



2016
FINAL REPORT

NATIONAL
EARTHQUAKE
CONFERENCE
May 4 - 6, 2016



INTRODUCTION



The 2016 National Earthquake Conference (NEC) brought together worldwide experts; inspired an immediate increase in financial support for earthquake safety research; and generated an ongoing, global dialogue about challenges the U.S. faces with seismic risk.

The Federal Alliance for Safe Homes (FLASH), FEMA, and partners hosted the NEC on May 4 to 6 in Long Beach, Calif. More than 350 individuals attended, representing 35 states and the U.S. Territories of American Samoa, Guam, and Puerto Rico. The conference theme asked, “What’s

New? What’s Next? What’s Your Role in Building a National Strategy?”

The first keynote speaker, Dr. Thomas Jordan, director of the Southern California Earthquake Center, set the tone for the successful gathering with a riveting presentation stating, “... the springs on the San Andreas system have been wound very, very tight. And the southern San Andreas Fault, in particular, looks like it’s locked, loaded, and ready to roll.”

Dr. Jordan’s statement energized the crowd and launched a stream of unprecedented social media interest and news coverage about the conference. Los Angeles Times writer Rong-Gong Lin II captured the story, and his article went viral within four hours garnering 32 million online views. Other news outlets including BBC, Time Magazine, The Washington Post, and all of the major television and cable news networks carried the statement.

News coverage flowed throughout the rest of the conference from live television and radio interviews featuring the experts gathered in Long Beach. More news stories about seismic risk continued for weeks after the conference. An NBC story by News 4 in Los Angeles recapped NEC findings and described how it prompted California Governor Jerry Brown to spearhead new funding for the statewide earthquake early warning system build out. This [report](#) details the NEC news and outreach impact.



CONFERENCE WELCOME REMARKS



“In the next two and half days, we are going to talk about What’s New? We are going to learn all the coolest and greatest new stuff, the science, message insights, protective actions, things like earthquake early warning, and our favorite program, QuakeSmart for Business. Then, What’s Next? We’ve asked our speakers to throw down the gauntlet and to say, this is where we need to go and finally the last piece is, What’s Your Role in Building a National Strategy? ...That’s the question we are going to define when we leave on Friday. Then when we get together four years from now, we will have spent a steady amount of time invested in answering that question.”

Leslie Chapman-Henderson
President and CEO, Federal Alliance for Safe Homes (FLASH)

“The partnerships here are very strong and they are going to be critical as catalysts for creating a nation that’s safer from earthquake risk. The dialogue that is happening, the sharing of ideas and information, building off one another’s successes creates this amazing energy...It is through these partnerships that we create a safer nation.”

Angela Gladwell
Deputy Assistant Administrator, Risk Management Directorate, FEMA



“As important as it is that we continue to advance our understanding of the science, we have to be equally committed to advancing our resiliency, both physically and economically to this devastating risk. And this is not just true in California. According to the USGS, nearly half the U.S. population is at risk in 42 states.”

Glenn Pomeroy
Chief Executive Officer, California Earthquake Authority

Welcome remarks may be viewed [here](#).

EARTHQUAKE SCIENCE AND ENGINEERING

DAY 1



OPENING KEYNOTE: SOCIETAL IMPACTS OF EARTHQUAKES



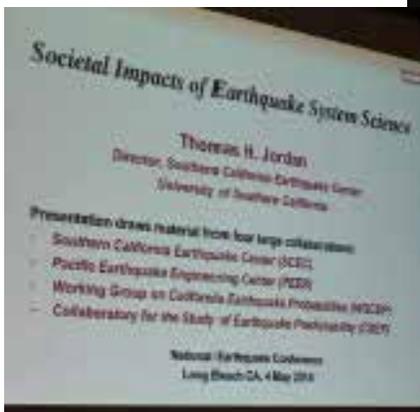
“It’s not a matter of if, but when a damaging earthquake strikes the U.S. The San Andreas Fault averages a large earthquake every 100 years and it’s been more than 300 years along some areas of the Fault. The springs on the San Andreas system have been wound very, very tight. And the southern San Andreas Fault, in particular, looks like it’s locked, loaded and ready to roll.”

Thomas H. Jordan
Director, Southern California Earthquake Center (SCEC)

Earthquake system science is defined as physical representations of active fault systems and emergent earthquake behaviors that have predictive capability. The fundamental problem with earthquake predictions is to provide information on earthquake behaviors useful to society. These behaviors include fault rupture, ground shaking, tsunami, liquefaction, landslide, and other secondary effects. Earthquake systems science allows evaluation of actions to lessen vulnerability and increase resilience to earthquakes.

Probabilistic Seismic Hazard Analysis including the Uniform California Earthquake Rupture Forecast (UCERF) and PEER Next Generation Attenuation (NGA) Project have provided a scientific basis for insurance rate reductions of 22.1% in 2006 and 12.5% in 2012 by the California Earthquake Authority. Earthquake system science has helped to reduce earthquake insurance cost by one third in California.

Watch Dr. Jordan’s presentation [here](#).



