Regional Resilience Initiative Policy Agenda for Recovery

December 14, 2012

earthquake and hazards program
Association of Bay Area Governments

Credits

Principal Authors

Danielle Hutchings Mieler, Earthquake and Hazards Program Coordinator

Dana Brechwald, Earthquake and Hazards Specialist

ABAG Management

Ezra Rapport, Executive Director

Miriam Chion, Planning Director

Project Consultants

Arrietta Chakos, Urban Resilience Strategies

Paula Schulz, Natural Hazards Mitigation

A special thanks to all participants in our workshop series, who provided the basis for our Policy Papers.

Thanks also to our interviewees, who provided detailed input essential to the development of these papers:

Doug Ahlers, Harvard Kennedy School

Renee Domingo, City of Oakland

Rich Eisner, Governor's Office of Emergency Service (retired)

Peter Ohtaki, California Resiliency Alliance

Julie Pierce, City of Clayton

Sue Piper, City of Oakland

Chris Poland, Degenkolb Engineers

Laurel Prevetti, City of San Jose

Bruce Riordan, Joint Policy Committee

Julie Sinai, University of California, Berkeley

Tom Tobin, Earthquake Engineering Research Institute

Will Travis, Joint Policy Committee

Regional Resilience Initiative
Executive Summary and Methodology

Resilience Initiative Overview

This document and the six papers that follow represent the culmination of the 18-month Regional Resilience Initiative undertaken by the Association of Bay Area Governments (ABAG). The goal of ABAG's Resilience Initiative has been to develop a sustainable process through which stakeholders in the Bay Area can progressively build resilience through collaborative planning for long-term disaster recovery. Through the Initiative, we have identified sector-specific recovery issues that may require jurisdictional coordination and collaboration, sought to understand the current capacity of the region to implement a coordinated recovery around these issues, and identified recommended actions needed to improve this capacity. Our focus has largely been on planning for long-term recovery.

Disaster recovery, as we have seen in past disasters, can span decades. But anticipating post-disaster issues and acting now to support post-disaster recovery is essential. Communities can work in concert with mitigation and disaster response initiatives to create a more sustainable and resilient region—one that has the ability to prepare and plan for adverse events, absorb and recover from their impacts and successfully adapt in the face of change.[1]

Building disaster resilience is an on-going, dynamic process where we seek to continually improve our capacity to respond to and recover from natural disasters, recognizing that disaster resilient regions must also be socially, economically, and environmentally resilient and that resilient regions are composed of resilient individuals, organizations, and communities.

To facilitate an effective and coordinated regional recovery from disasters, local governments, special districts, and regional, state and the federal government must come together in collaboration with key actors, such as businesses, nonprofit institutions, community leaders, and infrastructure agencies to determine responsibilities and decision-making structures.

While regional governance structures for coordination are well-established for disaster response, regional governance for long-term recovery is needed for large-scale disasters because:

- A common vision for regional recovery will instill investment confidence in residents, businesses and the larger global community that the Bay Area will recover;
- Damage to regional infrastructure systems will require coordinated and prioritized decision-making about restoration and reconstruction;
- Many cities will simultaneously face similar decisions about rebuilding housing, restoring business and financing restoration; crafting consistent, effective practices and leveraging mutual resources could facilitate a more uniform recovery across the region; and,

---

[1] Adapted from *Disaster Resilience: A National Imperative.* National Academies of Engineering, 2012.

- A coordinated regional recovery will further existing goals for a more sustainable, equitable and prosperous region.

A major Bay Area earthquake will leave lasting impacts on our region, altering our built environment, economy, and many other characteristics that make the Bay Area unique. How will Bay Area leaders work together to plan for and address the impacts? Who are the major players in this work? How will cities and counties come together with business, nonprofit and community partners to rebuild our region and restore our economy? What is the message and image we will send to the outside world after an earthquake? Will it be one of competition for limited resources or will we work together in the interest of the entire region and collectively advocate for our common needs? How will priorities be set? Stakeholders indicate that a financing strategy to address rebuilding of the Bay Area's economy, infrastructure and housing is a regional necessity. In addition, advocacy for state and federal funding, along with needed legislative and regulatory could be successfully crafted through an inclusive process. How we come together as a region to grapple with these questions and build regional resilience is the focus of these papers.

The papers are organized around the four Policy topics that emerged from our process: Governance, Housing, Infrastructure, and Economy and Business.

Governance

Recommendations from ABAG's Regional Resilience interview process confirm both the research and workshop findings that regional coordination and decision-making can speed disaster recovery and improve resilience if accomplished prior to the event. There is region-wide agreement that crises are the worst time to come together to craft public policy. Though many small and large cities make up the region, we are one economy, with shared physical and social systems. Environmental issues and regulations cut across jurisdictions and require coordination among levels of government and agencies well before these systems are disrupted. More than half of the Bay Area residents cross county lines to commute to work, making housing workers a regional concern.[2] Many assets are regional, including our transportation, power, sewer, water and communications systems.

The overarching goal of the Governance paper is to achieve forums for **regional communication and collaboration**. Our recommendation is to accomplish this through three goals – **create a regional resilience policy forum**, **develop regional resilience leaders**, and **use information and data analytics for disaster resilience**.

No regional coordinating body or disaster recovery framework is currently in operation to facilitate sharing and decision-making in the aftermath of a major disaster, although FEMA's National Disaster Recovery Framework and CalEMA's Regional Emergency Coordination Plans may provide guidance on such a framework. Jurisdictions independently work their way through the FEMA regulatory system and make recovery decisions on their own, based on their current situation. The urgency for quick action and competing demands for time may inhibit decision-makers' awareness of and access to information about other actions occurring around the Bay Area, or where their rebuilding decisions fit within the regional agenda. This can lead to fragmented recovery efforts and competition for federal funds. This is particularly an issue with the restoration and recovery of regional assets,

---

[2] *The Bay Area Regional Economic Assessment*. A Bay Area Council Economic Institute Report, October 2012.

such as infrastructure systems.   A forum to help coordinate and guide jurisdictions within the region could not only speed restoration of regional services but expedite jurisdictional recovery as well and ensure that the recovery process fits with larger regional goals for residents and businesses.

Helping staff and officials understand what may be asked of them before the disaster hits can help ensure that those involved have adequate powers and tools and are prepared for what they may be expected to contribute in the post-disaster recovery phase.   Identifying champions or new types of professionals who deeply understand recovery needs and have the ability to move between departments and influence officials can also greatly assist recovery if they are given appropriate roles and forums to use their skills.

In addition, jurisdictions need many different types of information after a disaster. For example local officials must have essential damage assessment information for utilities, government, and private sector organizations to assist with decisions about outages, damaged infrastructure, transportation disruptions, red-tagged buildings, and related debris and transportation issues. The same damage impact information can support decisions about long-term sheltering, temporary housing, and expedited disaster assistance. Information needs may range from information on individual buildings to a general picture of damage in other parts of the region.

Housing

One of the most seismically active regions in the country, California has developed strong building codes that will largely prevent loss of life in a major earthquake. These codes were developed over many decades and have been continually improved as earthquakes have demonstrated the need for new techniques and stricter codes. Still, these codes do not guarantee that even a new building will be inhabitable or restorable after earthquakes, and many older buildings built before modern codes have not been upgraded and may need to be demolished due to extreme earthquake damage. The challenge for policy makers in the recovery framework is to maintain affordable housing while also improving the seismic resilience of existing housing so that quality affordable housing can survive an earthquake or other disaster.

The first goal of the Housing paper is to **address regional goals of economic prosperity, environmental enhancement, and improved governance in housing recovery**. Some disaster projections forecast the loss of more than 150,000 housing units across the region. One possibility is to focus replacement housing construction within Priority Development Areas (PDAs), locally-nominated and regionally-supported infill development opportunity areas within existing communities.[3] PDAs are generally areas where there is local commitment to develop more housing along with amenities and services to meet the day-to-day needs of residents in a pedestrian-friendly environment served by transit. These qualities that make neighborhoods an enjoyable place to live also promote more resilient communities and supporting these services after an earthquake will be key to ensuring that residents can remain in their homes.

The second goal is to **facilitate housing recovery through good policy, financing, and insurance**. Uninsured homeowners will present an unprecedented problem for policymakers at all levels of government in future earthquakes. Without financing options, even middle class residents will struggle to repair and rebuild their

---

[3] Association of Bay Area Governments, FOCUS Program.
http://www.bayareavision.org/initiatives/prioritydevelopmentareas.html

homes and may decide to walk away from their homes entirely, delaying recovery of the region. In addition, fire risk to wooden structures due to gas line breaks is a major concern, especially where water systems have not been retrofitted.

The third goal is to **remove barriers to housing retrofit and replacement** for both **multi-family buildings** and **single-family homes**. Seismically vulnerable multi-family buildings pose particular challenges for local governments. These buildings are not easy to identify and retrofits are expensive, but the benefits of retrofitting are significant. Rebuilding multi-family housing post-earthquake is generally very slow, taking several years longer than for single-family homes and affordable units are often rebuilt above market rate, resulting in loss of affordable housing options. In some cities soft-story buildings are clustered together, creating potential for widespread loss of housing in concentrated areas.

Older single-family homes will likely account for 9% of overall housing losses after each major earthquake.[4] Single-family homes are generally relatively easy and affordable to retrofit. However, owners who embark on retrofit projects often quickly become perplexed by the lack of retrofit standards for some types of homes and the inconsistent array of retrofitting techniques proposed by contractors. Owners are further discouraged by the lack of incentive programs enjoyed by residents for energy retrofits. An estimated 2/3 of single-family retrofits are done improperly,[5] a waste of homeowners' money that provides inadequate seismic benefits and creates a false sense of security. Quality retrofits benefit not only homeowners and their families, but entire communities when they can get back on their feet faster after earthquakes.

Infrastructure

In the wake of a major disaster, the recovery of our major infrastructure systems will play a large role in our ability to recover quickly and effectively. Many recovery activities are highly dependent upon these systems. For example, the movement of goods - including supplies for rebuilding and daily goods and food for resuming daily lives - depends on a workable transportation system. People will not be able to stay in their homes if water and wastewater services are not available, and businesses will not be able to reopen. Repairing failed infrastructure systems and restoring their services are vital to the recovery of the Bay Area after a disaster, and failure to do so quickly and efficiently will result in widespread and long ranging, potentially devastating impacts.

The first goal of the infrastructure paper is to **increase technical understanding of region-wide system vulnerabilities.** Currently, few understand how systems are interdependent. What knowledge that is available is largely based on speculation, not on rigorous analysis. The region needs peer-reviewed technical studies to better understand system vulnerabilities and what consequences may result from cascading failures.

The second goal is **to increase ways to share risk information to collectively increase regional system resilience**. To better understand interdependencies, we must improve risk information sharing among service providers and regional stakeholders before a disaster occurs. We also have to participate in collaborative planning and accelerate mitigation.   This sharing and collaboration is vital to an effective recovery.

---

[4] *Preventing the Nightmare* (update), Association of Bay Area Governments, 2003.
[5] *Preventing the Nightmare: Technical Appendix B*, Association of Bay Area Governments, 1999 and *False Sense of Security*, Contra Costa Times, 2006.

Communication and information sharing also allows for informed prioritization of infrastructure recovery. Understanding upstream and downstream interdependencies for repairs, as well as which systems key community resources rely upon, can be used to develop an appropriate timeline for streamlined recovery. Understanding priorities and system interdependencies allows providers to identify primary repairs to minimize interdependency and restore certain portions of systems quickly.

Economy and Business

The impact of an earthquake on the economy has one of the farthest-ranging implications for disaster recovery in the Bay Area. Without a swift and strong economic recovery, the Bay Area will suffer from a protracted recovery with slow repopulation in heavily damaged areas, slow rebuilding of homes and businesses, loss of revenue from business, tourism, and taxes, and the potential relocation of major industries. Estimates are that a repeat of the 1906 earthquake would generate $120 billion in direct economic building related losses.[6] We have seen repeatedly in disasters that areas with the fastest economic recovery are those which already have strong economies and cultivate conditions to help businesses thrive before a disaster.

The Economy and Business paper has three goals: **retain big business**, **keep small and neighborhood serving businesses open**, and **minimize supply chain disruption and keep goods moving**. The Bay Area regulatory environment, including zoning, permitting and environmental regulations may also inhibit businesses after a disaster, making it too difficult to stay or reopen. Businesses have identified a lack of consistency between regulatory agencies' policies at the local, regional and state level and commented that this situation limited their ability to expand within the region under normal business conditions.[7] The challenges of post-disaster recovery will elicit calls for regulatory relief. With large volumes of rebuilding happening simultaneously, the capacity of regulatory agencies could potentially slow down the process.

Small and locally serving businesses remain an important component of a strong region and are especially vulnerable to closure after a disaster. An estimated 25% of small businesses do not re-open following severe disruptions from a major disaster.[8] One reason why small businesses are so likely to fail is that they tend to operate with small profit margins and limited reserve funds, which means that even a short period without cash flow may have a significant impact on business. Small businesses also may not be eligible for SBA loans, which require businesses to demonstrate that loans can be repaid—a challenge when disasters disrupt business operations.

Other potential barriers to economic recovery include the disruption of vendors and supply chains to and from the region and the repercussions for national and international markets. Business disruption has upstream and downstream impacts on supply chains that can exacerbate impacts on the economy. For example, disruption of a manufacturing business may limit global supply of a particular product, disrupting the economy far beyond the impacted area. While the Bay Area's share of the manufacturing industry is not particularly concentrated, what

[6] Kircher, Charles, et al, 2006. *When the Big One Strikes Again—Estimated Losses due to a Repeat of the 1906 San Francisco Earthquake*. Earthquake Spectra, Volume 22, No. S2, pages S297–S339. Note: similar losses are expected for a Hayward fault scenario earthquake.
[7] *The Bay Area Regional Economic Assessment*. A Bay Area Council Economic Institute Report, October 2012.
[8] California Seismic Safety Commission, March 2012. Post-Disaster Rapid Economic Recovery Plan Project – Leading Practices and Potential Steps for a Rapid Post-Disaster Economic Recovery," Report by Deloitte Consulting

is manufactured here is highly specialized and focused on sophisticated equipment design and development. Disruption of this specialized manufacturing could have global economic impacts.

Papers Structure and Format

This suite of papers seeks to provide a high-level analysis of the major goals for increasing resilience through a regional forum along with recommended actions for reaching these goals. The papers are structured into three general categories:

Theory—*Resilience Background and Context*

This paper provides the overall background and theory behind planning for resilience. It places disaster resilience planning in context with other types of resilience and sustainability efforts, particularly ongoing climate change planning and national resilience efforts. This paper also touches upon current state of disaster planning in the Bay Area and identifies major hazards of concern for the Bay Area.

Assessment—*Regional Governance, Infrastructure, Housing, and Economy and Business Policy Papers*

This suite of four papers examines the major issues of governance, infrastructure, housing, and economy and business. The four papers follow a similar format presenting significant goals for regional disaster recovery planning, and identifies regional actions that can be taken to address these issues. The regional decision-making paper serves as the foundation for the three other topic papers, as the goals and actions outlined there set the context for more easily implementing sector-specific recommended actions.

Action—*Action Plan*

The action plan summarizes and prioritizes the actions identified in each of the four issue papers. The actions are analyzed for feasibility and include discussion of how to implement our recommended regional policy platform.

Methodology

The Resilience Initiative was convened over an 18-month period. Stakeholder workshops were held throughout the process to solicit input on the major topic areas of housing, economy and business, including goods and services, and infrastructure. A final policy forum was held in October 2012 in conjunction with ABAG's Fall General Assembly, which focused on coordinated regional governance for long-term recovery and identified ways to increase shared understanding, opportunities for coordination, and tools for communication that will lead to regional strategies before the event that may improve the post-disaster recovery process.

In addition, the team conducted interviews in the summer of 2012 with key resilience stakeholders, thought leaders and elected officials closely involved with exploring new public approaches on resilience. A complete list of our interviewees can be found on the credits page in the beginning of the suite of papers.

The work was also periodically reviewed by ABAG's Regional Planning Committee and will be formally adopted by ABAG's Executive Board in 2013.

Regional Resilience Initiative
Background and Context

Introduction

The research conducted through the Regional Resilience Initiative at ABAG may offer larger lessons for other communities facing similar regional resilience issues, but is grounded in the unique context of the Bay Area and the factors that characterize our region and our vulnerabilities. The research perspective is also based in the Earthquake and Hazards Program's grounding in resilience and recovery theories, definitions, and tools, which gives these papers their unique voice. This paper provides the background ideas in which the rest of the work is based, as well as paints the picture of our regional context. Each of the subsequent papers comes from the point of view expressed in this paper.

The definitions and theory presented here may also help the region establish a baseline understanding of what we mean when we talk about resilience, hopefully engaging a wider variety of stakeholders. While it is not necessary to be fully engaged with all the concepts laid out here to implement actions towards increased resiliency, this paper may provide the narrative that some need to further explore the topic of disaster resilience.

The first part of this paper explains our definition of "resilience" and relates it to sustainability and disasters. With many definitions of resilience in use, we felt it was useful to define within this paper what constitutes resilience and a resilient region. The paper then describes the importance of planning to recover, as well as some of the tools that can be leveraged to address recovery and resilience. We then address where recovery fits in within the context of the umbrella of resilience, which also includes mitigation and response.

The second part of the paper describes our unique conditions within the Bay Area, including our assets and vulnerabilities. Understanding general trends and characteristics of the Bay Area, as well as a sense of the threats we face, allows stakeholders to better predict the types of issues we will face after a major disaster. The Bay Area enjoys a high quality of life with many natural and man-made resources and assets. By understanding what makes our region unique, we can plan to preserve and enhance our quality of life, despite major disruptions.

The following papers in this suite, with their high-level goals and specific recommended actions, all emerged from the foundation laid out by this paper, which guided our process and set the context for the Resilience Initiative work.

Defining Disaster Resilience

Resilience itself is not a new concept. Cities and counties have been and are currently pursuing various strategies to become more resilient, but may use a wide range of language to define, understand and communicate what they are doing.

Resilience may combine aspects of environmental sustainability, economic strength, risk management, emergency preparedness, and strong social communities; however a major aspect of defining resilience as a region is coming to a common understanding about what a desired resilient state looks like. It is ultimately not important that every county, jurisdiction, and special district in the Bay Area use the same definition of resilience, but it is helpful to have an overarching common concept to use to begin to create a usable and common language within the region.

Below we have provided some widely accepted definitions of many of the elements we feel contribute to resilience to help create a platform for regional understanding.

Sustainability

Sustainability and resilience are tightly integrated concepts – a sustainable region is inherently more resilient, and a resilient region is inherently more sustainable. Sustainability is commonly defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs." [1] California's State Hazard Mitigation Plan further defines sustainability using a vision by the National Commission on the Environment, which states that sustainability is "a strategy for improving the quality of life while preserving the environmental potential of the future," of "living off interest rather than consuming natural capital."[2] Sustainability largely refers to the way that a society uses resources and the implications of those actions on various systems, scales, and timeframes.

The term sustainability is often used to speak about environmental issues, but can be expanded to also include social and economic sustainability. This basic pyramid of environmental, social, and economic sustainability is often referred to as the "triple bottom line." This thought can be further expanded to include any valuable resource that a community relies upon for its quality of life, including physical, historical, and cultural resources. This multiple-resource approach to sustainability is particularly beneficial to use in the context of resilience, as resilience addresses not just protecting the built environment or physical world but maintaining and enhancing economies, social systems, and any number of other resources as well.

Resilience and sustainability have a symbiotic relationship. Increasing the sustainability of a community can increase resilience to disasters. For example, resilience to disasters cannot be maximized if environmental sustainability is not valued – in many instances, the degradation of the environment in fact can contribute to disaster vulnerability, such as the loss of wetlands increasing vulnerability to hurricanes or sea level rise. In addition, disasters that destroy or dramatically alter resources render communities unsustainable, since they impact the long-term ability of the community to access and use resources. Increasing resilience to disasters thus inherently increases the sustainability of a community, as it helps maintain access to resources, now and in the future.

Resilience

There are many specific definitions of resilience in academic literature, but we have found that all definitions share common characteristics. The National Academies defines resilience as "the ability to prepare and plan for,

---

[1] *Our Common Future, Bruntland Commission, 1987*
[2] *State Hazard Mitigation Plan, p. 102*

absorb, and recover from or more successfully adapt to actual or potential adverse events."[3] California's State Hazard Mitigation plan similarly defines resilience as "the ability of a system to absorb shock and maintain its structure and functions with a minimum loss… (and) resume pre-event functionality in a relatively short time."[4] From these definitions, we can gather that the inherent attributes of resilience are that it is a function, not an end state (it is an ability); it helps to minimize negative impacts of large events; and it facilitates the quick resumption of an operable state to a system, which may be similar to the previous state or superior to the previous state.

The San Francisco Planning and Urban Research Association's (SPUR) Resilient City initiative defines "seismic resilience" specifically around the concept of resilience to a major earthquake. The organization's definition is the "ability of a city to remain safe and usable after a major earthquake. A resilient city is able to contain the effects of earthquakes when they occur, carry out recovery activities in ways that minimize social disruption, and rebuild following earthquakes in ways that mitigate the effects of future earthquakes." [5]

While the exact definition of resilience may vary in its specifics in terms of describing its focus and scope, the Community and Regional Resilience Institute (CARRI) gives us a language of five core concepts to anchor every definition:

- Resilience is an **attribute** of the community, system, region, etc

- Resilience is **continuing**, an inherent and dynamic aspect of the system

- Resilience involves elements of **adaptation** and can easily adapt to new variables

- Resilience puts systems on a positive **trajectory** relative to its pre-disaster state

- Resilience is **comparable** and **relative** – it is possible to compare systems' ability to be resilient[6]

It is helpful to examine a few other factors that we feel contribute to a state of resilience or that help to explain how resilience is defined. First is the concept of scale – the state of being resilient is greatly enhanced when it exists at multiple scales, ranging from the individual, neighborhood, community, city, county, and region to the state and federal levels. For our purposes we also wish to emphasize adaptability and the ability to recognize opportunities for growth and improvement as a key element of resilience – the ability to see a disruption as a chance for transformation – to "build back better."[7] Lastly, as discussed above, it is important to see resilience and sustainability as highly interconnected.

Resilience can also be viewed through the complete life cycle of a disaster. Resilience begins with mitigating a system to be able to withstand or adapt during a disaster, then continues as response begins immediately after a disaster. An effective and resilient response effort understands how actions undertaken during the response phase have implications for the long-term health and recovery of the system. Resilience continues throughout short-term and long-term recovery, and effectively shortens the period of time between the disaster and full

---

[3] *Disaster Resilience: A National Imperative (2012)*

[4] *California State Hazard Mitigation Plan (p. 102) http://hazardmitigation.calema.ca.gov/docs/2010_SHMP_Final.pdf*

[5] *Defining what San Francisco needs from its seismic mitigation policies, (2009). SPUR.*

[6] *Definitions of Resilience: An Analysis. (2009). Plodinec, M.J. Community and Regional Resilience Institute (CARRI)*

[7] *From State Hazard Mitigation Plan, page 102. http://hazardmitigation.calema.ca.gov/docs/2010_SHMP_Final.pdf*

recovery. Lastly, in a resilient society, the long-term recovery phase includes the integration of mitigation measures in rebuilding practices, effectively beginning the life cycle again.

Similar to the term "sustainability," the term "resilience" applies more to a "philosophical perspective than a scientific concept."[8] An understanding of the many definitions and attributes of resilience helps to form the baseline concept of regional resilience, despite variations that neighborhoods, communities, cities, counties, infrastructure providers, and businesses may define in terms of system boundaries and scale within their own definition of resilience.

Defining a Disaster

It is also helpful to understand what we mean when we speak of a "disaster." In general, the types of disasters we are considering for the context of our work are those that are due to natural hazards, have disruptive consequences on one or more built environment, social, or economic system (man-made system), and are large enough to cross jurisdictional boundaries or overwhelm the capacity of a single jurisdiction or entity to overcome, making them regional in nature.

Disasters and their consequences can take on many forms and characteristics. Disasters can be "fast," such as a sudden earthquake or tornado; "slow," such as long-term degradation due to sea level rise or changes in weather patterns; or "hybrid," when fast and slow disasters occur simultaneously and a sudden event is exacerbated or compounded by existing slow disasters.[9] The impact of the disaster can be low or high, and can range in geographic scale.[10] Impacts can also vary based on preexisting conditions – if a community has a strong economy and is on a general upward trajectory in terms of quality of life and well-being, an impact may be much less devastating than in a community dealing with disinvestment and lowering of quality of life.

It should be noted that natural hazards are not in themselves disasters. In *Disasters by Design*, a natural hazard – an extreme, low-probability phenomena – has the potential to cause a disaster when it strikes a human collective, but is not in and of itself a disaster. The disaster emerges at the point of intersection between the hazard and man-made systems, and only if the hazard causes negative impacts on the systems. This interrelationship is a complex one with many variables – for example, man-made systems often create a negative feedback system that increases the frequency or strength of a natural hazard, such as when paving over wetlands reduces its ability to attenuate hurricanes and major storms; additionally the consequences of a natural hazard become more severe as man-made systems become more complex. The trauma and consequences of a disaster are inherently defined, reshaped, and redirected by human actions and perception.[11]

It is also worth examining the difference between a disaster and a catastrophe. Webster's dictionary defines a catastrophe as a disastrous event that results in a *final end or conclusion*. This definition implies a disaster that is insurmountable and where recovery to a pre-disaster or equivalent state is not feasible. According to thinking by San Francisco author Rebecca Solnit, in her book *A Paradise Built in Hell: The Extraordinary Communities That Arise in Disaster*, communities can overcome disasters, but by definition they cannot overcome catastrophes. The defining element that differentiates a disaster from a catastrophe is resilience. The elements that allow a

---

[8] *Disasters by Design: A Reassessment of Natural Hazards in the United States (1999). Joseph Henry Press.*

[9] *Envirenew Resilience Part 1 Report: Creating Resilient Communities (2012)*

[10] *Ken Topping (2012)*

[11] *Disasters by Design: A Reassessment of Natural Hazards in the United States* (1999). Joseph Henry Press.

community or system to adapt and overcome a disaster prevent any one event from becoming catastrophic and insurmountable (Solnit, 2009).

Objectives of Planning for Recovery

Why plan to recover?

After a disaster, many people in positions of authority face immense pressure to quickly make decisions and ensure that recovery action is taking place. The public expects quick restoration of the life they had previously known, and this pressure can often lead to decisions that are uncoordinated, not fully considered, stopgap in nature, or do not align with a community's agreed-upon long-term goals. Communication among various levels of authority and different systems may be lacking. Outside interests or financial constraints may place additional pressure on decision-makers. Decisions may be made without public input or public consideration. Outdated rules and regulations may present unforeseen problems, with no public policy tools available for change. Many *ad-hoc* groups may arise and make decisions of their own without awareness of or regard for other groups. Outside experts with little or no knowledge of local issues may come in to contribute their opinion, without sufficient knowledge of the local social context and with little regard to follow-through and consequences. Many issues may arise in the recovery phase that can have repercussions in the community for decades.

While specific recovery actions cannot be known or implemented until after a disaster, when the full consequences are assessed and the immediate needs of the community are met, there are many actions that can be taken before a disaster that assist and expedite recovery, such as adopting a Long Term Recovery Plan, creating a Recovery Task Force, and adopting a Repair and Recovery Ordinance.

It is possible, however, to begin to understand, anticipate, and put planning tools in place before a disaster to minimize or eliminate many of these issues and conflicts. The region, as well as individual jurisdictions, has many tools at its disposal to "plan for recovery." Planning for recovery can result in an expedited recovery, due to coordinated communication, pre-approved recovery plans, and established planning systems and frameworks. Resilience/recovery planning in advance of a disaster may also result in a recovery phase that requires far less repair or restoration investment, because interjurisdictional efforts are not duplicated, money is spent in a coordinated manner, and pre-disaster mitigation has lessened damage. Anticipating where people will live and creating a post-disaster housing plan means fewer displaced residents, which can contribute to a more stable economy post-disaster. Planning with businesses on how to retain their services after a disaster can also stabilize the local economy, and minimize disruption to people's everyday lives. Planning for recovery can also identify and prioritize actions for vulnerable populations and anticipate their unique needs. Lastly, the process of planning for disaster recovery before a disaster happens can result in a shared vision for the future, as stakeholders and residents begin to understand how they want their region to grow and what it could look like if a disaster expedites change and renewal. This can also result in a more empowered and informed public.

What planning/policy/legislative tools are available to support disaster recovery planning?

There are many tools currently in use today that can be used by stakeholders to plan for recovery. In considering these tools, we must keep in mind that the post-disaster decision-making landscape will likely be significantly different than the current landscape and so the way these tools are used may change. In examining existing

tools it is also useful to consider which tools are not helpful or useful or may hinder recovery, and to begin to identify new tools that may be needed for long-term disaster recovery.

Planners largely have tools for managing land use, housing distribution, and the urban character in the recovery phase. Planners can play a large role in how quickly and effectively rebuilding happens, and what the vision is for the process and outcome of the rebuilding process. Some planning tools are below.

- General plans and specific plans: These will guide the vision of the city with or without a disaster, but must make it clear that in the event of a disaster, the vision will still be followed.

- Zoning tools such as overlay districts, nonconforming use regulations, special use permits, etc: Review existing zoning through the lens of recovery and rebuilding to identify potential conflicts or issues.

- Zoning for temporary housing and temporary commercial spaces: Temporary zoning has major implications for reconstruction and land use decisions. Understanding how this will work before a disaster will greatly aid recovery.

- Buyouts and financial incentives for where to build/not build, easements, etc.: Have a plan for where a buyout program might be a possibility and where funding might come from.

- Historic preservation/historic district ordinances, historic landmark designations, and associated state and federal tax credits.

Who conducts this work?

Traditionally, work around disasters has been largely conducted by emergency managers. Yet as the practice of recovery planning evolves, the work involves new and different stakeholders throughout the recovery process. In addition to emergency managers, elected officials, city managers, county administrators, city/county attorneys, planners, community development staff, economic development staff, finance staff, and many other players in day-to-day government operations will likely play a large role in the recovery process. Additionally, a new type of professional is emerging that engages in recovery planning as a large or whole percentage of their job. These professionals are largely still defining their role and developing support for their positions. The *National Disaster Recovery Framework* from FEMA identifies the role of a Recovery Manager and Recovery Coordinator at the local, state, and tribal levels along with a Federal Disaster Recovery Coordinator position within FEMA. These FEMA-designated roles can help inform what recovery professionals may look like.

As recovery planning evolves, these new professionals, as well as existing staff who will perform beyond their daily duties after a disaster, will need outlets for sharing information, learning new skills and knowledge, and making connections with other recovery professionals. The region needs a forum to gather these professionals performing many functions including hosting lectures, learning events, and networking events, publishing newsletters, conducting research, setting standards for newly-defined tasks and job roles, and helping to match professionals to jobs and needy cities to professionals. Schools may also begin to develop curriculum and new degrees, similar to the newly developed Graduate Programs in Sustainable Management at the Presidio Graduate School.

Mitigation and response planning to facilitate recovery

Appropriate and robust pre-disaster mitigation can mean the difference between a speedy, stabilized recovery process and a city that does not ever fully recover. Most disasters will cause the greatest amount of damage, by far, to the built environment. Damage to the built environment can cause injuries and deaths, displace residents from their homes and employees and employers from places of business, and disrupt the provision of basic services. Damages to infrastructure can impede the flow of people and goods and have spillover effects on multiple sectors. While not all damages can be anticipated and mitigated against, structurally mitigating homes and other buildings to withstand ground shaking can significantly lessen overall damage to the built environment, and mitigation to infrastructure can reduce loss of service.

Mitigating damages means a more intact built environment after a disaster, greater stability for residents and businesses, and far less money required for physical repairs. If people are able to stay in their homes because of minimal damage, they are less likely to leave the area and also do not require temporary housing. Minimizing physical damage to businesses allows them to begin functioning again more quickly and keeps the economy more stabilized. And while mitigation to buildings now may require an upfront investment, the money spent pre-disaster will likely prevent a much larger outlay of money that would be required post-disaster to make repairs or rebuild in a tightened and competitive construction market – one federally-sponsored study on mitigation efforts states that for every dollar invested in pre-event risk reduction, four dollars in response and recovery funds are saved.[12] Keeping the built environment more intact through mitigation also preserves the character of the urban area, maintains existing affordable housing, and minimizes the likelihood of a significant change in demographics after a disaster.

The way disaster response is conducted also has lasting impacts on long-term recovery. Traditionally, these two phases have been seen as separate. However, the connection between response and recovery should be made explicit, since they so heavily influence one another. Disaster response procedures set up structures, timelines, and precedents that can carry long into recovery. Where emergency housing is located impacts where rebuilding and new development goes. Structures for decision-making may be set up hastily and place important decisions in uninformed hands or leave out important stakeholders. Short-sighted and compartmentalized decisions made to expedite rebuilding may not be coordinated regionally or fit in with long-term goals. Hours-long delays in decision-making during the response phase can translate into months-long delays during the recovery process. Actions during response can easily set a community on a difficult or unintended recovery path unless there is clear-sighted, long-term thinking taking place during response and communicated widely and effectively.

Quick, confident, and coordinated actions that foresee the long-term future, however, can be very powerful in instilling confidence and faith in residents and business leaders. If the community trusts that recovery will be effective and beneficial, people will be more likely to stay in the region. Transmitting this message quickly is highly important – if people perceive incompetence, lack of coordination, delay, or contentiousness in decision-makers, they will quickly lose confidence in the recovery of their community and are far more likely to leave. The same is true for businesses – small and large alike.

---

[12] MMC/NIBS, 2006

Context

While the concepts of resilience and recovery planning may be largely universal and relatable to many different locations and conditions, the unique characteristics of the Bay Area allow us to tailor our understanding to the specific needs and vulnerabilities we face. The following briefly describes many of the major components of the Bay Area's assets and vulnerabilities – what we want to protect and preserve, what we can leverage for a successful recovery, and what types of threats we can anticipate that will disrupt our quality of life.

Bay Area Overview [13]

The focus of this study is the greater 12-county Bay Area, which combines the 9-county San Francisco Bay Area, consisting of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma Counties, plus the counties of Santa Cruz, Monterey, and San Benito around Monterey Bay. The greater Bay Area is extremely diverse in every sense of the word - it is culturally rich, with a large diversity of ethnic groups; it is geographically diverse, with the bay, salt marshes, estuaries, wetlands, and hills and valleys, all shaped by major and minor faults; and its urban character ranges from downtown San Francisco with its high-density, highly urban form to the preserved farmland and rural areas to the North and South including the area around Monterey Bay. This diversity is what makes our region a unique, beautiful, and desirable place to live, but this is also what creates many unique challenges to building regional resilience.

Population

In 2010, the greater 12-county Bay Area had a population of 7.88 million people, with 7.15 million people located in the San Francisco Bay Area and 732,000 people in the Monterey Bay Area. The three most populous cities in the San Francisco Bay Area are San Jose (Population: 946,000), San Francisco (Population: 805,000) and Oakland (Population: 391,000). The three biggest cities in the Monterey Bay Area are Salinas (Population: 150,000) Santa Cruz City (Population: 60,000) and Watsonville (Population: 51,000). While the core area around the San Francisco Bay is densely populated and has a highly urbanized character especially in the big three cities (San Jose, San Francisco and Oakland), the area north of the San Francisco Bay and around Monterey Bay have a lower population density and a more rural character, dominated by open space and agricultural land. The greater 12 county Bay Area population is expected to grow by 1.98 million people or 25% in the next 25 years taking the overall population to 9.86 million by 2035. The majority of this growth will be focused in the core urban areas around the San Francisco Bay within the urban growth boundaries to protect open space and agricultural land.

---

[13] *Source for the following numbers are: ABAG (2012): Plan Bay Area, Jobs-Housing Connection Scenario (Draft) and AMBAG (2011): Envisioning the Monterey Bay Area, A Blueprint for Sustainable Growth and Smart Infrastructure, unless marked differently*

Jobs and Economy

The greater 12-county Bay Area was home to around 3.71 million jobs in 2010. A large majority of jobs (3.39 million) are located in the San Francisco Bay Area with the biggest employment centers in San Francisco (569,000 jobs), San Jose (375,000 jobs) and Oakland (190,000 jobs). The Monterey Bay Area had a total of 329,000 jobs. San Francisco has the highest proportion of jobs to population, making it an employment hub for the region. The biggest employment sectors in the San Francisco Bay Area in 2010 were Professional Services, Government, Leisure and Hospitality and Manufacturing and Wholesale. The biggest employment sectors for the Monterey Bay Area were Educational Services and Health Care and Social Assistance, Retail Trade, Agriculture and Fishing and Professional Services[14]. With the economy expected to grow in the next decades, the employment number for the 12 county Bay Area is expected to increase by 22% to 4.72 million jobs in 2035. A large proportion of those new jobs will be concentrated in the employment centers of San Jose, San Francisco and Oakland or in the development corridors that stretch along both sides of the San Francisco Bay. The employment growth will be driven by the Knowledge Based sector, which includes professional services, Information and finance, the Health and Education sectors and the Leisure and Hospitality sectors. Many major corporations are headquartered throughout the region. Silicon Valley and the broader South Bay is home to many leading IT and high-tech companies making it a world-class business location. There are four national laboratories, over 30 public and nearly 50 private colleges and universities, and over a dozen seminaries. Students, faculty, visiting lecturers, and researchers come to the Bay Area from around the world to take advantage of the rich resources these facilities provide, and they also contribute greatly to our economy by being major regional employers.

Regional Infrastructure

The regional transportation system in the greater Bay Area is divided between the San Francisco and Monterey areas with some linkages between. The highly urbanized core area around the San Francisco Bay is serviced by multiple transit options, such as BART, Amtrak, or the regional rail system operated by Caltrain as well as light rail and inter-county ferries. The areas outside the core area such as the North Bay, West Peninsula or the areas south of San Jose, are more dependent on bus services or the personal use of the automobile and the network of highways.

Much of this transportation system has been retrofitted over the 20+ years since the 1989 Loma Prieta earthquake. Weaknesses, however, still exist and according to a recent study by the San Francisco Planning and Urban Research Association (SPUR), the failure or significant damage to any of these regional transportation systems could temporarily paralyze San Francisco or a wider regional area. In addition to maintaining the currently existing infrastructure and its public transit network, expansion compatible with future population growth of the greater Bay Area is crucial. Developments in this direction are already being made with the planned expansion of BART to San Jose for example. In general, there is a regional priority to increase non-auto modes of transportation, including walking, biking, and public transportation. Besides various transit improvements the region has seen developments to improve 'bikeability' with the Bay Trail, which almost covers

---

[14] US Census 2010

the entire shoreline of the San Francisco Bay. This improvement not only meets regional goals of sustainable development, but also provides alternate transit routes post-disaster.

