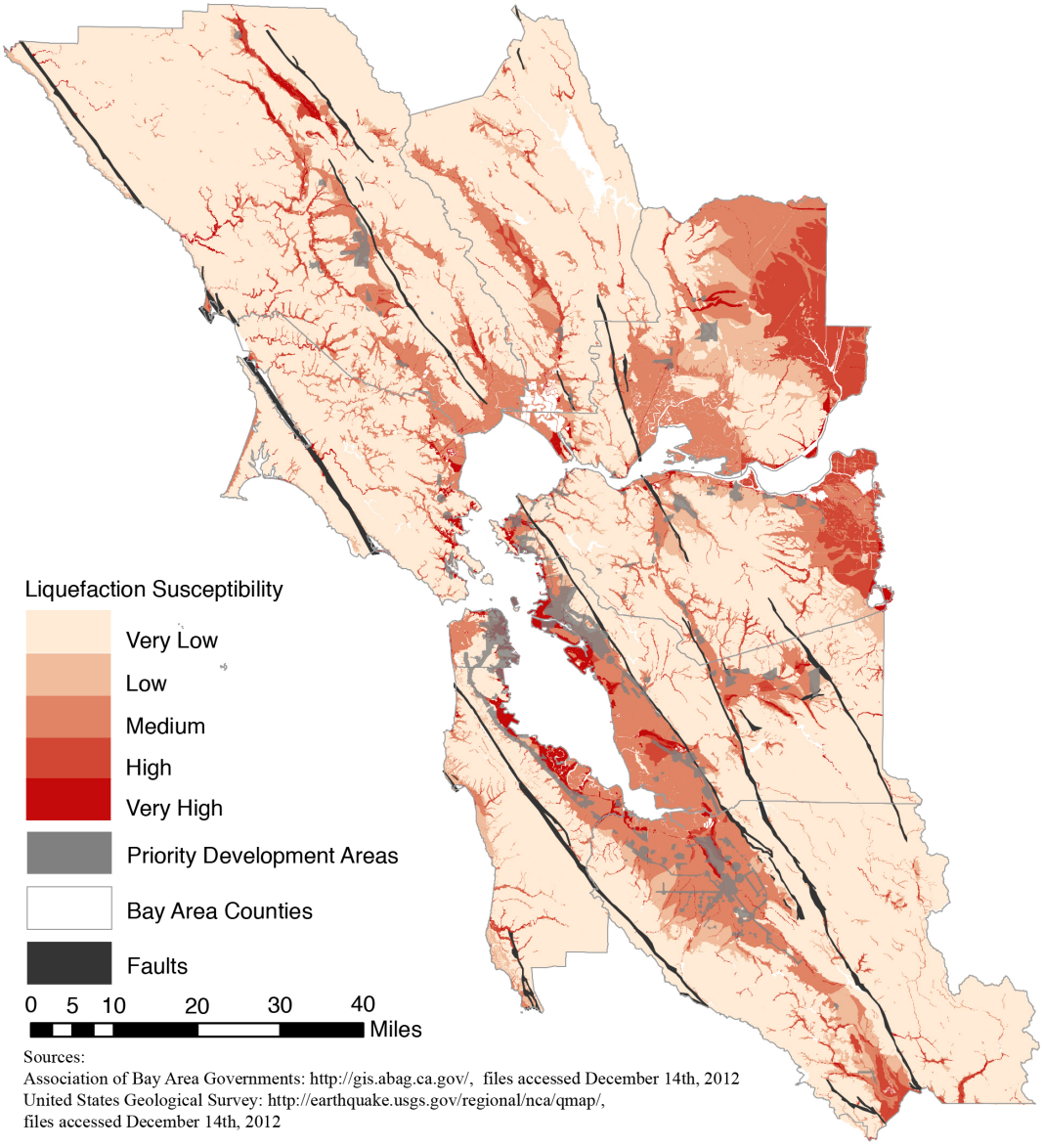
Inland valleys were largely developed after World War II with newer single-family homes and commercial buildings and fewer multi-unit apartments. Many of these are built to newer codes and should better resist shaking damage. Development on the region's hillsides is made up mostly of single family homes that range in age and vulnerability to earthquakes. Because hillsides are developed less densely with predominantly single-family homes, the scope of damage from secondary hazards and its implications for regional recovery are likely to be smaller. Both of these types of locations 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

20 http://www.bcdc.ca.gov/history.shtml

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.

Figure 3: Liquefaction Susceptibility in the Bay Area



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

Many parts of the Bay Area facing risk from earthquake hazards (including liquefaction susceptibility, as shown here) 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 accommodating new housing and jobs near transit within existing urban areas, which SPUR strongly supports. However, some of the areas best 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 these risks.

Reducing Earthquake Hazards

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

1. Making improvements or changes to the land to reduce the hazard;
2. Building in special ways in the hazard zones to reduce damage when these phenomena occur; and
3. Developing land use plans that avoid concentrating dense uses in earthquake hazard areas.

There are a number of technical approaches to significantly reduce the likelihood of liquefaction occurring during an earthquake. These involve densifying or 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 35.) 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 increased risk of damage due to liquefaction. New buildings built in these areas can instead use specially designed foundations to reduce this risk. These techniques typically add less than ten percent of the total building cost to a project. The real challenge is addressing the liquefaction risk for existing buildings that have inadequate foundations. Retrofits to foundations are challenging, 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 recognition 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 these many regulations, and a lack of clarity may result in extensive delays or in repairs or reconstruction that do not an owner's or jurisdiction's goals or requirements. City and regional post-disaster recovery can be accelerated

21 Michael Tymoff, Treasure Island Development Authority, Discussion on Oct. 29, 2012

through the adoption of clear policies and procedures regarding post-earthquake building evaluation, repair and reconstruction.

Case Study: Treasure Island

Planning for Liquefaction

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 is scheduled to 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 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, resulting in settlement of as much as two feet in some areas. This would make buildings unsalvageable and would extensively damage roads and underground utilities.

Due to these factors, the redevelopment plans include significant work to reduce liquefaction risk on the island. 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 on the island that are not slated for demolition in order to reduce the chances of those buildings being harmed. The liquefaction 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), approximately 10 percent of all infrastructure costs, which encompasses preparation of 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 open space parkland.

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.

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.

California has a key law in place regulating new construction and repair/renovation in liquefaction and landslide zones -- the Seismic Hazards Mapping Act. As part of this act, the state developed maps for some densely occupied areas of California, identifying zones with 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) are required to 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 are required to 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 knowledge of liquefaction and landslide hazards and has provided a tool to enable communities to require mitigation measures to be done 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 Zones of Required Investigation for landslide and liquefaction zones for the high-risk parts of the Bay Area.

In addition, local jurisdictions should make use of the provisions of the Seismic Hazards Mapping Act to insure that adequate studies identify the hazard to re-developed properties are conducted following the next damaging Bay Area earthquake. In the past, some owners who have suffered damage to their properties have been exempted from provisions like those of the Seismic Hazards Mapping Act in order to ease their burden and expedite redevelopment. But exempting owners from conducting appropriate studies to characterize and mitigate for liquefaction, landslide and surface rupture hazard 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 construction in sites found to have high liquefaction risk to build robust foundations or incorporate other structural solutions to minimize damage in the event of liquefaction.
c. Designate high liquefaction hazard areas as parks or other low-occupancy uses.

Responsible Parties: Planning departments 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, ground displacement may need to be addressed for the home to be occupiable. Some of this land remediation work is covered by an earthquake policy.

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 also is covered, but upgrades and strengthening for future earthquakes — such as installation of a mat foundation — is 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 up earthquake insurance policies.[22]

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 catastrophic financial impacts if their building is damaged, allowing them to repair and rebuild.

Responsible Parties: Building departments and departments of emergency management working with realtors, insurance brokers and others to increase awareness of 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

22 From Janiele Maffei, CEA

than just repaired if they meet a certain damage threshold. Those buildings that experience minimal damage under the defined threshold[23] can be repaired 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 adopt interpretive materials 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 departments 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 and requirements 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 (AIA), Structural Engineers Association of Northern California (SEAONC) 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 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 neighborhood residents or permanently displacing them.

23 The threshold for retrofit after an earthquake in Chapter 34 of the California Building Code is "substantial structural damage" which generally means a reduction in capacity of more than 20% 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.

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 41.) As seen in New Zealand, liquefaction, landslides and other earthquake hazards do damage not only to buildings but also to roads, underground pipelines and conduits, and the many other types of publicly funded infrastructure needed to make a neighborhood function. Communities need to decide whether it is a wise use of public resources to repeatedly repair such infrastructure in a zone that is likely to see repeated 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

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 a requirement that buildings in liquefaction zones have stronger foundations. Such opportunities to rebuild in ways that increase resilience should be strongly considered. After significant liquefaction damage in the Christchurch, New Zealand, earthquakes (see case study on page 41), authorities there developed zones where different kinds of foundation requirements were put in place.