NATIONAL SEISMIC HAZARD MODEL



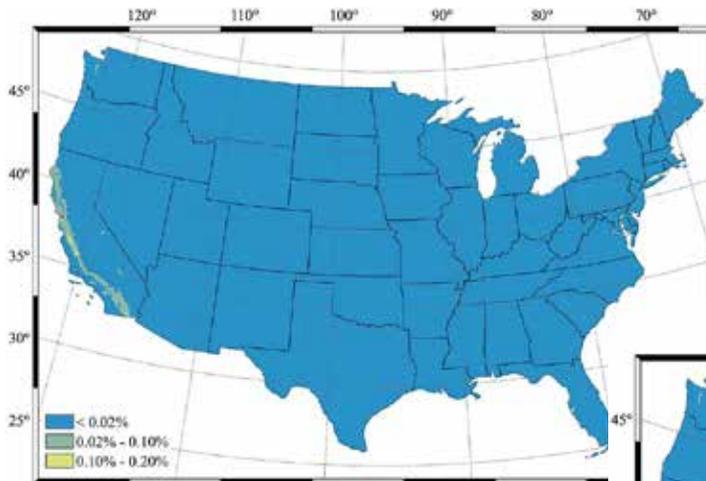
Nicolas Luco
Research Structural
Engineer, USGS

For the first-time ever in 2016, USGS has released a one-year seismic hazard forecast from induced and natural earthquakes.

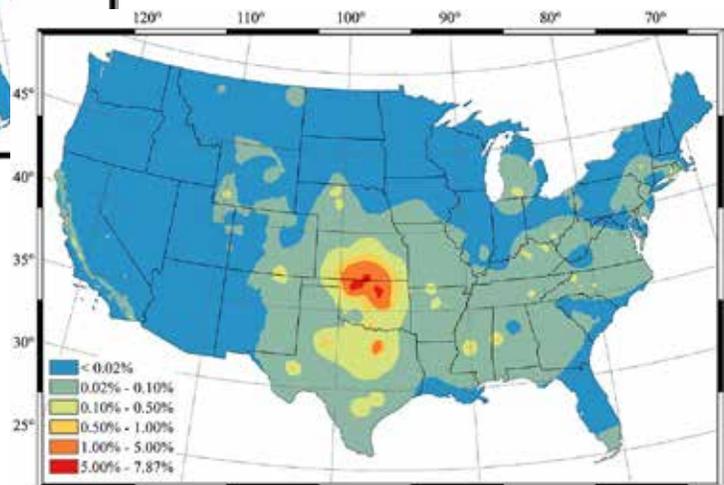
The maps will help shape building code policy. Items to be considered are:

- The potentially transient nature of induced seismicity relative to the 50-year or more lifespan of structures.
- The length of the current process of updating the seismic provisions in the building codes about the potential changes in induced seismicity.
- Who will incur the increased costs for designing against the induced seismicity hazard?
- The potential for a large magnitude induced earthquake.

View the full presentation [here](#).



**New Building Risk Without
Induced Seismicity**



**New Building Risk With
Induced Seismicity**

INDUCED SEISMICITY



Michael Blanpied
Associate Program Director
USGS



Zach Schmiesing
Thought Leadership Director
Verisk Analytics

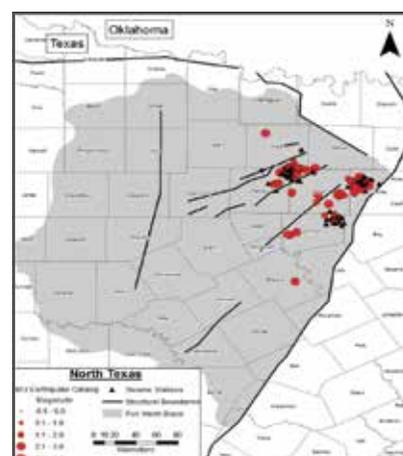
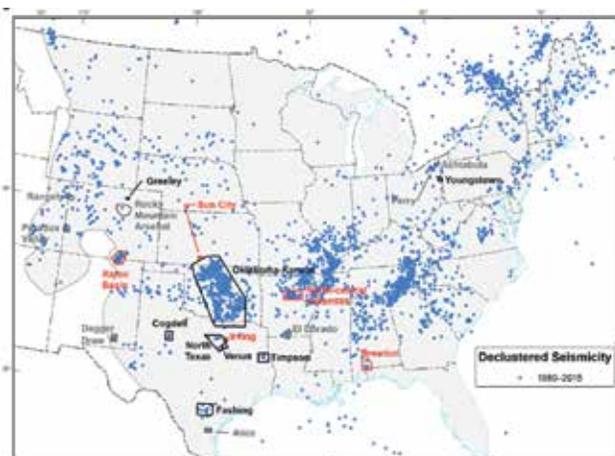


Jason Carriere
Emergency Management Coordinator
Irving Police

In the Central and Eastern U.S., the number of earthquakes has increased regardless of causation. Some areas now have risk similar to California. The one-year map released in 2016 will be updated in 2017. The issue of induced seismicity has many facets, considerations for building code changes and enforcement, political and financial prioritization of the hazard and impacts emergency management planning.