The region has three major airports – San Francisco, San Jose and Oakland International, as well as Monterey Regional and Sonoma County Airports. San Francisco and Oakland International are directly connected to BART, while San Jose International is also well connected to public transport.

The larger Bay Area has three ports located in Oakland, Richmond and San Francisco. The Port of Oakland is the fourth busiest container port in the U.S., handling over 2 million freight units annually, and is served by the Burlington Northern Santa Fe and Union Pacific Railroads. Oakland loads and unloads over 99% of the containerized goods that move throughout Northern California. The Port of Richmond handles oil tankers and associated shipping, as well as automobiles and other dry and liquid bulk goods, and is the leading port in the San Francisco Bay Area in tonnage of automobiles and bulk liquids. The port has five city-owned and ten private terminals and is served by the Burlington Northern Santa Fe and Union Pacific Railroads. The Port of San Francisco handles mainly cruise ships, passenger ferries, and commercial and sport fishing activities on the northern waterfront. Fisherman's Wharf is the center of Northern California's commercial and sport fishing fleets, and is a key tourist destination. Pier 45 houses the West Coast's largest concentration of commercial fish processors and distributors. All three ports play a major part in the regional economy, not only as hubs of trade, but also as employment centers.

The region has five major oil refineries in Benicia (Valero), Martinez (Shell and Tesoro), Richmond (Chevron), and Rodeo (ConocoPhillips), and depends on multiple power plants, wastewater treatment plants, waste management locations, and an extensive telecommunications system located throughout the Bay Area. The majority of the Bay Area depends on PG&E for power (some jurisdictions, including Palo Alto, Marin, and Alameda, generate their own), while multiple entities provide water, wastewater, and waste services, which vary widely in size and scope. Both the San Francisco Bay and Monterey Bay Areas are serviced by a dense network of PG&E gas transmission pipelines.

Natural and Manmade Hazards Affecting the Bay Area

While the focus of this Initiative was on the effects of earthquakes on the region, other natural and manmade hazards can have regional consequences requiring a recovery effort similar to that for an earthquake. These threats include tsunamis, firestorms and windstorms, prolonged rain events with widespread flooding and landslides, droughts, pandemics, terrorist attacks, catastrophic events caused by aging infrastructures and systems failures and technological disasters.

There is a need for additional assessment capabilities and studies of impacts particularly to infrastructure from earthquakes and other major disasters, including vulnerability of the Bay Area water supplies to Delta levees and flooding from a super storm, to better determine restoration requirements, timelines, and costs in advance of an event. There is also a need to identify vulnerable neighborhoods that might be most heavily impacted by various earthquake events in the Bay Area. Focusing on areas that may suffer significant structural damage, housing and business loss could stimulate pre disaster recovery planning and discover organizational, programmatic, financial, and legislative gaps.

Earthquakes

The region is particularly vulnerable to large earthquakes. There are numerous major active faults in the region with a combined thirty year probability of a major earthquake in excess of sixty percent. Two fault systems pose significant risk in the Bay Area. The Hayward Fault runs about 74 miles long mainly along the western base of the hills on the east side of San Francisco Bay through densely-populated Richmond, El Cerrito, Berkeley, Oakland, San Leandro, Hayward, Fremont, and San Jose. The San Andreas Fault, which cuts through Tomales Bay in Marin, runs offshore as it passes San Francisco and returns to shore as it passes through the San Francisco Peninsula, is the other significant regional threat. A large magnitude earthquake on either the Hayward or San Andreas Faults would cause significant damage to the region.

Soil liquefaction is a significant problem throughout much of Bay Area. Large areas around the Bay have been filled and now support residential and commercial buildings and infrastructure assets. Often the soils compaction at these sites is not sufficient to prevent liquefaction. Underground infrastructure assets—water and sewer pipes, natural gas and liquid fuel pipelines, power distribution lines, and communications cables and equipment are particularly vulnerable to liquefaction, as well as above ground structures. Deep soil basins, such as in Silicon Valley, can amplify ground shaking. Bridges, tunnels, and roadways will be impacted by disaster damage and debris. Large proportions of older buildings are not retrofitted for earthquakes and will be at risk, and others will be subject to land and mudslides. Along the coastal areas, there is the threat of tsunamis. For detailed information on earthquake and tsunami threats and impacts, see the ABAG website at http://quake.abag.ca.gov/.

Catastrophic Rain Events and Major Floods

So-called "pineapple express" storms which sweep off the ocean near Hawaii can cause a "super storm" that can result in a rapid "mega flood" which, in turn, could trigger a catastrophic failure of many of the old and degraded levees in the 1100-mile area in the Sacramento-San Joaquin Delta, originally built to control floodwaters and increase farmland. Such a flood would submerge hundreds of square miles, impacting and washing away communities and some of the region's (and nations) most productive farmland.

Fire and Windstorms

Between late November and early March strong Pacific storms can bring both substantial rainfall (saturating and weakening soil) and strong wind gusts that can cause trees to fall on power lines, sometimes affecting hundreds of miles of coast and interrupting essential services for up to several days in some more remote localities. In the spring and fall, strong offshore winds often develop. These winds are an especially dangerous fire hazard in the fall when vegetation is at its driest. Examples of firestorms are the 1923 Berkeley Fire and the 1991 Oakland-Berkeley Hills Fire (Tunnel Fire). In the last 120 years, there have been over 100 significant urban/wildland interface fires in the East Bay hills alone.

Mudslides and Landslides

Some geologically unstable areas have been extensively urbanized, and can become mobile due to changes in drainage patterns and grading created for development. These are usually confined to small areas, but there have been larger problems in the Santa Cruz Mountains.

Climate Change

In coming years, the Bay Area will be subject to increasing effects of climate change. The extensive coastline and bay shoreline will be subject to rising sea level, leading to more frequent and more severe temporary flooding as well as eventual permanent inundation. The Bay Area will also experience more frequent and more severe storms and storm surges, increased risk for wildfires, and increased temperatures, heat waves, and air pollution. Increased snowmelt earlier in the season could flood the delta, and beaches will experience increased erosion and sand loss. Sea level rise will put many regional assets at risk, including transportation, water, and power infrastructure, and will impact shoreline ecosystems and recreational space. Existing flood control measures will soon become inadequate, bearing greater loads and experiencing overtopping.

Multiple Hazards

Some locations in the Bay Area are located in areas that have conditions that make them susceptible to multiple hazards. In the case of earthquakes, many areas will experience not just ground shaking, but liquefaction, landsliding, surface fault ruptures, or tsunamis. Many of the same areas that will experience sea level rise are also areas that are highly vulnerable to liquefaction, and so will need to consider multiple hazards in the future. Fires ignitions after an earthquake due to damaged natural gas valves may cause significant damage in areas particularly susceptible to firestorms. In planning for recovery and resilience, hazards must be considered together, as planning efforts may be wasted if all hazards are not considered.

Conclusion

Placing the work of the Regional Resilience Initiative and the papers that have resulted from this initiative in context and embedded in theory helps to validate our work. Crafting a standard definition and theory of resilience within the region provides a platform for all additional work initiated by this project and helps create a baseline standard for discussing the idea of resilience. Expanding the conversation around resilience beyond the well-known realms of mitigation and response also encourages new professionals to join in the conversation, which helps ensure a more complete recovery process. Disaster recovery is not separate from many of the tasks that cities pursue today – it is the process of city-building and economic development, amplified and intensified. Resilience is largely about maintaining and improving the Bay Area's quality of life, despite natural events that may have the potential to disrupt our most significant systems. Expanding the conversation about disasters and resilience to present a more holistic vision will allow resilience-building actions to become more integrated into all aspects of developing and planning for our region.

Regional Resilience Initiative
Governance Policy Paper

Introduction

A major Bay Area earthquake will have lasting impacts on our region, altering our built environment, economy, and many other characteristics that make the Bay Area unique. How will Bay Area leaders work together to plan for and address the impacts? Who are the major players in this work? How will cities and counties come together with business, nonprofit and community partners to rebuild our region and restore our economy? What is the message and image we will send to the outside world after an earthquake? Will it be one of competition for limited resources or will we work together in the interest of the entire region and collectively advocate for our common needs? How will priorities be set? Stakeholders indicate that a financing strategy to address rebuilding of the Bay Area's economy, infrastructure and housing is a regional necessity. In addition, advocacy for state and federal funding, along with needed legislative and regulatory changes could be successfully crafted through a consensus process. How we come together as a region to grapple with these questions and build regional resilience is the focus of this paper.

Governance in the context of this paper refers to the broad spectrum of regional actors, stakeholders and institutions that will be involved in regional recovery from an earthquake. This paper addresses the major issues we uncovered throughout our Regional Resilience Initiative about our collective capacity to set priorities, make decisions, and implement policy. Our key recommendation is to facilitate a regional resilience policy forum to enhance resilience. The desired end state is a region that makes coordinated decisions and works for common resilience goals, at the jurisdictional and the regional levels.

The San Francisco Bay Area governance structure is complex: we have 101 cities, 9 counties, and hundreds of special districts with overlapping jurisdictional boundaries. Four regional agencies are responsible for land use (Association of Bay Area Governments), transportation (Metropolitan Transportation Commission), air quality (Bay Area Air Quality Management District), and shoreline development planning, programming, and regulation (Bay Conservation and Development Commission). The agencies connect through the Joint Policy Committee. To the south, the Association of Monterey Bay Area Governments performs these functions. As well, many other organizations and agencies have a stake in our region's recovery, including state and federal agencies, businesses, nonprofits, and faith based and community organizations. Their interests should be folded into local and regional discussions and planning efforts.

The Bay Area has developed a nationally recognized structure for emergency response to disasters. The planning that supports this response includes diverse stakeholders.[1] The recovery process, however, is more complex and

---

[1] During the 1991 Oakland-Berkeley Hills Fire (Tunnel Fire), regional first responders could not effectively coordinate to fight the blaze. Consequently, Bay Area legislators, Tom Bates and Nicholas Petris, sponsored legislation requiring the California

less defined. Few jurisdictions have developed recovery plans and even fewer plans or studies have been performed to develop a regional recovery process. The time period for recovery can last decades, and all levels of government and the private sector have roles to play. The recently released National Disaster Recovery Framework from FEMA provides some guidance for recovery roles and responsibilities, but maintains the emergency response in the city-county-state-federal structure. As a region with an interconnected economy, the Bay Area has a long history of effective planning across counties. How should we organize to continue this tradition to build a more resilient region and plan our recovery from earthquakes and other regional scale disasters?

Long term disaster recovery begins immediately after a disaster. A recovery plan needs to be adopted by the region with an assertive strategy for securing supplemental federal assistance. Given the federal deficit, this assistance will be increasingly difficult to obtain in the future; consequently, the regional recovery plan will need to be comprehensive, detailed, and as accurate as possible**. Community and elected leaders must recognize that few Bay Area assets, whether housing or infrastructure, are insured for earthquake damages**. The region will rely upon a recovery plan that is funded from local, state, and federal sources.

Jurisdictions can and should plan for their own recovery. But to adequately address regional recovery objectives, we need more than a few local plans. We need a coordinated regional effort that balances the needs and priorities of cities and counties. Only through coordination can a recovery plan be expedited that includes interjurisdictional and local priorities.

We recognize that regional agencies simultaneously grapple with similar questions about strengthening the regional economy and adapting to a rising bay. It is our intention that these efforts coalesce into a unified campaign to build resilience to all major threats we face. The recommendations are crafted as a regional policy agenda specific to earthquake risks, but can have a great impact if also applied to support and strengthen regional policy around all threats. Many of the recommendations are similar to those made by other policy bodies to address other regional disasters or threats.

The Overarching Goal: Regional Communication and Collaboration

Recommendations from ABAG's Regional Resilience interview process confirm both the research and workshop findings that regional coordination and decision-making can speed disaster recovery and improve resilience if accomplished before the unexpected occurs. There is region-wide agreement that crises are the worst time to come together to craft public policy. Though many small and large cities make up the region, we are one economy, with shared physical and social systems. Environmental issues and regulations cut across jurisdictions

---

Office of Emergency Services (now CalEMA) to develop a Standardized Emergency Response System (SEMS)—a comprehensive system for multi-agency and multi-jurisdictional response to emergencies. This system was taken to scale and adapted nationally as the National Incident Management System (NIMS). Through SEMS aid and resources are requested by cities to the county, by counties to the state, and finally by states to the federal government. Response coordination is organized and managed effectively. In addition, the Urban Areas Security Initiative has developed five Regional Emergency Coordination Plans.

and require coordination among levels of government and agencies well before these systems are disrupted. More than half of the Bay Area residents cross county lines to commute to work, making housing workers a regional concern.[2] Many assets are regional, including our transportation, power, sewer, water and communications systems.

Our ability to recover from a disaster as a region is uneven. The capacity to fully prepare for disruptions is a challenge for many local jurisdictions given current economic difficulties. This uneven ability can impede a consistent, region-wide recovery. Many municipalities don't have the financial resources to fund or manage disaster recovery; all would benefit from a regional approach to overcome resource disparities and support regional neighbors. Best practices and technical assistance for planning can be effectively provided at a region-wide level to coordinate regional information in support of local decisions and needs. Examining recovery at a regional level can strengthen restoration of local economies, address environmental concerns, and project confidence that encourages private sector business and financial institutions to continue to invest in the region.

Resilience Initiative's participants agreed that more region-wide coordination could support resilience-building at the local level. Bay Area leaders coming together to identify and address these issues now will reduce disaster impacts and promote an accelerated recovery that is equitable and strengthens our economy. Though commonly agreed upon issues emerged in the process and are presented below, findings from the stakeholder participation process must be further explored to plan better implementation and overcome barriers to disaster recovery. Our recommended actions begin to suggest ways in which to prioritize further research and action.

The overarching drive towards increased regional communication and collaboration, facilitated by the region but driven by jurisdictions, spurs ABAG's recommended actions in this paper, the other issue papers, and our Action Plan. Improved regional communication will help facilitate our recommended actions, and in mutual support, each of our recommended actions work to increase regional communication. All issues and recommendations laid out aim to use a regional forum to increase collaboration to enhance jurisdictions' ability to be more resilient to disasters.

Goal #1: Create a Regional Resilience Policy Forum

No regional coordinating body or disaster recovery framework is currently in operation to facilitate sharing and decision-making in the aftermath of a major disaster, although FEMA's *National Disaster Recovery Framework* and CalEMA's *Regional Emergency Coordination Plans* may provide guidance on such a framework. Jurisdictions independently work their way through FEMA regulatory system and make recovery decisions on their own, based on their current situation. The urgency for quick action and competing demands for time may inhibit decision-makers' awareness of and access to information about other actions occurring around the Bay Area, or where their rebuilding decisions fit within the regional agenda. This can lead to fragmented recovery efforts and competition for federal funds. This is particularly an issue with the restoration and recovery of regional assets, such as infrastructure systems. A forum to help coordinate and guide jurisdictions within the region could not

---

[2] The Bay Area Regional Economic Assessment. A Bay Area Council Economic Institute Report, October 2012.

only speed restoration of regional services but expedite jurisdictional recovery as well and ensure that the recovery process fits with larger regional goals.

Recommended Action G-1: *Use existing intergovernmental committees to convene jurisdictions and facilitate communication around disaster recovery collaboration*

The Joint Policy Committee (JPC) is tasked with overseeing and coordinating the work of the four regional agencies, including Association of Bay Area Governments (ABAG), the Bay Conservation Development Commission (BCDC), Metropolitan Transportation Agency (MTC), and the Bay Area Air Quality Management District (BAAQMD). Since recovery spans all four agencies, the JPC, as one option, is uniquely poised to facilitate a regional conversation around recovery, including local stakeholders from all four agencies. Additionally, ABAG's Regional Planning Committee (RPC) is an existing body that convenes regularly to bring together regional stakeholders around planning issues in the Bay Area. The RPC seeks to represent the greater interests of the Bay Area and find planning solutions that consider and accommodate a wide variety of Bay Area stakeholders. Since the Committee is composed of Bay Area elected officials representing jurisdictions and special districts, with a diverse stakeholders and the nonprofit community, the perspectives and opinions uniquely represent the local perspective, yet seek regional solutions. Such an existing body, along with a staff level task force, could serve as the structure for convening jurisdictions and facilitating recovery planning that comes up from the jurisdictions, rather than down from the region.

The role of a regional convener is to create a forum for policy discussions and information sharing, as the jurisdictions direct the content. Such a regional facilitator could involve varied stakeholders, convene in person on a regular basis, provide timely information, and facilitate projects and initiatives designated by the stakeholders. Desired outcomes would be more involved and informed stakeholders, consensus on major recovery decisions, and a coordinated regional policy platform. Providing a platform to develop disaster recovery planning could facilitate regional, state, and federal policy changes that benefit all jurisdictions.

> ### Sidebar: Houston COG case study
> Following Hurricane Ike in 2008 the Houston-Galveston Area Council, a 13-county region with more than 5.7 million people, helped rebuild its region. The COG's robust databases on infrastructure and household information provided decision makers with damage estimates for the whole region within days. The COG acted as an impartial mediator as funding and programmatic decisions were made, and facilitated regional discussions about economic development and needed structural protections such as seawalls.
>
> *"We had people and staff who were not heavily impacted by the storm, while a lot of our communities were literally digging out—trying to clear roads and get sewage plants back online—we were able to focus on some of those high-level needs we knew would be important as people moved at the federal and state levels to allocate disaster funds." –Chuck Wemple, HGAC's economic development program director*

Recommended Action G-2: *Examine the feasibility of a regional disaster recovery framework*

Within a broader forum, a regional disaster recovery framework could allow jurisdictions to develop procedures for making decisions about operations or processes as well as financial management issues that cross jurisdictional boundaries or are too cumbersome for one jurisdiction to manage alone. Jurisdictions will make many decisions independently based on their unique needs, and will largely run their recovery process within their own boundaries. Agreeing upon larger regional goals can help the Bay Area present a coordinated coalition to better attract and utilize resources and assistance.

A decision-making structure or framework could also speed the transition between disaster response, which has an existing regional system, and disaster recovery, where a system needs to be developed. Facilitating a transition ensures that communication and coordination take place and that decisions made during disaster response are considered in recovery, and allows recovery stakeholders to communicate their goals and priorities during the response phase. Often, decisions made during response have long-term repercussions on recovery, such as when rebuilding is allowed to take place in highly vulnerable areas, driven by the desire to return to "normal" as fast as possible. Having a structure in place for communication and decision-making that has consensus-driven goals during the response phase can help avoid mistakes in recovery. Certainly, rebuilding in recovery must take into account future hazard mitigation, as well as long term community sustainability.

A regional recovery framework must incorporate input from a wide variety of stakeholders. The roles of local, state, and federal agencies and regional organizations in recovery vary and overlap; cities and local jurisdictions must integrate the practical application of resources from the public and private sectors and institutions that are partnering in the recovery collaboration. Outreach to local community political leaders is also needed in recovery planning, along with boosted public outreach and education campaigns for community resilience, with defined recovery guidance measures and standards.

This framework may take the form of a written recovery plan, outlining procedures, roles, and tasks for all stakeholders involved, similar to FEMA's recently released *National Disaster Recovery Framework*. It should align with and incorporate other established recovery structures and concepts, such as the National Academy of Science's *Disaster Resilience: A National Imperative.* Model post-disaster recovery plans, such as those released by the American Planning Association, San Francisco's Resilient City Initiative, and Florida's *Post-Disaster Redevelopment Planning: A Guide for Florida Communities* could also serve as templates for a regional plan. This framework should also be flexible enough to consider other long-term growth issues, such as economic challenges, environmental sustainability, sea level rise, and other threats to the Bay Area's long-term quality of life. However, the final product should be guided by stakeholders' needs. The framework can provide information to help local jurisdictions identify staff and leadership roles as a part of local recovery plans, with guidance on how to fulfill those roles. If operational authority at both the regional and local levels is identified before a disaster, responsibility and accountability are defined, ensuring that the recovery process succeeds.

Recommended Action G-3*: Integrate resilience policy into existing current plans and practices*

Many elements that support resilience and recovery can be integrated into existing regional and local work. The region should seek ways to integrate resilience work with existing projects to facilitate increased resilience without significant additional resources. Regionally, disaster resilience policy should be incorporated into

ABAG's Sustainable Communities Strategy, the Joint Policy Committee's work on climate change, and other regional initiatives towards sustainability, economy, land use planning, and quality of life. These efforts create a regional vision with the potential to effectively guide disaster recovery.

For example, through Plan Bay Area[3] the Bay Area has already begun developing a vision for its future which will be carried out over the coming decades to create a more sustainable, equitable, prosperous place to live. The plan is a blueprint for sustainable future growth; this vision could be incorporated as we rebuild damaged neighborhoods and cities. The Bay Area has a rich history of visioning and implementing plans. We decided to reroute the Cypress freeway to better connect the Port of Oakland and enhance the West Oakland neighborhood; the Embarcadero and Central freeways in San Francisco were torn down to better connect the city with the waterfront and revive nearby neighborhoods. We know that such decisions can take years to reach and are hotly contested. However, having a common vision and guiding principles before a disaster can help guide and hasten our decision making process after the disaster.

Local leaders already grapple with difficult issues in their daily work, including finding affordable housing solutions, attracting good jobs and businesses, competing with other jurisdictions for tax dollars, providing services for needy residents, and reducing greenhouse gas emissions. Language and policy on recovery can be integrated into existing city-level documents to formalize policy and procedures rather than requiring new initiatives. Discussion of recovery can be integrated into the General Plan's Community Safety Element during a routine General Plan update, and Climate Adaptation Plans can be updated to acknowledge liquefaction as a threat that is often concurrent with areas vulnerable to sea level rise. Such efforts provide a solid basis for policy and action for disaster recovery. Robust, well-developed plans for the future adopted now can serve as blueprints for the future, whether or not a disaster hits. If a disaster does hit, the plans serve as a framework already in place for a recovery plan and reduce the need for a lengthy planning process after a disaster, which delays recovery.

Goal #2: Develop Regional Resilience Leaders

Initiative stakeholders felt that disaster recovery was well handled by emergency managers. However, long-term recovery can extend years or even decades after response ends and requires many specific capabilities and expertise in addition to those required of an emergency manager. Disaster recovery actively requires input from the whole community and requires coordination among a wide range of departments over a very long period of time. It also requires knowledge, understanding of and coordination with state and federal agency policies, programs and both public and private funding sources.

---

[3] Plan Bay Area is an integrated regional land use and transportation plan that combines the Sustainable Communities Strategy (SCS), Regional Transportation Plan (RTP), and Regional Housing Needs Allocation (RHNA) into a single vision for the Bay Area. This plan identifies anticipated growth and where it should be focused in coordination with jobs and transportation. Jurisdictions participate by nominating Priority Development Areas (PDAs) to focus future growth. ABAG and MTC presented multiple growth scenarios and solicited feedback from ABAG boards as well as the general public to arrive at the preferred growth plan, the Jobs-Housing Connection Strategy.

In the recovery phase many local government staff and officials will find themselves conducting similar tasks and fulfilling similar roles as they do today – only with the added pressure of how to permit quickly the rebuilding of housing, businesses, their own buildings, their economy, and major infrastructure systems. Everyday tasks will become elevated with higher stakes, more and impassioned input, and extreme pressure on quick implementation. The fiscal base of many cities will be severely damaged, necessitating the layoff of staff. They may also find that they are asked to perform tasks well beyond the original scope of their jobs. Helping staff and officials understand their post-disaster responsibilities before disaster hits can help ensure that adequate authorities and tools and are prepared for what may be needed in the recovery phase. Identifying champions and professionals with expertise in recovery policy and are adept in working with senior officials can assist recovery in strategic roles that leverage their skills.

Recommended Action G-4: *Lead reconnaissance missions for local leaders, staff, and community stakeholders to areas undergoing disaster recovery*

Many of our local leaders who have led their jurisdictions to greater resilience began to do so after they experienced firsthand the disaster recovery process, such as visiting New Orleans after Hurricane Katrina. Many of our region's earthquake planning champions were staff and elected officials during the Loma Prieta earthquake and the Oakland-Berkeley Hills Fire (Tunnel Fire); they vividly remember the challenges they faced in responding to and recovering from those disasters with little training or planning. For those who haven't experienced them first-hand and without recent local disasters in recent collective memory, disaster recovery tends to be abstract. It becomes easy to ignore risks and focus on short-term, urgent issues. However, seeing, speaking to, and relating to official counterparts in disaster-stricken cities can make tangible the reality of the recovery process and spur action at home. Experiencing the aftermath of a disaster can be a strong motivator for elected and community leaders to assume new responsibilities and guide action in their jurisdictions.

Professional groups already conduct such reconnaissance trips. The Earthquake Engineering Research Institute's (EERI) Learning from Earthquakes Program sends out reconnaissance teams into the field after major disasters to assess damage, document initial observations, and assess the need for follow-up research. The region could consider working with EERI to expand reconnaissance teams to include local and community leaders and appropriate staff. SPUR also leads annual learning trips for members, which could be geared towards disaster recovery as suitable.

Goal #3: Use Information and Data Analytics for Disaster Resilience

Jurisdictions need many different types of information after a disaster. Local officials must have essential damage impact information for utilities, government, and private sector organizations to assist with decisions about outages, damaged infrastructure, transportation disruptions, and related debris and transportation hazards issues. The same damage impact information can support decisions about long-term sheltering, temporary housing, and expedited disaster assistance. Information needs may range from information on individual buildings to a general picture of damage in other parts of the region.

Activities underway in the Bay Area support this information sharing, and existing technologies can be leveraged for this purpose to expand current efforts. More focused development of and integration with existing capabilities are called for to advance a system that communicates a common operating picture and supports regional situational awareness.

Recommended Action G-5: *Establish and maintain a recovery clearinghouse to house resources for pre-disaster recovery planning and post-disaster recovery guidance*

Currently there is no central repository for information on long-term recovery, so knowledge distribution throughout the region is uneven and lacking. Many stakeholders simply don't have sufficient information to plan for recovery and don't know where to find the information. The region could benefit from an informational clearinghouse to house and share case studies, best practices, model ordinances, checklists, recovery plans, financing strategies, and other forms of guidance to help stakeholders better understand the recovery process and to have easily accessible tools to enact relevant policy, before and after a disaster. A sample of such information was shared at ABAG's 2012 Fall General Assembly for all participants and regional members.

The clearinghouse should not just collect information, but direct stakeholders to the information they need most at the times they need it most –for example, just-in-time checklists, ordinances, and other information readily accessible to them immediately after a disaster strikes. The clearinghouse should allow for contributions and updated content from the users within the region as it is developed, which can be vetted and organized by clearinghouse managers. Staff can also provide technical assistance so users can understand what kind of resources and information is available to them at critical points in their recovery process. For example, distributing FEMA reimbursement checklists before money is spent to ensure that jurisdictions comply with reimbursement requirements.

In addition to collecting information and tools, the clearinghouse should manage regional hazards data on and data on the recovery process. Data by itself, such as building damage data, does little for stakeholders who need to make decisions quickly and under immense pressure in the post-disaster period. The data needs to be analyzed to tell its story and find its role in the larger disaster and recovery narrative. Specialized analysis can detect trends and patterns of land and building damage, population movement, and recovery trends; such analysis can inform policy decisions and plans and incite action. For example, mapping analysis can indicate to jurisdictions areas of concentrated damage, where significant demolition and rebuilding will need to occur, and where services for residents will need to be concentrated. At a regional scale, identifying jurisdictions with disproportionately severe damage can help inform where funding for rebuilding may go. Elected officials and the media can use maps, charts, or tables, or even narratives and statistics to convey understandable damage and recovery data. Analyzing data and crafting useful messages for varied stakeholders requires technical skills as well as understanding of who needs what information, at what time, and how to convey it effectively.

ABAG's Planning Group currently manages and analyzes land use, planning, and population data for the region and uses this data to work with local jurisdictions to meet long-term regional goals. Expanding the type of data sets it manages and analysis it performs to include disaster data, such as HAZUS™ results or vulnerability analysis

before a disaster, and damage data after a disaster, would enable local jurisdictions to more fully understand disaster planning implications without major significant resources.

Regional Resilience Initiative
Housing Policy Paper

Background

One of the most seismically active regions in the country, California has developed strong building codes that will largely prevent loss of life in a major earthquake. These codes were developed over many decades and have been continually improved as earthquakes have demonstrated the need for new techniques and stricter codes. Still, these codes do not guarantee that even a new building will be inhabitable after earthquakes and many older buildings built before modern codes have not been upgraded.

In a major earthquake on the Hayward or San Andreas faults, 5% of the Bay Area's housing stock will be immediately and permanently damaged[1]. Nearly two-thirds of these losses will be in multi-family apartment buildings. Approximately $85-90 billion dollars in direct residential building related economic losses are expected in this scenario.[2] Only $6-7 billion of the ground shaking loss will be covered by residential earthquake insurance, making recovery of housing a particularly difficult challenge. If the same earthquake were to occur today in the Midwest, 60-80% of losses would be covered by insurance because insurance companies there cover earthquakes as part of a normal insurance policy.[5] In Hurricane Katrina 50% of losses were covered due to the availability of and requirements for flood insurance under the National Flood Insurance Program. After each future earthquake in the Bay Area we could face unprecedented challenges to recover and rebuild up to 150,000 largely uninsured housing units. Compounding the problem, fire hazard post-earthquake can consume many more units, especially if fire suppression systems are not upgraded to survive an earthquake. Many of the units predicted to collapse (soft-story residential units) have gas meters located on collapse walls and do not have automatic shut-off valves—a recipe for fires on site.

While the greatest loss of housing will occur primarily along either the Hayward or San Andreas faults, the impact will be felt region-wide. Housing is the key to a strong region and will impact the recovery of businesses and the strength of our regional economy. Following the earthquake, red tagged units may be demolished quickly or abandoned. Special regulations may be necessary to return properties back to the marketplace. FEMA will relocate displaced persons to vacant rental units, but if there is an insufficient inventory of rental units, temporary housing in offsite locations may need to be constructed. In the past FEMA has purchased trailers and opened trailer parks, including temporary infrastructure, to the house the displaced. Sites for temporary housing for the displaced should be pre-identified if the process is to proceed smoothly.

Displaced residents will seek alternate housing options all over the region, impacting commute patterns and housing prices, and small business recovery. Low-income residents who live in flatland neighborhoods in cities such as Richmond, Oakland, San Leandro and Hayward and parts of San Francisco will be particularly impacted

---

[1] *Shaken Awake! Estimates of Uninhabitable Dwelling Units and Peak Shelter Populations in Future Earthquake Affecting the San Francisco Bay Area*, ABAG, 2003; and *ABAG Housing Data*, 2009

[2] *1868 Hayward Earthquake: 140-Year Retrospective*, RMS November 2010. Modeled loss estimates consider post-event loss amplification. All loss estimates are for property insurance coverage only. All losses above include shake and fire following earthquake. *Note: This estimate includes losses for Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties only. Similar losses are expected for a San Andreas fault scenario earthquake.*

[5] ibid

due to liquefaction, their proximity to the fault, and the preponderance of vulnerable housing types in these neighborhoods. Some low-income residents may be permanently displaced outside of the region due to loss of affordable housing options and temporary loss of jobs.

The challenge for policy makers is to address the present need to create and maintain affordable housing while also improving the seismic resilience of existing housing so that quality affordable housing can be maintained for the long-term. In some areas it will be difficult to rebuild housing in-kind and future climate change effects like sea level rise, storm surges, increased flooding, and liquefaction may make the decision to rebuild in certain areas unattractive.

Looking to ABAG's Priority Development Areas is a good place to start for reconstruction. These neighborhoods of regional significance can be strengthened and made more resilient to provide quality housing options and preserve regional investments for many years to come. It may be possible for FEMA to convert a portion of its rental assistance program to equity to help build permanent multi-family housing. Certainly, the region will be looking to state and federal housing finance assistance to construct new replacement units.

Some of the recommendations in this paper are highly technical and specific, reflecting the advanced state of knowledge in the region on housing mitigation and recovery needs. A major barrier to implementation of many of these needs is adequate financing and public will.

Goal #1: Address regional goals, including economic prosperity, environmental enhancement, and improved governance in housing recovery

Priority Development Areas are locally-nominated and regionally-supported infill development opportunity areas within existing communities.[6] They are generally areas where there is local commitment to develop more housing along with amenities and services to meet the day-to-day needs of residents in a pedestrian-friendly environment served by transit. These qualities that make neighborhoods an enjoyable place to live also promote more resilient communities and supporting these services after an earthquake will be key to ensuring that residents can remain in their homes.

PDAs are the cornerstone of ABAG's FOCUS program. More than 100 PDAs across the region will accommodate over half of the region's future growth on just 5% of the Bay Area's land. Policy makers have already begun to invest in PDAs by improving transit and infrastructure and encouraging smart growth policies. Further investment to retrofit existing housing and stronger building standards for new construction will improve the seismic resilience of these neighborhoods and will ensure that good affordable housing options are maintained even after major earthquakes.

Recommended Action H-1: *Identify high hazard areas with vulnerable housing types and vulnerable populations across the region*

Some areas will rebuild much faster than others and likely require fewer resources to do so due to prevailing market strength and current levels of investment (i.e. San Francisco). Previous disasters show that single-family homes will be mostly rebuilt within two years, while multi-family buildings will take longer.[7] Areas with lower household incomes, lower savings, and limited access to financing will face longer housing reconstruction times

---

[6] Association of Bay Area Governments, FOCUS Program.
http://www.bayareavision.org/initiatives/prioritydevelopmentareas.html
[7] Disaster Hits Home: New Policy for Urban Housing Recovery. Mary Comerio, 1998.

than other areas.[8] Incorporating future land use planning and development feasibility into disaster planning could result in more mitigation and recovery resources devoted to places that really need them.

By overlaying information on hazard zones with vulnerable housing type, vulnerable populations, and PDAs policy makers can direct policies and allocate resources to strengthen housing, reduce individual losses, shorten housing reconstruction timelines, minimize economic disruption and promote long-term regional growth and economic goals. It is estimated that a disproportionate number of vulnerable populations live in earthquake vulnerable neighborhoods across the region, particularly in cities along the Hayward fault. Multi-family housing in particular tends to take longer to rebuild and is often not rebuilt as affordable housing.

Goal #2: Facilitate housing recovery through good policy, financing, and insurance

Uninsured homeowners will present an unprecedented problem for policymakers at all levels of government in future earthquakes. Without financing options, residents may abandon their equity rather than paying their mortgage and will struggle to repair and rebuild their homes, delaying recovery of the region. Disaster housing losses will have substantial regional impacts; stakeholders recommended the following actions:

Recommended Action H-2*: Address the problem of underinsured homeowners with more realistic hazard insurance availability*

Policymakers can ensure that damaged homes are repaired and rebuilt more quickly by ensuring that more homeowners are covered by adequate hazard insurance coverage. Policymakers should work with the California Earthquake Authority to reduce both its annual premium and deductibles. The CEA is undertaking a research program that may allow for significant premium reductions for homes that have been seismically strengthened, providing both incentive for retrofit and benefit to homeowners. Earthquake insurance policies for renters, however, are a good deal and their use should be more widely encouraged.

Recommended Action H-3: *Support interim housing solutions, likely to be in place after future disasters for three to ten years, that encourage residents to invest in the Bay Area's recovery*

Assuring humane and feasible procedures for long-term temporary housing with greater focus on post-earthquake housing recovery will add to a successful recovery process, and maintain community synergy.

If possible, while homes are being rebuilt and repaired, residents should be enabled to remain in their homes or neighborhood through shelter-in-place policies. When residents remain, local businesses are more likely to stay in business, and families are more likely to quickly return to the routine of school and work. Red-tagged buildings however cannot be occupied; the residents will have to seek temporary emergency shelter and rental or temporary housing. To those who are sheltering in place, regional plans to provide neighborhood support centers can enable families to remain in place by providing centralized food and water distribution, access to generators, and medicine, and other needed services and supplies. Neighborhood support centers facilitate existing neighborhood support networks. Regional leaders should also work with other disaster prone areas to reform the Stafford Act to allow FEMA to help pay for permanent replacement housing, not just interim housing.

When temporary housing solutions are needed, counties should strive to accommodate displaced residents within their own counties to help maintain access to jobs and schools while preserving community fabric. The

---

[8] *2007 Metropolitan Disaster Planning: Analytical Support of the American Housing Survey.* U.S. Department of Housing and Urban Development, Office of Policy and Research, 2009.

citing of temporary housing should be carefully considered as it has important impacts on the locations and timing of permanent housing solutions and the long-term recovery of neighborhoods.

Recommended Action H-4: *Maintain affordable housing and return low-income tenants to their homes by identifying gaps in existing programs and financial mechanisms that will speed the repair and reconstruction of multifamily residences*

Previous California earthquakes have highlighted the need for innovative program changes and introduction of new financing programs to resolve the issues surrounding the repair or reconstruction of multifamily residential buildings. Reconstruction of buildings can present far more difficult challenges than new construction, in terms of time and financing. ABAG could coordinate regional efforts to better quantify the problem, and start formulating recommendations for legislative, programmatic, or financing options to fill the anticipated unmet need.

Goal #3: Remove barriers to housing retrofit and replacement

Multi-family buildings

Seismically vulnerable multi-family buildings pose particular challenges for local governments. These buildings are not easy to identify and retrofits are expensive, but the benefits of retrofitting are significant. Rebuilding multi-family housing post-earthquake is generally very slow, taking several years longer than for single-family homes and affordable units are often rebuilt above market rate, resulting in loss of affordable housing options. In some cities soft-story buildings are clustered together where there is potential for widespread loss of housing in concentrated areas.

Policy makers in cities with particularly large numbers of soft-story buildings such as Oakland, Berkeley and San Francisco have made progress in identifying potentially vulnerable buildings, but have had limited success in encouraging owners to retrofit these buildings. The size and complexity of the retrofit may trigger code upgrade requirements in older buildings, such as ADA, parking, etc., which can increase the total cost of the project and exceed the value of the property. Because of the large number of residents living in soft-story buildings across the region (an estimated 100,000 dwelling units), regional solutions may be beneficial. Further work is needed region-wide to accurately identify soft-story buildings and make the cost of retrofitting more affordable.[9]

Owner notification programs such as those taking place in Berkeley, Oakland, and Alameda are part of a broader societal trend recognizing the seismic vulnerabilities of soft-story buildings that will make it harder for owners to avoid liability in future court cases. This exposure is something that owners will have to take into account when deciding how they will operate their buildings.[10] San Francisco in particular, has embarked upon a ten year mandatory upgrade of soft-story multi-family buildings that will impose enforcement penalties. While politically difficult, this mandatory program will likely serve the City's, the building owner's, and the residents' best interests if it functions as planned.

Better awareness of seismic issues by tenants and prospective buyers may help create market driven incentives for owners to retrofit. Financial assistance programs can make retrofitting more attractive while providing a

---

[9] *Development of Simplified Guidance for Seismic Rehabilitation of Soft-Story Wood-Frame Buildings* (ATC 71-1). This soon to be released document will provide guidance for addressing seismic retrofit requirements for soft-story wood-frame buildings in seismically active regions. The project will also develop practical model code provisions for seismic retrofit of soft-story wood-frame buildings that can be adopted by cities.