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 in remediation or stabilization to facilitate rebuilding.

Similarly, the City of San Jose established a geologic review panel in 1994 to review rebuilding decisions related to landslides in the hillside portions of the city.[25] While the report was being developed, a moratorium on rebuilding was placed on 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 Land Use Planning After Earthquakes. William Spangle and Associates, Inc. 1980.

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

Consideration also needs to be given to requiring buildings that support disaster response and the early stages of recovery to be rebuilt or retrofitted to higher standards in preparation for the next event. Such buildings include essential facilities such as hospitals, emergency shelters and residential structures.

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

Case Study: Christchurch, New Zealand

Addressing Liquefaction Risk

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. Within a relatively short period of time, detailed mapping and more than 65,000 property inspections were completed to determine the extent of liquefaction and other ground failure conditions in the region. These data, combined with building damage data, were used to inform decisions about standards for rebuilding and whether certain neighborhoods could rebuild given the risk of future liquefaction and other ground-failure issues. The national government is offering nearly 8,000 homeowners a voluntary buyout. Some Bay Area communities may face similar levels of liquefaction and ground failure damage after our next large earthquake, and we may need to grapple with similar decisions about standards for rebuilding and whether to rebuild all neighborhoods. The experience in Canterbury offers valuable lessons for Bay Area communities to consider before our next earthquake.

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. A string of earthquakes shook the region beginning in 2010. The first occurred on September 4, 2010, when a magnitude 7.1 earthquake struck 25 miles west of the city center and only six miles underground[26]. Around 25,000 residential properties experienced liquefaction, rockfalls and other significant land movements that damaged homes as well as neighborhood streets and portions of the water, wastewater and stormwater drainage systems.[27] The extent of liquefaction was expected given the level of ground shaking, and local and regional planning agencies had previously mapped many of the affected areas as having moderate to high liquefaction potential.

On February 22, 2011, the city was struck by a magnitude 6.3 earthquake on a previously unmapped fault that was only four miles from the city center and three 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, wastewater, electric and stormwater 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

26 EERI, 2010, "The Mw7.1 Darfield (Canterbury), New Zealand Earthquake of September 4, 2010," EERI Special Earthquake Report, insert to EERI Newsletter, Earthquake Engineering Research Center, Oakland, California, Vol. 44, No. 11, November 2010.

27 EQC, 2012, Canterbury Earthquakes 2010 and 2011, Land report as at 29 February 2012.

28 EERI, 2011, "The M 6.3 Christchurch, New Zealand Earthquake of February 22, 2011," EERI Special Earthquake Report, insert to EERI Newsletter, Earthquake Engineering Research Center, Oakland, California, Vol. 45, No. 5, May 2011.

29 EQC, 2012, Canterbury Earthquakes 2010 and 2011, Land report as at 29 February 2012.

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 in ways to our National Flood Insurance Program (NFIP) and California Earthquake Authority (CEA) policies. One major distinction is that 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 arising from the September 4 and February 22 earthquakes, the EQC commissioned a three-step process of investigations to understand the extent and 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 — ten days after the June 13 aftershock and just four months after the most damaging earthquake — a new national cabinet, 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]

- Green zones were deemed suitable for rebuilding, although this zones was 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 as land repair would be "prolonged and uneconomic."
- Orange and white zones required further assessments (see below).

At that same time in June, 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 and the owner retains the benefit of all insurance claims for building damage.[33]

30 EQC, 2012, Canterbury Earthquakes 2010 and 2011, Land report as at 29 February 2012.

31 EQC, 2012, Canterbury Earthquakes 2010 and 2011, Land report as at 29 February 2012.

32 CERA, 2012a, Greater Christchurch Recovery Update, Newsletter of Canterbury Earthquake Recovery Authority, Issue 15, November 2012.

33 New Zealand Office of the Auditor General, 2012. Roles, responsibilities, and funding of public entities after the Canterbury earthquakes. Parliamentary Paper. October 2012.

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 ultimate future of the residential red zone land, although the national government has stated that local governments will not be installing new utility services in the residential red zones. There are added uncertainties, as well, about the availability of insurance and reconstruction financing and 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.

As of October 29, 2012, there were 7,860 properties 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]. The national government expects to recover some of these costs from the benefits paid on the land and buildings by the EQC and other insurers. The national government is also still considering how to value the residential red zone land that it 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 founding and building standards for repairs and reconstruction:

- **Technical Category 1** (TC 1) areas are 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 where minor to moderate land damage is possible in future earthquakes. New construction and foundation repairs to lightweight construction are required and 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. Specific geotechnical investigations are required to inform the foundation design selection, though no specific engineering design is required. The TC 2 areas are generally near rivers and streams where the liquefaction and ground failure risks are higher.
- **Technical Category 3** (TC 3) areas are 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

34 Ibid

35 CERA, 2012a, Greater Christchurch Recovery Update, Newsletter of Canterbury Earthquake Recovery Authority, Issue 15, November 2012.

36 Ibid.

37 New Zealand Office of the Auditor General, 2012. Roles, responsibilities, and funding of public entities after the Canterbury earthquakes. Parliamentary Paper. October 2012.

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.

When issuing the red zone decision, the national government stated that it was made 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 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 rebuilding.[39]

The Christchurch case study 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 failure issues 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 facing 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 — also fund repairs to damaged public facilities and infrastructure. Facing similar uncertainties about potential repetitive 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 future risk of hazards has been significantly reduced for New Zealand's government and residents, there are some new risks and uncertainties resulting from these policy actions. While most owners are accepting the government's buyout offer, some have not. Some who wish to stay in their homes have formed groups, although their lots may lack the infrastructure to support them. Lawsuits challenging specific aspects of CERA's decisions are going through the courts. Red zone residents also 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. New areas are seeing significant population growth without the adequate road systems, utility networks and other community needs to serve the new people. Other long-populated areas are now vacant, and there are crime and vandalism concerns in the newly empty neighborhoods. The required geotechnical investigations and foundation designs in the TC 3 areas are expensive, but resale values are unclear. All of which means there is a risk of neighborhood decline as well as 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 green 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 again suitable for housing. These techniques, which include grouting and soil consolidation, can only be applied effectively to large areas of vacant land. Similarly, Bay Area

38 CERA, 2011b, Briefing for the Incoming Minister, Canterbury Earthquake Recovery Authority, December 2011.

39 NZ DBH, 2012, "What do the Technical Categories mean for you?" Transcript of Dave Kelly, Director of the Canterbury Rebuild of the Building and Housing Group, http://www.dbh.govt.nz/canterbury-earthquake-technical-categories-video

communities might need to take the lead in mitigating liquefaction before allowing rebuilding, or they may decide to convert these areas to permanent open space. [40]

40 Other references for this case study include the following:

- Laurie Johnson, AICP, personal communications, July 30, 2012.
- Markham, Simon, 2012, "The Christchurch Earthquakes, 2010-12 - Disaster Recovery and Land Use Planning: An Urban Edge Perspective, " Powerpoint presentation presented at San Francisco Planning and Urban Research, San Francisco, CA, April 11, 2012.
- The Press, 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.

III. IMPLEMENTING RECOVERY: HOW REGULATIONS AND LAND USE TOOLS CAN HELP, OR HINDER, REBUILDING

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 one 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 need to answer the same questions when considering the rebuilding of public property and infrastructure. To answer these kinds of questions, local governments need to be aware of existing state and federal regulations that impact these types of decisions and 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 called out in historic preservation law, provide 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 in the wake of a disaster.

At the same time, complex planning challenges will need to be addressed. What tools will be needed in the post-disaster period to help 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 and have been written on all these topics. Our list is not exhaustive, as the number of regulatory challenges that local governments will face in the recovery 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 manner in which 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). The term “umbrella” is used because NEPA and CEQA review often encompasses review of other environmental

requirements 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] Compliance with these laws is not triggered by NEPA or CEQA review, but NEPA or CEQA documents usually include information on compliance with these laws.

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 the compressed time environment of post-disaster recovery. 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. Preparation and adoption of an EIR or EIS even under non-disaster conditions can take years. Such a lengthy process could pose substantial problems in the recovery period 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. Statutory exemptions are generally more difficult to challenge 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 not exempted by law but instead are created by regulation. They cover classes of actions that have been found to generally not have a significant impact upon the environment. Unlike statutory exemptions, categorical exemptions may not be used if certain exceptions apply. Among other exceptions, categorical exemptions/exclusions may be not be used if it is reasonable to assume that the project could result in a significant impact on the environment due to "unusual" or "extraordinary" circumstances.