When scientific interpretation changes and building codes in place are not well enforced, damage increases. Communities must have adaptive ability to deal with political and financial implications as well as the ability to prioritize the hazard. Gaps identified were the need for education in impacted regions; best practices for identifying, prioritizing and responding to the hazard; concrete data on the accuracy of the epicenters; worst case scenarios; better understanding of the infrastructure and building risks due to induced seismicity; and identifying the cause.

View the full presentation [here](#).



EARTHQUAKE EARLY WARNING PROGRAM



Tina Curry

*Deputy Director for Planning, Preparedness and Prevention
California Governor's Office of Emergency Services (Cal OES)*



Doug Given

*Earthquake Early Warning Coordinator
USGS*

Earthquake Early Warning implementation, called *ShakeAlert*, is being led by USGS, Cal OES, California Geological Society, Caltech, UC Berkeley, University of Washington, University of Oregon, and the Moore Foundation. To date, 650 of the planned 1,600 stations in California and the Pacific Northwest are online.

The system, once operational, will allow people to move to safety (Drop, Cover, and Hold On) and provide mental preparation for the anticipated shaking. It will allow transportation to be safely slowed or stopped, sensitive medical procedures or surgeries to pause, and provide an operational picture before the shaking begins to take action before effecting infrastructure. The goal is to have limited public warnings by 2018.

Construction costs estimated for California are \$23 million, \$15.2 million for the Pacific Northwest, totaling \$38.3 million for the West Coast. Annual maintenance and operations cost are estimated at \$16.1 million.

View the full presentation [here](#).



**West Coast
ShakeAlert Stations**



OPERATIONAL EARTHQUAKE FORECASTING (OEF) AFTERSHOCK FORECASTING



Jeanne Hardebeck
Research Geophysicist
USGS



Nicholas van der Elst
Geophysicist
USGS

Aftershocks from earthquakes can be damaging and deadly, in fact, the Christchurch M6.2 was an aftershock. Forecasting these aftershocks can increase safety and resiliency. USGS will be issuing aftershock forecasts following all future significant U.S. earthquakes. The forecasts will cover a range of time frames. The new, more detailed advisory format will be a text advisory geared toward the public and include more quantitative information in a technical addendum. Even though very large aftershocks are almost always rare, even low probability events happen with certainty given enough opportunity.

Aftershock forecasts are similar to ShakeMap and damage assessments; they help in response, recovery, and preparation. We can improve our ability to prepare and respond by using epidemic-type aftershock forecasting and mapping aftershock hazard for situational awareness. In epidemic-type forecasts, all earthquakes (even aftershocks) temporarily raise the probability of more earthquakes. Big aftershocks “reset” the aftershock sequence. The aftershocks are comparable to new outbreaks in an epidemic – they change the hazard. Secondary aftershocks constitute about 20 percent of aftershocks worldwide – and 50 percent or more in California. The change in forecasting means that every earthquake (even aftershocks) now gets its own Omori’s Law applied. The change is a more accurate way to think about aftershock sequences but is more computationally intensive.

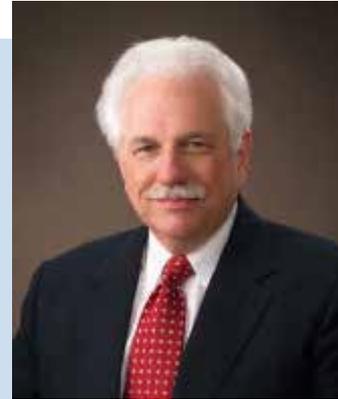
The epidemic model better captures the uncertainty related to the possibility of large aftershocks – more uncertainty, but fewer surprises. These epidemic-type forecasts that anticipate aftershocks of aftershocks will produce more accurate information with fewer surprises and be more like a weather forecast in that the numbers may change with new data. This type of forecasting also will be used in the future to produce aftershock hazard maps that will depict rapid assessment of hazard and aftershock “hot-spots.”

View the full presentation [here](#).

LESSONS FOR EMERGENCY MANAGERS FROM THE HAYWIRED M7.05 EARTHQUAKE SCENARIO



Keith Porter
*Professor, University of Colorado, Boulder
and Principal, SPA Risk, LLC*

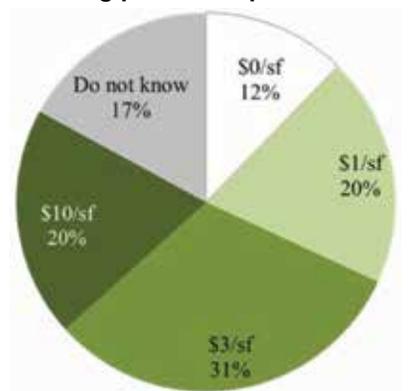


Charles Scawthorn
*Pacific Earthquake Engineering Research Center (PEER)
UC Berkeley and Principal, SPA Risk, LLC*

The Haywired M7 Earthquake Scenario, a project of USGS Science Application for Risk Reduction (SAFRR), engaged 227 agencies and organizations, including the private sector in a multi-fault, rupture scenario. This scenario also considered aftershock issues and recovery objectives. The scenario assumed a 23 percent building collapse rate with 2,000 people trapped in collapsed buildings and 25,000 people trapped in 5,000 stalled elevators. The study estimates that earthquake early warning combined with people reacting with the “Drop, Cover, and Hold On” safety maneuver could prevent up to 1,500 injuries saving \$300 million. The scenario conducted case studies of lifeline interaction including transportation, digital services, electricity, water, and gas. In the East Bay Municipal Utility District Case Study, there are 1.3 million people, 6,698 kilometers of pipe, and 390,000 services. Under the current circumstances, restoration of services would take an average of 40 days.