[10] Personal communication, Ken Moy, ABAG legal counsel

vehicle for education about seismically vulnerable buildings. Many cities view a revolving loan program through a voluntary assessment district, similar to those being developed for solar installations under the PACE program[11], as the best possible solution to provide financing to as many owners as possible. These loans are paid back in first position on property tax bills. The loan payments stay with each building and not with their originating owners, so when the buildings change hands, loans can be transferred to new owners and spread out over 30-year loan periods. The seismic improvements enhance the value of the building and help secure the existing mortgages. No sources of capital, however, have been identified to initiate the program.

Recommended Action H-5: *Establish affordable financing mechanisms to facilitate seismic mitigation of multi-family residential properties vulnerable to damage in earthquakes*

We recommend that policymakers work together to find creative financing mechanisms to facilitate retrofit of residential properties. One possible solution is to work through ABAG's Finance Authority to utilize the PACE program for seismic retrofits and to lobby the federal government to provide the initiating capital.[12] In addition to PACE, a suite of policies and incentives can be adopted by cities wishing to encourage seismic retrofit.[13] Other existing programs that can be tapped for seismic retrofits include the California Earthquake Authority (CEA) and local Community Development Block Grants (CDBG). In addition, local governments working together with lending institutions, insurance companies, and other government agencies before future earthquakes could design new coordinated lending processes*.*

Single Family Homes

Older single-family homes will likely account for 9% of overall housing losses after each major earthquake.[14] Single-family homes are generally relatively easy and affordable to retrofit. However, owners who embark on retrofit projects often quickly become perplexed by the lack of retrofit standards for some types of homes and the inconsistent array of retrofitting techniques proposed by contractors. Owners are further discouraged by the lack of incentive programs enjoyed by residents for energy retrofits. An estimated 2/3 of single-family retrofits are done improperly,[15] a waste of homeowners' money that provides inadequate seismic benefits and creates a false sense of security. Quality retrofits benefit not only homeowners and their families, but entire communities when they can get back on their feet faster after earthquakes.

Local policymakers can work with state and national policymakers to implement the following policies that would encourage more and higher quality home retrofits.

---

[11] Property Assessed Clean Energy (PACE) is a means of financing rooftop solar panel installation and other energy improvements through issuance of bonds to investors and then making loans to consumers which are repaid via an annual assessment on their property tax bill over the assigned term (typically 15 or 20 years). One of the most notable characteristics of PACE programs is that the loan is attached to the property rather than an individual. Recent legislation (AB 184, Swanson) has broadened the use of PACE to seismic retrofits. The residential PACE program is currently on hold nationwide pending a ruling by the Federal Housing Finance Agency. (source: PACEnow.org)

[12] AB184 (Swanson) allows PACE to be used for seismic retrofits, but it is not currently being implemented. Cities wishing to implement these programs must also come up with an initial pot of money that can be used to distribute the loan

[13] Samant, Laura and Tom Tobin. Memo to the Advisory Committee, Community Action Plan for Seismic Safety, "Incentives to Encourage Seismic Retrofits: Options for San Francisco". San Francisco, CA. 5 Sept. 2008. http://www.sfcapss.org/PDFs/Incentives_to_Encourage_Seismic_Retrofits.pdf

[14] *Preventing the Nightmare* (update), Association of Bay Area Governments, 2003.

[15] *Preventing the Nightmare: Technical Appendix B*, Association of Bay Area Governments, 1999 and *False Sense of Security*, Contra Costa Times, 2006.

Recommended Action H-6: *Reduce personal and community losses by increasing resilient building and retrofit practices*

While the California Building Code has adopted, by reference, a standard for retrofit of single-family homes[16], it only applies to very specific housing types that have crawl spaces with walls less than four feet in height. While adoption of this standard was an important step for residential seismic risk reduction there remain broad categories of single-family dwellings that are not covered by a retrofit building code. Clear and comprehensive guidelines for the retrofit of all remaining single-family dwellings are needed. This lack of standard means that permits will be issued for voluntary seismic retrofits that may not be adequate. The California Earthquake Authority and FEMA are working to develop recommendations for future evaluation and retrofit codes and standards and local policy makers should encourage their effort.

Recommended Action H-7: *Improve the quality of non-engineered retrofits by developing a statewide retrofitting license for contractors, or providing contractor training*

Similar to a plumbing or electrical license or the Home Improvement Certification category (which was allowed to sunset on January 1, 2004) a retrofitting license or certification would help ensure that contractors performing seismic retrofits are properly trained. Implementation would require action the by the California State License Board to develop some new regulations. A new class of license, or a certification within the existing B-1 license, would provide a new skilled class of contractors who could advertise their services and who would be better trained. This would greatly benefit owners increasing the likelihood that work is performed properly. Owners would also have recourse for work not performed properly. A first step in implementation is to organize some best management practices in a structural design bulletin to help inform the industry of the complexity of this type of work and add credibility to the need for a specialty license.

Bay Area local governments may not be able to wait for state action to implement this policy. An interim step might be to establish a regional certification program for pre-disaster retrofit and post-disaster repair that would address the most vulnerable Bay Area building types. This certification should build on previous ABAG efforts to train contractors on proper retrofitting techniques for a small class of single-family home. Bay Area cities and ABAG could develop improved retrofit training for single-family homes and encourage homeowners to hire contractors that have been properly and adequately trained. Future training should include:
- Testing to ensure comprehension;
- Required refresher courses every three years coincident with building code updates to disseminate new knowledge and information, and;
- Provide certification of completion to the retrofit installer who took the training, rather than a company to ensure that the individual on site during construction has actually been trained.

Recommended Action H-8: *Increase the number of retrofitted homes by providing financial incentives for homeowners to retrofit*

Financial incentives not only make retrofitting more affordable, they can also improve the quality of retrofits by setting a minimum standard that retrofits must achieve in order to receive assistance, and create opportunities to educate communities about the prudence of seismic retrofitting.

Berkeley has a model incentive program that could be emulated by other local governments. Berkeley raised the transfer tax from 1% to 1.5% and then offered to refund new homebuyers the 0.5% difference if it was used to

---

[16] Chapter A3 of the International Existing Building Code.

seismically strengthen their home. Since its implementation, 600-800 homeowners have taken advantage of the program and costs to the City are very low since the owners themselves are effectively paying for their retrofits through tax refunds. The City of Oakland successfully implemented a similar program from 2008-2010 during which 360 retrofit permits were issued, compared to only 6 prior to the program. These programs demonstrate the effectiveness of incentives, that they do not have to cover the full cost, and time of sale is a very effective way to reach homeowners when it is easy to add the cost of the retrofit to the mortgage or alternatively lower asking prices.

Regional agencies could consider including seismic improvements to any funding made available to support implementation of the Sustainable Communities Strategy. Funding seismic upgrades of existing buildings would help ensure the long-term sustainability of PDAs.

We recommend that policy makers also endorse the involvement of insurance industry in developing owner incentives for retrofitting structures. As required by state law[17], the California Earthquake Authority (CEA) has set aside approximately $20 million dollars from annual investment income for residential mitigation efforts. The CEA is developing a statewide mitigation program that may provide financial incentives to consumers that retrofit their houses and providing training to retrofit contractors. ABAG could use the results of the recommended action to *Identify high hazard areas with vulnerable housing types and vulnerable populations across the region* to identify the most vulnerable residential structures and provide a list of target neighborhoods to CEA for funding consideration.

---

[17] California Insurance Code section 10089.37

Regional Resilience Initiative
Infrastructure Policy Paper

Introduction

In the wake of a major disaster, the recovery of our major infrastructure systems will play a large role in our ability to recover quickly and effectively. Many recovery activities are highly dependent upon these systems. For example, the movement of goods - including supplies for rebuilding and daily goods and food for resuming daily lives - depends on a workable transportation system. People will not be able to stay in their homes if water and wastewater services are not available, and businesses will not be able to reopen. Repairing failed infrastructure systems and restoring their services are vital to the recovery of the Bay Area after a disaster, and failure to do so quickly and efficiently will result in widespread and long ranging, potentially devastating impacts.

Many of our significant infrastructure systems are vulnerable to damage in earthquakes.[1] The majority of the Bay Area population resides along two northwest, southeast transportation corridors., Highway 101 to the west, parallels the San Andreas Fault and, Highways 580 and 880 to the east, are situated on and adjacent to the Hayward fault. Nearly every major east-west connection that the Bay Area depends on upon for water, power, gas and transportation crosses several major faults, including the Hayward fault. Hundreds of street underlain with transmission lines also cross faults. These major lifelines transmission systems will be damaged by significant displacement across the fault in an earthquake. EBMUD estimates that 60% of their customers will be without water, and it could take as many as 60 days to restore intermittent service. Similarly SFPUC estimates that until its Hetch-Hetchy retrofit is complete in 2014, a catastrophic failure of this pipeline would leave customers without water for 10 to 30 days and in some instances for as many as 60 days. The liquefaction prone margins of the Bay will cause additional infrastructure damage, particularly for sewer treatment plants, the Port of Oakland and San Francisco and Oakland airports.

Many issues will impact our ability to quickly repair damaged infrastructure. These aspects warrant further understanding and study now, before the disaster, so stakeholders are better prepared to face the complex task of putting infrastructure systems back together when disaster hits.

The major infrastructure systems included in this analysis are:
- Power systems
    - Electricity generation and transmission
    - Oil and natural gas pipelines

---

[1] This section is largely adapted from *1868 Hayward Earthquake: 140-Year Retrospective*, RMS November 2010. Modeled loss estimates consider post-event loss amplification.

- Water and wastewater
    - Treatment
    - Transmission systems
- Transportation systems
    - Local roads
    - Highways
    - Public transportation systems – busses, rail and ferries;
- Telecommunications systems
    - Phone and data lines

Other significant infrastructure systems in the Bay Area not included in this initial study include gas refineries, and airports and ports. Each system depends on physically or virtually linked elements to stay operational. These elements range from the humans who operate and control the systems; mechanical and electrical equipment; transmission lines; buildings that house operations and equipment; and, information systems that process big data. In a disaster, all these components are vulnerable to damage from ground shaking, liquefaction, landslides, fire, or flooding, and damage to just one portion of the system may cause complete failure in all or part of the system, cutting off services to customers. Cascading systems' failure is a norm in metropolitan disruptive events due to tightly coupled infrastructure mechanics.

Service systems are interdependent and will not be able to be fully restored without the repair of corresponding, upstream structures. For example, treating wastewater is dependent upon power systems to operate pumps and other equipment. Because of such dependencies and links, which have complex characteristics, it can be very difficult to make assumptions about how disasters will impact a particular system or how recovery will take place if the impacts to lateral or upstream system are unknown. Interdependencies also create new or exacerbate existing failures over time if not promptly resolved. The implications of delayed recovery due to interdependencies are largely unknown. Salient lessons in social restoration and recovery can be found from recent landscape-scale disasters such as the 2011 Tohoku earthquake and 2012 Superstorm Sandy and applied in other disaster-prone regions.

The fractured nature of infrastructure system ownership and regulations exacerbate barriers to recovery planning to address the vulnerability of the interdependency of physical systems. Many utility systems are privately or jointly owned, and vary widely in size, control, access to resources, accountability, age, and seismic standards, guidelines, and code requirements. For example, there are over 500 special districts with overlapping jurisdictions that provide services within the Bay Area. The California Utilities Emergency Association represents California utilities on emergency related issues, but currently there is no forum for infrastructure owners to coordinate with other owners within the Bay Area and plan for recovery and restoration, so owners may not have a comprehensive understanding of how their systems fit in with other systems. There is a wide variety of practices, technologies, and mitigation standards within a sector if there are multiple owners or service providers. Consequently, this diversity creates problems with understanding, anticipating, and coordinating disaster recovery activities.

Goal #1: Increase technical understanding of region-wide infrastructure system vulnerabilities

Currently, few understand how systems are interdependent. What knowledge that is available is largely based on speculation, not on rigorous analysis. The region needs peer-reviewed technical studies to better understand system vulnerabilities and what consequences may result from cascading failures. Some of this information is considered confidential for security reasons; however, information should be shared sufficient to understand how to resolve issues post-earthquake.

New technologies can assist with gathering technical data for analysis, but may increase vulnerability as operators of complex interdependent infrastructure systems become more reliant on virtual systems to monitor and control infrastructure. While technology has the potential to provide greater and more sophisticated information on system performance, it also introduces new interdependencies on power and IT systems with reliance on computer servers. For example, PG&E's Smart Grid system provides better, more accurate information about the power system if it is operational. But reliance on specialized technology can make systems more difficult to restore and requires improved human expertise and intervention in crises, which can impede restoration and recovery.

We need a detailed understanding of how interdependencies interact and what impacts might occur in disruptions due to disasters. The following actions suggest how this might be done.

Recommended Action I-1: *Establish regional baseline assessment and system performance standards to identify vulnerabilities and define interdependencies*

Current methods for evaluating system performance in a disaster typically involve the use of an earthquake scenario to estimate ahead of time what damage and loss may occur. This loss estimate is then reviewed together with interviews with technical staff with technical expertise in understanding different system components and operations. Information about multiple systems and linking components then needs to be aggregated to comprehensively understand the system and its workings. This approach leads to a qualitative and holistic understanding of vulnerabilities, but is limited by incomplete human understanding and interpretation.

Other analytic tools include computer modeling of systems using software programs that generate disaster loss estimates, including HAZUS or systems' visualization applications developed for the defense industry. These methods provide a vulnerability snapshot of systems and system components. Elements of these assessments include information on component fragility, system fragility, and critical data on functionality, repair time, and repair cost. It is crucial to note that smaller service providers may lack resources to use existing tools effectively, or may not have accurate results due to lack of technical expertise in failure studies. Both qualitative and quantitative analyses offer data on typical systems' failures operators may encounter in disasters, which can support improved crisis response and provide powerful motivation to implement pre-disaster recovery planning.

The region needs to establish common tools for evaluation and assessment, and build consensus around the type of analysis and how to present findings. One way to begin this is to establish common earthquake scenarios for evaluating systems so consequences can be compared and interdependencies are defined across the region. San Francisco's Lifelines Council utilizes a repeat of the 1906 earthquake as its assessment scenario; this 7.9 San Andreas Fault earthquake falls within SPUR's definition of an "Extreme" earthquake scenario.

SPUR's "Resilient City " reports typically base recommendations on an "Expected" earthquake, defined as a 7.2 San Andreas quake, the same used for San Francisco's Community Action Plan for Seismic Safety program. Both of these scenarios are appropriate for San Francisco, but other scenarios such as a Hayward Fault event, may be more useful for planning in other Bay Area locations. Therefore, utilizing multiple planning scenarios may be productive for regional planning purposes. The common earthquake scenarios should be severe enough and present a wide enough scope of damage to be realistic and useful, but should not be so extreme that mitigation strategies would be seen as too costly.

We need to, as a region, assess the existing state of infrastructure systems, much of which is aging, deteriorating, and functioning at capacities beyond their original design, which all increase vulnerability. Considering that much of our infrastructure is buried or difficult to acquire data on, new methods should be identified and shared for quantifying *in-situ* conditions. Such assessment techniques include remote sensing technologies, sensors, use of cameras and video cameras, and component testing.

Regional infrastructure stakeholders could conduct and share research on evaluations, best practices, and recommendations for effective and uniform analysis of vulnerabilities. This might include common assumptions about what magnitude of earthquake to use as the basis for analysis and mitigation, and improve regional understanding about possible disaster losses.

Recommended Action I-2: *Conduct a regional assessment of system interdependencies and the consequences of cascading failures*

Similar to San Francisco Lifelines Council's current lifeline qualitative review, the region should conduct a high-level assessment of Bay Area infrastructure systems to identify and assess critical interdependencies. The study could be based on a standardized earthquake scenario or scenarios (see above) and identify and assess lifeline systems by performance (similar to SPUR's performance categories) along with peer-reviewed approaches. Then communities can prioritize system improvements based on defined performance targets that suggest key mitigation actions.

Understanding vulnerabilities is a first step that must be followed by defining disaster consequences. Infrastructure failures have direct and indirect economic, environmental, and societal consequences, ranging from lost revenue to a store without power to public health issues due to lack of wastewater treatment. We need better tools to understand the short and long-term consequences to the regional economy from infrastructure failures, including how time and geographical scales impact economic consequences. Attempting to understand the number of people who will be directly affected and the severity of the consequences can also be a significant motivator for developing a better recovery plan.

Recommended Action I-3: *Evaluate the usefulness of creating performance targets to establish region-wide performance goals for all infrastructure systems*

In addition to better understanding vulnerabilities and risks, providers need to have a more accurate understanding of feasible timelines for recovering their systems, interdependent systems, and the consequences of these timelines. Many providers' anticipated recovery timelines make assumptions about the performance of interdependent systems, and may not be accurate or feasible. Providers need a better understanding of factors outside of their control may impact their ability to quickly restore service. Providers also need to better understand potential trigger points and cascading effects of delays in recovery - is there a point when a delay triggers a much larger consequence, either within their system or in an interdependent system? Interdependencies may also change as time passes. For example, a system that has generator capacity for three days is not dependent upon power for this time, but once the generator fuel runs out, they become dependent on the power grid or short-term fuel supply if power is not yet restored. This type of delayed interdependency or failure is not well understood.

San Francisco Planning and Urban Research (SPUR) has created categories of expected performance for lifelines within San Francisco, as well as goals and targets for recovery of infrastructure systems within 4 hours, 3 days, 30 days, and 4 months and beyond after a disaster. We could consider developing similar performance categories at a regional level using peer-reviewed evaluation methodology to provide clear expectations and goals for all utility providers, as well as provide a useful tool for evaluating the current state of systems and communicating this information with other providers. SPUR also provides a table for identifying target states of recovery as compared to expected current status, and a similar table using regional performance goals could be widely utilized by regional infrastructure providers.

Recommended Action I-4: *Identify strategies to reduce interdependencies and develop plans to assist with implementation*

Concurrent with examining vulnerabilities and impacts, research could be conducted to identify cost-effective, feasible strategies to mitigate interdependencies, including system redundancy or backup, "islanding" vulnerable systems to limit their impacts and impacts to them, or creating smaller, self-contained "districts" of systems rather than one large, vulnerable system. This study should include identifying existing policies and regulations that impede or assist recovery as well as identifying what policies and regulations are need to propel infrastructure recovery.

Critical to reducing interdependencies is breaking down barriers of confidentiality. Currently, many providers have begun their own internal analysis of their systems to understand their own vulnerabilities. While being mindful of security, proprietary and liability issues, summary results of these analyses should be shared with other providers to provide a common operating picture. This can help providers understand how other sectors and providers' assumptions and timelines will impact their own restoration efforts. Providers and coordinating bodies could also benefit from understanding if their risk and vulnerability assessment tools are powerful and technically accurate enough to gain an adequate understanding of likely consequences from a disaster and be able to plan appropriate mitigation actions.

Goal #2: Increase ways to share risk information to collectively improve regional infrastructure system resilience

As previously identified, to better understand interdependencies we must improve risk information sharing among service providers and regional stakeholders before a disaster occurs. We also have to participate in collaborative planning and accelerate mitigation. This sharing and collaboration is vital to an effective recovery.

By understanding interdependent failures that occur and identifying cross-system "hot spots," communities can best and most quickly repair all services, not just individual systems. Strategic repairs on a region-wide basis will enhance and expedite Bay Area recovery.

One way to begin to understand this is to seek lessons from past disasters on the process of infrastructure system recoveries and what providers learned after the fact. These lessons may come from Bay Area providers who recall the recovery process after Loma Prieta in 1989, or they may come from the twenty east coast states hit by Sandy. Examining the recovery process in past disasters inevitably reveals interdependencies and impacts and can also uncover missed opportunities for efficiency to implement now before a future disaster.

Communication and information sharing also allows for informed prioritization of infrastructure recovery, allowing key nodes such as hospitals, support centers, emergency housing, and government buildings to recover first. Understanding upstream and downstream interdependencies for repairs as well as which systems key community resources rely upon can to develop an appropriate timeline for streamlined recovery. If one system is restored quickly but an upstream system is not, then the original repair has little systemic impact. Understanding priorities and system interdependencies allows providers to identify primary repairs to minimize interdependency and restore certain portions of systems quickly. Regional performance categories, as discussed above, can be utilized as a tool to begin make prioritizations based on the performance category.

Recommended Action I-5: *Establish a senior leadership forum on infrastructure resilience issues to convene providers and stakeholders*

Infrastructure providers and regional communities need a forum in which to share and gain situational awareness, spark mitigation programs and create new or utilize existing decision-making and prioritization tools. Currently, there are many sources of information available to infrastructure decision-makers, ranging from Caltrans, other providers, news reports, and crews working on the ground. Organized assistance can also help to identify cross-sectoral specific data needs and ways to circulate risk studies among providers. Tapping a third-party, neutral convener can offer impartial perspectives in prioritizing policy and strategic actions as well as providing a central information hub. A committee team can engage other stakeholders for decision-making and program prioritization, including the broader community.

There are already other mechanisms in place that serve this type of function, including BAESIC, CalWarn, and the Bay Area Water Multi-Agency Coordination Group, but these are sector-specific. Bringing existing groups together and modeling a larger forum based on existing models can leverage current actions. The committee team could also consider using the California Earthquake Clearinghouse, an existing body that compiles damage

information after a disaster for use by government agencies, non-profit organizations, and academia, as a conduit to collect and distribute infrastructure damage information after a disaster.

Regional Resilience Initiative
Economy and Business Policy Paper

Background

The impact of an earthquake on the economy has one of the farthest-ranging implications for disaster recovery in the Bay Area. Without a swift and strong economic recovery, the Bay Area will suffer from a protracted recovery with slow repopulation in heavily damaged areas, slow rebuilding of homes and businesses, and loss of revenue from business, tourism, and taxes. Estimates are that a magnitude 7.0 earthquake on the Hayward fault would generate $90-96 billion in direct commercial building related economic losses across eight of the Bay Area counties.[1] We have seen repeatedly in disasters that areas with the fastest economic recovery are those which already have strong economies and cultivate conditions to help businesses thrive before a disaster. Just as individuals who maintain a healthy lifestyle recover more quickly from illness, a strong economy has the potential to rebound quickly from an earthquake or natural disaster.

The major keys to economic recovery after a disaster is keeping residents employed, creating an environment that motivates big businesses to stay in the region, and keeping small businesses open. Keeping residents in the Bay Area and in their homes and able to meet their daily needs is also a high priority so employers have a work force available to keep maintain business momentum.

Currently and historically, the Bay Area region enjoys a strong local economy that is one of the most prosperous in the country and is continuing to improve despite a slow national economy. Of the major metropolitan areas within California, the Bay Area has the highest real GDP per capita, outpacing San Diego, Los Angeles, and the United States as a whole.[2] As a recognized center of innovation and one of the largest concentrations of people and wealth in the United States, the Bay Area economy is critical not only to the entire region, but to the state and federal governments as well, providing tax revenue and cutting edge innovation technology for all sectors of the U.S. economy, including defense.

The Bay Area functions as a single economic unit, meaning that among the counties in the region there is a high degree of interconnectedness between where people work and live. Jobs as well as housing are distributed widely throughout region, and only 53% of residents work in the county in which they live. This means that all of the counties and sub-regions are highly dependent on one another for their economic functioning and on the region's transportation network. San Francisco as the major jobs center has the largest net inflow of workers, while more suburban Contra Costa County has the largest net outflow.

---

[1] *1868 Hayward Earthquake: 140-Year Retrospective*, RMS November 2010. Modeled loss estimates consider post-event loss amplification. All loss estimates are for property insurance coverage only. All losses above include shake and fire following earthquake. *Note: This estimate includes losses for Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties only. Similar losses are expected for a San Andreas fault scenario earthquake.*

[2] The following section is largely adapted from The Bay Area Council Economic Institute Report *The Bay Area: A Regional Economic Assessment* (October 2012)

The Bay Area economy supports innovative, highly productive technology companies, which in turn support many other job industries. The region has significantly higher levels of concentration than the nation and the state in several key sectors: computer systems design and equipment, semiconductors and other electronic equipment, magnetic and optical media, software, space research and technology, communications equipment, industrial machinery, scientific research, pharmaceuticals and medicine, information services, and beverages. Competitiveness in these areas supports jobs throughout the region and at all levels of the economy. The region is also characterized by a highly productive tourism sector, with higher than average concentrations of accommodation and food services and the arts, entertainment, and recreation industries.

These industries benefit from a highly skilled and educated labor force, which is present in large numbers in the Bay Area. This concentration of skilled workers in turn attracts more skilled workers and businesses to employ them. The region also benefits from many research universities, private and federal laboratories, investment capital, and a business environment that encourages innovation and entrepreneurship. The local economy also benefits from the high quality of life in the Bay Area—the top reason new companies tend to locate here is because the founders live here or want to live here, suggesting that many business owners have strong ties to the region. However, the success of the region has also engendered drawbacks, such as high housing costs and long commutes to jobs.

Overcoming Barriers to Economic Recovery

Despite the strong regional economy, there will still be many issues impacting economic recovery after a disaster. For example, the economy will not just need to maintain its current strength, but will need to be even more profitable after an earthquake than before. After the 1989 Loma Prieta earthquake severely damaged Santa Cruz's downtown area an economist determined that businesses in the Pacific Garden Mall needed to do 35% more post-disaster business to afford to move back into replacement buildings because of the increased costs of new construction. This is a single example of what will need to be overcome to create a good business environment.

Goal#1: Retain Big Businesses

The Bay Area Council's (BAC) Regional Economic Assessment, largely focused on the biggest economic players in the region, and identified impediments to economic growth and prosperity that will likely be exacerbated in a disaster. For example, housing costs are already very high, stemming from lack of supply. This supply will decrease when a major earthquake damages a large portion of the existing housing supply, and the cost of new construction will likely increase costs for replacement housing. If housing costs go up so that workers can no longer afford to live in the Bay Area, businesses will lose their labor force.

The Bay Area regulatory environment, including zoning, permitting and environmental regulations may also inhibit businesses after a disaster, making it too difficult to stay or rebuild. In the Bay Area Council's report, businesses identified a lack of consistency between regulatory agencies' policies at the local, regional and state level and commented that this situation limited their ability to expand within the region. These challenges will likely be highlighted after an earthquake when large volumes of rebuilding happen simultaneously, potentially overwhelming the capacity of regulatory agencies and slowing the process. The California Seismic Safety

Commission has identified potential obstacles, regulations, and other impediments that can be resolved to help business quickly return to normal operations following a catastrophic event in California[3]. Many commercial buildings may be damaged beyond repair. Services will be needed to facilitate business relocation to available space throughout the region. Policy makers can make use of recommendations from this study to improve business and economic recovery.

Other factors likely to impact economic recovery include the dependency of businesses on our regional infrastructure systems—water, sewer, power, and access to broadband and communication—which are key to business operation and continuity. Ongoing infrastructure disruptions or unreliability will challenge businesses. Public transit, roads and highways are essential for the workforce to travel to work, particularly when more than half of Bay Area residents reside in a different county than where they work.[4] The recovery of the education sector is also key—K-12 schools not only provide education to children, but provide the daycare that allows parents to return to work. Long schools closures due to structural damage or prolonged shelter use will delay return of employees to work.

Goal #2: Keep Small and Neighborhood Serving Businesses Open

The BAC study focused on the leading industries and business in the Bay Area, but small and locally serving businesses remain an important component of a strong region and are especially vulnerable to closure after a disaster. An estimated 25% of small businesses do not re-open following severe disruptions from a major disaster.[5] Many of these businesses provide the day-to-day necessities for residents such as groceries, shopping, doctors' offices, pharmacies, and restaurants. Essential services are mandatory for getting residents to remain or return. Until essential goods and services are available, people will stay away.

One reason why small businesses are so likely to fail is that they tend to operate with small profit margins and limited reserve funds, which means that even a short period without cash flow may have a significant impact on business. Small businesses also may not be eligible for SBA loans, which require businesses to demonstrate that loans can be repaid. This is difficult to do with small profit margins, and particularly when your building, supplies and materials (means of production) have been damaged or destroyed. Businesses need to secure funding right away in order to plan to rebuild, but with the lack of availability of SBA loans and the fact that many small businesses cannot take on more debt, many businesses will fail if they can't secure funding. In addition, approximately 15% and 20% of the commercial losses of a major Hayward Fault earthquake are expected to be reimbursed by insurance.[6]

The Economic Development Agency (EDA) has various tools available to support Economic Development Districts in post-disaster long-term economic recovery, such as: support to develop long-term recovery strategies and integrate recovery planning into the Comprehensive Economic Development Strategy (CEDS);

---

[3] March, 2012 California Seismic Safety Commission Post-Disaster Rapid Economic Recovery Plan Project – Leading Practices and Potential Steps for a Rapid Post-Disaster Economic Recovery," Report by Deloitte Consulting LLP

[4] Bay Area Council Economic Institute Report *The Bay Area: A Regional Economic Assessment* (October 2012)

[5] California Seismic Safety Commission, March 2012. Post-Disaster Rapid Economic Recovery Plan Project – Leading Practices and Potential Steps for a Rapid Post-Disaster Economic Recovery," Report by Deloitte Consulting

[6] RMS, 2008. 1868 Hayward Earthquake: 140 Year Retrospective

resources to hire a regional disaster response coordinator as a full-time EDD staff member; funds to establish revolving loan funds (RLFs); assistance for public infrastructure improvements; and, technical assistance.[7]

As part of the recovery process from Hurricane Sandy, New York City is offering bridge loans of up to $10,000 for small business owners needing quick capital to avoid small business closures and help businesses get back on their feet. The Louisiana Bridge Loan Program after Katrina is a similar program to provide "gap funding" to businesses waiting on other types of funding. Over $55 million has been loaned to date. Loans of this type can be facilitated at the regional level in the aftermath of a major disaster.

In California, small businesses make up 99.2% of the state's employers and 82% of private sector jobs.[8] Projecting similar numbers on the Bay Area, the impact of small business loss has the potential for more widespread impacts in job losses, lost tax revenue for local governments and loss of revenue for vendors.

> **Case Study: Santa Cruz Pacific Garden Mall**
> Local governments can look to Vision Santa Cruz as a successful model that supported local downtown businesses, provided temporary storefronts and rebuilt the downtown in a new way that strengthened local business for the future. After the Loma Prieta earthquake in October, the city, together with downtown businesses, scrambled to set up tents and other temporary structures to enable local businesses to reopen in time for the holiday shopping season. The temporary downtown opened the day after Thanksgiving, just over a month after the earthquake. Holiday events and a farmers' market kept the downtown active as a destination for residents.

While there is clearly a need to identify and pursue innovative solutions to business disruption following a disaster, there is perhaps a greater need to find practical solutions to limit impacts on small businesses through economically feasible pre-disaster preparedness and mitigation initiatives. Small businesses may recognize they are located in vulnerable buildings, but often do not have the resources to undertake costly retrofits and have difficulty securing financing to do so. Some may opt to purchase insurance to provide coverage for limited damage or business disruption rather than invest in structural mitigation projects. New strategies for integrating hazard mitigation and risk reduction actions into long-term economic development is crucial to maintaining small business in the post-disaster environment.

Goal #3: Minimize Supply Chain Disruption and Keep Goods Moving

Other potential barriers to economic recovery include the disruption of vendors and supply chains to and from the region and the repercussions for national and international markets. Business disruption has upstream and downstream impacts on supply chains that can exacerbate impacts on the economy. For example, disruption of a manufacturing business may limit global supply of a particular product, disrupting the economy far beyond the impacted area. While the Bay Area's share of the manufacturing industry is not particularly concentrated, what

---

[7] July 2011, NADO Research Foundation, "Resilient Regions – Integrating Economic Development Strategies, Sustainability Principles and Hazard Mitigation Planning"

[8] California Seismic Safety Commission, March 2012. Post-Disaster Rapid Economic Recovery Plan Project – Leading Practices and Potential Steps for a Rapid Post-Disaster Economic Recovery," Report by Deloitte Consulting

is manufactured here is highly specialized and focused on sophisticated equipment design and development. Disruption of this specialized manufacturing could have global economic impacts.

The consequences of impacts to specialized manufacturing can be seen in Japan after the 2011 Tohoku earthquake and tsunami. The shutdown of specialized parts manufacturing plants in Japan led to assembly plant shutdowns in US. Because of their specialized nature, the lack of even small parts can shutter an entire plant if there is no alternative. Often, highly specific parts can't be made just anywhere – Japan in this case had specialized producers with patented production processes. While others could learn to produce a similar product, quality is an issue and certifying quality from another producer can take up to a year. The lack of production of automobiles in the US due to the loss of parts from Japan led to a constrained auto supply worldwide, impacting global prices. This event raised awareness of the economic challenges of recovery beyond the immediate concerns for protecting human life and property but to protecting economic interest, as it continues to impact domestic and multi-national business operations. The earthquake has had long-term economic consequences such as loss of market share, higher unemployment, and loss of businesses entirely.

On the other side of the supply chain, disruption of goods into the damaged area can cause a shortage of goods, materials and labor for rebuilding. Many businesses today operate with a "just-in-time" model for goods deliveries, stocking only enough goods to last until the next delivery. The transportation and shipping industries are key in a "just-in-time" era – businesses need fast availability of goods in constrained environments. After a disaster, small stockpiles of goods and lack of new deliveries can have major implications on response and recovery. Many hospitals store limited quantities of medical supplies and rely on frequent regular deliveries of supplies. Many have no requirement for suppliers to develop continuity of operations plans to enable supplies to be delivered after a major disaster, when they are needed most. Similar issues arise around groceries and food supplies - most grocery stores have limited stockroom supply and will quickly run out of food after a disaster if new deliveries cannot be made. Even banks and financial institutions often have very little cash supply on hand and may not have enough cash to cover their immediate expenses, much less be able to distribute cash to residents. This may become a serious issue if lack of power or broadband makes cash the only viable currency for purchasing goods. It is unknown how these types of shortages may impact the price of goods, but history shows that a constrained market raises prices for everyday goods.

The construction industry will also likely feel a shortage as building supplies such as wood, steel, cement, and aggregate become more difficult to import at the same time as demand increases due to extensive rebuilding and repair. The shortage of construction materials and skilled labor could increase the cost of rebuilding over pre-disaster prices and render insurance payouts insufficient.

Recommended Actions

The field of economic recovery from disasters is largely unexplored and unknown. As more frequent and larger disasters put more strain on local, regional, national, and worldwide economies, more detailed research and actions will likely emerge. At this stage, our recommendations are largely policy-level and rely on the basic assumption that a strong pre-disaster regional economy will help the economy recover quickly and come back stronger after a disaster. Some additional disaster-specific actions have been identified to support this process.

Recommended Action EB-1: *Support pre-disaster economic development through existing regional best practices*

The Bay Area Council's Economic Assessment report outlines actions designed to strengthen today's economy, and a strong and nimble economy today will provide a basis for a strong regional economic recovery after an earthquake.. We recommend that the region implement the following BAC's recommended areas for attention to ensure that the Bay Area's economy is strong before a disaster:

1. Identify a Public-Private Focal Point for Regional Economic Strategy
2. Engage Businesses Earlier in Individual Agency Plans
3. Harmonize Local Regulations at the Regional Level
4. Focus Economic Development Strategies in Sectors Where the Region is Most Competitive
5. Focus Economic Development Strategy More on Supporting the Survival and Growth of Young Companies than on Attracting Businesses from Other Jurisdictions
6. Develop a Stronger Regional Focus on Workforce Training

In particular, identifying a public-private focal point for regional economic strategy could be a strong tool in recovering the Bay Area economy and ensuring that decisions of elected officials benefit businesses and residents alike. Harmonizing regulations across the region has been identified as a potential stumbling block and can also foster a more even economic recovery, ensuring that businesses have the flexibility to recover in a uniform business climate.[9]

Recommended Action EB-2: *Implement the recommendations of the Resilience Initiative's Decision-Making, Housing, and Infrastructure Policy Papers*

Many of the key factors in economic recovery are closely linked to the issues laid out in the Initiative's issue papers on housing, infrastructure and regional decision-making. Strengthening these areas will bolster our overall economy and ability to recover quickly. These recommended actions also support issues identified in BAC report as necessary for a strong regional economy.

We recommend a particular focus on strengthening housing for recovery, as our housing stock is such an important resource for the strength of the economy, and is both largely uninsured and highly vulnerable to damage. Protecting our housing stock allows residents and workers to stay in the region and maintains housing affordability.

Expedited repair of infrastructure systems also allows businesses to reopen sooner, since they cannot operate without basic services and employees cannot reach their places of work without a working transportation system. In addition key transportation corridors could be identified and made accessible to goods movement companies to improve supply chain continuity.

---

[9] California Seismic Safety Commission, March 2012. Post-Disaster Rapid Economic Recovery Plan Project – Leading Practices and Potential Steps for a Rapid Post-Disaster Economic Recovery," Report by Deloitte Consulting

Implementing recommended actions about regional decision-making will help build political consensus on recovery priorities across the region, contributing to the sense that jurisdictions are working together for the common good of the region. This will instill confidence in businesses to continue to invest in the Bay Area, and instill confidence in residents that they will continue to have jobs and a high-quality place to live. Positive messaging about the pace of recovery will also be needed to bolster business confidence.

Recommended Action EB-3: *Encourage best practices that support business continuity and facilitate restoration of regional economies*

Knowledge on economic recovery is limited, particularly within the context of the Bay Area. We recommend partnering with research bodies such as the Bay Area Council and the California Seismic Safety Commission to continue to conduct Bay Area-specific research and studies on specific actions that local governments or regional groups can take to expedite economic recovery. We recommend implementing findings from the CSSC. Best practices already identified by CSSC and others include:

- Provide expedited permits and create a system for requesting additional temporary skilled staff through mutual aid agreements with other government agencies to ensure fast processing of permits to help businesses rebuild quickly and minimize costly downtime
- Identify temporary space for retail and commercial businesses to quickly relocate temporarily, helping to minimize disruption and downtime.
- Provide bridge financing to assist small businesses
- Create a "toolkit" for distribution, and include a) employee preparedness at home, b) continuity plan template, c) disaster recovery plan template, d) roadmap of what to do based on each part of the disaster cycle, e) "Everything a Business Needs to Know about Government Programs and Planning Before, During, and After an Emergency" pamphlet and guidebook.

Recommended Action EB-4: *Explore innovative financial incentives to support disaster resilience initiatives for small business*

Pre-disaster funding directed toward hazard mitigation for small business is currently limited to conventional lending practices which generally are either not available or not cost-effective for small business owners. Additionally, earthquake or business interruption insurance can be prohibitively expensive for small businesses operating with a small profit margin. There is a need to engage Chambers of Commerce, Economic Development Departments, lending institutions, the insurance industry and federal agencies, such as the Economic Development Administration, the Historic Trust Main Street Program, in a discussion of potential strategies to support pre-disaster hazard mitigation incentives for small businesses. At the local level, Business Improvement Districts, revolving loan programs, or pooled financing should be explored.