NEPA

NEPA is a federal law that applies only when federal money or a federal agency action is involved in an activity undertaken by the federal, state or local government or by private individuals. There are two key ways that NEPA review can be triggered in the disaster recovery context. First, NEPA can be triggered by the use of federal funds for 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. Examples include permits from the U.S. Army Corps of Engineers to allow repairs that occur in bodies of water, and approval by the U.S. Fish and Wildlife Service to rebuild damaged buildings in areas with federally listed threatened or endangered species or vegetation.

When there is 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

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

disaster assistance) creates several statutory exclusions from NEPA. Examples of emergency actions that are excluded from NEPA include the provision of individual assistance for food and housing, and funding or other assistance to restore facilities such as 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," those 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; 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; and
- 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. This is particularly important when different federal agencies have different interests and provide conflicting NEPA guidance.

Fortunately, some examples exist of successful interagency cooperation. One such example is 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 of FEMA activities that might impact historic resources.

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

44 40 C.F.R. Parts 1500-1508.

45 List of "Extraordinary Circumstances" - http://www.fema.gov/environmental-planning-and-historic-preservation-program/femas-categorical-exclusions, accessed October 25th, 2012

CEQA

If NEPA does not apply to a project, it is possible that environmental review will 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 rational behind NEPA's statutory exclusions: In a disaster situation it may be justifiable to authorize a project that responds to an emergency without first completing what is often a lengthy environmental review process under CEQA.

The so-called "disaster exemption" applies to projects to repair, restore, demolish or replace buildings or facilities damaged or destroyed as a result of a major disaster, so long as a state of emergency has been declared by 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 listed on a national, state or local historic register — the exemption may only be utilized 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 the 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 a low probability of occurrence in the short-term are not exempt under CEQA. There must be a true emergency — i.e., a sudden, unexpected occurrence involving a clear and imminent danger and 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]

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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.

48 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.

SPUR's Recommendations for Environmental Review

Before the Disaster:

17. Review execution of intergovernmental/inter-agency agreements such as the one between FEMA and SHPO for Bay Area specific issues 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 the definition in the California Historical Building Code.

A definition of imminent threat is needed for the purpose of applying the CEQA emergency exemption to projects that propose the demolition of significant alteration of listed historic resources (see also the Historic Preservation section below). The definition of imminent threat 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 the secretary for resources

19. Amend CEQA to allow for 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, so 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 below, 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

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 off of that broader program level EIR (or possibly qualify for a community plan exemption).

Responsible Parties: Planning departments

Redevelopment

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

One aspect of the disaster law that was particularly useful to local government in the wake of a disaster was the ability of local government to quickly establish a redevelopment agency and adopt a redevelopment plan if two tests were met:

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

The Community Redevelopment Disaster Project Law also provides that CEQA review may be delayed until after the adoption of a redevelopment plan following a disaster, so long as certain requirements are met. The capacity to utilize this streamlined process has also been lost now that redevelopment agencies have been dissolved.

54 California Health and Safety Code, Section 34000 et seq.

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 include:

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 dissolution of community redevelopment agencies in 2011, tax increment financing was used to finance 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.

It is unclear what powers these reconstruction authorities would in fact 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 that reconstruction authorities will have now that redevelopment agencies have been dissolved. One option is to model reconstruction authorities on the Capitol Area Development Authority[56] (CADA) legislation. CADA is an existing joint powers authority with the same powers that community redevelopment agencies used to have, including the power 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 also 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 modifications of existing general plans or zoning ordinances affecting vulnerable areas after a disaster; and

55 Government Code 8877.1 – 8877.6

56 Government Code Section 8180-8194

3. contingency plan 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 will need to 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 sources 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 modifications of general plans and zoning ordinances, as well as any other needed local authorization 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 recovery of areas suffering from major damage.

Determine appropriate methods of financing of activities to be undertaken by the reconstruction authority, including public and private funding sources. If tax increment financing is needed, 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

In planning there are often occasions where a previously allowable use continues to exist in an area where the zoning has been changed to a new use. Examples include the continued existence of industrial uses in areas where the zoning has been changed to residential. These are known as "non-conforming uses." Other times zoning changes and code upgrades can create certain

requirements for new development (such as requirements to provide or limit a certain amount of parking per unit, setback requirements, bedroom size requirements, etc.) that existing development does not meet. These 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 they will require owners to meet current zoning and building codes. There will be enormous pressure to allow owners to 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 and non-complying 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, so 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 (see page 30) 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 policy to determine under what conditions 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 so long as construction complies with building code requirements and commences within a certain period of time.

Responsible Parties: Planning departments 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. Buildings that are not listed as historic resources but that add to community character will also be damaged. 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, as well as consider the impact of aftershocks, which may damage the resource even further 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 demolished in favor of new development, the character of neighborhoods can be eroded. 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 lead to other types of hazards and 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 require that the building be repaired or demolished following adopted permit procedures.

If a building is a designated historic resource (i.e., it is listed on a national, state or local historic register) or a potential historic resource (e.g., if the building 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 be required 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 above in the Environmental Review section, there is a disaster exemption that could apply in the wake of a natural disaster, in which case even a listed historic resource could be demolished without CEQA review, so long as the building poses an imminent threat to the public 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 processes 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 departments, building departments, historic preservation organizations*

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 government and property owners about which buildings should be preserved and which can be altered or demolished.

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

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

57 See CEQA Guidelines Section 15043.

58 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

Responsible Parties: Planning departments

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 the local historic preservation group and historic preservation professionals to survey damaged historic buildings and provide information to 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 and stabilize those buildings in the near term, as well as information to help them repair the buildings in the longer term.

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

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

Responsible Parties: Building departments

37. Identify funds for shoring 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 organizations

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 organizations

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 stay 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 a period of time and make use of their 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 problem is the fact that some of the housing stock occupied by low-income households is itself vulnerable to earthquake damage, including housing stock in private ownership that is rent controlled or "naturally affordable" because it has not been well maintained, it is located in low-income neighborhoods and/or it provides limited living space (for example, single-room occupancy units). In San Francisco, some of the rent controlled housing stock is located in liquefaction areas. In part because the cost of retrofitting cannot be passed on to tenants under rent control law, many rent-controlled buildings have not been properly retrofitted.

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 assurance 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 entity that is trying to preserve both the asset (the building itself) and serve low-income households over time. Non-profit providers of affordable housing seek to invest in strengthening their buildings through rehabilitation projects. After a disaster, they will continue to serve low-income populations. However, many nonprofit providers of affordable housing typically do not possess sufficient earthquake insurance due to the expense of the policy and the fact that this type of insurance does not provide substantial coverage. After a disaster, nonprofit affordable housing providers may need additional assistance to repair and rebuild their buildings.

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. This housing has experienced chronic disinvestment over the past several decades, leading to significant deferred maintenance needs. 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 mitigate 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: Building departments and planning departments

40. Complete programs to rebuild public housing through federal programs such as Hope VI or local programs such as San Francisco's HOPE SF program.

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 government in coordination with developers and managers of affordable housing, California Housing Finance Agency

After the Disaster:

43. Include affordable housing as part of any post-disaster damage assessment.

When determining what resources will be needed to rebuild after a disaster, be sure to include affordable housing as part of the request for federal recovery funding.

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

44. Ensure that areas that are being re-planned after a disaster include affordable housing.

If new reconstruction authorities are established with tax increment financing capacity, some of that financing should be allocated to affordable housing uses. Under California's previous redevelopment legislation, 20 percent of tax increment financing was allocated to affordable housing uses.

Responsible Parties: Planning departments, community development departments, mayor's offices of housing, city councils

Case Study: New Orleans, Louisiana

Post-Disaster Planning to Manage Risk

On August 29, 2005, Hurricane Katrina overwhelmed New Orleans's 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 of 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, which proceeded 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.

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

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

61 Nagin, Ray, and Bring New Orleans Back Commission BNOB. 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 | Washington D.C.: American Planning Association.

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

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

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 the Unified New Orleans Plan. 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: assessing the more systemic citywide recovery needs, such as infrastructure recovery, and unifying 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 district 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 structure: 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] Figure 7 in Appendix 2 provides a list of sectors analyzed on a citywide basis as part of this assessment. Figure 8 in Appendix 2 shows the neighborhood assessment guidelines. The UNOP process also had an extensive communications component including newsletters, media relations, neighborhood meetings and other innovative communication strategies to address the unique conditions of the project. District planners held four rounds of meetings in each planning district of the city 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. Community congresses II and III 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 the recovery scenario preferences and principles for the plans.[67]

The UNOP plans were developed around a strategic recovery framework that works 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 incentivize the recovery of repopulating areas and the clustering

65 UNOP, Unified New Orleans Plan. 2007. "Citywide Strategic Recovery and Rebuilding Plan, Final Draft."
http://www.unifiedneworleansplan.org/index.php.