Implementation of the fuel plan in the scenario could lower the average restoration to 39 days providing a resilience benefit estimated at \$150 million. Replacing all the fragile pipe in the utility district would lower average repair time to 21 days resulting in a resilience benefit of \$6 billion. This study empowered lifeline operators to quantify the resilience benefits of renewing their infrastructure and to plan for better response. Also uncovered in the survey was the public’s willingness to pay more for resilient structures. In a survey, 20 percent said they would be willing to pay \$10 per square foot more, 31 percent said they would be willing to pay \$3 per square foot more, and 20 percent said they would be willing to pay \$1 more per square foot. A simple option for cities would be to adopt the 2015 International Building Code with the exception that where it refers to ASCE 7-10, all the values of ASCE 7-10 Table 1.5-2 are taken as 1.5.

What would you be willing to pay for occupiable or functional building post earthquake?



[View the full presentation here.](#)

A NEW SHAKEMAP SCENARIO COLLECTION FOR MITIGATION & RESPONSE PLANNING



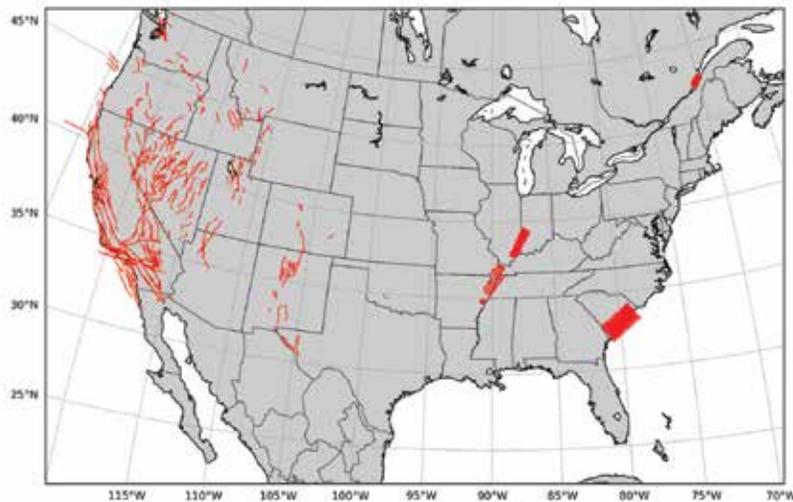
Eric Thompson
Civil Engineer
USGS



David Wald
Seismologist
USGS

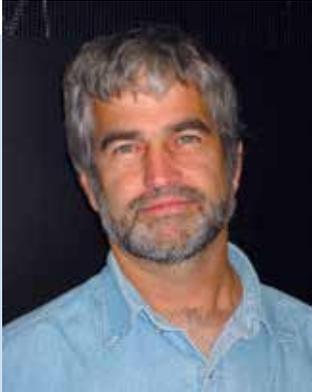
A scenario is a postulated sequence of development of events, a written plot, giving details of the individual scenes. A ShakeMap scenario is a scripted exercise that can describe any subset of the earthquake occurrence including shaking, losses, impacts, and response.

The technical aspects of the program include event selection, hazard calculation, documentation, and metadata. The idea is to develop a list of scenario catalogs. The current one being developed is the Building Seismic Safety Council (BSSC) 2014 catalog. This event set includes deterministic ruptures from the 2014 National Seismic Hazard Map. Outside of California, essentially all of the faults can be directly utilized as scenarios. Only a small subset of UCERF3 ruptures in California were included in the BSSC. The BSSC is seen as a good starting point. It can be used for the deterministic component of the hazard maps. However, it is not reproducible entirely and not representative of UCERF3 fault connectivity. The group will produce a UCERF3-based event set.