Regional Resilience Initiative
Action Plan

Introduction

This paper consolidates the recommended actions identified through ABAG's Regional Resilience Initiative process and explored in detail in our Regional Decision-Making, Housing, Infrastructure, and Business and Economy Policy Papers into one Action Plan. Organized by those four topic areas, this paper categorizes actions, sets priorities and identifies initial implementation tasks.

In general, actions associated with our Decision-Making Policy Paper serve as a platform to support and facilitate topic-specific actions. We recommend regional policy makers begin implementing many of the decision-making recommendations in the near-term, while simultaneously pursuing easily achievable strategies from the other categories. Many of the more complex recommendations will require coordinated regional policy before being enacted. Implementing the decision-making recommended actions will help with more even implementation across the region, increasing resilience as a whole.

Implementation Level

In this paper, each action has been identified by the level at which it can be initiated and implemented – regional, local, or both. Many actions will need to be developed and initiated through a regional effort, led by a regional body such as ABAG, MTC, or JPC. For certain actions, this regional work will then spur community-specific actions at the local level with policy, assistance, or information-sharing. The focus of this work is on regional-level initiatives, therefore very few actions are recommended for local initiation prior to regional resolution. Planning and technical guidance for those local actions will be available from the region.

Action Categories

Recommended actions are also categorized by type based on thematic similarity. The categories of actions are as follows:

Facilitation: These types of actions create forums and frameworks to facilitate action, but do not necessarily generate a concrete resilience action. They depend upon enabling participants to discover, communicate, and collaborate to implement concrete actions. These actions also help to build relationships, which is crucial to building resilience.

Education/Information: Education and Information actions actively seek to gather and communicate new information to assist stakeholders and encourage voluntary actions to plan for recovery or to increase resilience.

Evaluation: In many cases we may not have a clear picture on what the status or effectiveness of existing programs, policies, or resources. Evaluation tasks help to better understand our current level of resilience and set a baseline against which to track future work.

Policy Development: This category seeks to develop policy which supports resiliency capacity building and that can be adopted at the regional level or serve as a model for adoption at the local level. The goal is to provide tools that can be easily utilized by jurisdictions as well as establish consistent baseline policy for the entire Bay Area.

Further Study/Research: Many of the recommended actions require additional understanding or technical research on best practices or development of tools before specific actions should be implemented. Actions in this category warrant additional resources for study.

Program and Operation: These actions require a program with stakeholder support, resources, public involvement, and a defined outcome. Many of these types of actions will require local-level programs, with the region providing assistance and coordination.

Timeframe

Each recommended action is assigned a general timeframe for implementation. The reasoning behind the timeframes is below:

Short-Term: These are items that can be easily accomplished in the near-term with few additional resources or research. Many of these actions require organizational changes or slightly changed or expanded scopes of work rather than entirely new scopes of work. These changes could be completed within 1-5 years.

Medium-Term: Actions in this category require a bit more effort to implement. They may require some level of resources, additional research, or depend on another task or action to be accomplished before they are feasible. They may require setting up a new program or operation, or staff to plan for implementation. These actions could be completed within 5-10 years.

Long-Term: This category encompasses the most complex actions which may require substantial resources, research, or preparatory work. They may require broad coordination or change of political will that may take years to accomplish. These actions may be subdivided into phases to make them more achievable. Actions in this category may take up to 20 years to complete.

How to Use This Document

Each action is summarized in a quick overview table, enabling the reader to easily see the timeframe, categories, and level of implementation. This is followed by a text summary of the meaning of the action and initial implementation tasks. This document also contains two larger tables – a summary table at the beginning of the document showing all of the recommended actions at-a-glance (see below) and an initial implementation timeline following. This "timeline" helps to organize the actions to prepare for the development of a detailed implementation plan.

Recommended Actions Summary

Regional Decision-Making				
		Timeframe		
Recommended Action	**Level of Implementation**	**Short-Term**	**Medium-Term**	**Long-Term**
G-1: Use existing intergovernmental committees to convene jurisdictions and facilitate communication around disaster recovery collaboration	Regional	√		
G-2: Examine the feasibility of a regional disaster recovery framework	Regional		√	
G-3: Integrate resilience policy into current plans and practices	Regional, local			√
G-4: Lead reconnaissance missions for local leaders, staff, and community leaders to areas undergoing disaster recovery	Regional, local	√		
G-5: Establish and maintain a recovery clearinghouse to house resources for pre-disaster recovery planning and post-disaster recovery guidance	Regional, local	√		
Housing				
		Timeframe		
Recommended Action	**Level of Implementation**	**Short-Term**	**Medium-Term**	**Long-Term**
H-1: Identify high hazard areas with vulnerable housing types and vulnerable populations across the region	Regional, local	√		

		Short-Term	Medium-Term	Long-Term
H-2: Address the problem of underinsured homeowners with more realistic hazard insurance availability	Regional, local		√	
H-3: Support interim housing solutions, likely to be in place after future disasters for three to ten years, that encourage residents to invest in the Bay Area's recovery	Regional, local			√
H-4: Maintain affordable housing and return low-income tenants to their homes by identifying gaps in existing programs and financial mechanisms that will speed the repair and reconstruction of multifamily residences	Regional, local		√	
H-5: Establish affordable financing mechanisms to facilitate seismic mitigation of multi-family residential properties vulnerable to damage in earthquakes	Regional, local		√	
H-6: Reduce personal and community losses by increasing resilient building and retrofit practices	Local	√		
H-7: Improve the quality of non-engineered retrofits by developing a statewide retrofitting license for contractors, or providing contractor training	Regional		√	
H-8: Increase the number of retrofitted homes by providing financial incentives for homeowners to retrofit	Regional, local		√	
Infrastructure				
		Timeframe		
Recommended Action	**Level of Implementation**	**Short-Term**	**Medium-Term**	**Long-Term**
I-1: Establish regional baseline assessment and system performance standards to identify vulnerabilities and define interdependencies	Regional		√	

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
I-2: Conduct a regional assessment of system interdependencies and the consequences of cascading failures	Regional	√		
I-3: Evaluate the usefulness of creating performance targets to establish region-wide performance goals for all infrastructure systems	Regional			√
I-4: Identify strategies to reduce interdependencies and develop plans to assist with implementation	Regional			√
I-5: Establish a senior leadership forum on infrastructure resilience issues to convene providers and stakeholders	Regional	√		
Economy and Business				
Recommended Action	**Level of Implementation**	**Short-Term**	**Medium-Term**	**Long-Term**
EB-1: Support pre-disaster economic development through existing regional best practices	Regional, local	√	√	√
EB-2: Implement the recommendations of the Resilience Initiative's Decision-Making, Housing, and Infrastructure Policy Papers	Regional, local	√	√	√
EB-3: Encourage best practices that support business continuity and facilitate restoration of regional economies	Regional		√	
EB-4: Explore innovative financial incentives to support disaster resilience initiatives for small business	Regional, local		√	

Initial Implementation Guide

Short-Term (Completed in 1-5 years)	
Recommended Action	**Initial Implementation Tasks**
G-1: Use existing intergovernmental committees to convene jurisdictions and facilitate communication around disaster recovery collaboration	• Convene the Joint Policy Committee (JPC) and/or Regional Planning Committee (RPC) to discuss potential formation of disaster recovery forum • Identify potential roles and organizing structure for forum • Identify goals and objectives for forum • Recruit "champion" within RPC or JPC to help gather stakeholders • Coordinate with other similar initiatives, such as the Joint Policy Committee's Climate Action and Energy Resilience Project
G-4: Lead reconnaissance missions for local leaders, staff, and community stakeholders to areas undergoing disaster recovery	• Identify potential funding sources • Identify leaders to attend, such as ABAG's RPC members or other groups • Establish a MOU with the Earthquake Engineering Research Institute (EERI) to expand their program to include local stakeholders
G-5: Establish and maintain a recovery clearinghouse to house resources for pre-disaster recovery planning and post-disaster recovery guidance	• Identify a staff lead, with funding, to begin research and resource collection • Examine platforms for sharing, including websites, Base Camp, and file-sharing systems
H-1: Identify high hazard areas with vulnerable housing types and vulnerable populations across the region	• Gather vulnerable population data to input into GIS • Secure funding for ABAG staff time
H-6: Reduce personal and community losses by increasing resilient	• Establish a technical team to research and develop standard

building and retrofit practices	guidelines for single-family retrofits • Engage with the California Earthquake Authority and FEMA to coordinate efforts
I-2: Conduct a regional assessment of system interdependencies and the consequences of cascading failures	• Utilize ABAG's existing Lifelines Committee to oversee a system assessment • Research best practices for interdependencies assessments • Partner with San Francisco Lifelines Council to avoid duplicating efforts • Develop scenario and work plan
I-5: Establish a senior leadership forum on infrastructure resilience issues to convene providers and stakeholders	• Identify existing groups that may be able to expand to take on this responsibility • Establish goals and objectives for forum
EB-1: Support pre-disaster economic development through existing regional best practices	• Prepare an implementation plan for the Bay Area Council's recommendations, identifying appropriate stakeholders, fora, and funding sources for implementation projects
EB-2: Implement the recommendations of the Resilience Initiative's Decision-Making, Housing, and Infrastructure Policy Papers	• Identify short-term tasks in previous recommendations that most effectively support the regional economy and begin implementation
Medium-Term (Completed in 5-10 years)	
Recommended Action	**Initial Implementation Tasks**
G-2: Examine the feasibility of a regional disaster recovery framework	• Look at existing recovery plans and frameworks to establish best practices and ensure integration • Work with regional recovery forum to establish a working group tasked with development of a recovery framework • Establish stakeholder input process to solicit feedback from local

	jurisdictions
H-2: Address the problem of underinsured homeowners with more realistic hazard insurance availability	• Establish contact with the California Earthquake Authority and engage in discussions
H-4: Maintain affordable housing and return low-income tenants to their homes by identifying gaps in existing programs and financial mechanisms that will speed the repair and reconstruction of multifamily residences	• Gather best practices around multifamily reconstruction and repair financing • Begin drafting regional policy recommendations and examine the feasibility of new programs
H-5: Establish affordable financing mechanisms to facilitate seismic mitigation of multi-family residential properties vulnerable to damage in earthquakes	• Engage lobbyists and prepare a policy platform around PACE funds and upholding AB184 • Identify best practices and sources of funding for seismic retrofit funding • Explore innovative public/private partnerships for funding sources
H-7: Improve the quality of non-engineered retrofits by developing a statewide retrofitting license for contractors, or providing contractor training	• Organize best management practices to inform state licensing • Establish a regional certification program for pre-disaster retrofit and post-disaster repair, building on ABAG's previous efforts
H-8: Increase the number of retrofitted homes by providing financial incentives for homeowners to retrofit	• Work with One Bay Area Grant managers to establish language for seismic improvements in grant qualifications • Partner with the California Earthquake Authority to utilize their mitigation funding effectively • Implement Recommended Action H-1 to identify high priority areas for mitigation funding
I-1: Establish regional baseline assessment and system performance standards to identify vulnerabilities and define interdependencies	• Research best practices for assessing infrastructure vulnerabilities and baseline conditions • Establish a working group to identify standard earthquake scenarios and educate infrastructure providers on how to use the scenarios for assessment purposes • Provide a platform for providers to share their own research and

	best practices
EB-3: Encourage best practices that support business continuity and facilitate restoration of regional economies	• Identify topics for further research • Identify appropriate research teams or partnerships with research institutions to establish programs of study
EB-4: Explore innovative financial incentives to support disaster resilience initiatives for small business	• Identify private sector partners to begin conversations about incentives • Explore best practices and case studies around financing incentives

Long-Term (Completed in 10-20 years)	
Recommended Action	**Initial Implementation Tasks**
G-3: Integrate resilience policy into existing current plans and practices	• Incorporate resilience discussions into the second iteration of the SCS • Identify best practices for jurisdictions and develop a guide to assist in implementation
H-3: Support interim housing solutions, likely to be in place after future disasters for three to ten years, that encourage residents to invest in the Bay Area's recovery	• Identify best practices shelter-in-place policies and the development of neighborhood support centers • Develop pre-disaster temporary sheltering plans and policies
I-3: Evaluate the usefulness of creating performance targets to establish region-wide performance goals for all infrastructure systems	• Develop a technical team to examine SPUR and other existing performance categories for feasibility • Conduct necessary research on the Bay Area's infrastructure systems to develop categories tailored to our specific Bay Area needs
I-4: Identify strategies to reduce interdependencies and develop plans to assist with implementation	• Develop a technical research team composed of engineers and other mitigation experts • Research existing policy and develop recommendations based on technical research

Governance

G-1: *Use existing intergovernmental committees to convene jurisdictions and facilitate communication around disaster recovery collaboration*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
G-1: Use existing intergovernmental committees to convene jurisdictions and facilitate communication around disaster recovery collaboration	Regional	√		
Action Category				
Facilitation	*Education/ Information*	*Evaluation*	**Policy Development**	*Further Study/ Research*	*Program and Operation*

Utilizing an existing body such as the Joint Policy Committee (JPC) or Association of Bay Area Government (ABAG)'s Regional Planning Committee (RPC), create a regional forum for conversation and sharing, letting jurisdictions drive the content. The desired outcome would be more involved and informed stakeholders, consensus around major recovery decisions, and a coordinated regional policy platform.

Initial Implementation Tasks:

- Convene the Joint Policy Committee (JPC) and/or Regional Planning Committee (RPC) to discuss potential formation of disaster recovery forum
- Identify potential roles and organizing structure for forum
- Identify goals and objectives for forum
- Recruit "champion" within RPC or JPC to help gather stakeholders
- Coordinate with other similar initiatives, such as the JPC Climate Action and Energy Resilience Project

G-2: *Examine the feasibility of a regional disaster recovery framework*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
G-2: Examine the feasibility of a regional disaster recovery framework	Regional		√	
Action Category				
Facilitation	*Education/ Information*	*Evaluation*	**Policy Development**	**Further Study/ Research**	**Program and Operation**

Within a regional forum, a regional disaster recovery framework could allow jurisdictions to develop procedures for making decisions surrounding operations or processes as well as financial management issues that cross jurisdictional boundaries or are too cumbersome for one jurisdiction to manage alone. This framework may take the form of a written recovery plan, outlining procedures, roles, and tasks for all stakeholders involved, similar to FEMA's recently released *National Disaster Recovery Framework*.

Initial Implementation Tasks:

- Look at existing recovery plans and frameworks to establish best practices and ensure integration
- Work with regional recovery forum to establish a working group tasked with development of a recovery framework
- Establish stakeholder input process to solicit feedback from local jurisdictions

G-3: *Integrate resilience policy into existing current plans and practices*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
G-3: Integrate resilience policy into existing current plans and practices	Regional, local			√
Action Category				
Facilitation	**Education/ Information**	*Evaluation*	**Policy Development**	*Further Study/ Research*	*Program and Operation*

Many elements that support resilience and recovery can be integrated into existing work, at the regional level and within jurisdictions. At a regional level, disaster resilience policy should be incorporated into ABAG's Sustainable Communities Strategy, the Joint Policy Committee's work on Climate Change, and other regional initiatives towards sustainability, economy, land use planning, and quality of life. Language and policy on recovery also can be integrated into existing county and city-level documents including General Plans and Emergency Operations Plans to formalize policy and procedures rather than requiring new initiatives.

Initial Implementation Tasks:

- Incorporate resilience discussions into the second iteration of the SCS
- Identify best practices for jurisdictions and develop a guide to assist in implementation

G-4: *Lead reconnaissance missions for local leaders, staff, and community stakeholders to areas undergoing disaster recovery*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
G-4: Lead reconnaissance missions for local leaders, staff, and community stakeholders to	Regional, local	√		

areas undergoing disaster recovery					
Action Category					
Facilitation	**Education/ Information**	**Evaluation**	*Policy Development*	*Further Study/ Research*	**Program and Operation**

Experiencing the aftermath of a disaster can be a strong motivator for elected officials and other leaders to assume new responsibilities and guide action in their jurisdictions, as well as learn new tools and skills for their own recovery process. The region could consider working with EERI to expand its reconnaissance teams to include local and community leaders and appropriate staff.

Initial Implementation Tasks:

- Identify potential funding sources
- Identify leaders to attend, such as ABAG's RPC members or other groups
- Establish a MOU with EERI to expand their program to include local stakeholders

G-5: *Establish and maintain a recovery clearinghouse to house resources for pre-disaster recovery planning and post-disaster recovery guidance*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
G-5: Establish and maintain a recovery clearinghouse function to house resources for pre-disaster recovery planning and post-disaster recovery guidance	Regional, local	√		
Action Category				
Facilitation	**Education/ Information**	*Evaluation*	*Policy Development*	**Further Study/ Research**	**Program and Operation**

The region needs an informational clearinghouse to house and share case studies, best practices, model ordinances, checklists, and other forms of guidance to help stakeholders better understand the recovery process and to have easily accessible tools to enact relevant policy, before and after a disaster. Another role for the clearinghouse could be compiling an inventory of existing and newly created recovery-related Bay Area plans and assessing pre-and post-event mitigation and recovery investments to help leverage community improvements.

Initial Implementation Tasks:

- Identify a staff lead, with funding, to begin research and resource collection
- Examine platforms for sharing, including websites, Base Camp, and file-sharing systems

Housing

H-1: *Identify high hazard areas with vulnerable housing types and vulnerable populations across the region*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
H-1: Identify high hazard areas with vulnerable housing types and vulnerable populations across the region	Regional, local	√		
Action Category				
Facilitation	**Education/ Information**	*Evaluation*	*Policy Development*	**Further Study/ Research** **Program and Operation**

By overlaying information on vulnerable housing type and vulnerable populations with hazard and Priority Development Areas policy makers can direct policies and allocate resources to strengthen housing, reduce individual losses, shorten housing reconstruction timelines, minimize economic disruption and promote long-term regional growth and economic goals.

Initial Implementation Tasks:

- Gather vulnerable population data to input into GIS
- Secure funding for ABAG staff time

H-2: *Address the problem of underinsured homeowners with more realistic hazard insurance availability*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
H-2: Address the problem of underinsured homeowners with more realistic hazard insurance availability.	Regional, local		√	
Action Category				
Facilitation	**Education/ Information**	*Evaluation*	**Policy Development**	*Further Study/ Research* **Program and Operation**

Policymakers can ensure that damaged homes are repaired and rebuilt more quickly by ensuring that more homeowners are covered by adequate hazard insurance coverage. Policymakers should work with the California Earthquake Authority to reduce both its annual premium and deductibles. Earthquake insurance policies for renters, however, are a good deal and their use should be more widely encouraged.

Initial Implementation Tasks:

- Establish contact with the California Earthquake Authority and engage in discussions

H-3: *Support interim housing solutions, likely to be in place after future disasters for three to ten years, that encourage residents to invest in the Bay Area's recovery*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
H-3: Support interim housing solutions, likely to be in place after future disasters for three to ten years, that encourage residents to invest in the Bay Area's recovery	Regional, local			√
Action Category				

Facilitation	Education/ Information	Evaluation	Policy Development	Further Study/ Research	Program and Operation
Facilitation	**Education/ Information**	*Evaluation*	**Policy Development**	*Further Study/ Research*	**Program and Operation**

While homes are being rebuilt and repaired, residents should be enabled to remain in their homes or neighborhood through shelter-in-place policies. Regional plans to provide neighborhood support centers can enable families to remain in place by providing centralized food and water distribution, access to generators, and medicine, and other needed services and supplies.

Initial Implementation Tasks:

- Identify best practices shelter-in-place policies and the development of neighborhood support centers
- Develop pre-disaster temporary sheltering plans and policies

H-4: *Maintain affordable housing and return low-income tenants to their homes by identifying gaps in existing programs and financial mechanisms that will speed the repair and reconstruction of multifamily residences.*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
H-4: Maintain affordable housing and return low-income tenants to their homes by identifying gaps in existing programs and financial mechanisms that will speed the repair and reconstruction of multifamily residences	Regional, local		√	
Action Category				

Facilitation	Education/ Information	Evaluation	Policy Development	Further Study/ Research	Program and Operation
Facilitation	**Education/ Information**	*Evaluation*	**Policy Development**	**Further Study/ Research**	*Program and Operation*

Previous California earthquakes have highlighted the need for innovative program changes and introduction of new financing programs to resolve the issues surrounding the repair or reconstruction of multifamily residential buildings. ABAG could coordinate regional efforts to better quantify the problem, and start formulating recommendations for legislative, programmatic, or financing options to fill the anticipated unmet need.

Initial Implementation Tasks:

- Gather best practices around multifamily reconstruction and repair financing
- Begin drafting regional policy recommendations and examine the feasibility of new programs

H-5: *Establish affordable financing mechanisms to facilitate seismic mitigation of multi-family residential properties vulnerable to damage in earthquakes*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
H-5: Establish affordable financing mechanisms to facilitate seismic mitigation of multi-family residential properties vulnerable to damage in earthquakes	Regional, local		√	
Action Category				
Facilitation / **Education/ Information** / *Evaluation* / *Policy Development* / *Further Study/ Research* / **Program and Operation**				

Action Category					
Facilitation	**Education/ Information**	*Evaluation*	*Policy Development*	*Further Study/ Research*	**Program and Operation**

We recommend that policymakers work together to find ways to utilize the PACE program for seismic retrofits and to lobby the federal government to provide the initial pot of money. In addition to PACE, a suite of policies and incentives can be adopted by cities wishing to encourage seismic retrofit. In addition, local governments working together with lending institutions, insurance companies, and other government agencies before future earthquakes could design new coordinated lending processes**.**

Initial Implementation Tasks:

- Engage lobbyists and prepare a policy platform around PACE funds and upholding AB184
- Identify best practices and sources of funding for seismic retrofit funding
- Explore innovative public/private partnerships for funding sources

H-6: *Reduce personal and community losses by increasing resilient building and retrofit practices*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
H-6: Reduce personal and community losses by increasing resilient building and retrofit practices	Local	√		

Action Category					
Facilitation	**Education/ Information**	*Evaluation*	**Policy Development**	*Further Study/ Research*	**Program and Operation**

Clear and comprehensive guidelines for the retrofit of all remaining single-family dwellings are needed. This lack of standard means that permits will be issued for voluntary seismic retrofits that may not be adequate. The California Earthquake Authority and FEMA are working to develop recommendations for future evaluation and retrofit codes and standards and local policy makers should encourage their effort.

Initial Implementation Tasks:

- Establish a technical team to research and develop standard guidelines for single-family retrofits
- Engage with the California Earthquake Authority and FEMA to coordinate efforts

H-7: *Improve the quality of non-engineered retrofits by developing a statewide retrofitting license for contractors, or providing contractor training*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
H-7: Improve the quality of non-engineered retrofits by developing a statewide retrofitting license for contractors, or providing contractor training	Regional		√	
Action Category				
Facilitation	*Education/ Information*	*Evaluation*	*Policy Development*	*Further Study/ Research*	**Program and Operation**

Similar to a plumbing or electrical license or the Home Improvement Certification category, a retrofitting license or certification would help ensure that contractors performing seismic retrofits are properly trained. Implementation would require action the by the California State License Board to develop some new regulations. Bay Area local governments may not be able to wait for state action to implement this policy. An interim step might be to establish a regional certification program for pre-disaster retrofit and post-disaster repair that would address the most vulnerable Bay Area building types.

Initial Implementation Tasks:

- Organize best management practices to inform state licensing
- Establish a regional certification program for pre-disaster retrofit and post-disaster repair, building on ABAG's previous efforts

H-8: *Increase the number of retrofitted homes by providing financial incentives for homeowners to retrofit.*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
H-8: Increase the number of retrofitted homes by providing financial incentives for homeowners to	Regional, local		√	

retrofit					
Action Category					
Facilitation	**Education/ Information**	*Evaluation*	*Policy Development*	*Further Study/ Research*	**Program and Operation**

Financial incentives not only make retrofitting more affordable, they can also improve the quality of retrofits by setting a minimum standard that retrofits must achieve in order to receive assistance, and create opportunities to educate communities about the prudence of seismic retrofitting. Regional agencies could consider including seismic improvements to the One Bay Area Grant Program which provides funding to support implementation of the Sustainable Communities Strategy. We recommend that policy makers also endorse the involvement of insurance industry in developing owner incentives for retrofitting structures.

Initial Implementation Tasks:

- Work with One Bay Area Grant managers to establish language for seismic improvements in grant qualifications
- Partner with the California Earthquake Authority to utilize their mitigation funding effectively
- Implement Recommended Action H-1 to identify high priority areas for mitigation funding

Infrastructure

I-1: *Establish regional baseline assessment and system performance standards to identify vulnerabilities and define interdependencies*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
I-1: Establish regional baseline assessment and system performance standards to identify vulnerabilities and define interdependencies	Regional		√	

Action Category					
Facilitation	*Education/ Information*	**Evaluation**	*Policy Development*	**Further Study/ Research**	*Program and Operation*

The region needs to establish common tools for evaluation and assessment, and build consensus around the type of analysis and how to present findings. One way to begin this is to establish common earthquake scenarios for evaluating systems so consequences can be compared and interdependencies are defined across the region. We need to, as a region, assess the existing state of infrastructure systems, much of which is aging, deteriorating, and functioning at capacities beyond their original design, which all increase vulnerability. Regional infrastructure stakeholders could conduct and share research on evaluations, best practices, and recommendations for effective and uniform analysis of vulnerabilities.

Initial Implementation Tasks:

- Research best practices for assessing infrastructure vulnerabilities and baseline conditions
- Establish a working group to identify standard earthquake scenarios and educate infrastructure providers on how to use the scenarios for assessment purposes
- Provide a platform for providers to share their own research and best practices

I-2: *Conduct a regional assessment of system interdependencies and the consequences of cascading failures*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
I-2: Conduct a regional assessment of system interdependencies and the consequences of cascading failures	Regional	√		

Action Category					
Facilitation	*Education/ Information*	**Evaluation**	*Policy Development*	**Further Study/ Research**	*Program and Operation*

Similar to San Francisco Lifelines Council's current lifeline qualitative review, the region should conduct a high-level assessment of Bay Area infrastructure systems to identify and assess critical interdependencies. The study could be based on a standardized earthquake scenario or scenarios (see above) and identify and assess lifeline systems by performance (similar to SPUR's performance categories) along with peer-reviewed approaches. Then communities can prioritize system improvements based on defined performance targets that suggest key mitigation actions.

Initial Implementation Tasks:

- Utilize ABAG's existing Lifelines Committee to oversee a system assessment
- Research best practices for interdependencies assessments
- Partner with San Francisco Lifelines Council to avoid duplicating efforts
- Develop scenario and work plan

I-3: *Evaluate the usefulness of creating performance targets to establish region-wide performance goals for all infrastructure systems*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
I-3: Evaluate the usefulness of creating performance targets to establish region-wide performance goals for all infrastructure systems	Regional			√
Action Category				
Facilitation	*Education/ Information*	**Evaluation**	**Policy Development**	**Further Study/ Research**	*Program and Operation*

San Francisco Planning and Urban Research (SPUR) has created categories of expected performance for lifelines within San Francisco, as well as goals and targets for recovery of infrastructure systems within 4 hours, 3 days, 30 days, and 4 months and beyond after a disaster. We could consider developing similar performance categories at a regional level using peer-reviewed evaluation methodology to provide clear expectations and goals for all utility providers, as well as provide a useful tool for evaluating the current state of systems and communicating this information with other providers.

Initial Implementation Tasks:

- Develop a technical team to examine SPUR and other existing performance categories for feasibility
- Conduct necessary research on the Bay Area's infrastructure systems to develop categories tailored to our specific Bay Area needs

I-4: *Identify strategies to reduce interdependencies and develop plans to assist with implementation*

Recommended Action	Level of	Short-	Medium-	Long-

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
I-4: Identify strategies to reduce interdependencies and develop plans to assist with implementation	Regional			√
Action Category				
Facilitation	**Education/ Information**	*Evaluation*	**Policy Development**	**Further Study/ Research**	*Program and Operation*

Concurrent with examining vulnerabilities and impacts, research could be conducted to identify cost-effective, feasible strategies to mitigate interdependencies, including system redundancy or backup, "islanding" vulnerable systems to limit their impacts and impacts to them, or creating smaller, self-contained "districts" of systems rather than one large, vulnerable system. This study should include identifying existing policies and regulations that impede or assist recovery as well as identifying what policies and regulations are need to propel infrastructure recovery.

Initial Implementation Tasks:

- Develop a technical research team composed of engineers and other mitigation experts
- Research existing policy and develop recommendations based on technical research

I-5: *Establish a senior leadership forum on infrastructure resilience issues to convene providers and stakeholders*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
I-5: Establish a senior leadership forum on infrastructure resilience issues to convene providers and stakeholders	Regional	√		
Action Category				
Facilitation	**Education/ Information**	*Evaluation*	*Policy Development*	*Further Study/ Research*	*Program and Operation*

Infrastructure providers and regional communities need a forum in which to share and gain situational awareness, spark mitigation programs and create new or utilize existing decision-making and prioritization tools. Tapping a third-party, neutral convener can offer impartial perspectives in prioritizing policy and strategic actions as well as providing a central information hub. A committee team can engage other stakeholders for decision-making and program prioritization, including the broader community.

Initial Implementation Tasks:

- Identify existing groups that may be able to expand to take on this responsibility
- Establish goals and objectives for forum

Economy and Business

EB-1: *Support pre-disaster economic development through existing regional best practices*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
EB-1: Support pre-disaster economic development through existing regional best practices	Regional, local	√		
Action Category				

Facilitation	Education/ Information	Evaluation	Policy Development	Further Study/ Research	Program and Operation

The Bay Area Council's Economic Assessment report outlines actions designed to strengthen today's economy, and a strong and nimble economy today will provide a basis for a strong regional economic recovery after an earthquake. In particular, identifying a public-private focal point for regional economic strategy could be a strong tool in recovering the Bay Area economy and ensuring that decisions of elected officials benefit businesses and residents alike. Harmonizing regulations across the region has been identified as a potential stumbling block and can also foster a more even economic recovery, ensuring that businesses have the flexibility to recover in a uniform business climate.

Initial Implementation Tasks:

- Prepare an implementation plan for the Bay Area Council's recommendations, identifying appropriate stakeholders, fora, and funding sources for implementation projects

EB-2: *Implement the recommendations of the Resilience Initiative's Decision-Making, Housing, and Infrastructure Policy Papers*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
EB-2: Implement the recommendations of the Resilience Initiative's Housing, Infrastructure and Regional Decision-Making Issue Papers	Regional, local	√		
Action Category				

Facilitation	Education/ Information	Evaluation	Policy Development	Further Study/ Research	Program and Operation

Many of the key factors in economic recovery are closely linked to the issues laid out in the Initiative's issue papers on housing, infrastructure and regional decision-making. Strengthening these areas will bolster our

overall economy and ability to recover quickly. These recommended actions also support issues identified in BAC report as necessary for a strong regional economy.

Initial Implementation Tasks:

- Identify short-term tasks in previous recommendations that most effectively support the regional economy and begin implementation

EB-3: *Encourage best practices that support business continuity and facilitate restoration of regional economies*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
EB-3: Encourage best practices that support business continuity and facilitate restoration of regional economies	Regional		√	
Action Category				
Facilitation	*Education/ Information*	*Evaluation*	*Policy Development*	**Further Study/ Research**	*Program and Operation*

Knowledge on economic recovery is limited, particularly within the context of the Bay Area. We recommend partnering with research bodies such as the Bay Area Council and the California Seismic Safety Commission to continue to conduct Bay Area-specific research and specific studies on specific actions that local governments or regional groups can take to expedite economic recovery. We recommend research focused around our first two issues in particular - getting large businesses to stay in the region and keeping small businesses open.

Initial Implementation Tasks:

- Identify topics for further research
- Identify appropriate research teams or partnerships with research institutions to establish programs of study

EB-4: *Explore innovative financial incentives to support disaster resilience initiatives for small business*

Recommended Action	Level of Implementation	Short-Term	Medium-Term	Long-Term
EB-4: Explore innovative financial incentives to support disaster resilience initiatives for small business	Regional, local		√	
Action Category				
Facilitation	**Education/**	*Evaluation*	**Policy**	**Further Study/**	*Program and*

Pre-disaster funding directed toward hazard mitigation for small business is currently limited to conventional lending practices which generally are either not available or not cost-effective for small business owners. Additionally, earthquake or business interruption insurance can be prohibitively expensive for small businesses operating with a small profit margin. There is a need to engage Chambers of Commerce, Economic Development Departments, lending institutions, the insurance industry and federal agencies, such as the Economic Development Administration, the Historic Trust Main Street Program, in a discussion of potential strategies to support pre-disaster hazard mitigation incentives for small businesses. At the local level, Business Improvement Districts, revolving loan programs, or pool financing should be explored.

Initial Implementation Tasks:

- Identify private sector partners to begin conversations about incentives
- Explore best practices and case studies around financing incentives

Regional Resilience Initiative Appendix

Local Government Recovery Toolkit

Workshop Summaries

ABAG REGIONAL RESILIENCE INITIATIVE

General Assembly Toolkit Table of Contents

How to use this toolkit: This toolkit provides sampling of some of the work done by ABAG, other local, state, and federal partners, other local governments, and academics on the topic of long-term disaster recovery, and includes some conceptual and theoretical work as well as practical, usable tools such as model ordinances. Our goal is to introduce the topic of long-term disaster recovery as distinct from disaster mitigation and response and present the materials here as the start of a larger toolkit for local governments to plan for their own long-term recovery process, which will be developed and distributed at a later date. While the toolkit aims to provide tools that are useful to individual jurisdictions, we have also included content that explores the role of jurisdictions within their larger region during the recovery phase.

The content of this toolkit can be found on the memory stick we have provided to you at the October 18, 2012 General Assembly and can also be accessed at quake.abag.ca.gov/recovery/toolkit.

Contents:

1. **Checklists and Plans**

   The following resources are the top resources designed to assist local governments in navigating disaster recovery. They provide concise directions for actions to take to expedite and streamline the recovery process.

   a. *Before Disaster Hits: Top Items a Local Government Needs in Place to Launch Effective Community Recovery* and *Launching Community Recovery When Disaster Strikes* (Harvard Kennedy School)
   b. Excerpts from *Earthquake Recovery: A Survival Manual for Local Government* (Governor's Office of Emergency Services)
   c. *Oakland Long-Term Disaster Recovery Plan* (ABAG)

2. **Recovery Ordinances and Tools**

   This section provides practical, usable tools for cities to adopt ordinances and pieces of policy that can speed recovery. Pieces in this section include policy guidance, recommended actions with explicit instructions, and model ordinances.

   a. Building code provisions regarding seismic upgrades triggered by repair projects
   b. Chapter 5: A Planner's Tool Kit from *Planning for Post-Disaster Recovery and Reconstruction* (APA)
   c. Issuing Building Permits from *Earthquake Recovery: A Survival Manual for Local Government*
   d. *Post Disaster Redevelopment Planning: A Guide for Florida Communities* (Florida Department of Community Affairs)

3. **Funding and Economic Issues**

   One of the largest questions surrounding recovery is how money will flow, both to fund recovery and to maintain a strong economy. These resources provide case studies from other disaster events on how they managed money flows and economic impacts during their own recovery.

   a. *Restoring Regional Economies in the Wake of Disaster* (NADO)

b. Disaster Recovery Community Development Block Grant Programs – Hurricane Katrina
c. *Cedar Rapids, Iowa Recovery and Reinvestment Coordinating Team Progress Report*
d. *The Northridge Earthquake, USA and its Economic and Social Impacts* (Petak and Elahi)
e. *Disaster Recovery: Past Experiences Offer Insights for Recovering from Hurricanes Ike and Gustav and Other Recent Natural Disasters* (GAO)
f. *One Year Later: The Fiscal Impact of 9/11 on New York City* (Comptroller's office, City of New York)

4. Recovery Concepts and Frameworks

This section provides fundamental theories and concepts of long-term recovery as distinct from disaster response, with unique players, skills, and implications.

a. *National Disaster Recovery Framework* (FEMA)
b. *Disaster Resilience: A National Imperative* (The National Academies)
d. *Envirenew Resilience Part 1 Report: Creating Resilient Communities* (The Salvation Army – Southern Territory)

5. Case Studies and Additional Thinking

The following pieces provide additional context and case studies that support and expand upon the content above.

a. *The Resilient City* (SPUR)
    i. *Defining What San Francisco Needs from its Seismic Mitigation Policies*
    ii. *The Dilemma of Existing Buildings*
    iii. *Building it Right the First Time*
    iv. *Lifelines*
    v. *Safe Enough to Stay*
    vi. *The Culture of Preparedness*
    vii. *The Hub Concept*
    viii. *Rebuilding our Transportation Infrastructure*
b. *Post-Earthquake Housing Recovery: San Antonio/Fruitvale Neighborhoods Design Charrette Recommendations* (ABAG)
c. *Reconstruction of New Orleans after Hurricane Katrina: A Research Perspective* (Kates)

Bay Area Regional Disaster Resilience Action Plan Initiative Kick-Off Workshop

Summary of Proceedings

Held November 1, 2011
at NASA Ames Research Center, Moffett Field, CA

Executive Summary

Representatives of Bay Area government, private sector, and non-profit organizations met on November 1, 2011, at the NASA Ames Research Center, Moffett Field for the Kick-off Workshop for the Bay Area Regional Resilience Action Plan Initiative. The workshop was the first regional event in the 14-month Initiative by the Association of Bay Area Governments (ABAG) and the Bay Area Economic Council in collaboration with a broad coalition of Bay Area organizations. The goal of the Initiative is to enable Bay Area stakeholders to develop a Regional Disaster Resilience Action Plan focusing on recovery and restoration that is compatible with, supports and supplements current Bay Area jurisdictions' and State plans, policies, and capabilities. The workshop was structured in roundtables with breakout sessions to facilitate information sharing and identify what should be included in the Action Plan. Major topics addressed at the workshop were: transitioning from response to recovery decision-making; long-term housing for displaced residents and rebuilding; land use, and other related recovery issues; examples of recovery lessons learned, post-disaster business retention, and financing mitigation and recovery for resilience.

Selected Outcomes

Issues that that need to be included in the Action Plan or require further exploration:

- *Housing* – Assuring realistic procedures for long-term temporary housing; greater focus on post-earthquake housing recovery; involvement of insurance industry in developing owner incentives for retrofitting structures; the problem of underinsured home owners; tested procedures for determining how emergency housing will be distributed

- *Community Recovery* – Special needs and undocumented individuals; recovery-related human behavioral issues; relocation and reentry of displaced individuals; role of faith-based and community service organizations; leveraging public-private partnerships; need for a public outreach and education campaign for community resilience; and determination of recovery guidance and standards.