66 Ibid

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

68 UNOP, Unified New Orleans Plan. 2007. "Citywide Strategic Recovery and Rebuilding Plan, Final Draft."
http://www.unifiedneworleansplan.org/index.php.

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 has been directed toward emergency assistance and the short-term needs of individuals and property owners; a relatively small portion of federal assistance has been spent on longer-term rebuilding activities such as housing and infrastructure restoration.[70]

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 seventeen 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]

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 the UNOP as the foundation for the Orleans Parish recovery plan and "representing a citizen-driven recovery vision for the entire city of New Orleans".[75]

In October 2007, the ORM was 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 the State 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 preparation and adoption of a new Master Plan and Comprehensive Zoning Ordinance that are now guiding ongoing recovery and revitalization post-Katrina.

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69 Ibid

70 Ibid

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

72 Ibid

73 CPC, City Planning Commission. 2007. Consideration of the Citywide Strategic Recovery & Rebuilding Plan, Final City Planning Commission Report. City of New Orleans.

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

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

76 City of New Orleans. 2010a. "Blight Strategy". City of New Orleans, LA.

Throughout this time, the city has continued to face fiscal challenges in managing its operating expenses while also raising the necessary capital to fund recovery.[77] Meanwhile, he 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 also 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]

77 City of New Orleans. 2010b. "2011 Annual Budget". City of New Orleans, LA.

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

79 Ibid

IV. 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, plan implementation is always contingent on the availability of funding.

Some of the potentially significant land use-related financing challenges that Bay Area communities are likely to face post-disaster include:

1. determining rebuilding policies and finding the necessary funds to remediate ground failure areas, particularly areas impacted by liquefaction and slope failures;
2. managing blight in areas of 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; and
3. funding any significant reconstruction and redevelopment efforts including infrastructure, government centers, medical and educational facilities, and private development.

Financing of 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 experiences with 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 proxies for evaluating whether we have the resources to rebuild.

80 Kircher, Charles A., Hope A. Seligson, Jawhar Bouabid, and Morrow, Guy C. 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". RMS. http://www.rms.com/Publications/1868_Hayward_Earthquake_Retrospective.pdf.

- 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 the communities of 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. Based upon today's exposures, a repeat of the 1989 earthquake is estimated to cost $38 billion in economic losses and $3.6 billion in insured losses.[82] This loss is still far less than the highest probability ruptures expected 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 the 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, these levels of earthquake insurance coverage far exceed current levels in California.

Availability of Financial Resources for Recovery

Planning for post-disaster recovery may involve land use changes and visions of rebuilding to standards that improve upon pre-disaster conditions. Implementing such decisions requires a good working knowledge of the availability of financial resources that each stakeholder contributes to achieve the desired results, 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 mix of private and public financing sources will be needed to implement and sustain community recovery.

Private Sector Resources

Private sector resources include the resources of individuals and businesses, insurance payments, donations and resources 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 under-insured against the risk posed by earthquakes. As Figure 4 shows, there are 1.15 million residential earthquake policyholders in California, representing only 11.3 percent of California homeowners, and most of the policies have high deductibles and other limits and constraints on coverages[86]. Commercial properties,

81 RMS, Risk Management Solutions, Inc. 2009. Catastrophe Modeling and California Earthquake Risk: A 20-year Perspective. RMS Special Report. RMS. http://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." In Laxenburg, Austria: International Institute for Applied Systems Analysis (IIASA). http://www.iiasa.ac.at/Research/RMS/july2000/Papers/Northridge_0401.pdf.

84 Ibid

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

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

particularly small businesses, are also under-insured. Unless there are major market reforms, insurance will be a limited resource in a future Bay Area earthquake disaster.

Figure 4: How Many Californians Have Earthquake Insurance?
Summary of California Residential and Commercial Insurance Market (2011)

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 they will need to rebuild after the earthquake.

Market Type	Percentage of Insurance Policies with Earthquake Peril Coverage
Total Residential Market	11.30%
• Total Homeowners Market	13.17%
• Total Rental Market	5.85%
• Total Condominium Market	18.09%
• Total Dwelling Fire Market	5.10%
• Total Mobile Home Market	15.87%
Total Commercial Lines	6.87%

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

Donations are a significant component of post-disaster financial assistance, particularly early on after a disaster when media attention is high. Non-governmental 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 the 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, depending on the form of the donation and the conditions under which it can be used.

Private investment will ultimately be required for recovery of most community elements. Residents, property owners, retailers and businesses must decide that it is worth the risk to invest

in rebuilding. Aside from their own resources, they must be able to secure financing for their plans, which means 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 proceed with using their own resources. Oftentimes, 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 situations where a community plans to make improvements or rebuild differently. Private entities may be reluctant to support or engage in redevelopment if it does not appear that it will be adequately funded or proceed without lengthy delays.

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, displacement of workers and lack of funding to sustain government operations. The earthquake will also disrupt the local economy, reducing tax receipts and the availability of resources for recovery over the long term. Additionally, public coffers may already be limited given the economic downturn of recent years and the loss of some key financing mechanisms available in the past, such as redevelopment funds (see page 52 for more information on redevelopment). These factors may severely limit the abilities of our region's local governments to conceive and lead a sustainable community recovery and to implement any improvements to rebuilding that might be envisioned through land use planning.

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 one-half of one 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 them.

State and Federal Disaster Assistance

Recovery-related funding from the state and federal governments is primarily intended to supplement the resources of the community to repair damaged public infrastructure and facilities. State and federal funds that go directly to the private sector have traditionally been more focused on providing 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 have 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

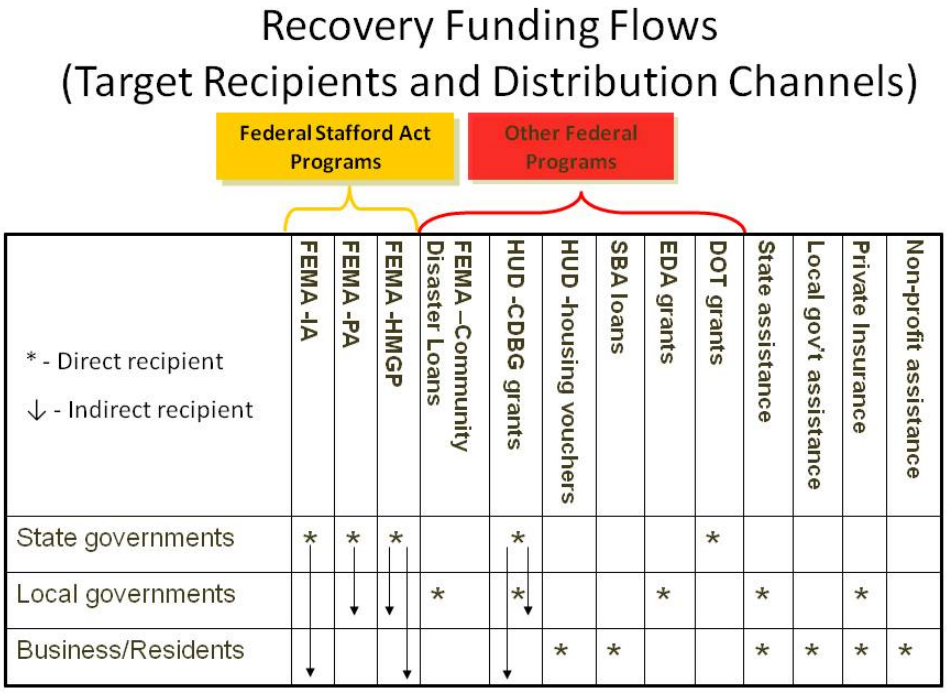
87 Santa Cruz Public Libraries. 2012. "Local Ballot Measures." 1990 November General Election, Local Ballot Measures.

http://www2.santacruzpl.org/ref/measures/index.php?PID=36&PHPSESSID=7fe20c8c6b91977412085e9e54774038&sr=15&pp=5&cp=4.

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); and assist individuals and households with housing and immediate needs (FEMA Individual and Household Assistance). Other federal and state assistance programs would also likely be initiated, such as programs to repair damaged highways and provide low-interest loans to homeowners and small businesses. Figure 5[88] shows typical assistance programs that are available following a major disaster and the usual direct and indirect recipients of these different resources.

Figure 5: How Recovery Funding Is Distributed

Funding for recovery comes from a variety of different sources, including the federal government through the Stafford Act. Some of the funding is distributed directly from the federal government to businesses and residents, while other sources of funding flows to state and local governments for distribution.



Source: Laurie Johnson, 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.* Prepared in partial fulfillment of the Doctor of Informatics degree, March 2009, Kyoto University, Kyoto, Japan.

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 and cost estimation efforts in order to apply for and receive the funds.