US Faults

FUTURE IMPROVEMENTS TO THE U.S. TSUNAMI WARNING SYSTEM/Tsunami PLAYBOOK



Paul Whitmore
Director, NOAA/NWS National
Tsunami Warning System



Kevin Miller
Tsunami Program Lead
Cal OES

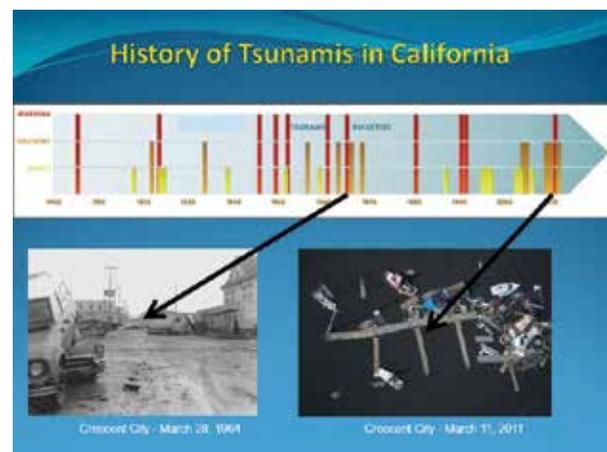
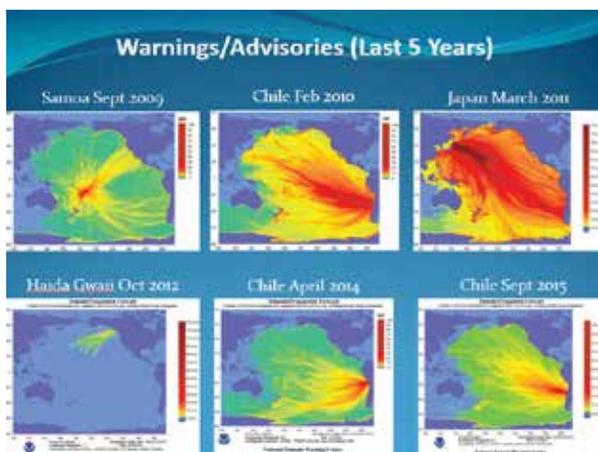


Rick Wilson
Senior Engineering Geologist
California Geological Survey

The U.S. Tsunami Warning System has undergone major change since the 2004 Indian Ocean Tsunami. The Tsunami Warning Centers data processing is broken down into two phases: Phase One consists of a quick seismic analysis and alert. Phase Two is the tsunami detection and forecast. There are potential future improvements for both phases to be made in the speed, accuracy, and content categories.

In Phase One, the speed for the warning product has plateaued to about three minutes on average. There is much room for improvements in the initial analysis of the particular tsunami source. The question about content is, “should it include forecast impact?”

In Phase Two, new sources of tsunami observations are needed to improve the speed of assimilation. At present, they are about 30 percent accurate. It is hard to determine inundation accuracy. The content on the tsunami detection and forecast contains inundation limits, currents, the entire coast, and is easy to understand.



LEVERAGING TOOLS AND NETAP RESOURCES TO REDUCE EARTHQUAKE RISK IN YOUR COMMUNITY



Brian Blake
*Program Coordinator
Central U.S. Earthquake
Consortium (CUSEC)*



Mike Griffin
*Principal
CCS Group*



Ayse Hortacsu
*Director of Projects
Applied Technology
Council (ATC)*



Mai Tong
*Physical Scientist
FEMA Building Science Branch*

The Missouri Seismic Safety Commission (MSSC) School Earthquake Safety Initiative helps to determine risk by identifying the areas in Missouri with the greatest seismic hazard, helps schools develop a mitigation plan, and takes action to retrofit. The MSSC project assessed school earthquake readiness in two Southeast Missouri school districts in 2013, three in 2015, and plans to continue in 2016 with 10 additional districts. The volunteer inspectors were trained to the FEMA P-154 Rapid Visual Screening of Buildings for Potential Earthquake Hazards criteria.

The preliminary findings for the 73 buildings in five school districts in Southeast Missouri reviewed (vintage range 1949 – 2008) were:

- Majority – older building stock with no seismic design attention or detailing
- Numerous additions throughout
- Masonry – predominate construction
- 19 percent screened out (post-1998 construction)
- Numerous nonstructural hazards identified
- Clearly evident is newer construction to the International Building Code seismic provisions provides enhanced seismic safety

New outreach materials were developed to promote the program to additional districts to encourage seismic safety and to kick-start the risk identification process for school districts.

Funding opportunities for mitigation also were offered through the Missouri State Emergency Management Agency small grant program, which provides \$10,000 for seismic safety improvements at schools, nonstructural component strengthening, and mitigation improvements. Project managers advised school officials of FEMA Mitigation Grant Programs, the use of capital improvement bonds and through school maintenance budgets to mitigate high-risk conditions, and how nonstructural component and content risks can be mitigated cost effectively.

SOUTH NAPA QUAKE: ONE YEAR LATER



Wendy Phillips
*Senior Program Specialist
FEMA*



Mike Mahoney
*Senior Geophysicist
FEMA*



Ken Hudnut
*Science Advisor for Risk
Reduction, USGS*



Tim Strack
*Chairman, California Seismic
Safety Commission*

A report of the Napa afterslip phenomena consolidated USGS field data and observations into actionable information unique to FEMA's concerns. The report included the afterslip in Browns Valley, shaking amplification information for downtown Napa, information on long-term fault hazards and information, and LiDAR imagery to support the Alquist-Priolo Earthquake Fault Zone Mapping.

The South Napa fault afterslip forecast issued by the USGS on December 4, 2014, has remained accurate and correct as of April 2016. Additional data has been acquired by USGS using FEMA support, and the afterslip is being monitored to continue to verify the accuracy of the forecast. Updates will be issued every two months throughout the project period, which was scheduled to conclude November 6, 2016.