- *Infrastructure Interdependencies* – Restoration of critical infrastructure—priorities, processes, and timetables; need for involvement of utilities and other essential service providers in regional recovery planning; multi-state disaster coordination; recovery-related cyber security issues; and exploration of ways, including legislation, to address mitigation measures for infrastructures pre and post-disaster.

- *Continuity* – Sharing information among businesses on continuity plans; back-up command and control centers for businesses; assuring job availability for displaced persons; lessons learned for security issues from disasters; and a more formal public/private sector partnership to facilitate collaborative working agreements on recovery.

- *Recovery Decision-making and Financial Issues* – Need to look at the entire 12-county region on disaster recovery; roles of local, state, and federal (including military) agencies and regional organizations in recovery and how to improve collaboration; better accuracy and transparency of the resource allocation process post-disaster and educating the public on what is available and what they should expect; outreach to local community political leaders to join in recovery planning; an inventory of recovery-related Bay Area plans; and exploring options for pre-and post-event mitigation and recovery investments.

Table of Contents

Bay Area Regional Disaster Resilience Initiative Kick-Off Workshop

More than 180 representatives of Bay Area government, private sector, and non-profit organizations that have roles and responsibilities or significant interest in disaster recovery and restoration convened on November 1, 2011 at NASA Ames Research Center, Moffett Field for the Kick-off Workshop for the Bay Area Regional Resilience Action Plan Initiative. The focus of the Workshop was to examine priority issues that will be factors in how well Bay Area communities can withstand a major earthquake or other regional disaster or incident and how rapidly and effectively they can rebound with limited damage to the regional economy and public well-being.

The Workshop was the first regional event in a 14-month Initiative by the Association of Bay Area Governments (ABAG) and the Bay Area Economic Council in collaboration with a broad coalition of Bay Area public, private sector, and non-profit organizations, and other regional agencies and associations. An impetus for the Initiative and the workshop was lessons learned from recent earthquakes in Haiti, Chile, New Zealand, and especially Japan. These events highlighted the importance of ensuring the quality of life, the economy, and economic competitiveness of the Bay Area in the event of a major disaster or incident that causes widespread damage or destruction to interdependent lifelines and other infrastructures, businesses, residential housing, and the institutions—schools, healthcare facilities, government services, and social services—that support Bay Area citizens.

The goal of the Initiative is to enable Bay Area stakeholders to develop a Regional Disaster Resilience Action Plan focusing on recovery and restoration that is compatible with, supports, and supplements current Bay Area jurisdictions' and State emergency management, continuity, mitigation and other plans, procedures, policies, and technologies, and also incorporate best practices from other regions. The Action Plan will take into account infrastructure interdependencies and mutual assistance and other cooperative agreements with regions beyond the Bay Area that will expedite recovery and restoration.

Funding for the Initiative is provided by the Regional Catastrophic Preparedness Grant Program (RCPGP) of the Bay Area Urban Areas Security Initiative (UASI) with support by private sector and other contributions. Co-Organizers of the workshop included: the Association of Bay Area Governments, Bay Area Center for Regional Disaster Resilience, Bay Area Council, California Resiliency Alliance, National Disaster Resiliency Center (and workshop host), and the Carnegie Mellon University Disaster Management Initiative. The Workshop sponsor was Exponent.

1. Workshop Objectives

Objectives of the workshop were to:

1. Enable Bay Area stakeholder organizations to share perceptions on and to explore and discuss selected high-priority issues and how to better fulfill their resilience objectives, roles, and missions;

2. Assist Bay Area businesses and other organizations to improve their disaster recovery and continuity plans;

3. Point out priority recovery issues that should be examined to develop a regional Action Plan;

4. Highlight existing Bay Area capabilities to address major disasters and incidents;

5. Identify and discuss gaps and types of activities to improve the Bay Area's capacity to withstand, adapt, and rapidly return to normal, and as necessary, a new normal.

2. Scope

- The Kick-Off Workshop was designed to begin the process of gaining information, insights and perspectives for the Action Plan through presentations from practitioners and experts with stakeholder interactive discussions on a set of significant disaster recovery issues. The issues were selected by a stakeholder Workshop Development Team as particularly important for recovery and longer-term restoration after a major earthquake. Challenges of transitioning from response to recovery decision-making;

- Providing long-term housing for displaced residents, rebuilding housing and commercial facilities, land use, and other related recovery issues;

- Examples of recovery lessons learned;

- Assuring businesses remain in the Bay Area; and

- Financing mitigation and recovery for resilience.

3. Format

The day-long workshop was structured to provide participants with the maximum opportunity to share information and discuss issues and challenges, as well as identify what needs and potential activities should be included in the Action Plan that can enhance Bay Area disaster recovery capabilities. After opening remarks, there was a short overview of the Bay Area Disaster Resilience Initiative followed by four roundtable discussions with short presentations by key representatives of private sector, government, and non-profit organizations. Each roundtable was followed by participant questions and comments and then by concurrent facilitated breakouts[*] in

---

[*] Breakout facilitators were volunteer members of the Workshop Development Team:
Peter Ohtaki, Executive Director, California Resiliency Alliance
Jim Turner, Private Sector Liaison Officer, San Francisco Department of Emergency Management
Stephen Baruch, Emergency Management & Business Continuity Advisor, Nexis Preparedness Systems
Kathleen Cha, Senior Communications Officer, ABAG

which participants collectively addressed several challenging questions that were designed to raise awareness and stimulate problem solving and information sharing. The last roundtable was followed by interactive discussion among all participants. There was also a working lunch with a presentations and discussion on lessons learned from previous disasters. *(For the session issues questions, see Appendix C.)*

4. Highlights of Proceedings and Participant Observations

Note: The following highlights of the presentations and participant observations and discussions will be factored into the Gap Analysis, in addition to information from future Initiative workshops, the regional table top exercise, lessons learned from other regional events and activities, and data collected on Bay Area plans, tools, technologies and other capabilities to ensure the Action Plan and supporting Gap Analysis are as accurate as possible.

4.1. <u>Opening Remarks</u>

The workshop opened with short remarks from Bay Area business and political leaders. ***Russell Hancock, President and CEO, Joint Venture Silicon Valley,*** commented on the need to focus on disaster recovery in the region and the importance of the Bay Area Disaster Resilience Action Plan Initiative. He expressed his hope that the Bay Area can become a showcase for preparedness for the world. ***Jerry Hill, California State Assembly Member, 19th District,*** referred to the devastation of San Bruno in the September 2010 natural gas pipeline explosion, and in Santa Cruz from the Loma Prieta earthquake in October 1989, pointing out that first responders know what to do in a disaster, "but do we know what to do to rebuild the communities?" ***Jim Wunderman, President and Chief Executive Officer, Bay Area Council*** emphasized the need to know "what is before us" when an earthquake occurs, and that businesses can't wait for recovery—they have to recover quickly. Bay Area organizations must work together—they cannot function separately, and in some cases legislation may be necessary. He cited legislation that was passed to enable the ferries to help in transport across the Bay if bridges were affected in an earthquake. ***Steve Jordan, Executive Director, National Disaster Resiliency Center (NDRC) and workshop site host,*** welcomed the participants and spoke briefly of the mission of the NDRC and its activities.

4.2. <u>Overview of Bay Area Regional Disaster Resilience Action Plan Initiative</u>

Danielle Hutchings, Earthquake and Hazards Program Coordinator, ABAG, described four characteristics of a resilient region—capabilities to minimize a disaster's disruption on everyday life and the economy (hazard mitigation, preparedness), prevent or minimize loss or damage to life, property, and the environment (emergency response), quickly return citizens to work, reopen businesses, restore essential services needed for economic functionality (recover), and able to survive, adapt, evolve, and grow in the face of turbulent change (adapt). She provided a description of the Initiative, and the process and timetable for completion of development of the Action Plan. She outlined the multi-step process to bring together interested key public, private, and non-profit stakeholder organizations in the 12-county Bay Area region and set up a broad cross-sector Initiative Planning Group to select the major focus areas and priority issues that

comprise the outline of the Action Plan, undertake a Gap Analysis through assessing existing Bay Area capabilities against disaster recovery needs, and identify gaps and short, medium, and longer-term activities that can address the shortfalls and enhance Bay Area resilience. A series of events focusing on key recovery issues will be used to facilitate development of the Action Plan, including the present Kick-Off meeting. A second workshop will be held in January focusing on recovery aspects of lifelines and other critical infrastructure interdependencies, followed by a regional tabletop exercise and a workshop to review and complete the Action Plan in September. Both the Action Plan and Gap Analysis will undergo coordination by the Initiative Planning Group before finalization. In October, the implementation phase will begin with selection of projects and activities, determination of lead and partner organizations, development of requirements, schedules, and milestones, and identification of financial and expertise resources to support the work. Many of the Action Plan activities will be "quick wins" and some will need state and federal seed money and private sector contributions. The action plan will be a "living document" that will be continually updated as new lessons are learned and needs identified. Overall, there are significant benefits from the Action Plan development process—building collaboration, trust, and relationships among the various participating stakeholder organizations and individuals. The Initiative is fundamentally a stakeholder-driven, collaborative process, and the outcome will be a strategy to improve the region's resilience and avoid re-creating the wheel. The Action Plan will not result in unfunded mandates and will respect jurisdictional and organizational authorities, missions, and interests.

Paula Scalingi, Executive Director, Bay Area Center for Regional Disaster Resilience, provided an overview of the initial framework, which had been distributed to participants at the beginning of the workshop. She explained that the framework was the outline for the Action Plan and was comprised of 16 focus areas, each with priority issues that together covered all aspects of disaster recovery, including preparedness, mitigation, response, prevention, and protection that had a direct bearing on recovery. The focus areas and priority issues been identified by the Bay Area Regional Disaster Resilience Initiative Planning Group through a meeting and follow-on conference calls over the past few months. See the 16 focus area outlined in Appendix C *Initial Action Plan Framework.*

4.3. Session 1 Roundtable: Transitioning from Response to Recovery

John Wiecjorek, Deputy Regional Administrator, Cal EMA Coastal Region, outlined the state's process for disaster recovery that entails initial damage estimates that are incorporated into the Response Information System (RIMS), followed by damage assessment teams to assess impacts on jurisdictions. He said that Local Assessment Centers would be established under the California Standardized Emergency Management System (SEMS) and debris removal undertaken. There would be coordination among state and local agencies. SEMS would not end with response but continue with different organizations joining the process.

Michael Haralambakis, Deputy Director, Recovery Division, Region IX, Federal Emergency Management Agency (FEMA), noted that effective recovery depends on pre-disaster preparedness, and that response and recovery start at the same time. For example, the decision of where to shelter people and debris placement will impact long-term recovery. He cited the National Recovery Framework, which will be rolled out shortly, which provides guidance for federal, state, tribal, local government, and citizens to support disaster recovery. He noted the

need for the whole community to be involved in preparedness and provided an example in the Joplin, MO, tornado devastation of people losing their personal identifications and how government worked with banks to enable them to use checks.

Bruce Martin, Fire Chief, City of Fremont, pointed out that local priorities determine recovery priorities and there is no clean line regarding when response ends and recovery begins. This was a lesson learned when he was part of a California emergency response mutual aid assistance team deployed to New York after Hurricane Irene. New York is a home rule state in which each jurisdiction determines its own policies. Local priorities take precedence; collaboration is essential. There was no top-down model like SEMS. People were self-reliant. The private sector filled gaps as needed and individuals took care of themselves. He gave as an example Bank of America's mobile banking centers and Verizon COWS (Cells on Wheels) trucks with equipment to provide wireless communication in disaster areas.

Jerry Hill, California State Assembly Member, 19th District, said that Jim Wunderman and the Bay Area Council have been extraordinary models of resilience. Important factors in expeditious recovery are coordination, communication, and collaboration. Government can't stand in the way, but must facilitate recovery.

***Steve Jordan, Executive Director, National Disaster Resiliency Cente*r**, pointed out that recovery can go on for years. The need is to get the community back to a sense of normalcy. He said response is not a federal responsibility, but is local, and that 95 percent of people in a disaster are assisted by a neighbor. He noted that "safety is not the absence of danger; it is the result of preparedness." The goal is to build stronger, more resilience regions although enhancing capabilities within communities.

Breakout Session Results

Participants discussed issues involved in developing an organizational structure for managing regional recovery, including roles and responsibilities of government private sector and non-profit organizations, coordination, and decision-making. *(See Appendix B for Session 1 Issues Discussion Questions.)* Many of the points discussed focused around recovery decision-making. Issues raised included:

- *Roles and Responsibilities:*
  - There are many different gaps and perceptions on recovery. A significant gap is understanding roles and responsibilities in disaster recovery and that the Bay Area is highly diversified—some jurisdictions have high capacity for resilience and others a low capacity.
  - People and organizations have roles during recovery that are often forced upon them by circumstances. They may not understand the impacts of decisions made on recovery, such as economic development choices or relocation of individuals. Stakeholder awareness needs to be raised to understand these consequences. This means the broad stakeholder community must be involved in planning. At the same time, we need to figure out how to "trickle up" in determining what needs to be done, rather than rely on trickle down from

government. Decisions need to be made at the local level and include federal, state, and local agencies.

○ Non-profits and faith-based organizations play huge roles in recovery, and government starts to step back after response ends.

○ The San Francisco Empower Communities Program has developed cross-sector councils for routine topics that can address preparedness issues.

○ There should be a work group created or daylong workshop conducted on roles, responsibilities, and decision-making for recovery.

- *Economic recovery issues:*

○ The focus in recovery planning should be on "community continuation" not just business continuity. The influx of companies coming into a devastated region from outside to help rebuild can displace local businesses and hurt the economy. There is a need for mechanisms for local businesses to participate in restoration and recovery through developing a network of resources to call.

○ Credentialing for private sector organizations remains a problem post-event. For example, a city can authorize individuals to have access to a disaster site, but law enforcement personnel must recognize them.

○ There should be a regional donation management system established before an event happens; currently "donations are siloed."

- *Information sharing:*

○ There is a need for a common operating picture through stakeholder and general public information sharing. "The problem is that all the players who need to share information aren't."

○ A Bay Area wide system should be created to enable government agencies to share information with the private sector. This can be accomplished through developing an inventory of the information needs of key stakeholder groups and using cloud computing and social media. An example was provided of the U.S. Army Corps of Engineers using Facebook during the Mississippi River floods to reach people. At the same time, there is always concern about sensitive data getting into the public domain that will increase vulnerability, and that social media tools such as Twitter and Facebook use up bandwidth needed for response and initial recovery efforts.

○ Communications and critical IT resilience for recovery need to be addressed. Organizations should determine how they can "fall back on old fashioned ways" (for example, hard-wired telephones) of communicating for 30 to 60 days after a regional disaster. A potential mitigation measure is expansion of the 211 system to the whole Bay Area. Also, ABAG could assist through providing hosting information for regional recovery with a data repository and information sharing.

- *Community and neighborhood resilience:*
  - The need to focus on people and communities in the recovery process and build community capacity for resilience in advance through public information, training, and education; finding ways to reward people who are prepared.
  - Shelter-in-place should be assessed in terms of feasibility and process. It is unclear how shelter-in-place could be enforced. For example, 55 percent of employees in San Francisco do not live there.
  - Sustaining medical surge capacity would be a challenge. Support hospitals would be set up within 12-24 hours in an emergency, but the need to continue supporting them could be long-term.

4.4. Session 2 Roundtable: Long-term Housing for Displaced Individuals and Rebuilding Housing

Alessa Adamo, Executive Director, SF CARD (Moderator), pointed out that "you can't plan in a silo" on issues such as temporary housing and business recovery. She gave as an example the fact that San Francisco is 49 square miles with 750,000 residents, but during the day, the population swells to 1.5 million, of which 750,000 need to leave at the end of the day to go home. The challenge was finding temporary housing for a densely populated area that relies on resources outside the jurisdiction.

Laurence Kornfield, Special Assistant to City Administrator for Earthquake Safety Implementation, City and County of San Francisco, spoke on the Community Action Plan for Seismic Safety (CAPSS) project to reduce earthquake risks. He said the CAPSS work plan is a 20 to 30 year program aimed at assuring, after major earthquakes, that residents will be able to stay in their own homes, quickly have access to important privately run community services, no buildings will collapse catastrophically, and businesses and the economy will quickly return. A key issue is redefining what is sufficient to enable individuals to safely stay in their homes. He noted there was a shelter-in-place task force to define habitability standards. The goal was to have community–based institutions to serve people sheltering in place within a half mile of their home to enable 95 percent of residents to shelter-in-place. Right now 25 percent of the population cannot shelter in place.

Karma Hackney, Individual Assistance Branch, California Emergency Management Agency, pointed out the importance of coming to consensus on what long-term housing requires. Who would be in charge; what does long-term mean? We need to scope the problem and consider the magnitude of the recovery process. Tent cities and cruise ships are not realistic for long-term sheltering. Is the idea to relocate individuals and families from the Bay Area? If so, how do we determine where to put mobile homes or other temporary shelters? How would we bring them back? There is a need for guidelines and decisions. Then there is the additional challenge of bringing businesses back without people to staff them or customers to patronize them. There will be ordinance and zoning issues that will need to be addressed for temporary housing. There should be regional discussion on these issues—a regional task force with state and federal support. Solutions will need to address local needs.

Piotr Moncarz, Corporate Vice President, Exponet, said restoring the economy of Silicon Valley is a significant issue in looking at Bay Area disaster recovery. Different parts of the Bay Area will need to be treated differently. A related key issue is how to restore and salvage/replace the contents of buildings to restore businesses. For example, medical buildings that are red-tagged for demolition would have important patient and other records inside.

G.L. Hodge, Administrator, Providence Baptist Church and Member, Interfaith Council and San Francisco Foundation for Vulnerable Communities, focused on the need for faith-based organizations to be involved in the stakeholder coalition for Bay Area Disaster Resilience Initiative. People will come to churches in a disaster looking for help. Churches must be prepared to provide assistance. There won't be time to wait for the government local response system to get organized. It's necessary to work from the bottom up. An issue is how transportation can be arranged for individuals in temporary housing and supporting people in need. Churches will be a major resource for assisting individuals with food banks, transportation, and other services, such as Meals on Wheels. It will be necessary to educate citizens on how to volunteer for what needs to be done, and that they don't have to be vulnerable because they are part of a vulnerable population.

Comments and Breakout Session Results

Participants discussed plans for housing and providing essential community services for displaced individuals and families, including at-risk individuals, and providing them access to their jobs and neighborhoods; procedures for tagging damaged homes and determining home demolition, restoration, and land use; and the authorities of financial and other institutions regarding mortgages and other financial obligations, and costs of rebuilding. *(See Appendix B for Session 2 Issues Discussion Questions.)* There were many key points raised, mostly in the form of questions that need to be addressed:

- *Insurance issues:*
  - Many people are underinsured. A challenge for town homes and condominiums is that Home Owners Associations can't afford insurance. There will be legal and liability issues associated with what HOAs must cover regarding damages and what portions of the building a tenant must cover.
  - Many people don't understand what is and is not covered and discover belatedly they are underinsured. It was noted that people in the Loma Prieta earthquake had 15 minutes or less to recover what was important to them before abandoning their homes.

- *Issues involved with long-term housing:*
  - How can enough skilled help be assured for damage assessment and tagging homes in a regional disaster that impacts a significant part of the state?
  - What are the provisions for getting children back to school and family-accessible shelters for pets?
  - A huge issue is how disaster lifeline supplies—emergency power, food, water, sanitary facilities, pharmaceuticals, diapers, and other necessities for daily living—will be

distributed and sustained over a long period of time. How can we undertake prolonged mass care?

- How will regional mass transit be managed to service neighborhoods and communities? Is there a regional transportation plan for prolonged disaster recovery?

- What rights will renters have?

- How will disaster service workers housed?

- What regulatory waivers will be necessary for long-term housing?

- *Incentivizing resilience:*

  - How do we get businesses to remain in the Bay Area if there are few to no customers in the first few months after a regional disaster?

  - Need for better building standards and mitigation of significant infrastructure vulnerabilities.

  - How can local governments work together to have an integrated baseline resilience capacity for their jurisdictions and the Bay Area?

  - Ways to finance mitigation and building retrofits could include voluntary donations, through the insurance industry or through Small Business Administration loans.

- *Post-disaster behavioral issues:*

  - People have difficulty understanding that a major earthquake or other devastating event will take months to years of recovery. Many believe the solution is to temporarily leave the Bay Area or stay with relatives until "things get back to normal", which is envisioned to be a matter of days or a few weeks. They do not take into account issues such as the need for employment, paying mortgages, or keeping children in school over the long-term.

  - There are no federal or state plans to relocate large numbers of people out-of-the-area; rather the focus on shelter-in-place. At the same time, the term shelter-in-place has different meanings to different people. The cities of Dublin and Livermore have established a committee to look at what needs to be done on temporary housing.

  - Recreating a sense of community is important, as well as a sense that the community is safe and secure. At-risk individuals and groups will require a wide variety of services, including in-home care, and specialized supplies (e.g., wheel chairs, respirators, and other equipment).

  - How can a "new normal" be created in which people will be content to live for a time? Different people and groups will have different needs. For example, access to sports stadiums and facilities and resumption of football or baseball team play will be a symbol of normalcy to many.

  - People need to deal with the fact that they cannot rebuild in areas prone to liquefaction or which post-disaster are environmentally contaminated, and they may need to meet stricter and more expensive building standards and code upgrades that they cannot afford.

- There will be diverging political, economic, and societal issues centering around land use and other rebuilding decisions that will require negotiation and cross-jurisdiction trade-offs.
- How will jurisdictions address relocation by choice of displaced homeowners to neighboring communities where damage is less or not an issue?

4.5. Working Lunch: Looking Back at Recovery Lessons Learned

Robert Dolci, Acting Director, Center Operations, NASA Ames Research Center, provided reflections on the Hurricane Katrina recovery from his tenure at NASA's Stennis Space Center. He said that Stennis was able to stage and facilitate distribution of FEMA and state resources, but that unfortunately, there was no comparable federal large facility in the New Orleans area. In the first week after Katrina, 500 trucks delivered 20 million pounds of ice and 2.6 million gallons of water, as well as 1.8 million MREs. There were 28 federal agencies and their components and 25 states contributing. He noted that Moffett Field is a regional FEMA storage and staging location and will be used for this purpose if there is a regional disaster.

4.6. Session 3 Roundtable: Assuring the Bay Area Remains in Business

Peter Ohtaki, Executive Director, California Resiliency Alliance (Moderator), observed that in a major regional disaster it is the small businesses that "go under" and the large firms and particularly IT and tech firms can readily move their operations elsewhere or their staff can work remotely.

Richard McCarthy, Executive Director, California Seismic Safety Commission, commented that the 1985 Kobe earthquake and the one in 1999 in Taiwan resulting in both localities losing a major share of their businesses. Likewise the Bay Area in a disaster will lose market share. There are 30 major corporations in the state. It is necessary to protect market share through removing regulations and incentivizing businesses to remain or, if they leave, to return. There needs to be out-of-the-box thinking on how to deal with these issues.

Raelene Wong, Director of Global Business Continuity, Applied Materials, observed that we are still struggling to get business and government together. We need a common operating platform to achieve this with everyone working from the same assumptions. A key issue is how cities will prioritize building inspections, because this will impact recovery decisions. Businesses will need to focus on relocation and housing employees. There is a need to ensure that R&D does not leave the Bay Area permanently.

Bill Corder, Regional Director of Public Safety, Westfield Shopping Centers, noted that it was difficult for businesses to comprehend disaster consequences. While in smaller towns, businesses tend to have relationships with local government officials, in larger cities, this is often not the case, and private sector organizations find it hard to be included in emergency response planning, training, or exercises. The best success for the private sector in partnering with government has been with public safety agencies. It is necessary to partner with government to know what the public requires in an emergency and to convey information on private sector needs. The key is not to let politics become involved in recovery issues because this enables the media to amplify

problems. The Incident Command System (ICS) gets "really muddy" when the responders arrive at the scene of the disaster or event. Businesses often have a separate command post to handle suppliers and other resource needs. The issue remains who is in charge in a disaster and how will regional decision-making be coordinated. There is a need for operational standards for resilience to assist a community on rebuilding decisions, which will determine what businesses return. "The frustration is that brilliant people talk about what needs to be done and not do it."

Breakout Session Results

Participants discussed business disruptions in a major earthquake, business contingency plans and earthquake insurance, how decisions would be made on restoring and rebuilding damaged or destroyed commercial buildings, and assistance and incentives that could be provided to retain business in the Bay Area. *(See Appendix B for Session 3 Issues Discussion Questions.)* Observations included:

- *Business continuity challenges:*
  - Looking at the consequences for Japanese businesses and manufacturers from the recent earthquake and tsunami, there should be an assessment of potential impacts on Bay Area businesses from disrupted supply chains in a major disaster. In some cases, businesses will find their product or service severely impacted, while other industries, such as construction, might thrive because of rebuilding needs.
  - Large businesses should have a hot site—a recovery service that allows a business to continue computer and network operations in the event of a disaster. Small businesses need to set up contracts with suppliers to assure supply chain continuity.
  - Examples of ways to expedite business resumption include tax holidays, a financial safety net for small businesses, and social services targeted at the private sector.

- *Business rebuilding issues:*
  - Business continuity plans should include rebuilding. The challenge is determining what will happen or what to invest and where. Businesses will need to determine their customer base. Clean up time would depend on the type of disaster and be hard to calculate. It will be difficult to know how much housing needs to be rebuilt, and if businesses are uncertain whether residents will return, they will not rebuild or relocate to the Bay Area.

- *Business recovery financial issues:*
  - Financial lending institutions will be instrumental in regional business recovery.

4.7. <u>Session 4 Roundtable: Financing Recovery & Resilience</u>

Paula Scalingi, Executive Director, Bay Area Center for Regional Disaster Resilience (Moderator), said financing recovery, including pre and post-event mitigation, is one of the most challenging needs. There may be existing mechanisms in the Bay Area that can be leveraged or an approach from disasters in other parts of the nation that could provide a model.

Matt Regan, Vice President of Government Relations, Bay Area Council, underscored that the "picture was not rosy." Financing recovery is "not a geography problem but a government and economic problem." If a major earthquake occurred now, "the state is broke and the public is economically stressed." As a result, both federal and state governments would bring much less money to assist in recovery. Difficult decisions must be made on what investments to make. Priority should be on infrastructures that will be essential to getting the region up and running. There is a six to eight week window to get infrastructure operational before businesses will leave. Restoration will be hampered by poor transportation planning, necessitating long commutes because of damage to bridges and tunnels. State legislation may be required for waivers to restore infrastructure to avoid expensive review and evaluation processes. However, if speed is necessary, it would be best to by-pass legislative solutions, if possible. Public-private partnerships can assist in building relationships that can expedite recovery decision-making.

Peter Crase, Disaster Assistance Program Manager, Cal EMA, opened by noting that FEMA has been running low on money and the state is economically stressed. Cal EMA works only with government and the public. On recovery financial issues, they do briefings, handle applications, and reimburse local governments for disaster impacts. Political pressure can speed up the procedures.

Bob Canter, President and CEO, Emeryville, Chamber of Commerce, commented that businesses will be impacted by disasters differently. The larger corporations are better prepared—they can go off-site or to other states. We are never going to rescue every business. After Hurricane Katrina devastated New Orleans, one third of the population left and one-fourth of businesses did not return. Businesses don't think about disaster impacts until a threat emerges, then they will forget again after a few days. Small Businesses have a misconception that FEMA will help. Emeryville is upgrading its continuity plan. It has a grant to provide backpacks to businesses. There is a small business continuity plan template. This is the type of issue that local and regional Chambers of Commerce continue to push. Chambers of Commerce are a good way to spread the message about disaster preparedness and resilience. This is an issue that everyone can get their arms around.

Larry Souza, Principal – Real Estate and Financial Economist, Johnson Souza Group, Inc., pointed out that we need to look at financing recovery from both a monetary and fiscal policy standpoint. We need a financial system that can be continuous. If a disaster strikes, there will be a run on money and the local economy will shut down. The goal is to provide access to capital. There needs to be inter-institutional cooperation. The Federal Reserve would be the lead for financing recovery in concert with financial institutions, the FDIC, and the Federal Home Loan Bank. Tools that are already available are tax credits, revenue bonds, and federal credit guarantees. Community block grants could be created, along with tax credits for construction projects, HUD Block Grants, accelerated application and cost recovery to attract capital, and bridge and long-term loans secured. There also could be reconstruction loans and bonds. Redevelopment and Development zones could be utilized. However, there would need to be federal and state legislation in many cases to effect these changes.

Interactive Discussion Results

Participants discussed issues around securing funds for restoration of buildings and infrastructure, and mechanisms that could be used or created to provide these resources. *(See Appendix B for Session 4 Issues Discussion Questions.)* Issues raised included:

- *Government assistance:*
  - FEMA will provide public assistance only. There is no FEMA grant program for business disaster assistance.

- *Other Assistance:*
  - Businesses can resort to the SBA for loans, but they must qualify first. Requirements include having insurance and financial books in order.
  - There are also forgivable loan programs.

5. Workshop Results

The following results are based on participant views expressed during and after the workshop, attendee evaluations, and comment cards.

Overall, participants were interested and motivated in moving forward to develop a Bay Area Regional Disaster Resilience Action Plan and ensuring it covers all significant issues, and raised a wide range of needs and ideas. Several participants referred to the importance of determining recovery priorities and acting on them. As one private sector representative observed, "The problem with lessons learned is that we don't learn them." Many participants commented in their evaluations that the workshop was a "good first step" in this direction. Topics that participants identified that should be included in the Action Plan Framework or which needed further study:

Housing Issues – Need for greater focus on post-earthquake housing recovery; involvement of the insurance industry in developing owner incentives for retrofitting structures; policies and procedures to address assistance for renters; the problem of underinsured home owners and incentives for rental insurance; procedures for determining how emergency housing will be distributed to those who need it and how to "enforce this;" holding an exercise with financial institutions, the Small Business Administration, and other key agencies and organizations with single family and multi-family housing owners to walk through a scenario and "see how it will play out for planning housing recovery."

Community Resilience Recovery Issues – Special needs and undocumented individuals; relocation and reentry after evacuation and rebuilding; children-related recovery issues; role of faith-based organizations and community service organizations such as the Salvation Army and United Way; creation of partnerships of business, local government, and non-profits at the community level; need for a public outreach and education campaign for community preparedness and resilience; coordination among and support for Community Emergency Response Teams (CERTs); how to effectively handle donations for recovery; and determination of guidance and standards for community resilience.

Infrastructure Resilience and Interdependencies – Restoration of banks/financial institutions and other critical infrastructure—priorities, processes, and timetable; need for involvement and collaboration of utilities and other essential service providers that serve the Bay Area regional recovery planning; outreach and involvement with neighboring states where interdependencies extend; post-cyber attack restoration and security issues; and exploration of ways, including legislation, to address mitigation measures for infrastructures pre-disaster.

Business and Operational Continuity – Sharing information on steps that businesses are taking to help prepare their employees in their homes and communities for disasters; back-up command and control centers for businesses; assuring job availability for displaced persons; lessons learned for security issues from disasters; virtual recovery sites for public agencies; ways to share and transfer knowledge on continuity, including recovery issues; and a more formal public/private sector partnership that would facilitate collaborative working agreements on recovery issues, including a legal document template that could be used for this purpose.

Recovery Decision-making and Financial Issues – Need to look beyond San Francisco to the whole Bay Area and have an agreed disaster recovery mission; greater understanding of the roles of local, state, and federal (including military) agencies and regional organizations in recovery and how to improve collaboration and centralized communications systems; improving the accuracy and transparency of the resource allocation process post-disaster and educating the public on what is available and when, and what they should expect; outreach to local community political leaders to gain their involvement in recovery planning; inventory of recovery-related Bay Area plans; idea of a pre-event registration of homes, people, and assets to assist in recovery; exploring the feasibility of creating a "reverse 911" system across the entire Bay Area; and examination of the connection between longer-term recovery and climate change. Several participants noted a key need was, as one put it, "how to get local, state, and federal agencies involved in emergency planning to agree on one plan" for the Bay Area.

6. Next Steps

Participants were informed they would be provided a summary of workshop proceedings, which would also be provided to the broader Bay Area Resilience Coalition organizations and associations. The workshop findings would be incorporated into the Action Plan framework and the supporting Gap Analysis. Activities to obtain information on capabilities, findings, and needs would include a stakeholder survey, focus group meetings and interviews with key practitioners, experts, and other key Bay Area stakeholder representatives, collection of outcomes and lessons learned from regional workshops and exercises around the Bay Area, and research on existing plans, tools, and technologies that are available for Bay Area disaster recovery. A template for stakeholders' use to provide a capability description for the Gap Analysis has been developed and is on the ABAG website. As needed, discussion groups on priority topics will be created or existing groups utilized for this purpose. ABAG's website will be expanded in the coming year to provide a repository of regional capabilities and drafts of the Action Plan, Gap Analysis, and other Initiative support documents for stakeholder review and comment. An important and continuing focus of the Initiative will be to foster increasing interaction and collaboration among regional stakeholders, jurisdictions, Cal EMA and other state agencies, and FEMA Region IX and other federal partners.

6.1   Workshop Follow-On Events

Participants were invited to join in planning the next workshop, to be held January 31, 2012, which will focus on lifeline and other critical infrastructure and essential service provider dependencies and interdependencies. A regional tabletop exercise focusing on significant recovery issues identified in the workshops and other Action plan development activities will be held in late spring. A stakeholder exercise design team will be set up to develop the exercise after the next workshop.

Appendix A
Workshop Participating Organizations

AAA Insurance Exchange
Adjusters International
Alameda County
- GSA-Purchasing
- Sheriff's Office

Allied Barton Security Services
AMEC Environment & Infrastructure
American Red Cross
- Bay Area
- Silicon Valley

Amgen
Amtrak
Anderson Niswander, Inc.
Applied Materials
Arup
Association of Bay Area Governments
AT&T
Bay Area Center for Regional Disaster
  Resilience
Bay Area Council
Bay Area Preparedness Initiative
Bay Area Rapid Transit (BART)
Berkeley Fire Department
Business Recovery Managers Association
  (BRMA)
California Air National Guard
  129th Rescue Wing
CALFIRE – South Santa Clara Co. FD
California Community College
California Department of Public Health
- Drinking Water Program

California Emergency Management Agency
  (Cal EMA)
California Hospital Association
California Resiliency Alliance
California Seismic Safety Commission
California State Assembly
California Volunteers
Caltrans
Carnegie Mellon University
CERT / RACES

Cisco Systems, Inc – Tactical Operations
City of Berkeley Housing & Community
  Services
City of Clayton
City of Emeryville
City of Fremont
City of Oakland Office of Emergency
  Services
City of San Rafael Office of Emergency
  Services
City of San Ramon
City of Santa Clara
City of Sunnyvale
Contra Costa Health Services
Eastern Contra Costa Transit Authority
EBMUD
Eden I&R/211 Alameda County
Emeryville Chamber of Commerce
EPMI-MORH 1 Apartments
Exponent
FBI
Franklin Templton Investments
Fremont Fire Department
GeoHazards International
Google
Health Education Services
HEG, Inc
Intel
Jeanne Perkins Consulting
Joint Venture Silicon Valley
Kwan Henmi Architecture/Planning
Lawrence Livermore National Laboratory
Livermore-Pleasanton Fire Dept.
Metropolitan Transportation Commission
Mineta Transportation Institute
Monterey County OES
Mountain View Fire Dept.
NASA Ames Research Center
National Disaster Resiliency Center
Naval Postgraduate School
NetApp
Nexis Preparedness Systems, Inc.

Nossaman LLP
North County Fire Authority
Northern California Regional Intelligence
  Center (NCRIC)
Northroad Builders
Pacific Gas and Electric Company
Paramount Maintenance, Inc.
Peralta Community College District
Port of Oakland
Providence Baptist Church of San Francisco
RAI Laboratory LLC
Ravenswood Family Health Center
Ready47
San Francisco International Airport
San Francisco
  • Dept. of Emergency Management
  • Fire Dept. – Neighborhood Emergency
     Response Team
  • Office of the City Administrator, GSA
SF CARD (Community Agencies Responding
  to Disaster)
San Jose State University
Santa Clara County OES
Santa Clara University
Santa Clara Valley Transportation Authority
Santa Clara Valley Water District
San Mateo County Sheriff's OES
SecTek, Inc – Protective Services Div.
Secured Environment
SLAC National Accelerator Laboratory
South Bay Regional PSTC
Southern Marin FD CERT
SRI International
Stanford University
Suulutaaq, Inc.
UC Berkeley Goldman School
Ultratech, Inc.
U.S. Coast Guard
  • Sector San Francisco
  • Base Support Unit Alameda
U.S. Department of Health & Human
  Services
U.S. Department of Homeland Security
  • FEMA
  • Office of Health Affairs

U.S. Drug Enforcement Administration
U.S. General Services Administration,
  Region 9
U.S. Small Business Administration
  • Office of Disaster Assistance
URS Corporation
Verizon Wireless
Visa, Inc.
Wells Fargo
Western Digital Media, Inc.
Western Disaster Center
Westfield Shopping Centers
Young and Lamay Associates

Appendix B
Breakout Session Issues Questions

Session 1: Transitioning from Response to Recovery

1. When does the Standardized Emergency Management Systems (SEMS), which provides the organizational structure for managing a Bay Area unified disaster response, end?

    ▪ What takes its place to orchestrate Bay Area recovery and restoration?

2. What are the roles and responsibilities of federal, state, and local governments in recovery?

3. How will jurisdictions coordinate on recovery priorities and activities?

4. How will private sector and non-profit organizations and associations participate in recovery decision-making?

Session 2: Housing for Displaced Individuals & Rebuilding Housing

1. What are the plans for housing and providing essential community services for tens of thousands of people whose homes are either destroyed or damaged in a major earthquake?

    ▪ How will transportation be arranged to enable them to continue their jobs and visit their neighborhoods?

    ▪ How will "special populations"—the elderly, disabled, low-income, homeless, be addressed?

2. How will "tagging" of damaged homes be conducted and what does it entail?

3. How are decisions made on home demolition, restoration, and land use?

    ▪ What are jurisdiction's recovery authorities? Rights of property owners?

    ▪ How will financial institutions handle mortgages on destroyed, damaged, or abandoned property?

    ▪ How will uninsured homeowners and rental property owners finance the rebuilding of their properties?

Session 3: Assuring the Bay Area Remains in Business

1. How long could businesses expect to be disrupted in a major earthquake if they are impacted by physical damage to critical infrastructure?

2. Do Bay Area businesses typically include major disaster recovery in contingency plans?

3. Do they have earthquake insurance?

4. How will decisions be made on restoring and rebuilding damaged or destroyed commercial buildings?

5. What assistance or incentives could be provided by government or the private sector to keep businesses from going out of business or leaving the Bay Area?

Session 4: Financing Recovery & Resilience

1. How will the enormous amount of funds necessary for restoring and rebuilding housing, commercial buildings, and infrastructure be acquired?