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."

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 in order to receive and use the funds. As a result, there will be bottlenecks at the state and federal levels in both processing and managing these program streams.

The application of 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 could trigger state and federal legislation to provide supplemental funding to meet the broader and longer-term challenges in rebuilding housing, infrastructure and local economies. But getting this legislation passed at the funding levels that are likely needed 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 also obtain new resources to assist in the rebuilding effort following a major disaster.

SPUR's Recommendations for Financing

Before the Disaster:

45. Develop a comprehensive disaster-recovery financing plan. As described above, the federal government has a wide range of programs authorized 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 the potential availability of assistance for key areas of recovery, as well as the gaps; and

89 Hazus — a GIS-based loss estimation software that is publicly available from FEMA — has been used by agencies post-disaster 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.

- 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 are driven by modifications to land-use planning, represent significant or long-term improvements to facilities or systems, and do not readily fit within the limitations of existing state and federal government assistance programs. Local governments should identify mechanisms for addressing these elements, including integrating disaster recovery needs into local capital improvement program 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) working in coordination with city manager's offices, departments of emergency management, planning departments and other key local agencies

46. 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 and procedures for the execution of this program. In order to maximize the benefits and effectiveness of the program, it is imperative that local governments and other qualifying local public and nonprofit agencies identify the procedures for applying for assistance; the steps to working with FEMA and state program managers to adapt the program to community-specific needs; the flexibility and limitations to using the program to meet those needs; and the plan for executing reconstruction work using grant funds. In general, the program is used to restore facilities to pre-disaster condition; however, there are options that allow local governments and other qualifying agencies the flexibility 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) working in coordination with city manager's offices, departments of emergency management, and other key local agencies

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

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. The plan lays out a mechanism for a designated local foundation to act 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 coordination among foundations, nonprofits and faith-based organizations in their communities to understand respective roles and the opportunity to collaboratively manage donations after a disaster. Local governments should also invest in systems such as AidMatrix, which manages material donations and connects them with donors, or 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 donations to finance recovery online. The fund, established under the San Francisco Administrative Code, has received legal and legislative review and contains strict provisions for its release and 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) working in coordination with city manager's offices, departments of emergency management, and community foundations and other key local nonprofit agencies

48. 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 and economic development along the waterfront, would it have been possible to plan ahead to fund that project? Communities should plan ahead to finance potential land use changes that may result from a disaster. In many cases, these land use changes can help stimulate economic development and even accelerate economic recovery after a disaster. It is important that economic development planners understand in advance what 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 understand what 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 at-grade roadway 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. Other situations where post-disaster land use changes could accelerate economic redevelopment include removing elevated freeways and redeveloping shuttered industrial sites or closed military installations. Communities often have plans to rehabilitate or replace aging or obsolete features or replace vulnerable buildings or infrastructure with more resilient facilities; these plans should incorporate contingencies that 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) working in coordination with planning departments, public works departments and other key local agencies

49. Incorporate seismic hazards and well-documented conditions of existing infrastructure and upgrade needs into capital improvement plans.

Cash-strapped local governments are increasingly pressured to delay major capital upgrades to a future time, and any available funds for capital improvement are more likely to pay for more 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

50. 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 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 (i.e. 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. For more information on earthquake insurance, please see Section 2 of this report.

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

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

State-level fiscal impacts of a major Bay Area earthquake need to be assessed and recommendations made as to what should be done now to better prepare for and mitigate this potential statewide economic and financial risk. Additional risk financing options should be developed to increase availability and accessibility to more of the region's constituents (i.e., working with the CEA and insurance companies).

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

After the Disaster:

52. 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 also need to assess post-disaster social and economic impacts, considering the ripple effects that can impacts local revenues and resources for recovery such as lost wages, tax revenue impacts and income losses. 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 recovery-financing gaps. Local staffing plans need to recognize the additional resource demands of managing the recovery process. Staffing for specialized post-disaster procedures, such as expedited plan reviews and approval processes, sometimes do not qualify for FEMA Public Assistance Program funding.

If local governments have developed a pre-disaster recovery financing plan, it should be reassessed and amended as necessary once the disaster landscape is revealed. Also, local governments need procedures to continue to identify, catalog, analyze 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 more comprehensive understanding of the post-disaster needs and resources available, it will be time consuming and more difficult to develop ad hoc programs and implement new and creative financing schemes. The outcomes are also likely to be more uncertain. Comprehensive and transparent post-disaster damage and economic loss estimates can also reduce disaster politics and issues of equity in distribution. There is a role for regional agencies in helping to provide guidance for undertaking and completing these assessments and plans, integrating the information into the regional picture, and communicating and advocating for the region's recovery financing needs.

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

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

It is important for communities to realistically plan for recovery and develop a recovery financing framework that accompanies local recovery plans and appropriately channels resources to support the community's vision and goals. 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, as described above, the FEMA Public Assistance Program may provide funding for restoration of damaged public buildings to pre-disaster condition but may not provide funding for significant changes. It is important that communities understand these constraints as part of their planning processes and consider other possible sources of funding to fill the gaps.

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

54. 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 quite 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, it is important that communities 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 recovery needs.

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

55. Seek innovative ways to finance recovery projects.

There are a variety of mechanisms that can be used to finance recovery projects. These include public private partnerships (often called P3s, see page 76 for more information) and special districts established for specific development activities, such as infrastructure financing districts and community-based economic development districts. Local governments need staff knowledgeable about innovative financing mechanisms, grant writing and fundraising in order to sustain recovery and encourage property owners, businesses and investors to commit for the long term, as well as to tap into other funding resources such as social-network donors, community banks, angel donors and socially conscious venture capital or investment funds. Geologic hazard abatement districts (GHADs) are another example of a mechanism that communities can use to reduce hazard-related vulnerabilities. (For more information on GHADs, see page 77).

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

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

As described above, public funding will provide only part of the necessary recovery resources and will not meet all needs. Additionally, 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 assess requirements for funding, identify conditions that need to be met in order to 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) working in coordination with city manager's offices and economic development, emergency management and planning departments

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 in an environment where public funding resources are increasingly scarce. The replacement of San Francisco's Doyle Drive with the Presidio Parkway is a prominent local example where a critical infrastructure project was accelerated considerably by a P3 arrangement. The project involves up-front private investment that 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 destroyed by an F-5 tornado on May 22, 2011. The agreement includes a dozen potential projects, valued at nearly $800 million, with financing plans that include a mix of federal and state disaster programs, tax increment financing from the city's redevelopment district, and other government tax credits, private investment and long-term debt[90].

57. Create a community recovery finance hub.

Local governments may need to assist residents, small businesses and local non-governmental organizations in obtaining financial resources for recovery, particularly to perform necessary post-disaster structural retrofits and land use mitigation efforts. Local governments are encouraged 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. We encourage local governments to 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) working in coordination with city manager's offices, emergency management and planning departments, and well as local financial institutions and federal and state disaster assistance partners

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

58. Secure resources for land use relocations and buyouts.

To reduce vulnerability to future disasters, 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 is compatible with the hazard. In the United States, relocations and buyouts are frequently used to remove structures from areas that are flood-prone, often using 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 be considered for removing structures from areas that are prone to liquefaction or earthquake-generated landslides. FEMA grants for relocations and buyouts may be limited by program eligibility requirements and cost effectiveness determinations. In areas that are prone to multiple hazards, such as liquefaction zones that are also subject to flooding, the combined risk to structures in these areas may increase the cost effectiveness of removing them. In the post-disaster environment, local governments should: pursue opportunities for using grant funds for these purposes; work with state grant managers to find ways to fit relocation and buyout projects into recovery and mitigation programs; and lobby for using disaster-specific funding programs to reduce vulnerabilities by removing structures from hazardous areas.

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.

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

Case Study: Los Angeles, California

Redevelopment for Recovery After the Northridge Earthquake

The magnitude 6.7 Northridge Earthquake struck the Southern California region 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), of which more than $25 billion were property damage-related losses and $14 billion were insured.[92]

With a population of more than 3.5 million people at the time, the City of Los Angeles sustained the majority of the region's damage, with heavy concentrations of damage within the relatively suburban areas of the San Fernando Valley region north of downtown. The City of L.A. 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 recovery organizational structure recommended by the plan was never applied. City leaders cited 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

91 EERI, Earthquake Engineering Research Institute. 1995. Northridge Earthquake Reconnaissance Report, Volume 1. Vol. 11. Earthquake Spectra. Oakland, CA: Earthquake Engineering Research Institute.

92 Petak, William J., and Shirin Elahi. 2001. "The Northridge Earthquake, USA and Its Economic and Social Impacts." In Laxenburg, Austria: International Institute for Applied Systems Analysis (IIASA).