What was unique about the South Napa afterslip was how fast and suddenly the fault "hit the brakes", unlike other earthquakes where the afterslip was of longer duration. Initially, the South Napa earthquake fault rupture was one of the fastest-creeping afterslip faults in the world, even faster than the creeping sections of California's San Andreas Fault and Taiwan's Chihshang Fault. However, within the first couple of months of 2015, South Napa had become a bit slower than both faults that move steadily at 1 and ½ inches per year due to low friction across the plate interface and relatively steady rates of tectonic motion. In other faults that are known to creep, such as the Hayward Fault, high rates of afterslip are expected in urban areas post-earthquake. Based on the experience from South Napa, afterslip can be disruptive and should be taken into account in exercise planning, such as Haywired, to prepare communities.

ADDRESSING RISKS FROM NATURAL HAZARDS IN SCHOOLS



Ayse Hortacsu
Director of Projects
ATC



Mike Mahoney
Senior Geophysicist
FEMA



Maggie Ortiz-Millan
Program Manager, Earthquake
Engineering Research Institute (EERI)

Schools are more than just another occupancy class, they hold an entire generation of our nation's population and the public expects schools to be safe. However, as government-controlled buildings, schools generally are older and of poorer construction than other classes of buildings. The U.S. can look to China and the effects of the damage from the Sichuan China earthquake to school buildings where many of the fatalities were the children. These children were in the thousands of school buildings that collapsed. There are two initiatives headed by EERI and ATC that focus on developing guidance and tools for safer schools.

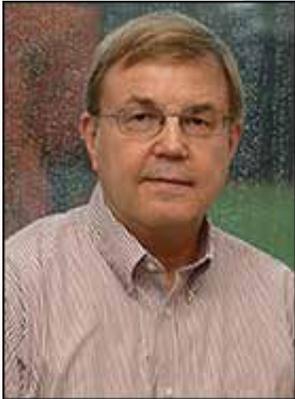
The School Earthquake Safety Initiative (SESI), headed by EERI, works to create and share knowledge and tools that enable progressive, informed decision making around school earthquake safety.

The ATC heads another initiative that seeks to address the seismic risk on schools. It is called the ATC-122 Project. This project was started to develop a School Safety Guide that provides operational policies and practices, as well as guidance for the physical protection of a school facility.



View the full presentation [here](#).

THE NEW EXECUTIVE ORDER FOR FEDERAL BUILDINGS



“The philosophy that the President provided in the opening remarks in the Executive Order referred to strengthening our national security and resilience to the earthquake threat and in doing that, he said that the Executive Order was intended to promote public safety, economic strength, and national security. I am very pleased that this last phrase was identical to the NEHRP Strategic Plan.”

Jack Hayes
NEHRP Director, National Institute of Standards and Technology (NIST)

The New Executive Order for Federal Buildings: Executive Order 13717, Establishing a Federal Earthquake Risk Management Standard, followed a lengthy study by the Mitigation Frameworks Leadership Group (MitFLG). This order strengthens national security and resilience for the earthquake hazard. The order will promote public safety, economic strength, and national security.

This new order recognizes that consensus codes and standards focus on life safety and encourages agencies to “go beyond” codes and standards requirements to achieve resilience. The new executive order puts basic requirements for new federal buildings, as well as existing buildings.

View the full presentation [here](#).

5/5

Executive Order 13717

Establishing a Federal Earthquake Risk Management Standard

- Other general provisions:
 - Implementation of EO is responsibility of each individual agency.
 - Agencies are free to require higher-than-code performance levels for any of their buildings.
 - Agency heads may exempt a building from the EO provisions if the head determines that the building is substantially related to an important law enforcement purpose or exemption is needed to address extraordinary circumstance related to national security or public safety (OMB Director must be notified).

 **national ~~earthquake~~ hazards reduction program**

PANEL: IMPROVING THE BUILT ENVIRONMENT



Bob Hanson
Professor Emeritus
University of Michigan



Mai Tong
Physical Scientist, FEMA
Building Science Branch



Nicolas Luco
Research Structural
Engineer, USGS



William T. Holmes
Structural Engineer
Rutherford + Chekene



Annie Kao
Field Engineer
Simpson Strong-Tie Co.

The ATC-58 Project funded by FEMA consists of two phases. The first step developed the framework and basic Performance-Assessment Engine, while the next step is developing the Design Criteria and Stakeholders Guide. The purpose of this program is to assist decision-makers to select appropriate performance objectives, assist design professionals to develop efficient performance-based designs, quantify the performance of typical code-conforming buildings, and provide guidance on the simplified design of buildings to achieve desired performance objectives. FEMA P-58 is a powerful new tool that allows assessment of the likely performance of individual buildings.

The 1971 M6.6 San Fernando earthquake killed 64 people and caused over \$550 million in damage. In 1977, Congress passed the National Earthquake Hazards Reduction Program (NEHRP) Act to reduce the risks to life and property from future earthquakes. NEHRP agencies started to support the development of code resource, and the last reauthorizations gave emphasis on implementation of hazard reduction. The 2015 NEHRP recommended provisions that made significant changes and updates, one of which is the use of the FEMA P-695 to determine component qualification and seismic systems.