   ▪ Government resources?

   ▪ Private Sector Resources?

2. What existing mechanisms would be used or could be created to provide the investment dollars needed to restore communities and infrastructure?

Bay Area Regional Disaster Resilience Initiative
Initial Draft Action Plan Framework

This outline of topics and respective issues is the initial draft framework for the Bay Area Disaster Resilience Action Plan—a roadmap of activities that will build on what already has been accomplished by jurisdictions and organizations to improve our region's ability to recover from a major earthquake or other disaster. This framework will serve as the scaffolding for the Action Plan, which will be constructed over the next year through a "Whole Community" process that involves all interested stakeholders from throughout the 12-County Bay Area region—businesses, utilities, non-profits, community groups and institutions, schools and other academic institutions, local governments, and tribal, state, and federal agency partners. The framework will also be used for a supporting Gap Analysis that will inventory current Bay Area preparedness, mitigation, response, recovery, and other capabilities that have a direct bearing on recovery in order to identify areas that still need attention while avoiding "recreating the wheel."

Your knowledge, expertise and insights are essential to the Action Plan's effectiveness in charting a path forward to make the Bay Area disaster resilient. Please look over the following draft Framework and let us know what should be added or changed. ABAG will post an updated Draft 2 on its Earthquake and Hazards Program website after the Kick-Off Workshop to enable comment by all interested Bay Area stakeholders.

1. **Significant Events that could Impact the Bay Area's Economy, Environment, and the Health, Safety, and Well Being of Citizens** *(e.g., earthquakes and tsunamis, firestorms, prolonged rain events with widespread flooding and landslides, pandemics, terrorist attacks, events caused by aging infrastructures and systems failures, and technological disasters)*

   - Major all hazards threats and events, natural and manmade, including unanticipated significant events that would have region-wide impacts and require significant recovery and restoration

   - Current level of understanding of damages and consequences for lifelines, other infrastructures, and housing, commercial, and other structures from these threats and events

2. **Lifeline and Other Infrastructure Dependencies and Interdependencies – Recovery Challenges** *(includes the 18 U.S. Department of Homeland Security infrastructure sectors and also community institutions, schools and academic institutions, housing sector, as well*

as people—the staff and customers of Bay Area government agencies, businesses, social and other services, individuals and families)

- Identification and prioritization of Bay Area critical infrastructures and essential services, including, interdependencies-related vulnerabilities that extend outside the Bay Area and cascading impacts that could impede recovery, taking into account supply chains and other supporting services, such as labor unions and construction firms

- Awareness of lessons learned from recent disasters

- Status of regional interdependencies analysis capabilities and expertise

- Capabilities to ensure confidentially of proprietary and sensitive infrastructure, health, and other data

3. **Preparedness and Mitigation to Better Withstand and Rapidly Recover** *(actions that can be taken before a major event to lessen the consequences, stem cascading impacts, expedite recovery, and keep down recovery costs)*

- Jurisdiction and organizational plans and procedures

- Security and physical protection and prevention measures

- Guidelines and Standards

- Pre-event mitigation actions and financial, political and cultural challenges (e.g., retrofitting/hardening housing, other structures and critical assets; creating backup/redundant systems and remote operations; upgrading aging infrastructures; incentivizing broader insurance coverage)

4. **Regional Response Policies, Plans, and Solutions that Affect Recovery** *(focus on those areas of disaster response that would have a direct impact on how quickly the Bay Area can recover with limited economic, social, environmental consequences)*

- Cooperation and coordination among jurisdictions on plans, procedures, and activities

- Evacuations and re-entry plans

- Short-term sheltering, including non-traditional sheltering alternatives

- Infrastructure interdependencies impacts that can complicate response

- Post-disaster lifeline resources (food, water, fuels, pharmaceuticals, etc.)

- Certification of response and other essential workers for site access

- Hospital and healthcare surge capacity

- Security for hospitals, pharmacies, and grocery stores

- Arrangements for at risk populations (infants and children, assisted living/nursing home residents, disabled, homeless, and economically stressed individuals; prison inmates)

- Providing information and communicating with non-English speaking groups

- Missing persons and mortuary issues

- Arrangements for pets, livestock, and disposal of dead animals

- Mutual aid agreements (cross-jurisdiction and multi-state)

- Availability of emergency managers and first responders

- Communicating with responders, utilities and other service providers, broader business community, volunteer-based organizations, and general public

- Debris management for response, including temporary siting

- Resource requirements and management

- Logistics and supplies availability

5. **Recovery Priorities** *(focus on the range of immediate to longer-term recovery needs, recognizing that these needs and objectives will change over time from immediate post-event)*

- Planning for recovery

- Roles and missions (federal, state, tribal, local, private sector, non-profit/community)

- Recovery management structure—what organizations, how organized, and which mechanisms will be used (or need to be created)

- Decision-making (cross-jurisdiction, cross-sector, cross-discipline)

- Cooperation and coordination

- Prioritization of service restoration

- Resource requirements and management

- Damage assessment, inspection, and availability and certification of personnel

- Hazardous materials handling

- Debris removal

- Decontamination of soil, buildings and assets, reservoirs/waterways

- Monitoring of air and water quality

- Managing volunteer aid and donations

- Returning to operation businesses, schools, and faith-based facilities that enable communities and the economy to rebound

- Identifying and securing government and other types of assistance

- Keeping businesses in the Bay Area—assistance and incentives

6. **Rebuilding and Reconstruction Challenges** *(focus on long-term (post-event to ten years or more) activities and issues that must be addressed to rebuild housing, businesses, and infrastructure and enable communities to return to a "new normal" and receive financial reimbursements)*

- Long-term housing needs

- Other issues involved in design, reconstruction and rebuilding to achieve a "new normal"

- Prioritization of reconstruction of infrastructure, housing, commercial facilities, and other buildings in an era of limited resources

- Coordination structure and mechanisms that will be used for long-term reconstruction activities and projects—what organizations, how organized, and which mechanisms will be used (or need to be created)

- Decision-making (cross-jurisdiction, cross-sector, cross-function)

7. **Regional Recovery Roles, Responsibilities, and Authorities to Enable Collective Recovery** *(developing the cooperative multi-jurisdictional, cross-sector, and cross-discipline process for addressing region-wide priorities when response and the* Standardized Emergency Management System (SEMS) *ends)*

- Defining and understanding of recovery roles, responsibilities, and authorities of federal, state, tribal, and local agencies

- Defining and understanding recovery roles and responsibilities of private sector organizations, non-profits, community institutions, and other groups

- Organizational structures that could enable effective recovery/restoration and the transition from response to recovery—what entities would be involved, how organized, and how would these structures work?

- Recovery decision-making (cross-jurisdiction, cross-sector, cross-discipline)—what organizations would be involved and what mechanisms used?

- Jurisdictional authorities and cultural and other challenges to regional cooperation on disaster recovery

8. **Environmental Resilience** *(covers environmental hazards, potential consequences, capabilities and timeframes for cleanup to enable repopulation of affected areas, and other environmental issues that affect recovery and restoration)*

- Types of environmental impacts (e.g., hazardous materials, contamination of buildings and assets, soil, water systems; sewage releases; chemical, biological, and radiological events)

- Consequences for the Delta and other waterways and water supplies, fish, and wildlife

- Organizational roles and authorities in environmental damage assessment and re-occupancy of impacted areas
   - Federal government
   - State
   - Tribal
   - Local jurisdictions
   - Private sector

- Detection, alert and warning, and assessment capabilities, including timeliness

- Decontamination and hazardous materials disposal capabilities (procedures and technologies)

- Emergency management preparedness, response, and recovery plans for events with significant environmental impacts

9. **Communications and Information Sharing for Recovery** *(focus on examining how the "Whole Community" can be engaged in appropriate ways in two-way information sharing to improve preparedness and facilitate recovery, as well as provide a common operating picture, or situational awareness, to help decision-makers)*

- Multi-jurisdiction from local to state, tribal, and federal agencies and cross-sector

- Local government agencies sharing of information and best practices

- Process—collection, storage, integration, analysis, dissemination, and related security and proprietary data issues

- Utilization of state and municipal information fusion centers

- Innovative ways to use traditional media, social media, and public communications

- Inclusion in information sharing of schools and other institutions, faith-based, and other organizations with significant populations; also among families and individuals

- Health and Healthcare information-related issues

- Communications systems reliability, resilience, and security

10. **Continuity of Operations of Business, Government, and Community Institutions and Social Service Providers** *(focus on the need for individual organizations that are located within the Bay Area to be resilient—to have the continuity plans and capabilities that enable them to deal with disruptions and damage and restore operations and business services as rapidly as possible)*

- Pre-event preparedness and mitigation that affect recovery (addressing interdependencies and supply chains, remote siting, back-up systems, building in redundancies, preservation of vital records, etc.)

- Identification of essential operations and business activities, including supply chains

- External outreach to service providers and customers to address infrastructure interdependencies and associated consequences from major disasters and events

- Operational challenges associated with loss of services and damage to assets

- Assuring essential staff, including technical experts, and general workforce

- Assuring access to information and situational awareness

- Addressing challenges for small and medium businesses (retail, manufacturing, and other commercial firms) and organizations

- Assessment of potential damage or disruptions to operational and business services, including logistics, suppliers, customers, availability of truck drivers, warehouses, etc.

- Telecommuting, including the "last mile issue," and teleconferencing issues

- Workforce policy issues (compensation, absences, safe workplace rules, flexible payroll issues, etc.)

- Notification and provision of information to employees

- Training of employees

- Testing of continuity plans and procedures

11. **Creating Disaster Resilient Communities, Families, and Individuals** *(focus on the resilience and recovery capabilities of individuals, families, neighborhoods, communities, and special populations—children, the elderly, and disabled individuals—and the social service and other organizations that serve them)*

- Challenges and needs

- Understanding and dealing with psychological impacts, including enabling individuals to embrace a "new normal" and be willing to help create it

- Identifying and addressing individual and family assistance needs

- Education and academic institutions (daycare centers, schools, colleges and universities, libraries, community centers)

- Faith-based institutions and volunteer organizations

- School and business closures

- Event cancellations (e.g., sporting events, concerts, and other events that contribute to regional identity)

- Insurance issues

- At risk individuals (e.g., elderly, disabled, economically and mentally-stressed)

- Ethnic, cultural, tribal, and other special constituencies and groups

- Individual and family recovery needs

12. **Legal, Regulatory, and Liability Issues that Affect Recovery** *(focus on cross-sector challenges that affect government agencies, businesses, and non-profits)*

   - Human resources and other employee issues

   - Insurance issues

   - Contractual issues (e.g., with suppliers and customers, union-related and tenant issues)

   - Challenges associated with meeting regulatory requirements and standards, obtaining waivers and permits, and creating temporary policies and procedures

   - Liability associated with preventative medical actions

   - Issues involved in competing rights and authorities (land use issues, resident's rights related to housing, and other challenges)

   - Privacy issues

   - Ethical issues

13. **Public Outreach and Education** *(focus on raising awareness of threats and consequences, addressing public expectations, and effectively communicating what citizens and organizations should do individually and collaboratively to develop disaster resilience)*

   - Developing and implementing a coordinated regional public information strategy with focus on different constituency needs: private sector, general public, cultural and other groups

   - Communications mechanisms that can be used, including social media, public communications, and other systems

   - How to engage and utilize media pre and post-disaster

   - Promoting community involvement in disaster recovery

   - Developing a "Culture of Preparedness and Resilience" that empowers individuals, organizations, and communities to collaborate to make necessary improvements

14. **Exercises and Training for Recovery** *(focus on need to engage "Whole Community" from neighborhoods to regional, multi-state, and at national-level, and engaging private and non-profits, tribal, and government organizations at all levels)*

- Identifying, and tailoring exercises and training to meet the needs of target audiences—government, business community, utilities, non-profits, tribes, communities, neighborhoods, and residents

- Targeted workshops and exercises that focus on key areas in the Bay Area Disaster Resilience Action Plan, e.g., roles, authorities, and responsibilities, information sharing and communications, response challenges that directly affect recovery, and other specific recovery issues

- Inclusion of private sector and non-profit organizations with government (all levels) and tribes in regional workshops and exercises

- Training on procedures and processes for incident and recovery management that takes into account business interests and perspectives

- Training tools and activities (course curriculum, webinars, workshops, "train the trainers," etc., that can be incorporated into regional disaster preparedness plans

15. **Specialized Lifeline and Sector-Specific Needs that Affect Recovery and Restoration**
(note: the following lifeline and sector focus areas will be fleshed out, each one having a set of priority issues that will be addressed in the Action Plan)

   A. Transportation (all modes—road, rail, maritime, waterways, mass transportation, ferries, freight and shipping, including roads, bridges, tunnels)

   B. Energy (electric power, natural gas, fuels, alternative energy sources)

   C. Communications and Critical IT Systems

   D. Water and Waste-Water Systems

   E. Agriculture and Food Industries

   F. Dam and Levees

   G. Seaports

   H. Airports

   I. Hospitals, Healthcare, Public Health, and Emergency Services

   J. Banking, Finance, and Insurance Services

   K. Disaster Supply Chains (drug stores, grocery stores, and temporary food and water distribution, etc.)

   L. Schools/other Academic Institutions

   M. Housing Sector

16. Financial and Other Resource Needs for Bay Area Disaster Recovery and Resilience
(focus on how Bay Area businesses, community institutions, and other organizations and individuals will identify and have access to the enormous amounts of funds, expertise, and other assistance to invest in recovery and rebuilding activities that could continue for years, as well as what mechanisms and avenues could be utilized or created for this purpose)

- Post-disaster assistance (government and other funding/reimbursement) from:
  - Federal, State, and Local governments
  - Private sector
  - Non-profit and community organizations
  - Financial institutions (e.g., low-interest loans, mortgage forgiveness/renegotiation)
  - Other mechanisms the can provide assistance (e.g., redevelopment agencies)
  - Volunteer and public service organizations

- Meeting protection and mitigation needs to expedite recovery and build disaster resilience
  - Potential investment mechanisms
  - Recovery bonds
  - Loans and incentives to small and medium businesses
  - Funds and technical support needed for training and exercises

Bay Area Regional Disaster Resilience Initiative

Infrastructure Interdependencies Workshop I – Utilities and Transportation Systems

Summary Report of Proceedings

Held January 31, 2012

at the Association of Bay Area Governments, Oakland, CA

Executive Summary

In response to the growing awareness that a better understanding of how infrastructure systems will impact post-disaster recovery is needed, more than 150 representatives of government, private sector, and non-profit organizations met at the Association of Bay Area Governments in Oakland, CA, on January 31, 2012 for the Infrastructure Interdependencies Workshop I. The Workshop focused on disaster recovery needs, gaps, and potential improvement activities associated with the interconnected energy, communications, and transportation infrastructures that serve the Bay Area.

The Workshop was the second event in a 14-month Initiative undertaken by the Association of Bay Area Governments (ABAG) and the Bay Area Economic Council with a broad coalition of Bay Area stakeholder organizations and associations to develop a Regional Disaster Resilience Action Plan focusing on disaster recovery. Co-Organizers of the Workshop included: the Association of Bay Area Governments, Bay Area Center for Regional Disaster Resilience, Bay Area Council, California Resiliency Alliance, East Bay Municipal Utility District, Alameda County Water District, San Jose Water Company, and Nexis Preparedness Systems (also the Workshop sponsor).

The objectives of the workshop were to better understand how a major earthquake could impact the region's utilities and transportation systems; increase understanding of regional infrastructure interdependencies that could impact recovery from a disaster; highlight the challenges for businesses that depend on these infrastructures; foster stakeholder collaboration to address these challenges; and develop the mutually beneficial relationships needed for building a disaster resilient Bay Area.

The workshop consisted of four sessions of presentations focusing on electric power and natural gas, water systems, transportation systems (road, public transportation, and maritime transportation), and communications and critical IT systems infrastructure. Other activities included interactive participant discussions and facilitated breakout group discussions.

Key Outcomes

The most significant lessons learned from the Workshop fell into the following five areas: understanding infrastructure interdependencies; stakeholder collaboration; recovery roles, responsibilities and decision-making; regional situational awareness during recovery; and moving beyond response to awareness of recovery needs. The top issues are summarized below.

1. **Current understanding of infrastructure interdependencies is very limited.** Significantly more in-depth analysis of infrastructure interdependencies is needed to understand the extent of damage to equipment, systems and structures, and to determine realistic timelines for restoration after a disaster. This level of analysis and understanding will require better risk assessment processes and tools, particularly with a regional focus, to address interdependencies and how they cause system vulnerabilities; economic, environmental, and societal consequences; and enable identification of cost-effective mitigation measures.

2. **Collaboration among infrastructure sectors, other essential service providers, and the broader stakeholders on disaster preparedness and recovery efforts is limited, but growing.** Service providers and stakeholders should explore strengthening and expanding existing coordination mechanisms or creating new ones. Coordination and communication should occur before a disaster, to better understand interdependencies, vulnerabilities, and assumptions, as well as during the immediate response and recovery phases to expedite restoration. A Bay Area Regional Emergency Operations Center should be created that can facilitate this collaboration for disaster response and recovery. This new local regional EOC would seamlessly interface with the CalEMA-led Coastal Regional EOC (REOC), which has recently relocated from Oakland to Sacramento for budget reasons.

3. **No regional disaster recovery framework or process currently exists for operational and financial decision-making post-disaster.** Such a framework could expedite restoration of utilities, communications, transportation, and other critical infrastructure and essential services. This step would be vital to developing a workable decision-making system with identified participating organizations before it is needed.

4. **Regional situational awareness during recovery is essential for decision-making.** It is necessary to provide essential information for utilities, government, and private sector organizations to make individual and collective decisions about outages, damaged infrastructure, transportation disruptions, and related debris and transportation hazards issues. There are already activities underway in the Bay Area that support this information-sharing, and existing technologies that can be leveraged for this purpose. Efforts should be made to begin focused development of, and integration with existing capabilities, a system to provide this necessary common operating picture.

5. **Many stakeholders with years of experience focusing on disaster response find it challenging to look beyond the immediate post-disaster period.** Planning for recovery and long-term restoration actions that will take months, and in some cases years, is a relatively new way of thinking in disaster planning and requires new skill sets and additional stakeholders to be at the table. Regional recovery and resilience-focused exercises are useful tools to raise stakeholder awareness, foster cross-sector, multi-jurisdiction collaboration, and identify actions to build Bay Area disaster resilience.

The workshop closed with a short discussion of follow-on activities for the Bay Area Disaster Resilience Initiative, including the second Infrastructure Interdependencies Workshop that will focus on remaining critical infrastructures and service providers, and a scenario-based discussion forum to further examine regional interdependencies and other recovery-associated needs and capabilities for inclusion in the Action Plan.

All materials from the workshop, including presentations and this summary, are available on the ABAG website at **http://quake.abag.ca.gov/resilience/workshops**.

Table of Contents

Infrastructure Interdependencies Workshop I –
Utilities and Transportation Systems

Overview

In response to the growing awareness that a better understanding of how infrastructure systems will impact post-disaster recovery is needed, more than 150 representatives of government, private sector, and non-profit organizations met at the Association of Bay Area Governments in Oakland, CA, on January 31, 2012 for the Infrastructure Interdependencies Workshop I. The Workshop focused on disaster recovery needs, planning gaps, and potential improvement activities associated with the interconnected energy, communications, and transportation infrastructure systems that serve the Bay Area.

The Infrastructure Interdependencies Workshop I was the second regional event in a 14-month Initiative undertaken by the Association of Bay Area Governments (ABAG) and the Bay Area Economic Council in collaboration with a broad coalition of Bay Area stakeholder organizations and associations to develop a Regional Disaster Resilience Action Plan focusing on disaster recovery. Infrastructure interdependencies are a significant focus of the Initaitive, because these linkages will determine how quickly and effectively essential Bay Area services, businesses, local governments, schools, community institutions, and other organizations will resume operations, and housing and commercial buildings repaired and rebuilt.[1]

The focus of this Workshop was on deepening understanding of how infrastructure system interdependencies will impact the post-disaster recovery and what actions will be needed to quickly restore utilities and transportation systems that serve the Bay Area. These utilities include energy systems (electric power, natural gas, and petroleum fuels), water and wastewater systems, and communications and critical IT systems. Transportation infrastructure includes road, rail, and maritime systems, including bridges and tunnels.

Elsewhere in the Bay Area, work is already underway by the San Francisco Lifelines Council and some jurisdictions and infrastructure operators in the Bay Area to examine impacts from earthquakes and other events, and gain a better understanding of the interconnections among infrastructure systems and actions that may lessen the cascading consequences of damage or disruption. However, this work largely focuses on specific systems or municipalities, and to date there has not been a focus on interdependent infrastructures serving the 12-county Bay Area region or how prolonged disruptions could complicate region-wide recovery activities.[2]

Workshop I Co-Organizers and Planning Team

---

[1] An overview of the Bay Area Regional Disaster Resilience Initiative, the Initial Draft Action Plan Framework, and Initiative Kick-Off Workshop Summary of Proceedings Report can be obtained on the ABAG website: http://quake.abag.ca.gov/resilience/.

[2] The second Interdependencies Workshop, to be held in early May, will focus on other infrastructures and services—banking and financial institutions, community and academic institutions, hospitals and healthcare, sea and airports, commercial enterprises and government services, etc.

Co-Organizers of the Infrastructure Interdependencies Workshop I included the Association of Bay Area Governments, Bay Area Center for Regional Disaster Resilience, Bay Area Council, California Resiliency Alliance, East Bay Municipal Utility District, Alameda County Water District, San Jose Water Company, and Nexis Preparedness Systems, who also served as the Workshop sponsor. These organizations and several others contributed time and effort to developing the workshop.[3] *(See Appendix B for full list of Workshop Planning Team members.)*

1. Workshop Goal and Objectives

The overall goal of the workshop was to increase understanding of how infrastructure dependencies and interdependencies can exacerbate the consequences of a major earthquake or other disaster and impede recovery and restoration; enable stakeholder information sharing that can highlight interdependencies-related issues and preparedness gaps; and identify potential actions to incorporate into the Bay Area Regional Disaster Resilience Action Plan and other organizational continuity and recovery plans.

Specific objectives included:

1. Raise awareness of how earthquake scenarios could impact the region's interdependent energy, water/wastewater, communications, and transportation systems.

2. Better understand how infrastructure interdependencies may impact recovery actions, such as:
    - Assessing damage and restoring services;
    - Developing recovery plans and processes for determining restoration;
    - Communicating to key customers and the public expected restoration timelines;
    - Dealing with policies, regulations and other constraints that could impede restoration.

3. Highlight the challenges for businesses that depend on these utilities and transportation systems, and requirements for business resumption and economic recovery.

4. Underscore the value of public, private sector, cross-function and multidiscipline stakeholder cooperation and collaboration in meeting the above interdependencies challenges.

5. Provide opportunities to develop mutually beneficial relationships during the workshop.

2. Scope and Format

The day-long Workshop was limited to utilities and transportation providers to present an opportunity for participants to have more in-depth information from infrastructure representatives and discussion of interdependencies-related issues and challenges. The major

---

[3] Funding for the Initiative is provided by the Regional Catastrophic Preparedness Grant Program (RCPGP) of the Bay Area Urban Areas Security Initiative (UASI) with support by private sector and other contributions.

activities consisted of four sessions of presentations by infrastructure providers focusing on electric power and natural gas, water systems, transportation (roads, public transportation, and maritime transportation), and communications and critical IT systems infrastructure. The day also included interactive participant discussions, facilitated breakout group discussions,[4] and a presentation on infrastructure disaster preparedness needs during the working lunch by the workshop sponsor. Participants were provided at the beginning of the workshop with discussion questions for the breakout session and two matrices to fill out during the workshop - one to enable them to rank the importance of specific interdependencies for utilities, transportation services, and their own organizations, and a second to rank the severity of consequences to interdependent utilities and transportation from disruptions of these services. These matrices were provided to increase organizational awareness and were not collected *(See Appendix C for issues questions and matrices).*

3. Highlights of Proceedings and Participant Discussions

Note: As in the case of the Nov. 1, 2011 Initiative Kick-Off Workshop, information gathered from the presentations and participant observations and discussions will be augmented with lessons learned from other regional workshops, exercises, and activities, and data collected on Bay Area plans, tools, technologies and other capabilities and incorporated into the Action Plan and supporting Gap Analysis.

The following narrative represents the highlights and key points from each of the activities on the day's agenda.

3.1. Opening Remarks

Nancy Ward, Regional Administrator, FEMA Region IX, set the tone for the Workshop by emphasizing the need to go beyond planning for response to address disaster recovery and to engage the "whole community" of stakeholders—public, private sector, and non-profits—to develop communities that are resilient to all types of disasters. She noted that government could not shoulder the burden for recovery given that 85-90 percent of infrastructure was operated by the private sector, and federal funds would continue to shrink.

She said that FEMA Region IX has been working on catastrophic disaster planning with the state and localities, and that interdependencies were a concern, particularly in the areas of water and transportation systems disruptions. She added that restoration of lifelines was the key to recovery, but that "we rely on what we think we know."

She asked participants to consider that a major earthquake affecting the Bay Area could impact 1000 bridges, disrupt BART operations for two years, and "make Hurricane Katrina look like a garden variety flood." She concluded by commending the Workshop organizers for holding an

---

[4] Breakout facilitators were volunteer members of the Workshop Development Team:
Stephen Baruch, Emergency Management & Business Continuity Advisor, Nexis Preparedness Systems
Peter Ohtaki, Executive Director, California Resiliency Alliance, and
Paula Scalingi, Executive Director, Bay Area Center for Regional Disaster Resilience

event that can better spotlight Bay Area capacities, capabilities, and recommended actions that can improve Bay Area disaster resilience.

3.2   Regional Interdependencies and Associated Earthquake Impacts Overview

Paula Scalingi, Executive Director, Bay Area Center for Regional Disaster Resilience, provided a short overview of infrastructure interdependencies and their importance for regional and community resilience. She drew participants' attention to the *Infrastructure Interdependencies Backgrounder* document provided in the Workshop handout materials (*See Appendix D*) that described how interdependencies are a major determinant of vulnerabilities, consequences and risk and have significant implications for recovery and long-term restoration. She pointed out that these interdependencies are highly complex and difficult to address because they are outside organizational control, and may extend beyond a region, crossing state, national, and international borders. She commented that increasing our understanding of interdependencies required identifying the threats of greatest concern, assets and services that, if destroyed, damaged, or disrupted, could adversely affect other systems or services, how interdependencies change with the length of a disruption, and how backup systems or other mitigation measures could reduce interdependency problems and improve resilience. This necessitates a comprehensive, collaborative approach, such as that taken by the Bay Area Regional Resilience Initiative, which enables "whole community" stakeholders through workshops, exercises, and other activities to share information to illuminate and lessen impacts from interdependencies–associated vulnerabilities.

Area Disaster Resilience Initiative Update

She closed with a status report on Bay Area Disaster Resilience Initiative activities. She explained that since the Initiative began in August 2011 by convening a Bay Area Resilience Coalition of stakeholder organizations, two workshops had been conducted to explore resilience challenges. The stakeholders had identified focus areas and priority issues they wanted included in the Action Plan and these had been incorporated into the Action Plan Framework. She noted that production of the Gap Analysis of current disaster recovery capabilities and needs was underway. She outlined the remaining activities, included planning and conducting an Interdependencies Workshop II focusing on remaining infrastructures/service providers, a scenario-based event to examine significant issues for the Action Plan, development and production of the Action Plan, and an implementation strategy to determine project requirements, milestones, funding and other assistance.

Danielle Hutchings, Earthquake and Hazards Program Coordinator, ABAG, provided an overview of impacts an earthquake may have on utilities, transportation, and communications/critical IT systems. She pointed out that there were seven earthquake faults in the region that could cause earthquakes of 6.7 magnitude or larger.

Water and Wastewater

Addressing water and wastewater vulnerabilities, she pointed out that there are more than 100 water retailers on the western side of the Bay Area and that in the event of a major Hayward fault earthquake, there could be from 6,000 to 10,000 water pipeline breaks or major leaks, compared

to 507 in the1989 Loma Prieta earthquake. The Hetch-Hetchy aqueducts, EBMUD aqueducts, South Bay aqueduct, and numerous local pipelines also cross the Hayward fault and are vulnerable to damage, yet improvements have been made to many of these systems at fault crossings.

The Delta is also a major concern for the regional water system. Seventy-five percent of the region's water is supplied by water systems that receive all or part of their supply from the Delta or have aqueducts passing through the Delta. A Hayward fault earthquake could cause Delta levee failures and could disrupt the transport of fresh water for several years. She observed that some water districts lack access to alternative sources of water if their main supply were disrupted.

Transportation

She described the regional transportation system, which consists of a network of eight toll bridges, 2,000 state-owned and 2,000 locally owned overpasses, interchanges, and smaller bridges, 20,800 miles of highways and roads, 9,000 miles of bus routes, 750 miles of bikeways, and 5 commuter ferry lines. She noted that in a major earthquake there could be as many as 1,700 road closures and damage to the Berkeley Hills BART tunnel that would likely take more than two years to restore to full service. Large portions of roads, bridge approaches, railways, airport runways, and the region's ports would also be subject to damage due to liquefaction.

Energy

Regarding energy, she stated that most of the electric power routed to the East Bay travels through two transmission stations in Moraga and El Sobrante that could be damaged. The gas and electric distribution systems are also vulnerable to system disruptions due to building damage, shaking and liquefaction. A high proportion of customers could either lose or shut off their gas service for fear of fires due to gas line leaks, requiring inspection and relighting of pilot lights across the Bay Area by infrastructure provider employees.

Communications and IT

Communications and critical IT systems could also be subject to significant damage and disruption. She observed that network servers are not considered essential facilities and may be housed in vulnerable buildings. Loss of power for a prolonged period could increase the length of service disruption, although communications providers can provide temporary cell towers that can be deployed quickly.

3.3. <u>Session 1: Energy – Electric Power and Natural Gas</u>

Jonathan Frisch, Manager Business Continuity & Emergency Planning, Corporate Security, Pacific Gas and Electric Company, provided an overview of PG&E Bay Area electric and gas systems, potential impacts from a major earthquake, and PG&E recovery priorities.

Overview of System

Opening with a quote from Marshall McLuhan that "the electric age … established a global network that has much the character of our central nervous system," he described the PG&E system as huge, encompassing wind and solar power, dams, natural gas pipelines, gas storage facilities, and an electric transmission and distribution network connected with the western U.S. power grid. PG&E does not generate significant power in the Bay Area but brings it in from outside the region. The PG&E service area has 141,215 circuit miles of electric distribution lines, 18,616 circuit miles of interconnected transmission lines, 42,141 miles of natural gas distribution pipelines, 6,438 miles of transportation pipelines, 5.1 million electric customer accounts, 4.3 million natural gas customer accounts, and 20,000 employees.

Expected Damage and Key Interdependencies

Damage to the region's energy systems in a major earthquake would depend on a variety of factors including the fault, the epicenter, magnitude, time of day, day of week, season, extent of liquefaction, landslides, subsidence, structural damage including building collapses, fires, and adjacent infrastructure damage (water, sewer, roadways). He noted that PG&E assets, including gas pipelines, traverse earthquake fault lines and areas where liquefaction is an issue, or may be co-located with water pipelines and other structures that could cause simultaneous infrastructure failures if the other systems were damaged. Recovery needs in turn would depend on transportation disruptions and related logistics issues; availability of personnel, equipment, replacement parts, and fuel for repair vehicles; the ability of repair crews to get into damaged areas, availability of communications, and safety considerations; frequency and size of aftershocks; and operational and system restoration requirements. For example, PG&E has warehouses with equipment needed for repairs but these may be damaged or inaccessible. Operators' need to balance the electric load could create electricity reliability problems during recovery. He pointed out that transmission would need to be restored before distribution to customers for both electric and gas systems. Gas service restoration could take much longer, especially if many residents turn off their own gas, because there is a limit on how many homes and businesses can be restored in 24 hours. Damaged underground pipelines, cables, and other assets would take longer to repair than those above ground.

Existing Efforts to Speed Recovery

Post-disaster restoration priorities would also "depend" on a variety of factors. PG&E has a pre-defined priority list of critical need customers (e.g., hospitals, water systems that require power for pumping) but restoration priority is primarily an operational decision. PG&E's approach to recovery will be regional and system-wide and will address local government and community needs through local Emergency Operations Centers or the State EOC. Having current information on recovery needs and actions of other infrastructures and government decision-making on recovery priorities and issues will be essential.

Interactive Discussion

Participant questions and comments centered on the following issues:

- **Lessons learned for energy systems restoration from the Loma Prieta earthquake and other emergencies.** Discussion centered on the need for close communication and coordination between PG&E and localities on priorities and on areas where restoration or mitigation measures are challenging (e.g., the Santa Cruz Mountains) based on experiences from previous disasters, including Loma Prieta. However Frisch noted that Loma Prieta was "far from a worst case scenario," so lessons learned may not necessarily apply to a greater disaster.

- **How to obtain reliable information on road closures for utilities to expedite disaster recovery.** PG&E will rely on Caltrans, local news reports, and reports from its crews to gain a clear picture of road, bridge, and overpass damages and closures. This information is essential in planning where to send crews for repairs. Discussion followed on how to gain broad situational awareness of debris and other transportation impediments through development of a social media transportation hazard alert capability.

- **How Smart Grid technologies can support or impede resilience.** Frisch pointed out that if Smart Grid systems are operational in a disaster, they can provide PG&E much better information to aid service restoration. However, if these systems are out, then this can exacerbate restoration challenges. It was important to recognize that there are evolving energy-related IT technological advances, and it is necessary to address security and resilience challenges.

- **How PG&E is addressing disaster mitigation needs and a potential forum for mitigation investment decisions.** Frisch said that communities can influence mitigation priorities and that there is an "opportunity for dialogue" and collaboration; the California Public Utilities Commission is the mechanism where investment decisions would be made.

3.4. Session 2: Water Systems

Jim Wollbrinck, Security and Emergency Preparedness Specialist, San Jose Water Company

Overview of System

San Jose Water is the largest water utility in Santa Clara County, with a 138 square mile service area, 230,000 customers, and 2,500 miles of water main. There are 128 water utilities in the County, including eight major and 99 large water retailers, and three waste water utilities.

Key Interdependencies and Gaps

Challenges in a major disaster will be competition for resources among the region's 1,033 potable water utilities, 554 of them major systems, and interdependencies-related issues—supply chain disruptions affecting just-in-time deliveries of chemicals for water treatment, repair materials, and particularly fuel for back-up power generation and maintenance vehicles. Fuel distribution companies will shut down during a disaster. Other significant areas where improvement is needed is better coordination among the Bay Area's critical infrastructures and key resources, particularly with important service providers, e.g., PG&E, AT&T, Sprint, and fuel companies. A key gap is the lack of integration of waste water systems with water systems in

emergency planning and exercises. Regulatory issues pose additional problems. There are constraints on fuel stockpiles and air quality standards limit testing of power generators, and public health "do not use" or "boil before use" requirements that can affect restaurants, hospitals, and families.

Existing Efforts to Speed Recovery

There is good cooperation among the eight major water utilities, which have an active coordination group called the Bay Area Emergency and Security Information Collaborative (BAESIC). BAESIC was created after the September 11, 2001 attacks to enable mutual sharing of security-related information, coordination, and undertaking projects and activities to improve mutual security and preparedness. One of these projects was a post-Hurricane Katrina study of Bay Area water needs after a major Hayward Fault earthquake, which demonstrated the need for 2.5 million gallons a day of potable water for three to 30 days to serve a population of 7.69 million.

Recommendations to Improve Resilience

Mr. Wollbrinck provided several recommendations for addressing gaps and needs, including the creation of a Bay Area Emergency Operations Center for critical infrastructure, other essential service providers, local government officials and key stakeholders to coordinate response and recovery activities. (This local, regional EOC would be seamlessly connected to the State-led Coastal Regional EOC, which recently relocated from the Bay Area to Sacramento for budget reasons.) He also recommended a regional emergency fuel distribution plan, development of capabilities to provide utilities with a common operating picture during emergencies, exercises to improve cross-sector coordination and joint response, a procedure to provide emergency regulatory relief, and a "workable" debris management plan.

Steve Dennis, Health and Safety Supervisor / Security Manager / Emergency Response Coordinator, Alameda County Water District

Overview of System

Alameda County Water System has a 103 sq. mile service area serving approximately 330,000 people in the East Bay (Fremont, Newark, and Union City). There are three sources of supply—groundwater (30%), the California State Water Project (50%), and the San Francisco Public Utilities Commission/Hetch Hetchy Water System (20%).

Key Interdependencies and Gaps

The Hayward Fault runs adjacent to ACWD reservoirs and major pipelines. In 2008, the utility hired a consultant to assess system vulnerability to a major earthquake. The study estimated 1,500 to 2,000 pipeline failures leading to a system "bleed-out" in as little as six hours leaving 250,000 residents without water. There would be a loss of surface water supply sources, production facilities shutdown and groundwater supply interruption due to power supply loss. Finding the sources of leaks would not be easy and would take time—weeks to months. It was important to recognize that a catastrophic seismic event will affect all water utilities in the Bay

Area with failed pipelines, interrupted sources of supply, damaged production facilities, and prolonged denial of service.

Existing Efforts to Speed Recovery

Progress has been made to develop regional and statewide water sector collaboration. The BAESIC group has developed key contacts communication directory potable water procurement guidance, and water agencies across the state have created a California Water/Wastewater Agency Response Network (CalWARN), a mutual assistance agreement to deal with major emergencies. This collaboration, however, does not extend beyond water systems to other critical infrastructures and service providers or involve key stakeholder organizations.

Recommendations to Improve Resilience

Steps need to be taken to improve communications capabilities, access to key resources, people, equipment, power, and fuel, and clear access to affect repairs. He concluded by emphasizing the need to have all critical infrastructures and essential service providers working together to address major emergencies and that "the rough stretches can only be done in caravan style." Restoration of water service after a disaster will take much longer without effective working partnerships and coordinated preparedness with interdependent service providers.

Edward Sullivan, Security and Emergency Preparedness, East Bay Municipal Utility District

Overview of System

The East Bay Metropolitan Utility District serves 1.3 million water customers in a 331 sq. mile area that includes 29 cities and communities in two counties. The utility also has 650,000 wastewater customers in an 83 sq. mile area that covers nine cities and communities.

Existing Efforts to Speed Recovery

Over the last ten years it has built and strengthened its infrastructure to withstand earthquake damage and developed operations continuity plans to include resilience. Key dependencies are power, fuel and water treatment chemicals. EBMUD focuses on both horizontal and vertical coordination through the recently created Bay Area Water Multi-Agency Coordination Group, which focuses on providing a common operating picture during pre-disaster planning and during response and recovery, and prioritizing and leveraging limited resources accessible to the members following an event working with the State Emergency Operations Center.

3.5. **Breakout Group Discussions**

Participants raised a number of significant points in the three concurrent facilitated breakout group discussions held after the first two sessions. These included:

- **The need for service redundancy capacities for power, water, communications, and transportation is a big issue for some smaller communities**.