93 City of Los Angeles. 1995. In the Wake of the Quake, A Prepared City Responds. A Report to the Los Angeles City Council. Mayor and Ad Hoc Committee on Earthquake Recovery.

94 Spangle Associates. 1997. Evaluation of Use of the Los Angeles Recovery and Reconstruction Plan After the Northridge Earthquake. Portola Valley, CA: Spangle Associates.

95 City of Los Angeles. 1995. In the Wake of the Quake, A Prepared City Responds. A Report to the Los Angeles City Council. Mayor and Ad Hoc Committee on Earthquake Recovery.

96 Spangle Associates. 1997. Evaluation of Use of the Los Angeles Recovery and Reconstruction Plan After the Northridge Earthquake. Portola Valley, CA: Spangle Associates.

97 Ibid

control.[98] For four years, the city planning department grandfathered pre-existing zoning or nonconforming circumstances using pre-existing rules. 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 initiative and programs undertaken by the city following the earthquake. [99]

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

To determine potential project boundaries and whether redevelopment was a viable recovery 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 determination process took a few months and much political discussion.[101] The CRA identify 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] Between 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 timeframes could be extended in five-year increments.[103] One of the original six study areas, in central Los Angeles, was dropped as 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, was 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

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

99 Inam, Aseem. 2005. Planning for the Unplanned: Recovering from Crises in Megacities. New York, NY: Routledge, Taylor & Francis Group.

100 Spangle Associates. 1997. Evaluation of Use of the Los Angeles Recovery and Reconstruction Plan After the Northridge Earthquake. Portola Valley, CA: Spangle Associates.

101 Ibid

102 Ibid

103 Ibid

104 Ibid

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

106 Topping, Kenneth C., and Paul J. Flores. 1997. “Financing Mitigation and Recovery: A Status Report from Recent U.S. Earthquake.” In , 97-A:61–72. Pasadena, CA: Earthquake Engineering Research Institute.

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 allowed 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 in place 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]

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 project work programs.[111] In each area, the CRA undertook a major economic revitalization project, 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 leveraged post-Northridge funding resources, particularly federal CDBG and Economic Development Administration funds, into 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.[113] 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, plans and initiatives that had 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 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.

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107 CRA, Los Angeles Community Redevelopment Agency. 1998. "Five-Year Implementation Plan, Progress Report, East Hollywood/Beverly-Normandie Earthquake Disaster Assistance Project."

108 Spangle Associates. 2002. Redevelopment After Earthquakes. Portola Valley, CA: Spangle Associates.

109 Ibid

110 Ibid

111 Ibid

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

113 CRA, Los Angeles Community Redevelopment Agency. 1995. "Hollywood 5 Year Implementation Plan, 1995 to 1999, Hollywood Redevelopment Project". Amended May 4 1995.

114 Ocana, Mirta. 1999. "Hollywood Recovery, Interview with City Council District 13 Senior Legislative Deputy."

115 DeBruhl-Hemer, Donna. 1999. "Hollywood Recovery, Interview with Project Manager, Hollywood/East Hollywood Redevelopment Districts, Community Redevelopment Agency."

116 McCoy, John. 1998. "Earthquake Recovery Projects, Interview with Deputy Administrator, Housing Services, Community Redevelopment Agency."

The Los Angeles Housing Department managed more than $300 million in federal funds earmarked for housing recovery.[117] The department developed and administered several multi-family rental housing repair programs and provided loans of up to $35,000 per unit, with various low- to 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 with concentrated damage in multi-family housing — termed "ghost towns" after the earthquake — were either under construction or completed 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]

117 City of Los Angeles. 1995. In the Wake of the Quake, A Prepared City Responds. A Report to the Los Angeles City Council. Mayor and Ad Hoc Committee on Earthquake Recovery.

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

119 City of Los Angeles. 2002. "Housing Element, City of Los Angeles General Plan, As Adopted by City Council on December 18, 2001 Under Council File No. 00-0257."

120 Spangle Associates. 2002. Redevelopment After Earthquakes. Portola Valley, CA: Spangle Associates.

121 City of Los Angeles. 1995. In the Wake of the Quake, A Prepared City Responds. A Report to the Los Angeles City Council. Mayor and Ad Hoc Committee on Earthquake Recovery.

V. INFORMATION

Following a disaster, meaningful, up-to-date information will be needed to complete comprehensive damage and loss assessments for public facilities and infrastructure, private housing and commercial buildings. Information related to occupancy, business continuity, employment and the availability of utilities and transportation is needed to inform both short-term and long-term recovery policies. Yet in the post-disaster period, good data may not be readily available to inform new policies. Without good 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

Part of the challenge in the post-disaster period is that many local jurisdictions may not currently 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 related issues. The majority of counties and municipalities share some of their GIS data, typically street names and locations; layouts of property parcel; and locations of public facilities such as parks, schools and libraries. But access to related information such as county assessor parcel data (names of owners, site addresses, year 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 planning data will help planners determine things like 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 and engage in activities that would help position cities to recover more quickly and efficiently after a disaster. Clear information about liquefaction and landslide risks and the seismic performance of existing building types can be used inform 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 and prioritized mitigation 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 and loss infrastructure and public and private building stock have sustained in order to extrapolate 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 consequent 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 that will prevent people from full occupancy of their homes even if they are minimally damaged, increasing the likelihood that residents will leave

Considering future land use

- Opportunities to rebuild infrastructure in a more suitable location, in a way that better supports residents or in way that 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 buy-out programs

Types of Data that Inform Recovery

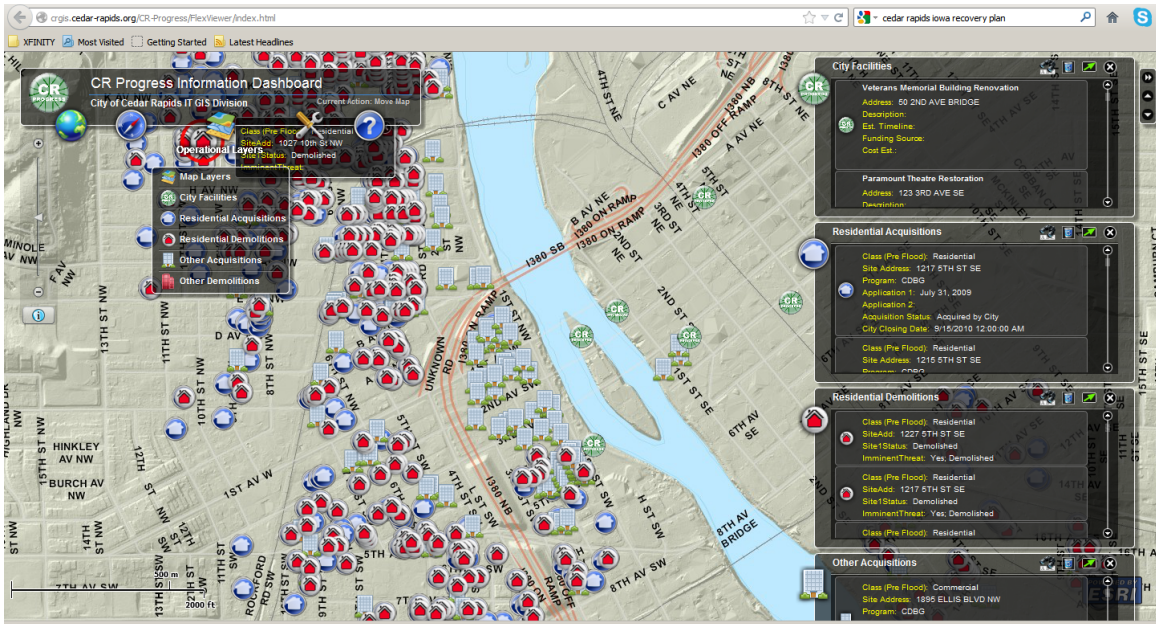
There are numerous types of mapped data that help to inform recovery efforts. These include data that provide information about the existing built environment (such as political and geographical boundaries, land use and zoning, listed historical resources, streets and street names, railroads and public transit), data that help identify areas of physical and social vulnerability (such as fault lines, liquefaction zones, landslide zones, locations of vulnerable buildings such as soft-story buildings and unreinforced masonry buildings, areas occupied by low-income households, the elderly and other socially vulnerable groups) and data that helps to understand the extent of damage after a disaster, where the damage is located and what has been affected (such as number and location of destroyed structures; number and location of red, yellow and green tagged buildings; use and occupancy; status of damaged historic buildings; and location of shelters and temporary housing). Appendix 3 on page 106 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 make use of these tools and partner with the private sector to find ways to refine these tools to make them even more usable. Cloud-based mapping can be a powerful recovery planning tool for both communities and residents in understanding implications of damages and adapting 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, residential demolitions and acquisitions, and other demolitions and

acquisitions.[122] The map is publicly available so that residents, funders and other stakeholders with interest in the recovery can both see the specific projects planned and track the progress of the city's recovery.