The '97 ground motion map initially established a procedure for directly basing building-code design maps on USGS NSHM. Project '07 reassessed Project '97 procedures and introduced current "risk-targeted" maps. Project '17 is a collaboration of the Building Seismic Safety Council (BSSC), with funding from FEMA and USGS. It will propose new ground motion maps for, ultimately, the 2024 *International Building Code*.

Concrete buildings built to older code, generally before the 1976 Uniform Building Code, or pre-code buildings, are not reinforced correctly to allow realistic seismic deformations without significant damage and sometimes complete failure. These issues frequently result in a



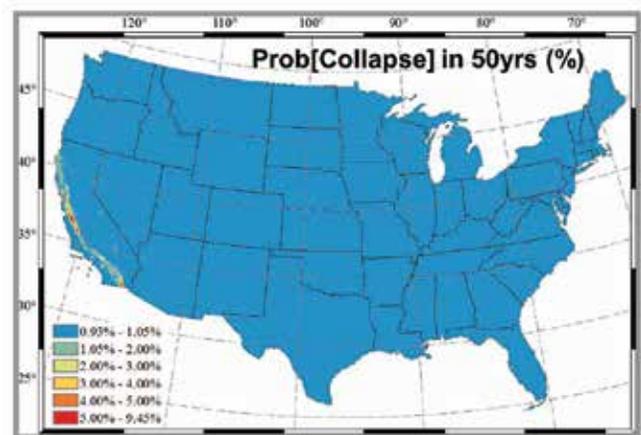
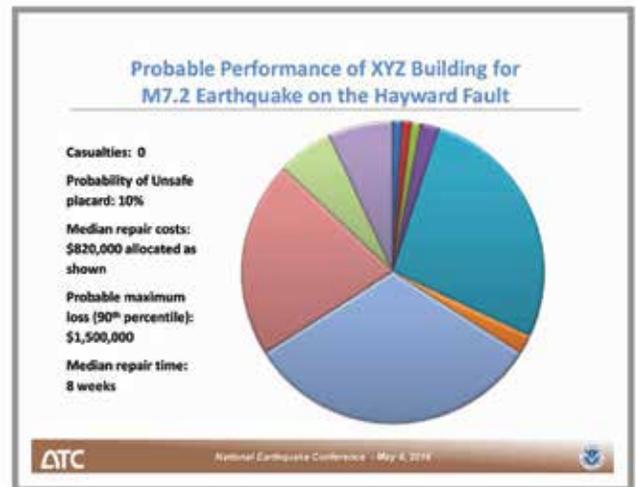
PANEL: (CONTINUED) IMPROVING THE BUILT ENVIRONMENT

story-wide collapse, causing a high casualty rate. With the support from EERI, PEER, and ATC, the Concrete Coalition was formed to advocate the identification and count of old concrete and the development of sensible solutions to reduce risks associated with these buildings. The objective of ATC-78 was to focus on the identification of structures with a high danger of collapse.

Engineers are always looking for easier and more economical solutions. Building experts estimate that in the San Francisco Bay Area and Los Angeles there are more than 46,000 unsafe buildings that require retrofit. Apartment and condominiums with parking or commercial space on the first floor are prone to collapse if the ground floor walls and columns are not strong enough to support the building during earthquakes. This type of construction is called soft or weak story construction.

In the 1989 Loma Prieta earthquake, six of the seven collapsed buildings were four-story corner apartments with first-floor parking. In the 1994 Northridge earthquake, 200 weak multiple story buildings suffered damage or collapsed. Simpson Strong-Tie developed an innovative, cost-effective way to brace these buildings with a strong frame connection intended to yield without breaking. The strong frame connection is bolted to the structures without welding, reducing costs and risk of fire.

Additionally, after an earthquake the damaged connection is replaced without replacing the entire moment frame. Other retrofit solutions include foundation anchor plates and post installed concrete anchors. Accredited agencies test all Simpson's code-listed products.



View the full presentation [here](#).

COMMUNICATION, EDUCATION, AND PARTNERSHIP

DAY 2



THE HUMAN STORY: NEW ZEALAND AND TAIWAN'S EXPERIENCE



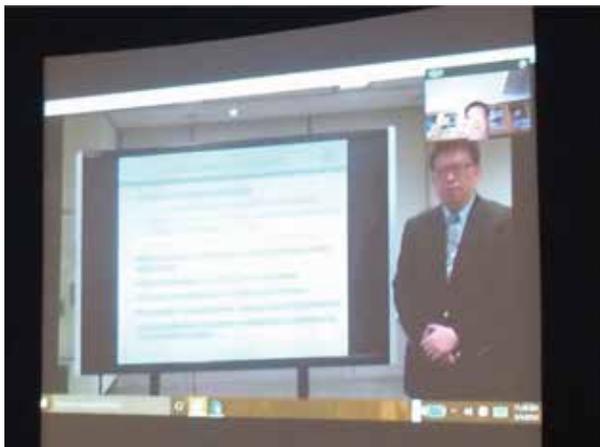
Mike Gillooly
Chief Resilience Officer, Christchurch,
New Zealand



Wei-Sen Li
Secretary General, National Science and
Technology Center for Disaster Reduction, Taiwan

The M6.4 earthquake that shook Taiwan on February 6, 2016, took 117 lives. One major building collapse took 115 of those lives. Building retrofits will reduce impacts and save lives. The Taiwan earthquake also revealed the need for better business continuity planning and enhancement of supply chains. This earthquake occurred just days before another M5.7 that struck Christchurch, New Zealand.