- **Along with power restoration, expeditious restoration of water service will be a top priority in recovery and regional resilience**. Extended provision of bottled water may be needed for communities across the region, requiring a workable plan for designating points-of-distribution and assuring sufficient supply.

- **Regional recovery planning should address region-wide availability of back-up ATMs, mobile bank branches, and other financial services necessary for business resumption**.

- **A decision-making process with appropriate identified stakeholders needs to be established to assess and prioritize competing needs** of the many jurisdictions, businesses, utilities, community institutions, etc., that will be asking for recovery support, supplies, and other resources.

  - The decision-making process should define who makes the decisions and how they are made, and be able to weigh restoration needs of critical organizations (hospitals, major health clinics, utilities, law enforcement, and fire departments), at risk individuals, debris removal issues, etc., in addressing recovery priorities

  - The role of elected officials in this decision-making process, as well as private sector and other non-government interests, needs to be determined.

  - Regulations and policies that could impede recovery should be identified, including alternatives for regulatory relief or policy revisions. In some cases, waivers or other relief will need to be approved by federal agencies.

- **It is difficult to get organizations to focus on disaster recovery—there are more questions than answers on challenges and what needs to be done.**

- **Various communications work-arounds are being employed by Bay Area organizations**-- GETS (land line) and Wireless Priority Cards, satellite communications technology, and HAM radios. Alameda County Water District has an independent two-way radio system with redundant receiver, and Sonoma County has a memorandum of understanding with the San Francisco Section Amateur Emergency Radio Service.

  - The downside of satellite communications is that everyone will be trying to use it at the same time—this was a problem in Haiti where system capabilities became overwhelmed by media users.

- **Providing communications at all levels during the immediate recovery period needs to be addressed** (e.g., among families, between employers and employees, and social service groups and at risk individuals).

  - There are social media tools that can be utilized, e.g., in the San Bruno gas pipeline explosion, people posted information on Facebook. PG&E uses twitter and has a public Facebook page, and could create an employee network page. Organizations are creating independent systems, e.g., there is a Google-sponsored website to look for family members.

- **Steps should be taken to maximize coordination at the neighborhood level and to enable public access to information on post-earthquake damages, outages, and restoration**

status. The USGS earthquake site and ABAG websites could serve as a clearinghouse for this information.

- **Having situational awareness during recovery to provide the necessary common operating picture is essential for utilities, government, and private sector** organizations to have necessary information to make individual and collective decisions about outages, damaged infrastructure, transportation disruptions, and related debris and transportation hazard issues.

- **A Bay Area EOC with representation from critical infrastructures and key resource stakeholders should be established** for response and recovery coordination and decision-making.

- **Closer coordination among utilities and other essential service organizations is necessary for all-hazards preparedness and security**. A coordination group could be established for this purpose.

- **Better risk assessment processes and tools are needed, particularly on a region-wide basis** to address infrastructure interdependencies, vulnerabilities, economic, environmental, and societal consequences, and enable identification of cost-effective mitigation measures.

- **A regional Joint Information Center or some other type of regional mechanism is necessary** for coordinating and disseminating recovery information.

- **Recovery public information planning should prepare people for prolonged service disruptions.** Currently the public's expectations are that basic services will be restored quickly, based on guidance from 72hours.org that they need to be self-sufficient for 72 hours.

- **Individuals need ways and mechanisms to report damages and hazards.** These can be as simple as a Facebook page or website, and can greatly assist emergency responders in how they approach their response.

- **FEMA will "push" resources to those localities best organized to receive them.** There is a need to include private sector organizations in EOCs to undertake and sustain recovery efforts, particularly where provision of essential resources (e.g., fuel, water, construction, and other materials) is required.

- **Tabletops and other types of exercises are good tools for recognizing regional recovery and resilience needs** and fostering cooperation, collaboration, and understanding of regional interdependencies. Regional exercises should be part of a continual preparedness learning process

3.6. <u>Working Lunch Presentation</u>

Brian Klosterman, President & CEO, Nexis Preparedness Systems and Workshop Sponsor, spoke on the importance of pre-event arrangements for emergency supplies as a key element of organizational continuity planning and preparedness.   Nexis Preparedness Systems is an

emergency supply management company that provides end-to-end service for managing organizations' emergency preparedness supply processes through calculating resources needed, monitoring expiration dates, and providing for resource rotation and replenishment, and employee preparedness and training. He recounted some lessons learned from his company's work providing businesses, healthcare, schools, and other organizations with such services, such as assessing a company's preparedness supplies and discovering that emergency food was insufficient, or finding out supplies were outdated and could have been donated to charities before they expired.

3.7. Session 3: Transportation – Road, Rail, and Maritime

Tracy Johnson, Manager Seismic Engineering, BART

Overview of System

BART has five lines running 104 miles in a four-county service area and a 360,000 weekday daily ridership. Over 150,000 people cross the Bay on BART each day. During peak commute periods, BART carries as many people as the Bay Bridge. Nearly 20 million trips per year are made by Alameda County residents. BART crosses at least seven earthquake faults and has an aging infrastructure (the system is forty years old). BART's greatest dependency is on power, and it is highly interdependent with PG&E, which has 12 switching stations along the BART track network. The track has a 1 KV electric third rail and is supported by 62 substations and 46 gap breaker stations.

Key Interdependencies and Gaps

Challenges to mitigation efforts include the need to keep sensitive information secure, keeping up with change, and keeping mitigation as a priority in an era of budget constraints. BART until recently has focused mostly on internal continuity needs and is now focusing on building relationships with key stakeholders, sharing emergency response plans, and expanding communications capabilities, including building redundant communication links, to deal with disasters and significant incidents.

Existing Efforts to Speed Recovery

Actions that BART has taken to improve resilience include evaluating interdependencies between BART and PG&E power feeds, examining risks to operations if power is disrupted, and reducing exposure to impacts from power interruptions.

Robert Braga, Caltrans District 4, Division of Maintenance

Overview of System

Caltrans functions as owner and operator of the state and interstate highway system. He added that the California Highway Patrol (CHP) has responsibility and authority for safe travel along state/interstate highways, and is also responsible for security on state routes and facilities. Caltrans District 4 encompasses the nine San Francisco Bay Area counties (population 7.4

million with an area of 8,757 square miles) and has 3,200 employees with an annual operating budget of $490 million to cover 7,600 lane miles of highways, including 420 miles of carpool lanes and seven toll bridges (Antioch, Benicia-Martinez, Carquinez, Richmond-San Rafael, San Francisco-Oakland, San Mateo-Hayward, and Dumbarton).

Key Interdependencies and Gaps

Caltrans dependencies include lifelines and critical facilities for traffic management, including maintenance and traffic operations, and route recovery to capacity, including planning and programming, design, and construction. Critical facilities include 18 bridges, tunnels, and distribution structures. Caltrans core functions and key interdependencies include IT, power, water, sewer, fuels, communications, and contractors and suppliers of construction materials (e.g., asphalt) and heavy equipment. He noted that after the Loma Prieta earthquake, Caltrans strengthened its transportation routes. Caltrans expects to take 72 hours to a week to repair or reroute traffic after a major earthquake, and this will depend on the affected transportation route. Also, to address interdependencies challenges,

Existing Efforts to Speed Recovery

Caltrans has State bulk fuel contracts with flexibility by contract providers to deliver fuel on site, alternate emergency power systems capability at key facilities, onsite generators, ability to "hook-up" portable generator units, and operational redundancy of transportation management centers. Other Districts are structured to handle programming, planning, and design functions if required. Caltrans has multiple communications systems for operational communications: satellite (video/teleconference capabilities), microwave, and 800 MHz systems with extensive redundancy. The Transportation Management Center, which is operational 24/7 and jointly staffed by Caltrans, CHP, and MTC monitors and rapidly deploys available traffic management and motorist information services. Continuing challenges include the need for further coordination with contractors, suppliers, and essential service providers on planning strategies to mitigate and/or address their interdependencies and expanding IT redundancy with minimal funding beyond operational needs. Caltrans is pursuing partnerships with the business community, exploring interdependencies, in order to arrive at "best practices" to mitigate and/or address interdependencies, expanding IT redundancy, and seeking funding for redundancy of operational capabilities and for mitigation of infrastructure interdependencies**.**

LCDR Ken Kostecki, U.S. Coast Guard San Francisco Sector

Overview of System

The USCG has long focused on hurricanes, but has less experience in dealing with other disaster events. The focus after a major earthquake will be on getting individuals and supplies over the water to where they need to go.

Key Interdependencies and Gaps

Dependencies are on fuel and electricity. The USCG has contingencies in place for expediting this mission. It has broad authorities to move cargoes that are critically important and can waive vessel regulations, for example, on passenger limits, or to transport oil. The USCG also has a

role in maritime transportation in assuring national supply chain management in partnership with FEMA, Cal EMA, U.S. Army Corps of Engineers, National Guard, and local governments. The USCG also works with tug and tow companies, local labor organizations, maritime associations, and harbor safety. The gaps the USCG faces are in resource management, lack of interoperability, and personnel transfers that impact available expertise.

Existing Efforts to Speed Recovery

Exercises are an important tool to build preparedness and continuity capacity, and they are looking at ways to enhance coordination. The USCG will work through the State Regional Emergency Operations Center.

3.8. Session 4: Communications and Critical Information Technology Systems

Ken Fattlar, Director of Network Operations, Verizon Wireless

Overview of System

Verizon customers include governments, emergency services, businesses, and individuals. There are three switching stations in the Bay Area. Regulatory Requirements are strict in California. Cell sites must have a conditional use permit. There are air quality regulations that restrict use of generators, hazardous materials (batteries/fuel) requirements, and electromagnetic emissions standards. Major equipment suppliers are Alcatel Lucent, Ericsson, Cisco, and Juniper.

Key Interdependencies and Gaps

Infrastructure dependencies include electric power (primarily PG&E), transport circuits (the links between cells, switches, and the outside world), and transportation (roads) and fuel (primarily diesel), which is particularly critical. Users who are dependent on Verizon include emergency services, law enforcement, fire, healthcare providers, every other utility, government entities, businesses, and "any customer wanting service."

Existing Efforts to Speed Recovery

Verizon is addressing these challenges through becoming as self-sufficient as possible and practical. All cell sites have batteries and most sites have generators that can provide six to eight hours of power. Providing service requires significant system redundancy, which Verizon addresses with SONET rings, layer 3 routing, and alternate circuit paths. It is building relationships with its key service providers and has mobile back-up systems COWs (cells on wheels), COLTs (cell tower system incorporated in a light truck), GOATs (generator on a trailer to power cell sites), and RATs (repeater and trailer units for radio traffic). Verizon also has emergency microwave systems as well as other resources available on a national scale. In a major earthquake, however, there will be damages to communications infrastructure and a big spike in communications traffic which is a cause for concern. Potential gaps Verizon faces in a major disaster include: gaining situational awareness of immediate post-event conditions (where to deploy COWS and COLTS and where road and other disruptions impede repair); the need for fuel for repair trucks, mobile cell systems, and generators; damages to buildings and limited site

accessibility that impedes repair; power and equipment issues, emergency services priorities, and access to restricted areas. Verizon is also addressing mitigation needs through building cooperative relationships with other communications providers, utilities, and local emergency services, and through its membership in the California Utilities Emergency Association (CUEA). These relationships and having access to a regional EOC are key to Verizon's regional recovery after a major disaster.

Jim Hennessy, National Account Manager, Public Safety, Verizon Wireless, presented several technologies for cell communications connectivity for workshop participants' consideration.

Rakesh Bharania, Network Consulting Engineer, Cisco Systems Tactical Operations

Overview of System

There has been an evolution in people, process, and technologies to support disaster and humanitarian relief from radio and phone systems based on single devices with voice only, and command and control centric at fixed locations to integrated mobile and fixed communications using a wide range of devices carrying voice, video, and data, and systems field deployable anywhere.

Key Interdependencies and Gaps

The critical issue after a disaster is how to "communicate the right information to the right people at the right time." However, the assumption that when a disaster happens, telecommunications will go down is false—the answer is "not always." About 60% of Haiti's telecommunications stayed operational after the 2010 earthquake. The Chile and Japanese earthquake aftermaths show the same situation. The reality is that "everything is IP now—and has been for some time." The internet is just as critical as radio communications; Haiti, for example, was a data-driven response. In Japan's magnitude 9.0 earthquake/tsunami, both IIJ redundant backbone fiber links between Tokyo and Sendai were severed and 20% of Japan's total traffic dropped immediately due to outages. Three of eight fiber links failed to the United States, but good links remained available. The Internet was used heavily by the Japanese public for streaming video and social media, and there was rapid recovery from the event. One of the major Tokyo/Sendai fibers was restored by a day later and all three trans-Pacific fibers were restored by the second day. The reason was that most of Japan's core internet infrastructure was outside of the impacted region. The network continued to work normally outside of the immediate area and was used for emergency information.

Existing Efforts to Speed Recovery

Another example is the San Bruno gas pipeline explosion. There were local communications disruption to cell phones and mobile data services immediately around the affected neighborhood. A mutual aid request to Cisco through the Northern California Regional Intelligence Center (NCRIC) in support of San Mateo County Office of Emergency Services provided communications support to the Incident Command Post. There was GIS support through a Google disaster response team for the National Transportation Safety Board. Overall, the Internet infrastructure in developed countries is highly resilient to disasters at a macro scale

due to redundant links and dynamic routing. At the same time, local disruptions are possible, so it is important to build IT redundancy into organizations.

4. Workshop Additional Outcomes

The following needs and ideas for action were stated by participants during and after the workshop on their attendee evaluations and comment cards.

Utilities/Transportation Interdependencies Impacts and Issues—Need for:

- **More in-depth information and analysis** of second and third-level interdependencies, the extent of damage to equipment, systems, and structures, and realistic timelines for restoration taking interdependencies into account. *(One participant observed that for most organizations there was a "lack of realistic thought" on interdependencies impacts and that "a lot of agencies really think they have some control.")*

- **More detailed information on expected transportation disruption impacts** from major disasters and how information will be conveyed to enable circumventing disruptions from damaged bridges, tunnels, and roadways.

- **Focus on vulnerability of the Bay Area water supplies** from Delta levee failure and flooding from an earthquake or super storm.

- **Examination of communities' and neighborhoods' reliance on utilities, communication, and transportation, and impacts on health and safety and the economy.**
  - Engagement of Community and Neighborhood Emergency Response Teams and other community and social service groups to work with communities on disaster recovery challenges.

Recovery Decision-Making (operational and financial) to Expedite Restoration of Utilities and Transportation—Need for:

- **Information on regional plans for major disaster response and recovery**, including staging and management of resources, how the decision-making process and communications will be handled, and defined roles and responsibilities of federal and state agencies, local government, utilities, private sector, and other key stakeholders.
  - Identification of what decision-making mechanisms exist and what need to be created for restoration prioritization and financing rebuilding.

- **Development of an effective regional resource database** with procedures for making contributions.

Cooperation and Coordination on Interdependency-Related Recovery Issues—Need for:

- **A coordination mechanism** to enable interdependent critical infrastructures and key resource organizations to coordinate activities for preparedness and during disaster recovery.

- **Creation of a Bay Area regional EOC** to interface with the State-led EOC in Sacramento to enable critical infrastructures and other key private sector and government stakeholders to better coordinate for response and recovery. *(Several participants recommended this.)*

- **Development of "shared governance agreements"** to put in place to expedite recovery.

- **Meetings of Emergency Support Function representatives at the State and regional levels** along the lines of FEMA ESF meetings. (This would also apply to Recovery Support Function representatives under the new National Disaster Recovery Framework.)

- **A review of regional recovery plans** to determine what procedures already exist, their "workability" and operational utility, a stakeholder workshop to gain information and discuss operalization of these plans post-disaster, and a regional "clearinghouse" for these plans available to stakeholders. (*A State official noted that there are Regional Catastrophic Earthquake Plans that focus on recovery objectives and discuss coordination structures that are already established and that it would be counter-productive to "recreate something that already exists." A Caltrans representative similarly pointed out that a regional debris management plan already is in place. Non-government participants appeared not to know or were unfamiliar with the content of these and other state and local plans, or if they did, saw them as incomplete or "unworkable," issues that point out the need for state and local officials to brief these plans to the broader stakeholder community.*)

Training and Education to Address Interdependencies Challenges—Need for:

- **Regional recovery and resilience-focused exercises** to raise awareness of vulnerabilities, workability of plans and procedures, and particularly a priority process for restoration, and identification of gaps.

- **Regional recovery interdependencies exercise scenarios** that local governments can use for their stakeholders.

- **Training of officials and stakeholders** in recovery material/equipment protection and scam prevention.

5. Next Steps

The meeting closed with a short discussion of follow-on activities for the Bay Area Disaster Resilience Initiative, including the second Infrastructure Interdependencies Workshop that will focus on remaining critical infrastructure and service providers, and a scenario-based event to further examine regional interdependencies and other recovery-associated needs and capabilities for inclusion in the Action Plan. Workshop I presentations are posted on the ABAG website and that this report summarizing the day's proceedings would be prepared and provided to them. All materials are available at **http://quake.abag.ca.gov/resilience/workshops**.

Appendix A
Workshop Participating Organizations

AAA Insurance Exchange
AC Transit
Adjusters International
AECOM
Alameda County
- Public Health Department
- Sheriff's Office
- Social Services Agency
- Water District
American Red Cross
Amtrak
Association of Bay Area Governments
Bank of America
BARCfirst
Bay Area Center for Regional Disaster
    Resilience
Bay Area Council
Bay Area Rapid Transit
Bay Planning Coalition
Business Recovery Managers Association
California Department of Public Health,
    Drinking Water Program
Caltrans
California Emergency Management Agency
California Energy Commission
California Highway Patrol
California Hospital Association
California Resiliency Alliance
Carnegie Mellon University, Silicon Valley
Children's Hospital Oakland
Cisco Systems
City College of San Francisco
City of Clayton
City of Monterey - Police Department
City of Oakland
City of San Ramon
City of Santa Clara
Contra Costa County OES
Contra Costa Voluntary Organizations
    Active in Disaster
Data911
Degenkolb Engineers

East Bay Municipal Utility District
Eastern Contra Costa Transit Authority
Expert Property Management, Inc.
Exponent
FEMA Region IX
Franklin Templeton Investments
Golden Gate Safety Network
The Greenspan Co.
ICF International
Kaiser Permanente
Laurie Johnson Consulting
Lawrence Livermore National Laboratory
Marin County Sheriff's Office of
    Emergency Management
Marin Interagency Disaster Coalition
Metropolitan Transportation Commission
Monterey County Office of Emergency
    Services
Mountain View Fire Department
Pacific Gas and Electric Company
Peralta Community College District
Moffett Park Business Group
National Disaster Resiliency Center
Northern California Regional Intelligence
    Center (NCRIC)
NetApp
Nexis Preparedness Systems
NICE PACS
Oakland Office of Emergency Services
Peralta Community College District
Port of Oakland
Port of San Francisco
Project Management Institute, San
    Francisco Bay Area
City and County of San Francisco
- Dept of Emergency Management
- Fire Department Neighborhood
    Emergency Response Team
- Municipal Transportation Agency
SF Bay Area InfraGard
San Francisco Museum of Modern Art
SF Public Utilities Commission

Wastewater Enterprise
San Jose Water Company
San Mateo County OES
Santa Clara County Fire Department
Santa Clara County Health Care
Santa Clara Valley Transportation Authority
Santa Clara Valley Water District
Sonoma County Fire & Emergency Services
Symantec
Testco

Town of Ross
UC Berkeley School of Public Health
U.S. Army, Presidio of Monterey
U.S. Coast Guard
U.S. EPA Region 9
Urban Resilience Strategies
URS Corp
Verizon Wireless
Wireless Continuity

Appendix B
Planning Team Members

Stephen Baruch	Nexis Preparedness Systems
JoAnna Bullock	Association of Bay Area Governments
Darryl Burton	Business Recovery Managers Association
Steve Dennis	Alameda County Water District
Danielle Hutchings	Association of Bay Area Governments
Gerald Kiernan	Bay Area Center for Regional Disaster Resilience
Catherine Lyons	Bay Area Council
Katie Martinez	San Francisco Public Utilities Commission
Peter Ohtaki	California Resiliency Alliance
Nancy Okasaki	Metropolitan Transportation Commission
George Orbelian	Project Kaisei
Paula Scalingi	Bay Area Center for Regional Disaster Resilience
Monika Stoeffl	
Edward Sullivan	East Bay Municipal Utility District
Kay Vasilyeva	City and County of San Francisco, DEM
Jim Wollbrinck	San Jose Water Company

Appendix C
Breakout Session Questions/
Interdependencies Identification Matrices

1. Looking at past disruptions of energy, water, transportation, and communications/IT systems from disasters and other causes, what were some of the infrastructure interdependencies challenges you saw as the most significant?

2. How would your organization get information to assess the impacts of these disruptions on its service providers, in terms of the magnitude and duration?

3. Which agencies or organizations would you expect to be able to provide this information; how and how soon?

4. What role do you believe utilities and other private sector stakeholders should play with local, state, and federal agencies in recovery efforts to restore services?

5. How is movement of utility restoration resources (personnel and materials) into and out of regions—including cross-state lines—handled and how would these decisions be made?

6. How are recovery and restoration decisions made when they involve interconnected infrastructures and local, state, and federal governments, infrastructure operators, businesses, and community institutions and social services?

7. What dependencies and interdependencies does your organization have with other infrastructures and service providers with focus on those that are of greatest concern?

8. What is your organization doing to address interdependencies challenges?

9. What are priority gaps your organization faces related to gaining information and awareness on, and mitigating potential interdependencies-related impacts affecting disaster recovery?

10. What actions or activities do you feel should be undertaken to address these gaps?

11. What is the level of your organizational dependencies on utilities, transportation, and communications and IT?

<p style="text-align:center; color:#3a5fa0;">**MATRIX WORKSHEET 1**</p>

Organizational Dependencies and Interdependencies associated with Infrastructures and Essential Service Providers

Taking into account backup systems, systems redundancies, and other contingency measures your organization has, what is the level of your organization's dependencies on utilities, transportation, and communications and IT and how many hours can it operate without these services?

(Please use matrix below to identify the appropriate level and hours.)

	Electric Power	Energy Natural Gas	Fuels	Water Systems	Transportation Road	Rail	Maritime	Air	Public	Comm and IT Systems
Your Organization's Dependencies* **note your infrastructure or industry:*										
No. of hours your organization can operate without service										

Dependency Level

1 – Low dependency
2 – Moderate dependency
3 – Average dependency
4 – High dependency
5 – Critical dependency *(essential to fulfilling mission or providing goods and services)*

MATRIX WORKSHEET 2

Threats and Interdependencies-Related Impacts

Looking at all-hazard threats, what do you see as the most important in terms of interdependencies-related impacts on utilities, transportation, and communications/IT?

(Please use matrix below to identify level of importance.)

	Energy			Water Systems	Transportation					Comm and IT Systems
	Electric Power	**Natural Gas**	**Fuels**		**Road**	**Rail**	**Maritime**	**Air**	**Public**	
NATURAL THREATS										
Earthquake										
Tsunami										
Firestorm										
Windstorm										
Pandemic										
Major Flooding										
MAN-MADE THREATS										
Nuclear/Radiological										
Chemical										
Biological										
Technological / Aging Infrastructure Event										

Interdependency Impact
1 – Low impact
2 – Moderate impact
3 – Average impact
4 – High impact
5 – Critical impact *(essential to fulfilling mission or providing goods and services)*

Appendix D
Infrastructure Interdependencies Backgrounder

In the past decade across the nation, the critical infrastructures and other essential service providers that enable our communities to thrive and grow have become increasingly interconnected and interdependent. These infrastructures include energy (electric power, natural gas, fuels); telecommunications, transportation (rail, road, maritime); water and water treatment systems; banking and finance; emergency services; government services; hospitals, healthcare and public health; agriculture and food; commercial facilities; nuclear reactors; materials and waste; dams and levees; manufacturing; chemical facilities; and postal and shipping. To a large degree, this trend towards ever greater linkages has been created by our growing reliance on electronic systems, computer processing and the Internet for managing and operating these infrastructures. This interconnectivity and the resulting interdependencies can exist at multiple levels of increasing complexity and extend beyond a community, a state, and nations, creating unexpected vulnerabilities and significant consequences.

Although emergency and business continuity practitioners are beginning to focus on interdependencies, we remain limited in our understanding of them, the vulnerabilities they create, and how to prevent or lessen their impacts. Disruptions in one infrastructure can cascade, ultimately affecting more than one infrastructure, affecting essential government services, businesses, and individuals in an entire region with far-reaching health and human safety, economic, environmental, and national security consequences.

Examples of Infrastructure Dependencies and Interdependencies

Water and waste water systems, are dependent on a wide range of infrastructures and other essential services, including electric power to run pumps and control systems, petroleum fuels for transportation of repair and maintenance personnel, communications to handle the ordering of chemicals and other supplies and equipment and to direct operations, all modes of transportation for supply and shipping, and financial systems to support billing, payments, and other business services. Likewise electric power utilities depend on natural gas, coal, and petroleum to fuel generators, as well as on road and rail transportation to deliver fuels to the generators, water for cooling and to reduce emissions, and telecommunications to monitor system status and system control, e.g., Supervisory Control and Data Acquisition (SCADA) systems and energy management systems.

Similarly, other infrastructures depend on water and electric power and other infrastructure services.

- Computer, process control, telecommunications, and other systems that run infrastructures depend upon water for cooling. Water systems may require electric power for operating pumps and need logistics and transportation for supplying water treatment chemicals.

- Natural gas fuels critical gas-fired generators in the electric power system. Electric power in turn may be required to operate the critical systems that are essential for delivering gas (e.g., control systems, storage operations, and compressor stations).

- A substation in an electrical distribution system can provide electric power to a key telecommunications switching center, and rail transportation depends on electric power for signaling, crossing protection, monitoring, and other terminal operations. Under certain conditions, failure or loss of power in a substation, for example, directly affects operations at a telecommunications switching center.

- The telecommunications center, in turn, supports SCADA systems for natural gas and oil pipelines, as well as electric power, water, and transportation systems that support electric power.

- Agriculture and food processing, warehousing and distribution, and manufacturing are dependent on all the major infrastructures, for example power for processes and refrigeration, communications for shipping and logistics, all modes of transportation for shipping materials and products, and financial systems to support purchasing of materials and sales of goods.

When infrastructure failures occur and repair crews and replacement components are needed, service providers also depend on other infrastructures, including telecommunications/IT, petroleum fuels (for vehicle and emergency generator fuel), road transportation, and, in some cases, rail transportation. Other dependencies, because of their location or exposure to the environment, are not physically linked but are coupled. A common utility corridor that consists of overhead or underground electric power transmission and distribution lines, underground pipelines, and telecommunications cables dramatically illustrates such dependencies. In many instances, multiple infrastructure assets that are co-located, for example along bridges, roadways, or in a single location, can increase susceptibility to and likelihood of simultaneous outages due to physical hazards, such as a flood, explosion, fire, and earthquake, as well as sabotage.

Another type of dependency can exist in complex systems without a direct link. The failure of a substation, for example, can lead to reconfiguration of the electric network, which, in turn, can overload a similar substation within the system if the demand exceeds capacity. In such cases, a direct link usually does not exist, and the failure occurs only when certain conditions are imposed (e.g., maximum load conditions). Natural hazards, such as earthquakes or extreme weather conditions, clearly show how threats can affect multiple infrastructures at the same time. Such threats also reveal interdependencies that can complicate or delay response and mitigation or recovery of a particular infrastructure from an incident.

Why a Holistic Regional Risk Mitigation Approach is Important

Because these dependencies and interdependencies remain little understood, the emergency management and continuity of operations plans of critical infrastructures, other service providers, and businesses are at best adequate to address localized disasters and not major incidents and disasters with regional consequences, including supply chain disruptions. These plans do not take into account extensive and prolonged impacts that may include disruption or destruction of critical components, systems, and facilities, causing outages of weeks or months, and shortages of supplies, personnel, and capabilities to restore critical services. Such widespread and prolonged service disruptions can cause huge regional economic and psychological impacts that can significantly diminish commerce and cause the relocation of residents in affected communities. At the same time, economic constraints pose additional challenges for states, localities, and stakeholder organizations, which have limited manpower,

funds, and technical expertise to assess all-hazards vulnerabilities from interdependencies, and identify and remedy them.

Whether a natural disaster, manmade incident, or pandemic, there is clearly a need for a holistic regional strategy to improve the resilience of our infrastructures and other essential services, as well as the communities and regions that depend upon them. This all-hazards, multi-jurisdiction, cross-sector approach to preparedness and resilience includes detection, prevention, mitigation, response, recovery/restoration, training, exercises, and community outreach. It requires utilities and other service providers to examine external linkages that affect their operational and business continuity. It also necessitates bringing together local public, private, and non-profit stakeholders with state and federal partners in collaboration to share information and understand and address regional vulnerabilities and consequences posed by infrastructure interdependencies.

Bay Area Regional Disaster Resilience Initiative

Infrastructure Interdependencies Workshop II - Essential Goods and Service Providers

Summary Report of Proceedings

Held May 2, 2012
At Applied Materials, Santa Clara, CA

Executive Summary

Bay Area government, private sector, and non-profit organizations participated in the second of two workshops focusing on Bay Area infrastructure. Infrastructure Interdependencies Workshop II, held May 2, 2012 at Applied Materials in Santa Clara, examined disaster recovery challenges associated with dependencies and interdependencies of financial institutions, food and agriculture systems, hospitals and healthcare providers, the building materials industry, and community and academic institutions. Interdependencies Workshop II built on the first Interdependencies Workshop that was held on January 31, 2012, which focused on utilities, transportation, and communications systems. Workshop II was the third in a series of events held by a broad coalition of Bay Area organizations to undertake a Bay Area Regional Disaster Resilience Initiative focusing on long-term disaster recovery. The workshop was structured with sessions focusing on the various infrastructure sectors consisting of short overview presentations from infrastructure and essential goods and service provider representatives on their services and products, service area, key customers, and priority dependencies and interdependencies concerns, and how they are addressing them.

Key Findings

1. **Cross-Sector and multi-jurisdiction (local/state/federal including military) collaboration and coordination** are crucial to identifying, understanding, and addressing interdependencies of essential goods and service providers.

2. **Disaster management roles, responsibilities, and authorities**, including those of essential goods and service providers, should be examined and better delineated and understood, along with structures that incorporate key stakeholders in the decision-making process.

3. **Useable and accurate information and situational awareness** are seen as a critical need by providers of essential goods and services to deal with interdependent operational and business continuity requirements.

4. **Outsourcing disaster preparedness and management to social service organizations has created a significant vulnerability** in that they may be unable to sustain these efforts in an era of budget constraints.

5. **Public education and training** are necessary to inform citizens of the conditions they can expect post-disaster in respect to availability of essential goods and services. Cross-sector exercises are an important tool to identify interdependencies gaps, potential mitigation measures, and foster coordination and collaboration.

6. **Issues and gaps that were suggested for incorporation into the Bay Area Resilience Initiative** include: regional mapping of critical infrastructures and essential goods and services providers to enable assessment of consequences, clear guidance for managing disaster volunteers, engagement of communities at the neighborhood level in disaster resilience, outreach to and education of elected officials on disaster recovery issues and needs, and further examination of lessons learned associated with infrastructure interdependencies from past events.

Table of Contents

Infrastructure Interdependencies Workshop II
Essential Goods and Service Providers

Bay Area government, private sector, and non-profit organizations reconvened on May 2, 2012 at Applied Materials in Santa Clara to participate in the second of two workshops focusing on Bay Area infrastructure interdependencies of essential goods and service providers that are fundamental to the Bay Area's economy and the health and safety of its citizens. The Infrastructure Interdependencies Workshop II examined disaster recovery challenges associated with dependencies and interdependencies of financial institutions, food and agriculture systems, hospitals and healthcare providers, the building materials industry, and community and academic institutions. Workshop II built on the first Interdependencies Workshop that was held on January 31, 2012, which focused on the interdependencies among power, water and wastewater, communications, and transportation systems. This second Interdependencies Workshop was the third in a series of events held by a broad coalition of Bay Area organizations to undertake a Bay Area Regional Disaster Resilience Initiative.[1] The action plan will build on existing capabilities and identify and prioritize needed activities to better prepare the Bay Area for a rapid post-disaster recovery.

1. Workshop Goals and Objectives

Objectives of the workshop were to:

1. Examine how earthquake scenarios could impact the region's interdependent essential goods and service providers and potentially impede recovery and restoration.

2. Explore the regional interdependencies that businesses and essential goods and service providers must address in:
   - Assessing damages and restoring services;
   - Developing recovery plans and processes to minimize business disruption;
   - Communicating expected service resumption and restoration timelines to customers and the public;
   - Managing policies, regulations and other constraints that could impede timely service resumption.

3. Highlight the challenges in maintaining the health and safety, economic, and environmental well-being of the region during the recovery process.

---

[1] Co-organizers of the workshop were the Association of Bay Area Governments, Bay Area Center for Regional Disaster Resilience, California Resiliency Alliance, Carnegie Mellon University Disaster Management Initiative, National Disaster Resiliency Center, and San Jose Water Company. Workshop sponsors were Applied Materials, Inc., Vanir Technology, Inc., and The Greenspan Co./Adjusters International.

4. Underscore the value of public, private sector, and non-profit cooperation in meeting the challenge of interdependent systems and provide opportunities to develop mutually beneficial relationships during the workshop.

5. Create new contacts and connections for cross-disciplinary collaboration and information-sharing to create the necessary awareness and common operating picture to facilitate recovery.

6. Create awareness and understanding of interdependencies goods and service systems and needed activities to improve resilience, as well as initial ideas for how to further explore these needs, for incorporation into:
   - Organizational and business continuity plans and community recovery plans;
   - The Bay Area Regional Disaster Resilience Action Plan.

2. Scope and Format

Interdependencies Workshop II continued the focus of the previous Workshop I on the dependencies and interdependencies within and beyond the Bay Area among critical infrastructures and essential goods and service providers that underpin the economy, and public health and safety of Bay Area citizens. While the primary focus of the workshop was on disaster recovery, the workshop also addressed how preparedness, response, and mitigation issues impact recovery.

The day-long workshop, like the previous Interdependencies Workshop, was structured with sessions focusing on the various infrastructure sectors with short overview presentations from infrastructure and essential service provider representatives on their services and products, service area, key customers, and priority dependencies and interdependencies concerns and how they are or plan on addressing them. Each session included a period for interactive discussion that focused on questions and comments from the participants. *(For agenda and session issues questions, see Appendix B)*

3. Highlights of Proceedings and Participant Observations
Note: As in the case of the Nov. 1, 2011 Initiative Kick-Off Workshop, information gathered from the presentations and participant observations and discussions will be augmented with lessons learned from other regional workshops, exercises, and activities, and data collected on Bay Area plans, tools, technologies and other capabilities and incorporated into the Action Plan and supporting Gap Analysis.

The following narrative represents the highlights and key points from each of the activities on the day's agenda.

3.1. Opening Remarks

State/Local Perspectives

Christina Curry, Assistant Secretary of Preparedness, Cal EMA, set the tone for the workshop by underscoring the importance of addressing infrastructure interdependencies for disaster preparedness and recovery and that they are a reason behind SEMS, the Standardized Emergency Management System, which is the basis of the state's emergency response structure for managing major disasters and events. She pointed out that the Bay Area is part of a global system—interdependencies do not respect organizational or jurisdictional boundaries. This means that we cannot operate as individual sectors. She noted the importance of public-private partnerships in addressing interdependencies challenges and of collaboration among emergency management at all levels of government and with public health and law enforcement. Five years ago, California began to work with private sector partners to take a systems approach to disaster preparedness and management. An example is the Southern California fires, where lot of private sector support and resources were utilized, and the H1N1 response, in which the private sector assisted with the deployment of pharmaceuticals.

Curry also said that today, there are 14 private sector partners participating in the State Operations Center and good assistance on resources. Looking ahead, she said that Cal EMA's Critical Infrastructure Protection Division has been assessing infrastructure sector vulnerabilities, particularly the food and agriculture sectors. They are also focusing on potential energy assurance challenges this summer associated with the shutdown of the San Onofre nuclear power plant for refurbishment. She lastly noted the state's Golden Guardian exercise for 2013 will be focusing on earthquake recovery in the Bay Area, and that Cal EMA welcomed stakeholder input to the scenario and issues that should be explored through events such as today's Interdependencies Workshop.

Janell Myhre, Director, Santa Clara County Office of Emergency Services, provided the local government perspective on infrastructure interdependencies and the importance of cross-sector and cross-jurisdiction collaboration. She noted that California has been a lead in many emergency preparedness areas, creating the Emergency Management Agency Coastal Region to facilitate coordination of 10 counties and adopted an Emergency Management Coordination Plan in 2005. A useful case study highlighting the need for a multi-jurisdiction/private sector/non-profit organization to address a significant incident is the 2007 Cosco Busan container ship oil spill in the Bay, with widespread interdependencies impacts on commercial fishing, fuel supply, ferries, cargo operations at the port and shipping, as well as the Bay ecosystems and wildlife. The Coast Guard was activated and a Unified Command set up. Public concerns and perceptions were huge issues. The incident resulted in the creation of a local coordination effort that was a new development for the By Area. A related issue was the influx of more than 4000 volunteers who arrived on the scene, spurred by social media accounts of the environmental issues. The oil spill demonstrated the need for coordination among state and local officials as well as between the unified command and affected local communities starting early in the response and recovery process, and also for incorporation of local emergency response structures into contingency planning. Consideration should be given to adding a local on-scene coordinator position in the Unified Command structure.

Q&A – Key Points Raised

- There is significant need for orchestrating how to involve volunteers in post-disaster response and recovery activities.

- The State has established a California Volunteers office to handle emergencies and other volunteerism activities.

- The State is also working with regional water systems through the California Water/Wastewater Agency Response Network (CalWARN), which supports and promotes statewide emergency preparedness, disaster response, and mutual assistance matters for public and private water and wastewater utilities.

- In Santa Clara County, Collaborative Agencies Disaster Relief Effort (CADRE) works with the County Office of Emergency Services to enable non-profit organizations to provide support and resources in emergencies.

3.2. Interdependencies II Workshop Overview

Danielle Hutchings, Earthquake and Hazards Program Coordinator, Association of Bay Area Governments, defined human resilience as the capacity to effectively influence and adapt to change, and that it could be applied to many things beyond just disaster resilience. She commented that a community is unlikely to be disaster resilient if it is not also socially, environmentally, economically resilient. Resilience requires resilient individuals, organizations, communities, and regions. She referred to FEMA's Disaster Recovery Continuum, which lays out a process that includes an ongoing preparedness phase, a short-term post-event response phase, an intermediate recovery phase of weeks to months, and a long-term recovery phase of months to years post-disaster.