Figure 6: Cedar Rapids' Post-Flood Recovery Project Database

The city's 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 residential and other land use acquisition projects to mitigate future flood risk.



Source: City of Cedar Rapid, Iowa, 2012, http://crgis.cedar-rapids.org/CR-Progress/FlexViewer/index.html

SPUR's Recommendations for Information

Before the Disaster:

59. Identify and anticipate 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 pieces of 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 inform their 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 served as their

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

main markets and supply sources. At the other end of the spectrum, elected officials and other decision-makers will require much broader situational data highlighting major issues in order to make high-level decisions about their jurisdictions. 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 working in coordination with local governments and utility providers; for local issues, planning departments working in coordination with technology departments and other departments that collect information such as assessor's offices

60. 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. Characterizing vulnerability prior to a disaster helps jurisdictions to 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. Data sets that contribute to a comprehensive vulnerability picture 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, education levels and language spoken at home; this data helps to 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 departments and building departments

61. 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, mayor's offices

62. Develop and sustain standardized, transferrable procedures for collecting and managing data as well as staff skilled in information management at the jurisdictional level.

Jurisdictions need to have a robust and standardized set of data that can not only provide an accurate picture of the built environment and land use prior to the disaster but can also be readily accessed after a disaster to rapidly inform decision-making. This includes setting standards for basic data sets and formats, ensuring that the data sets are gathered and organized in a central database and physically protecting data from earthquake damage by having 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. Minimum land use data should include up-to-date data 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 strategy plans, and long-range transportation and infrastructure plans.

Jurisdictions also need to ensure that they have adequate staff skilled in information management and GIS who can operate and coordinate across departments. These staff members need to not only have the traditional mapping skills typically found in the planning department, but they should also understand how to utilize innovative forms of data and data communication such as social media. While larger jurisdictions such as San Francisco have the resources and capacity for devoted staff, many smaller jurisdictions may be able to pool their resources and have a small staff or consultants that serve multiple jurisdictions.

Responsible Parties: Planning departments and building departments

63. 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.

It is generally understood that transparent, transferrable data that is widely available and accessible throughout the region can assist the recovery process in many ways; however, feasibility issues prevent the adoption of such an idea. A working group could further research the mechanism with which this might take place, set boundaries about the types of data that should be a part of the system and determine what value they bring to the user. 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 data to be shared more quickly.

Responsible Parties: ABAG

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

In the post-disaster period, information needs will range from detailed analysis of damage to patterns of land use and repair efforts: Each piece of information helps to inform the other. Making information more powerful, sharable and accessible during this period requires a prior commitment to releasing information without extensive quality control over the data. A key to sharing data will be the resources of various agencies and department to work with data from a wide variety of users and formats. Hands-on use of GIS tools in each pertinent department 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 that data 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 that anyone can access. The tool not only maps the property but also provides detailed reports that compile and allow users to access detailed data points online that would normally only be accessible through painstaking research at the planning department. While this tool is already available now, in the pre-disaster period, it has the potential to be a powerful tool after a disaster as well.

Responsible Parties: Planning departments

After the Disaster:

65. 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 its 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 data sets to extract usable messages and pieces of information from the many raw data sets being collected. Initial damage data can be analyzed to begin to paint a larger damage picture in the region. Points of data that may be particularly revealing include areas that experienced a high degree of shaking or liquefaction, which can point to larger geologic land damage patterns, or jurisdictions with disproportionate damage and greater fiscal needs. Analysis can come in the form of creating maps from GIS data and organizing data into larger databases to produce charts and tables that point to trends. These larger conclusions based on existing damage can then begin to inform land use changes and the rebuilding process, such as the decision to impose a temporary building moratorium in areas that have suffered extreme land damage. Characterizing land damage and liquefaction patterns can also help update our understanding of vulnerabilities in future events.

Data analyzed for these purposes 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, if their neighbors are still around or if recovery will be fast or prolonged. Managing data and information communication will involve prioritizing what data is critical to analyze and distribute first, and to whom, and what should take a lower priority. A data management plan can also address how to distribute data and 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 and standards helped

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

planners and other decision-makers access all available data easily and provided the basis for further analysis to inform planning.

Responsible Parties: Association of Bay Area Governments (ABAG)

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

Immediately after a disaster, there will be many assessment activities. The scope of assessment varies 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: There is a higher level of scrutiny needed for public structures (from bridges to schools), and such assessments may be delayed until trained people and equipment are available for the assessments.

During previous Bay Area responses to disasters, damages were evaluated with a toolsets such as paper maps or paper forms. While these tools may be easily dispersed, studies have shown that the use of tablet computers or smart phones reduces data collection efforts by up to 75 percent and further speeds use of this information by eliminating the need to convert notes on paper to spreadsheets or databases. When the data is collected directly into a GIS format that codes locations by latitude and longitude, such data become 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 technology fails (for example, if smart phones 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 smart phones or tablets, if they have them, or those issued to them by their employer, minimizing the investment by jurisdictions. Any hardware or low-tech backup systems (such as paper maps and forms) must also be stored off-site or in safe buildings to ensure that they are available and accessible after a disaster.

Responsible Parties: Building departments

67. 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 assessing their assets and compiling data: Everyone affected will have some knowledge and information 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 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 independently obtained data on their parcels can help jurisdictions obtain and maintain large data sets quickly and with minimal resources throughout the entire recovery period. Cities could sponsor development of custom mobile applications for all smart phone types, similar to those suggested in the previous recommendation but geared towards 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. 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 land 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, their 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, more site-specific geotechnical investigations must be performed and information provided on land remediation and foundation design parameters. These data points, combined with other site-investigation information, are all 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 as more information becomes available.

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

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

Information about the extent of damage and confidence in the speed and efficiency of recovery are key in whether residents decide to stay in the area or leave, either temporarily or permanently. If the general public feels that information or decisions are being hidden or withheld from them, their confidence in the recovery process and the decision makers will wane. Residents need to trust 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

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

decision-makers want to wait until information is verified and a careful message has been crafted, but this delay in communication may result in distrust from the public. 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 on a regular basis as the status of a building changes.

Responsible Parties: Mayor's offices

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

Recovery progress cannot be measured unless indicators are tracked and analyzed. To ensure that recovery goals and visions are met in a timely manner, data on recovery indicators needs to be followed for a period of several years after the disaster and widely distributed to all stakeholders, ranging from decision makers to the general public to the national media. Recovery progress can provide important signals to residents and businesses that it is safe to return, to investors that the economy is stable enough for new ventures and to large business owners that there are sufficient employees for their business. Such signals can also boost social and political support in the recovery process.

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

Responsible Parties: Association of Bay Area Governments (ABAG), planning departments, nonprofit organizations

125 http://www.gnocdc.org/

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 region's 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 for how we rebuild after the disaster. We can change our land use regulations to better facilitate recovery. We can consider geological risks such as liquefaction 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 have the opportunity to create the solid groundwork that will be needed to support a successful recovery.

APPENDIX 1. PLAN OF ACTION

On Solid Ground: Recommendations	
I. Developing a Recovery Vision	
Before the Disaster	
Action	**Responsible Agencies**
1. Update codes and plans now to build a culture of preparedness and help facilitate post-disaster recovery.	Planning departments and building departments
2. Answer the question of "who decides who decides" in the post-disaster period.	Mayors, city councils, city managers in consultation with planning departments, building departments and departments of emergency management
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 Agencies**
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, city managers in consultation with planning departments, buildings departments and departments of emergency manager
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 departments 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 working in coordination with the recovery task force or other group overseeing recovery
II. Earthquake Hazards in the Bay Area	
Before the Disaster	
Action	**Responsible Agencies**
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 departments 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 departments and departments of emergency management, working with realtors, insurance brokers and others to increase awareness of 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 departments 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 Agencies**
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 working in coordination with planning departments and professional associations
III. Implementing Recovery	
A. Environmental Review	
Before the Disaster	
Action	**Responsible Agencies**
17. Review execution of intergovernmental/inter-agency agreements such as the one between FEMA and SHPO for Bay-Area specific issues to ensure that environmental review occurs as efficiently as possible.	Planning departments, working in coordination 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 the definition in the California Historical Building Code.	Governor’s Office of Planning and Research and the secretary for resources

19. Amend CEQA to allow for 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 Agencies**
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 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 "tier" off that broader program level EIR (or possibly qualify for a Community Plan Exemption).	Planning departments
B. Redevelopment	
Before the Disaster	
Action	**Responsible Agencies**
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 modifications of general plans and zoning ordinances, as well as any other needed local authorization for the activities referenced in the recovery plan.	Planning departments
After the Disaster	
Action	**Responsible Agencies**
26. Where needed, create new Reconstruction Authorities and adopt disaster recovery plans to aid recovery of areas suffering from major damage.	Planning departments; city councils and boards of supervisors to establish reconstruction authorities
C. Non-Conforming Uses	
Before the Disaster	
Action	**Responsible Agencies**
27. Develop policy to determine under what conditions non-conforming and non-complying uses can be rebuilt.	Planning departments 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 Agencies**
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 Agencies**
30. Complete survey work to help clarify which buildings are historic resources and which are not. Complete processes 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 departments, building departments, historic preservation organizations
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 government and property owners about which buildings should be preserved and which can be altered or demolished.	Planning departments and building departments in coordination with historic preservation organizations
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 Agencies**
34. Ensure that building departments coordinate with planning departments and historic preservation professionals in when determining which damaged historic buildings present “imminent threats” to public safety.	Building departments in coordination with planning departments

35. Work with the local historic preservation group and historic preservation professionals to survey damaged historic buildings and provide information to owners about how to shore up damaged buildings.	Historic preservation groups working in coordination with planning departments and building departments
36. Clarify to the public that a red tag is not an “order to demolish.”	Building departments
37. Identify funds for shoring buildings until a determination regarding demolition and alteration can be made.	Planning departments in coordination with historic preservation organizations
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 organizations
E. Affordable Housing	
Before the Disaster	
Action	**Responsible Agencies**
39. Develop programs to mitigate dangerous building types that house low-income people so that low-income households can stay in their homes after an earthquake.	Building departments and planning departments
40. Complete programs to 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 non-profit 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, California Housing Finance Agency (CALHFA)

After the Disaster	
Action	**Responsible Agencies**
43. Include affordable housing as part of any post-disaster damage assessment.	Building departments, departments of finance, mayor's offices of housing or community development departments
44. Ensure that areas that are being re-planned after a disaster include affordable housing.	Planning departments, community development departments, mayor's offices of housing, city councils
IV. Financing	
Before the Disaster	
Action	**Responsible Agencies**
45. Develop a comprehensive disaster-recovery financing plan.	Finance departments (or lead local agencies responsible for municipal finance) working in coordination with city manager's offices, departments of emergency management, and other key local agencies
46. 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) working in coordination with the city manager's office, emergency management, and other key local agencies
47. Develop and adopt mechanisms to receive monetary and material donations. Actively seek resources from state and federal resources, the philanthropic community and private investment.	Finance departments (or lead local agencies responsible for municipal finance) working in coordination with city manager's offices, departments of emergency management, and community foundations and other key local nonprofit agencies
48. Develop strategies for economic recovery as part of ongoing economic development efforts.	Economic development departments (or lead local agencies responsible for economic development) working in coordination with planning departments, public works departments, and other key local agencies

49. Incorporate seismic hazards and well-documented conditions of existing infrastructure 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
50. Work with regional and state entities to address known gaps in local recovery resources.	ABAG, in collaboration with the region's local governments, and with relevant state agencies including the California Emergency Management Agency and the CEA
51. 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 agencies including the CEA, ABAG, and other regional agencies and local governments
After the Disaster	
Action	**Responsible Agencies**
52. 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) working in coordination with city manager's offices and economic development, emergency management, building, public works and planning departments
53. 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) working in coordination with city manager's offices and emergency management and planning departments
54. Develop and maintain proactive communications with capital markets and credit agencies.	Finance departments (or lead local agencies responsible for municipal finance) working in coordination with city manager's offices, economic development, emergency management, building inspection, public works and planning departments
55. Seek innovative ways to finance recovery projects.	Finance departments (or lead local agencies responsible for municipal finance) working in coordination with city manager's offices and emergency management and planning departments

56. Engage the private sector in planning for investment in recovery.	Finance departments (or lead local agencies responsible for municipal finance) working in coordination with city manager's offices, emergency management and planning departments
57. Create a community recovery refinance hub.	Finance departments (or lead local agencies responsible for municipal finance) working in coordination with city manager's offices, emergency management and planning departments, and well as local financial institutions and federal and state disaster assistance partners
58. Secure resources for land use relocations and buyouts.	Finance departments (or lead local agencies responsible for municipal finance) working in coordination with city manager's offices, emergency management and planning departments, and federal and state disaster assistance partners
V. Information	
Before the Disaster	
Action	**Responsible Agencies**
59. Identify and anticipate stakeholders that 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 working in coordination with local governments and utility providers; for local issues, planning departments working in coordination with technology departments and other departments that collect information such as assessor's offices
60. Conduct vulnerability analyses inform mitigation and anticipate post-disaster damage patterns.	Planning departments and building departments
61. Understand general economic and population trends before the next disaster to help anticipate the consequences afterward.	Planning departments, mayor's offices
62. Develop and sustain standardized, transferrable procedures for collecting and managing data as well as staff skilled in information management at the jurisdictional level.	Planning departments and building departments

63. 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.	Association of Bay Area Governments (ABAG)
64. Plan for ways to make information more sharable and open for the public in the post-disaster period.	Planning departments
After the Disaster	
Action	**Responsible Agencies**
65. Create and implement a data management strategy to compile and manage data at a regional level.	Association of Bay Area Governments (ABAG)
66. Use smart tools to collect damage assessment information that can be used to make planning decisions.	Building departments
67. 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, planning departments and building departments
68. Share information with the public in real time, even if that information may need to change as more information becomes available.	Mayor's offices
69. Continue to collect, analyze, and distribute information on the recovery process after the disaster event to identify trends, instill confidence in residents and businesses, and maintain the recovery vision.	Association of Bay Area Governments (ABAG), planning departments, nonprofit organizations

APPENDIX 2: RECOVERY ASSESSMENT AND THE UNIFIED NEW ORLEANS PLAN

The Unified New Orleans Plan (UNOP) process was a five-month recovery planning process launched in August 2006 that took a two-tiered approach to planning. A citywide planning team had two key charges: 1) assessing the more systemic, citywide recovery needs such as infrastructure recovery, and 2) unifying 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 selecting recovery scenario preferences; and 3) construct the recovery plans and a prioritized list of recovery projects. Figure 7 below provides a list of sectors analyzed on a citywide basis as part of the recovery assessment. Figure 8 shows the neighborhood recovery assessment guidelines. The information derived from the city and district level recovery assessment then informed the next stages in the recovery planning: scenario development, specific recovery projects and planning policy.

Figure 7. Categories for Citywide Recovery Assessment

Categories used in assessments conducted by planners as part of the Unified New Orleans Plan process.

- Hurricane/Flood Risk Assessment and Management
- Population
- Housing
- Economic Development
- Public and Private Utilities: water, stormwater drainage, sewerage, 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

Source: UNOP 2007

Figure 8. Guidance for Neighborhood-Level Assessments

Questions used to guide assessments conducted by planners as part of the Unified New Orleans Plan 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 pick up, 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 brown outs?
- Is there still visible debris in the district? How effective and reliable is garbage pick up?

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 re-opened since Katrina?
- Based on the Citywide Recovery Assessment, are any other educational or health facilities scheduled to be re-opened 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 re-opened 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?

Source: UNOP 2007

APPENDIX 3: INFORMATION LAYERS NEEDED 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. Using 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.

Figure 9: Data That Characterize 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.

Data on the Built Environment
Political and geographical boundaries including congressional districts, metropolitan planning areas, cities, council districts, special districts, school districts, ZIP codes and census blocks
Census blocks group social characteristics 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, etcetera) and age
Existing plans for growth: general plans, specific plans, 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

Source: SPUR analysis

The United States Geological Survey (USGS) has long recognized the need for scientific information to be unrestricted by political boundaries while still providing such information in a way that is useful to local jurisdictions. It provides valuable GIS data identifying typography, hydrology and location of faults. Recently, the USGS expanded its dataset to include structures important to disaster planning and emergency response.

The following GIS data layers are important for disaster planning purposes, as they help illustrate areas of greatest physical vulnerability:

Figure 10: Data That Illustrate Physical Vulnerability

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	California Geological Survey
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	US Dept 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.*	California Geological Survey

Earthquake shaking hazards	http://gis.abag.ca.gov/gisdata.html	ABAG
Wells	http://www.conservation.ca.gov/dog/maps/Pages/GISMapping2.aspx or ftp://ftp.consrv.ca.gov/pub/oil/GIS/	California Geological Survey
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.	CA Dept. of Conservation
Unreinforced masonry buildings	Must be developed by jurisdiction	Local
Soft-story buildings	Must be developed by jurisdiction	Local
Social vulnerability indicators: income, language spoken, age, level of education	http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml	US Census Bureau
Existing blight or other problem properties	Must be developed by jurisdiction	Local

Source: SPUR analysis