Hutchings noted that the goal of the Bay Area Regional Disaster Resilience Initiative for the past eight months has been to work with stakeholders to understand what is being done already and what collaborative planning and activities need to be undertaken for a successful Bay Area recovery after a disaster. The emphasis of the Initiative is on reconstituting lifelines, businesses, government services, community institutions, housing, and essential services that underpin the region's economy. Hutchings briefly described the process so far: a Housing and Business Recovery Workshop held November 1, 2011, an Infrastructure Interdependencies Workshop I January 31, 2012, a Resilience Survey, a Gap Analysis of current resilience capacities (underway), and a draft list of priority recovery issues that require regional coordination and collaboration. Hutchings highlighted some key findings of these activities thus far: that current understanding of infrastructure interdependencies is very limited; cross-sector collaboration on disaster preparedness and recovery is limited but growing; there currently is no regional disaster recovery framework or process for operational and financial decision-making post-disaster; regional situational awareness during recovery is essential for decision-making; and that stakeholders find it challenging to look beyond the immediate post-disaster response period to long-term recovery needs. She lastly provided an overview of the agenda of the day's workshop, noting that essential goods and services are not normally a focus of this type of event.

4

3.3.Session 1. Banking and Financial Institutions

Moderator: Peter Ohtaki, Executive Director, California Resilience Alliance, opened the panel with the observation that infrastructure interdependencies are commonly associated with utilities and transportation, and it was fortuitous that the workshop was looking at other essential services. He noted that businesses are dependent on financial services for credit and money, including loans and financing for rebuilding.

Barry Cardoza, BARCfirst, described the internal dependencies and interdependencies of banks, observing that people are the most critical factor. Other dependencies/interdependencies include technologies, back-up systems including data centers to provide operational redundancy, facilities, and communications and information technology capabilities. External dependencies and interdependencies include power and transportation, critical vendors, other financial institutions, the federal reserve, armored car carriers, facilities management companies, large banks that may specialize in a particular service, and public sector authorities that can close schools and businesses.

He observed that stakeholders need to address whether their business after a major disaster or event would be able to perform financial transactions. If not, what measures could be taken to deal with the challenge? There is oversight of financial institutions to ensure preparedness, for example, the Federal Financial Institutions Examination Council (FFIEC), Comptroller of the Currency (OCC), and the Securities Exchange Commission. There are also recognized national and/or international standards like NFPA 1600, BS 25999, and the emerging International Standards Organization's ISO 22301 standard on Business Continuity. Banks may have an additional obligation to certify against one of those standards under the Private Sector Preparedness Accreditation and Certification Program (PS-Prep) due to competitive pressures. In addition, financial institutions are collaborating to increase security and resilience and are working with cross-sector and federal, state, and local agencies in various partnership arrangements, such as the ChicagoFIRST model, which has spread across the country. BARCfirst, the Northern California Business Continuity financial coalition, is based on this model, as is SoCalFirst, the Southern California Coalition. He concluded by pointing out that the Bay Area has in the last few years experienced various regional crises—for example, wild fires, H1N1, the San Bruno gas pipeline explosion, and civil protests, and that Bay Area financial institutions appear to have so far dealt with these events well.

Mike Luckin, Senior Vice President, Enterprise Risk Management, Technology Credit Union (TechCU), said that Technology Credit Union is a regional financial institution focusing chiefly on Silicon Valley and the broader South Bay. It has $1.5 billion in assets with 70,000 members and 10 retail locations. Many of its members are high-tech firms that are highly dependent on technology to handle routine banking needs, including ATMs and use of cell phones for deposits and other transactions. Over 90 percent of their operations are handled electronically, so there is concern that these technologies could fail. Key dependencies include commercial power and emergency generators, availability of staff, technology and communications, diverse critical vendors, recovery capabilities, other financial institutions, and the Federal Reserve Bank (for liquidity availability). TechCU, like all credit unions are heavily regulated.

Luckin observed that there are many regulations that cover business operations and also disaster preparedness. Regulatory bodies include the Consumer Finance Protection Bureau, Federal Financial Institution Examination Council, National Credit Union Administration (NCUA), and the California Department of Financial Institutions. A priority disaster resilience need is educating staff on preparedness. TechCU used the Great California Shakeout as an exercise tool for this purpose. Other key needs are assuring availability of critical staff, meeting expectations of customers in the event of a disaster, and most importantly, having access to cash. Lessons learned from Hurricane Katrina included the need for cash to cover customer transactions, lack of coins to make change and impediments to transporting coins, and assuring generators would be operational for a prolonged emergency. He concluded with the observation that smaller financial institutions can handle localized emergencies and small disasters, but will be challenged by significant disasters.

Interactive Discussion – Key Points Raised

- Other types of financial service organizations—mutual funds, credit companies, brokers, etc., will also be involved in regional disaster recovery. All will need assistance in getting their workforce back to be operational. Certification of personnel is a huge issue that BARCfirst had been addressing.

- Only a few larger banks have mobile ATMs. Credit Unions will need to partner with each other to share ATMs and branches. ATM sites will be posted on bank websites. Smaller banks and credit unions don't customarily have a lot of extra cash on hand and in a major emergency it may take a week to get the necessary cash infusion. Banks are focusing on building partnerships with local law enforcement.

- Re-fueling emergency power generators will be a major concern. To conserve emergency power, banks will shut down certain operations and locations.

- A major earthquake could sever underground cables that support communications and IT operations.

- Public education will be necessary to handle expectations. Non-profits and businesses may find that even with memorandums of understanding with vendors, contractual arrangements may not be honored for resources.

- There will be a need for investment funds post-disaster at reasonable rates. Banks will handle customer needs based on an individual basis.

- An idea is to identify "neighborhood hubs" post-disaster for the location of essential services, including financial instructions, for individuals.

3.4.Session 2 - Essential Goods and Services

Moderator: Danielle Hutchings, Earthquake Hazards Program Coordinator, ABAG

Timothy James, Government Relations, California Grocers Association, described the California Grocers Association as having 500 retail members operating more than 6,000 food stores in California and Nevada with approximately 200 grocery supplier companies. The Association is a charter member of the Cal EMA Business and Utilities Operations Center (BUOC). He pointed out the essentials that grocers have to operate, including food-safe state and county certified cold storage facilities, and adequate utility services, e.g., water and power, to operate them; trucks and drivers for just-in-time product delivery; trained employees in food safety knowledge and distributors with available warehouses and drivers; and capabilities for sales and checkout operations either handled with cash or electronically. Regarding key interdependencies, the number one issue is having useable information. It can be confusing to have requests for assistance or resources from multiple authorities (e.g., the State and Regional Operations Centers and localities). Decisions on moving product and staff are not made by management at the individual retail stores but at the corporate level. In conclusion, he underscored that the ability to operate depends on regulatory authorities, transportation, and utilities.

Rick Beatty, Vice President of Bay Area Materials, Lehigh Hanson, provided an overview of the dependencies and interdependencies of the building materials industry from the perspective of the fourth largest producer of cement and largest producer of aggregates (crushed rock, sand, and gravel) in the world. Lehigh Hanson also produces ready-mixed concrete, asphalt, and a range of other building materials including precast concrete products, pressure and gravity pipes, pavers, tiles, and clay bricks. The corporation is a conglomeration of companies and assets, with many located in and serving the Bay Area. Lehigh Hanson products can be found in homes, roads, water systems, and other critical public and private projects from hospitals to airports, and will be essential in post-disaster repair and reconstruction of structures, roadways, bridges, and other infrastructure. Lehigh's Permanente plant, in operation since 1939, produces more than half the cement used in the Bay Area and more than 70% of the cement used in Santa Clara County. Much of this material is produced locally but other materials are imported. An example is materials for Bay Area bridges, which come from British Columbia. The biggest dependency is energy, which the building industry "uses tons of," including fuel, natural gas, and "anything that produces heat." Transportation is crucial to bring in and transport materials and product among facilities during the production and distribution process; Lehigh has an import terminal at the Port of San Francisco for its materials from Canada. He concluded with the observation that the industry is highly regulated, highly capital intensive, and competitive. However, in the aftermath of the Loma Prieta earthquake in 1989, local building materials companies did cooperate.

Interactive Discussion – Key Points Raised

- Grocers need to include energy planning in continuity of operations plans.

- Small independent grocers rely on buying cooperatives, such as Unified Grocers.

- Non-profits that distribute food should be incorporated into regional food distribution planning for emergencies to ensure an orderly process.

- Caltrans and local jurisdictions have agreements in place with building materials contractors.

- For debris removal heavy equipment needs to be available; plans should be in place with the understanding that it may be necessary to improvise and rely on volunteers for debris removal.

- There are no standards for how to handle spoiled food waste, which pay pose a public health threat. Localities have to decide whether to store in place or dump in certain locations. This needs to be worked out with public health officials on a case-by-case basis.

3.5. <u>Working Lunch -Tracking Resources and Reports for Earthquake Recovery</u>

Joseph Robinson, Vanir Technology Inc., Workshop Sponsor, with guest Mike Whelan, Salamander Technologies Inc., highlighted Vanir Technology capabilities to enable industrial and government clients to ensure the safety and security of their employees, visitors, and facilities. He provided a demonstration of technologies to identify and credential personnel, visitors, and volunteers through pre-loading information needed to assign, track, and manage resources into one ID card that can include all information on an individual from their name to relevant qualifications and medical history—whatever information is necessary.

3.6.Session 3<u>Hospitals and Healthcare</u>

Moderator: Paula Scalingi, Executive Director, Bay Area Center for Regional Disaster Resilience

Cheri Hummel, Vice President Disaster Preparedness, California Hospital Association, provided insights into hospital interdependencies, preparedness gaps, and activities to address the challenges. She noted that California Hospital Association (CHA) is one of the largest hospital associations in the nation serving more than 400 acute care hospitals and health systems and representing 95 percent of the licensed hospital beds in California. TheCHA Hospital Preparedness Program has been established and sustained with federal grant funds for the past six years. Program staff provide emergency preparedness services and products to all hospitals statewide. This includes technical assistance, educational workshops, exercise planning tools, a dedicated website, meeting participation and advocacy. Program staff also foster relationships and partnerships among hospitals and health systems, community response partners, and local, regional and state emergency planning partners. In addition, they hold an annual Disaster Planning Conference for California hospitals, which this year is October 15-17, 2012 in Sacramento. Hospitals' disaster preparedness activities are subject to a number of regulations, including Centers for Medicare & Medicaid, Accreditation Standards, physical plant and physical structural requirements, and U.S. Health and Human Services Department grant requirements. The cost for hospital accreditation is substantial. The Joint Commission (TJC) accreditation requires a hospital to have a 96-hour plan that addresses the following six critical

areas: communications, resources and assets, security and safety, staff, utilities, and patient care. Additionally, hospitals are required to hold two drills a year. Like many businesses, hospitals rely upon just-in-time delivery of key supplies. Many hospitals and health systems are reviewing their vendor contracts and inquiring about their vendor's disaster plans. For example, how the vendor will prioritize competing requests, products and deliveries during a disaster. California regulations require hospitals to be self-sustainable for 72 hours. Organizational planning includes addressing personal preparedness. A critical surge capacity issue is how decisions will be made when the demand for patient care exceeds the resources and capabilities available.

Hummel said that important dependencies and interdependencies include: information and situational awareness; utilities—particularly water; supplies; personnel access post-event; and transportation (patient movement and evacuation). Regarding water dependencies, CHA is looking at how hospitals can store water. While some large hospitals can afford water storage, other hospitals can't and will need to rely on contracts with providers (proposed code would require every hospital to have a minimum 5000 gallon storage tank available to receive water). Identified preparedness gaps where support is needed include: fatality management;, security resources; managing an influx of patients with limited staff; resources; capability (crisis care); decontamination capability; representatives with hospital operations knowledge and expertise should be placed in local, regional and the State operations' center. Lastly, exercises with multiple disciplines including the CA National Guard involved are key. CA has not experienced an event requiring mass patient movement; however, a catastrophic EQ in the bay area could prompt such an activity. CHA has developed an emergency food planning guidance toolkit will be released soon. Continuity of operations will be a key focus of the 2012 annual Disaster Planning Conference for California Hospitals. Looking ahead, CHA will be aligning its grant program to deal with decreased funding and focusing on capabilities-based planning and healthcare reform impacts on surge capacity.

Ray Bonilla, IT Crisis Management and Business Continuity, Kaiser Permanente, described Kaiser Permanente's integrated healthcare model to provide high-quality, affordable health care services and to improve the health of its members and the communities served. Kaiser Permanente maintains a four-star rating by the California Office of the Patient Advocate. Its physicians have been named top performers by the Integrated Healthcare Association for past six years. It is the nation's largest not-for-profit integrated health care delivery system, located in nine states and the District of Columbia and with nearly 8.9 million members,36 hospitals, 533 medical offices, 16,000 physicians, and168,000 employees that must coordinate and have shared standards. A major focus of Kaiser Permanente is transforming care delivery—empowering patients and members to manage their health care through technology. Areas where Kaiser Permanente is recognized for exemplary care include: clinical care, asthma, lung care, checking for cancer, diabetes care, heart care, maternity care, and mental health. A partial list of emergency management regulatory requirements for Kaiser Permanente include the Health Insurance Portability and Accountability Act (HIPAA), the Joint Commission, and Centers for Medicare & Medicaid Services (CMS)— and the California Department of Public Health

Bonilla noted that Kaiser Permanente was dependent on nearly all infrastructure systems — energy, water, transportation, communications, waste management, postal and shipping, supply

chains, healthcare and public health, other hospitals, food and agriculture, government services, manufacturing, media, community and particularly people— both staff and customers. Additional challenges include the need for coordinated communications—useful, actionable, and detailed information—from public and private sectors; the ability to build integrated actionable responses; cross-sector standardized protocols to leverage and/or share resources; balancing individual and community interests; legal requirements that do not take into account operational realities; and centralization of critical suppliers. Kaiser Permanente is working to mitigate the challenges, including promoting a common language in preparedness training—the NIMS/ICS framework, sharing emergency operations plans with community partners, inviting community partners to internal preparedness meetings, hosting joint planning forums and exercises, participating in various community groups and forums, plugging into credible information sources, and ensuring several layers of supplier redundancy. Steps taken include: building partnerships to bridge gaps between public and private sectors, improving communication channels and seeking first-hand information, championing solutions across sectors, hosting forums to review plans, lessons learned and after-action reports, participating in industry associations, meetings, and conferences, and sharing best practices.

Michelle D. Heckle, Emergency Management/ Environmental Health & Safety Children's Hospital & Research Center at Oakland, said Children's Hospital and Research Center is an independent and free standing healthcare provider that is responsible only to the Hospital Board. Children's Hospital specializes in children and is a Level 1 pediatric trauma center that has rehab services on-site and serves California children and children from other states and international locations. In 2011, the Hospital served 218,456 children (outpatient visits) and 10,255 hospitalized children (inpatients) during normal conditions. Trauma, neonatal and pediatric intensive care patients are transported within a 50 mile radius through use of emergency transportation, including helicopters. Children's Hospital uses its own tools for emergency management planning, and is prepared to deal with surge challenges including addressing four issues: staff, "stuff" (resources/equipment/ critical services and supply chains), space, and systems. The hospital is beginning to enhance communications through forming a Pediatric Care Coalition with other hospitals and public health, suppliers and transport companies. There is a need to examine emergency preparedness requirements and plans for children's care. One particular challenge is the influx of adults in a major emergency that could lead to blood bank depletion or other problems and, vice versa, an influx of children as adult hospitals. Another is the lack of skilled pediatric specialists and beds in a major disaster. Children's Hospital wants to increase area-wide hospital surge capacity and have other hospitals serve their less critical patients. The Hospital is undertaking a roadmap for a sustainable pediatric surge plan and network to supplement the surge plan the State has for the general patient population.

Interactive Discussion– Key Points Raised

- A challenge in a major disaster is that individuals that don't require hospital assistance may go there anyway because the community knows that hospitals are open 24/7. Also due to regulatory requirements, hospitals are required to have their basic services on backup generators. Therefore, they may be one of the few resources with lights on in the community. Research from previous disasters shows that many injuries incurred during an event are not severe enough to require hospitalization. Many inuries are minor and

can be treated elsewhere. Hospitals should be preserved for the most severely injured or high acuity patients. Public education and awareness are necessary and training to volunteers could be provided for dealing with minor medical needs.

- Communities and government should be planning to establish alternate care sites to augment hospital and clinic services.

- During emergencies the Red Cross has an exemption for HIPAA information so they can be provided information from hospitals.[2]

- Most Alameda County hospitals are within two miles of the Hayward fault and there is one community below a dam.

3.7.Session 4 - Academic Institutions and Social Service Providers

Moderator: Monika Stoeffl, Monika Stoeffl Consulting

Tom Busk, Community Preparedness and Response, American Red Cross-Silicon Valley, spoke of the Red Cross mission to provide services and programs that help communities prevent, prepare for, and respond to emergencies. The Red Cross identifies and helps support programs that are run by churches or other groups to provide emergency services and conducts shelter operations training. The local chapter depends on neighboring chapters in disaster response and recovery. The Silicon Valley Red Cross is working with water utilities on a water restoration plan for the region. In the event or a major disaster, the Red Cross will support other groups in long-term recovery and then step down as VOADs move in to assist. The Red Cross works in partnership with other organizations, including local emergency management, and has a seat in the County EOC. An example of how the Red Cross works with local agencies is after

---

[2] Providers and health plans covered by the HIPAA Privacy Rule can share patient information in all the following ways: TREATMENT. Health care providers can share patient information as necessary to provide treatment. Treatment includes: sharing information with other providers (including hospitals and clinics), referring patients for treatment (including linking patients with available providers in areas where the patients have relocated), and coordinating patient care with others (such as emergency relief workers or others that can help in finding patients appropriate health services). Providers can also share patient information to the extent necessary to seek payment for these health care services.
NOTIFICATION. Health care providers can share patient information as necessary to identify, locate and notify family members, guardians, or anyone else responsible for the individual's care of the individual's location, general condition, or death. The health care provider should get verbal permission from individuals, when possible; but, if the individual is incapacitated or not available, providers may share information for these purposes if, in their professional judgment, doing so is in the patient's best interest.Thus, when necessary, the hospital may notify the police, the press, or the public at large to the extent necessary to help locate, identify or otherwise notify family members and others as to the location and general condition of their loved ones. In addition, when a health care provider is sharing information with disaster relief organizations that, like the American Red Cross, are authorized by law or by their charters to assist in disaster relief efforts, it is unnecessary to obtain a patient's permission to share the information if doing so would interfere with the organization's ability to respond to the emergency.
IMMINENT DANGER. Providers can share patient information with anyone as necessary to prevent or lessen a serious and imminent threat to the health and safety of a person or the public -- consistent with applicable law and the provider's standards of ethical conduct.
FACILITY DIRECTORY. Health care facilities maintaining a directory of patients can tell people who call or ask about individuals whether the individual is at the facility, their location in the facility, and general condition. Of course, the HIPAA Privacy Rule does not apply to disclosures if they are not made by entities covered by the Privacy Rule. Thus, for instance, the HIPAA Privacy Rule does not restrict the American Red Cross from sharing patient information.

Hurricane Katrina, the Silicon Valley Red Cross set up a temporary community at San Jose State for displaced individuals and families.

Busk noted that a significant issue was the tendency over the last 10 years to outsource critical social service work, including disaster preparedness and management, to non-profits. These organizations may not have the resources to sustain the work. There is a Silicon Valley Fund for assisting non-profits in their emergency preparedness responsibilities. A committee has been set up to identify non-profits that require help.

Alessa Adamo, Executive Director, SF CARD, provided an overview of community service organization dependencies and interdependencies using SF CARD as an example. SF CARD was created in 1994 with a mission to provide disaster services to nonprofits and faith-based organizations after the Loma Prieta earthquake. SF CARD, because it is a training agency, does not have a large dependency on supplies or vendors. However, a major operational dependency is the need for accurate and timely information from trusted sources in an emergency to support its mission to push out information to the non-profit service sector. Other significant, related dependencies for sustainability are funding and retention of donated office space and equipment. SF CARD interdependencies focus on other community and social service non-profits, government agencies, and private sector organizations that have disaster preparedness missions, including the San Francisco Interfaith Council; the American Red Cross-Bay Area; regional intermediary agencies (CADRE, THRIVE, CARD); local government agencies (the San Francisco Department of Emergency Management, Human Services Agency, Department of Public Health, Mayor's Office on Disabilities, Neighborhood empowerment network, etc.); State agencies, such as California Volunteers and Cal EMA; federal agencies (FEMA Region IX, the U.S. Department of Homeland Security, Center for Faith-Based & Neighborhood Partnerships); and private sector organizations that focus on disaster preparedness (Building Owners and Managers Association of San Francisco and Business Recovery Managers Association).

Adamo said that SF CARD is addressing regional interdependencies challenges by creating cross-sector relationships. It has joined organizations such as BACSPP (Bay Area Cross Sector Partners in Preparedness), California Resiliency Alliance, and the Bay Area Center for Regional Disaster Resilience, and is working with private sector businesses throughout the Bay Area, and establishing contacts with Bay Area public sector disaster managers. SF CARD is addressing priority gaps through narrowing information gathering to the most trusted sources, assessing the accuracy and relevancy of the information, avoiding the potential for information overload, creating stronger cross-sector relationships, and accessing opportunities for exchanging information with these partners in an emergency. SF CARD is also focusing on proactive use of the various information-sharing platforms, such as Interagency Chatter, a social media information dissemination mechanism for the non-profit community.

Stephen Stoll, Director, Office of Emergency Preparedness/Homeland Security, U.C. Berkeley, pointed out that higher education facilities (universities, colleges, and community colleges) are dependent on most critical infrastructure sectors. In the case of the University of California at Berkeley, there are 50,000 people on campus each day and 2,000 to 3,000 visitors. The Campus has 2,347 acres and 324 buildings and is located on 10.5 square miles. The City of Berkeley (population 112,356) is bounded by the cities of Albany, Oakland, and Emeryville. The University has a Multi-Hazards Mitigation Plan that covers 24 types of incidents, including

technological incidents (hazmat release and radiological, chemical, and biological) and terrorist threats ranging from animal activists to bomb threats, explosions, and civil unrest. There is also a Campus Emergency Response Program, which is largely volunteer-based, and there is a University EOC that handles response and mitigation. The biggest threats are earthquakes and fire. The University's proximity to the Hayward Fault poses significant problems. In addition, the campus has mostly eucalyptus trees, which are highly flammable.

Stoll said dependencies and interdependencies include: the 350-plus different departments that are self-focused, facilities services, including utilities and supply chains, and reliance on the City of Berkeley services for fire, hazmat, and hospitals. Impacts to the University from a catastrophic event would affect not only teaching and research, but the community and local businesses that support its student population and activities. Concerns and solutions include identification of existing resources and gaps, awareness and acknowledgement of resilience and what resilience requires, identification of dependencies and interdependencies (a critical need), developing relationships and participation in meetings, groups, etc., that can help improve preparedness, establishment of memorandums and letters of agreement with utilities, contractors, and vendors, producing plans and procedures, and training. A particular concern is that the University has many historic buildings that are susceptible to earthquake damage and many casualties would be expected in an earthquake. Efforts are underway to promote coordination among the University's many independent departments, and a template has been developed for departments to fill out on their critical assets and functions. There is need to raise awareness within the departments on the need for disaster preparedness and resilience. There is a lot of great paper on the shelves but little participation and follow-on.

Interactive Discussion– Key Points Raised

- University coordination with local agencies is necessary and can help improve resilience, but in a major disaster, localities will take care of citizens first and academic institutions will be largely on their own.

- There is a need for more use of CERT Teams at universities and colleges.

- Disaster preparedness must involve international students and their parents.

4. Workshop Additional Outcomes

The following results are based on participant views expressed during and after the workshop, participant evaluations, and other comments.

Cross-Sector Collaboration

- **Public-private-non-profit partnerships are important** in addressing interdependencies challenges of providers of essential goods and services and in enabling collaboration among emergency management at all levels of government and with public health and law enforcement.

- **Financial institutions are collaborating to increase security and resilience** and are working with cross-sector and federal, state, and local agencies in various partnership arrangements.

- **Non-profits that distribute food should be incorporated into regional food distribution planning** for emergencies to ensure an orderly process.

- **There needs to be greater coordination among state and local officials and between the unified command and affected local communities** starting early in the response and recovery process, and also for incorporation of local emergency response structures into contingency planning.

- Consideration should be given to adding a **local on-scene coordinator position** in the Unified Command structure.

- **University coordination with cities and counties** is necessary to improve resilience.

- There needs to be **greater coordination with the National Guard and military authorities** on disaster recovery planning and activities.

Roles, Responsibilities, and Authorities

- In instances where federal or state authorities take precedence on response and recovery actions and decisions, **affected localities should be engaged and involved in the decision-making process.**

- For many providers of essential goods and services, **decisions on where and how to provide services or move products and staff are not made by management at the individual organizations but at the corporate level.**

Operation and Business Continuity Needs

- Smaller financial institutions can handle localized emergencies and small events, but **will have problems responding and recovering from regional disasters**.

- For most providers of essential goods and services, a priority recovery issue is **having useable and accurate information and situational awareness.**

- Non-profits and businesses need to recognize that **even with memorandums of understanding with vendors, contractual arrangements may not be honored** for resources after a regional disaster.

- **Banks and other financial institutions will require staff to resume business.** Certifying personnel to gain access to work locations to resume operations remains a key issue.

- **The trend to out-source to social service organizations disaster preparedness and management has created a significant vulnerability** in that these organizations in an era of budget constraints may be unable to sustain these efforts.

- There is a need to **assess and improve emergency preparedness requirements and plans for childrens' care.**

- In a major disaster, **academic institutions with large student resident populations will be largely on their own** in addressing post disaster challenges.

Interdependencies-Related Impacts and Resilience Gaps

- There needs to be **greater focus on interdependencies of providers of essential goods and services** as well as those associated with utilities and transportation. These organizations are dependent upon most of the other infrastructure sectors.

- **Businesses are dependent on financial services** for credit and money, loans and financing for rebuilding.

- **Re-fueling emergency power generators will be a major concern**. To conserve emergency power, banks will shut down certain operations and locations.

- Only a few larger banks have mobile ATMs. **Credit Unions and local financial institutions will need to partner to share ATMs and branches**.

- Smaller banks and credit unions don't customarily have a lot of extra cash on hand and in a major emergency **it may take a week to get the necessary cash infusion.**

Regulatory Issues

- **Most providers of essential goods and services are subject to regulatory requirements that may help or hinder post-disaster capabilities to resume business.** These include legal requirements, policies and standards that govern operations, health and safety, privacy, emergency preparedness, etc.

Public Information, Education and Training

- Local governments and providers of essential goods and services need to **educate the public** on what conditions they can expect post-disaster that directly impact their ability to resume operations.

- **Cross sector exercises** are necessary to illuminate interdependencies gaps and potential mitigation measures.

- The public needs to be made aware that **hospitals in a major disaster or event will only be able to assist the seriously injured.** The public also needs to have information post-disaster of what hospitals are available and where open health centers and medical clinics are located.

- Within universities and other large organizations where departments and offices are autonomous, **awareness needs to be raised about resilience and preparedness** and the need for a coordinated approach to planning, response, and recovery.

Issues and gaps participants recommended for inclusion in the Action Plan:

- The capability for regional mapping of critical infrastructure and essential service providers to enable assessment of consequences, including economic impacts and monetary loss, and informed decision-making;

- The need for public education through raising awareness and getting citizens involved in preparedness improvements;

- The need for clear guidance for disaster volunteers;

- Engagement of communities at the neighborhood level in disaster preparedness;

- Necessity of focusing on long-term impacts and recovery;

- Inclusion of "victim of loss" in recovery boards, councils, and committees to make sure their views are factored into recovery decisions;

- Outreach to and education of elected officials on disaster recovery issues and needs; and further examination of lessons learned associated with infrastructure interdependencies from past events.

5. Next Steps

Participants were told they would be provided a summary of the workshop and were asked to note on their evaluations if they wished to join the Planning Team for the final event in the Bay Area Disaster Resilience Initiative to be held in October or November 2012.

All materials from this and previous workshops are available at **http://quake.abag.ca.gov/resilience/workshops**.

Appendix A
WORKSHOP PARTICIPATING ORGANIZATIONS

Adjusters International
Alameda Health Consortium
Aloft Consulting
American Red Cross
Amtrak
Applied Materials
Association of Bay Area Governments
AT&T
BARCfirst
BART
The Baruch Group
Bay Area Center for Regional Disaster
  Resilience
Bay Area Council
California Department of Public Health
California Emergency Management Agency
California Energy Commission
California Grocers Association
California Hospital Association
California Resiliency Alliance
Children's Hospital & Research Center
  Oakland
Citizen 911
City of Mill Valley
City of Palo Alto
City and County of San Francisco
  • Department of Emergency
    Management
  • SFFD NERT
City of San Jose
  • Office of Emergency Services
City of San Ramon
City of Santa Clara
Contra Costa County
Facebook
GeoHazards International
Healthchek LLC
ICF International
IntTerra
Jeanne Perkins Consulting
Kaiser Permanente
Lawrence Berkeley National Laboratory

Lehigh Hanson
Marin County Sheriff's Office, OES
Marin Interagency Disaster Coalition (Marin
  VOAD)
Monica Stoeffl Consulting
Mountain View Fire Department
Northern California Regional Intelligence
  Center (NCRIC)
The National Disaster Resiliency Center
NDRC Learning Center
Nexis Preparedness Systems
Orbelian Holdings, L.P.
Port of Oakland
San Carlos/Redwood City Fire
SF CARD
San Jose Water Company
San Mateo County OES
Sandia National Laboratories
Santa Clara County
Santa Clara Valley Water District
Second Nature
Sonoma County Fire and Emergency
  Services Department
South Bay Regional Public Safety Training
  Consortium
Technology Credit Union
The Greenspan Co./Adjusters International
UC Berkeley
  • School of Public Health, Center for
    Infectious Disease Emergency
    Readiness
Urban Resilience Strategies
URS
U.S. Department of Homeland Security
U.S. Environmental Protection Agency
Valley Transportation Authority
Vanir Technology
Verizon Wireless
WGU

Appendix B
Agenda

Infrastructure Interdependencies Workshop II—
Interdependent Essential Goods and Service Providers
May 2, 2012 | Applied Materials, Santa Clara

8:30 a.m.   **Registration**

9:00 a.m.   **Welcome and Introductions**

            State/Local Perspectives
- Christina Curry, Assistant Secretary of Preparedness, Cal EMA
- Janell Myhre, Director, Santa Clara County Office of Emergency Services

9:20 a.m.   **Interdependencies II Workshop Overview**
- Danielle Hutchings, Earthquake and Hazards Program Coordinator, Association of Bay Area Governments

9:40 a.m.   **Banking and Financial Institutions***(Moderator: Peter Ohtaki, Executive Director, California Resilience Alliance)*
- Barry Cardoza, LLC for BARCfirst
- Mike Luckin, TechCU

            Interactive Discussion

10:45 a.m.   **Break**

11:00 a.m.   **Essential Goods and Services***(Moderator: Danielle Hutchings, ABAG Earthquake Hazards Program Coordinator)*
- Timothy James, Government Relations, California Grocers Association
- Mike O'Brien, Port Facilities Security Officer, Port of Oakland
- Rick Beatty, Vice President of Bay Area Materials, Lehigh Hanson

            Interactive Discussion

12:00 p.m.   **Working Lunch: Tracking Resources and Reports for Earthquake Recovery**
            Joseph Robinson, Vanir Technology, Workshop Sponsor with guest Mike Whelan, Salamander Technologies Inc.

1 p.m.   **Hospitals and Healthcare***(Moderator: Paula Scalingi, Executive Director, Bay Area*

Center for Regional Disaster Resilience)
- Cheri Hummel, Vice President Disaster Preparedness, California Hospital Association
- Ray Bonilla, Manager Crisis Management and Business Continuity, Kaiser Permanente
- Michelle D. Heckle, Emergency Management/ Environmental Health & Safety
  Children's Hospital & Research Center at Oakland

Interactive Discussion

2:00 p.m.   **Academic Institutions and Social Service Providers** *(Moderator: Monika Stoeffl, Monika Stoeffl Consulting)*
- Tom Busk, Community Preparedness and Response, American Red Cross-Silicon Valley
- Alessa Adamo, Executive Director, SF CARD
- Stephen Stoll, Director, Office of Emergency Preparedness/Homeland Security, U.C. Berkeley

Interactive Discussion

3:00 p.m.   **Next Steps**

3:30 p.m.   **Adjourn**

Appendix C
Planning Team Members

Stephen Baruch	Nexis Preparedness Systems
JoAnna Bullock	Association of Bay Area Governments
Darryl Burton	Business Recovery Managers Association
Steve Dennis	Alameda County Water District
Danielle Hutchings	Association of Bay Area Governments
Gerald Kiernan	Bay Area Center for Regional Disaster Resilience
Catherine Lyons	Bay Area Council
Katie Martinez	San Francisco Public Utilities Commission
Peter Ohtaki	California Resiliency Alliance
Nancy Okasaki	Metropolitan Transportation Commission
George Orbelian	Project Kaisei
Paula Scalingi	Bay Area Center for Regional Disaster Resilience
Monika Stoeffl	
Edward Sullivan	East Bay Municipal Utility District
Kay Vasilyeva	City and County of San Francisco, DEM
Jim Wollbrinck	San Jose Water Company

Appendix D
Infrastructure Interdependencies Backgrounder

In the past decade across the nation, the critical infrastructures and other essential service providers that enable our communities to thrive and grow have become increasingly interconnected and interdependent. These infrastructures include energy (electric power, natural gas, fuels); telecommunications, transportation (rail, road, maritime); water and water treatment systems; banking and finance; emergency services; government services; hospitals, healthcare and public health; agriculture and food; commercial facilities; nuclear reactors; materials and waste; dams and levees; manufacturing; chemical facilities; and postal and shipping. To a large degree, this trend towards ever greater linkages has been created by our growing reliance on electronic systems, computer processing and the Internet for managing and operating these infrastructures. This interconnectivity and the resulting interdependencies can exist at multiple levels of increasing complexity and extend beyond a community, a state, and nations, creating unexpected vulnerabilities and significant consequences.

Although emergency and business continuity practitioners are beginning to focus on interdependencies, we remain limited in our understanding of them, the vulnerabilities they create, and how to prevent or lessen their impacts. Disruptions in one infrastructure can cascade, ultimately affecting more than one infrastructure, affecting essential government services, businesses, and individuals in an entire region with far-reaching health and human safety, economic, environmental, and national security consequences.

Examples of Infrastructure Dependencies and Interdependencies

Water and waste water systems, are dependent on a wide range of infrastructures and other essential services, including electric power to run pumps and control systems, petroleum fuels for transportation of repair and maintenance personnel, communications to handle the ordering of chemicals and other supplies and equipment and to direct operations, all modes of transportation for supply and shipping, and financial systems to support billing, payments, and other business services. Likewise electric power utilities depend on natural gas, coal, and petroleum to fuel generators, as well as on road and rail transportation to deliver fuels to the generators, water for cooling and to reduce emissions, and telecommunications to monitor system status and system control, e.g., Supervisory Control and Data Acquisition (SCADA) systems and energy management systems.

Similarly, other infrastructures depend on water and electric power and other infrastructure services.

- Computer, process control, telecommunications, and other systems that run infrastructures depend upon water for cooling. Water systems may require electric power for operating pumps and need logistics and transportation for supplying water treatment chemicals.

- Natural gas fuels critical gas-fired generators in the electric power system. Electric power in turn may be required to operate the critical systems that are essential for delivering gas (e.g., control systems, storage operations, and compressor stations).

- A substation in an electrical distribution system can provide electric power to a key telecommunications switching center, and rail transportation depends on electric power for signaling, crossing protection, monitoring, and other terminal operations. Under certain conditions, failure or loss of power in a substation, for example, directly affects operations at a telecommunications switching center.

- The telecommunications center, in turn, supports SCADA systems for natural gas and oil pipelines, as well as electric power, water, and transportation systems that support electric power.

- Agriculture and food processing, warehousing and distribution, and manufacturing are dependent on all the major infrastructures, for example power for processes and refrigeration, communications for shipping and logistics, all modes of transportation for shipping materials and products, and financial systems to support purchasing of materials and sales of goods.

When infrastructure failures occur and repair crews and replacement components are needed, service providers also depend on other infrastructures, including telecommunications/IT, petroleum fuels (for vehicle and emergency generator fuel), road transportation, and, in some cases, rail transportation. Other dependencies, because of their location or exposure to the environment, are not physically linked but are coupled. A common utility corridor that consists of overhead or underground electric power transmission and distribution lines, underground pipelines, and telecommunications cables dramatically illustrates such dependencies. In many instances, multiple infrastructure assets that are co-located, for example along bridges, roadways, or in a single location, can increase susceptibility to and likelihood of simultaneous outages due to physical hazards, such as a flood, explosion, fire, and earthquake, as well as sabotage.

Another type of dependency can exist in complex systems without a direct link. The failure of a substation, for example, can lead to reconfiguration of the electric network, which, in turn, can overload a similar substation within the system if the demand exceeds capacity. In such cases, a direct link usually does not exist, and the failure occurs only when certain conditions are imposed (e.g., maximum load conditions). Natural hazards, such as earthquakes or extreme weather conditions, clearly show how threats can affect multiple infrastructures at the same time. Such threats also reveal interdependencies that can complicate or delay response and mitigation or recovery of a particular infrastructure from an incident.

Why a Holistic Regional Risk Mitigation Approach is Important

Because these dependencies and interdependencies remain little understood, the emergency management and continuity of operations plans of critical infrastructures, other service providers, and businesses are at best adequate to address localized disasters and not major incidents and disasters with regional consequences, including supply chain disruptions. These plans do not take into account extensive and prolonged impacts that may include disruption or destruction of critical components, systems, and facilities, causing outages of weeks or months, and shortages of supplies, personnel, and capabilities to restore critical services. Such widespread and prolonged service disruptions can cause huge regional economic and psychological impacts that can significantly diminish commerce and cause the relocation of residents in affected communities. At the same time, economic constraints pose additional

challenges for states, localities, and stakeholder organizations, which have limited manpower, funds, and technical expertise to assess all-hazards vulnerabilities from interdependencies, and identify and remedy them.

Whether a natural disaster, manmade incident, or pandemic, there is clearly a need for a holistic regional strategy to improve the resilience of our infrastructures and other essential services, as well as the communities and regions that depend upon them. This all-hazards, multi-jurisdiction, cross-sector approach to preparedness and resilience includes detection, prevention, mitigation, response, recovery/restoration, training, exercises, and community outreach. It requires utilities and other service providers to examine external linkages that affect their operational and business continuity. It also necessitates bringing together local public, private, and non-profit stakeholders with state and federal partners in collaboration to share information and understand and address regional vulnerabilities and consequences posed by infrastructure interdependencies.