The Christchurch earthquake that took place in 2011 and the aftershocks that have continued revealed the need for better risk communication. Recovery has been very complicated with issues of land use and the rebuilding of infrastructure. A better understanding of risk—and increasing risk literacy on how to manage, reduce risk and transfer residual risk—is needed.



***@fema @Cal_OES** Taiwan's Dr. Li wants to find modern ways to locate people under rubble **#NEC2016** interview via SKYPE"*

*"The more [mitigation \$] you put in beforehand, the better off you'll be" - Mike Gillooly, **#infrastructure #ChCh #NZ #earthquake #NEC2016***

View the full presentation [here](#).

INTEGRATING ACCESS AND FUNCTIONAL NEEDS



Vance Taylor
Chief, Office of Access and
Functional Needs, Cal OES

Cal OES Vance Taylor “we can only integrate access and functional needs by working together” [#NEC2016](#) @ [quakesmart](#) @[FederalAlliance](#)

Access and Functional Needs refers to individuals with physical, programmatic, and communicational accessibility needs before, during, and after an emergency. In January of 2008, the California Governor’s Office of Emergency Services (Cal OES) established the Office of Access and Functional Needs (OAFN) to do just that and integrate the needs of those people into emergency management systems.

This office offers guidance to emergency managers and planners, and disability and older adult service systems for planning and responding during disasters and recovery. The agency has established that when dealing with people with access and functional needs, language matters. The history of lawsuits in these scenarios stems from inaction, making a sincere and consistent effort is a better approach, even if it isn’t perfect. The agency’s approach is expected to reduce the likelihood of legal action and make sure that the needs of this population are met.

[View the full presentation here.](#)



RESILIENCE THROUGH DESIGN



Patrick Otellini
*Chief Resilience Officer
City and County of
San Francisco*



David Bonowitz
*Structural Engineer
San Francisco*



Marissa Aho
*Chief Resilience Officer
City of Los Angeles*



Lucy Jones
*Scientist Emerita
USGS and Research
Associate, Caltech*



Leslie Chapman-Henderson
*President and CEO
Federal Alliance for
Safe Homes (FLASH)*

Resilient San Francisco was developed around four goals to address six key challenges that face San Francisco. Each goal contains a series of actions aimed at making progress on the goals.

These goals include:

- Plan and prepare for tomorrow.
- Advance innovations in earthquake preparedness.
- Invest in infrastructure and transportation for our growing city.
- Adapt San Francisco to climate change.

San Francisco has an abundance of soft story construction. Building codes changed in the late 1970s that no longer allowed this type of construction, but these kinds of dangerous buildings house approximately 15 percent of the total population. The city and county made tremendous progress retrofitting these homes to prepare for an earthquake. San Francisco has implemented a program to correct the remaining soft story structures throughout the city. There are 6,735 noticed buildings in the soft story program and 5,054 buildings subject to the ordinance.

There was also an ordinance passed for the mandatory evaluation of private schools in the city. The evaluations revealed that 33 percent of private schools were in buildings with characteristics that indicate they might perform poorly in future earthquakes as compared to 12 percent of public schools. A building façade maintenance ordinance also passed. The ordinance requires mitigation of unsafe conditions.

Resilience is about time. It's important to know your building stock and your community. Resilience often requires mandates to assign responsibility and provide authority. The usual mix of incentives and triggers are not enough. There is a new emphasis on safety plus recovery. Recovery time is the key metric for resilience.

RESILIENCE THROUGH DESIGN (CONTINUED)

The definition of urban disaster resilience is a society that functions after an earthquake. The economic repercussions of not being prepared are high. New Orleans lagged behind Nashville in economic growth by \$80 billion in 2005. By 2009, that number grew to \$105 billion in the wake of Hurricane Katrina.

The Los Angeles Retrofit Program didn't focus on potential casualties from an earthquake. It focused on living after an earthquake when there are uncomfortable economic repercussions. The program concentrated on getting beyond life safety to addressing economic and immediate occupancy goals. Considerations included water, fire, loss of housing, and commercial space. Fortification of the Los Angeles water system is important because 88 percent of the water comes from outside the city. The program also sought to increase understanding that life safety does not mean that buildings will be ready for immediate occupancy

The goals of the program focused on the following areas:

- Fortify our water system;
- Strengthen our buildings; and
- Enhance reliable telecommunications.

Resiliency is impossible without strong building codes. But how can we best make the case? Proven results in code development, adoption, and enforcement are not keeping pace. Many states (California, Florida, Virginia) are doing a commendable job. Some states are moving forward but slowly and with "volunteer" enforcement provisions.

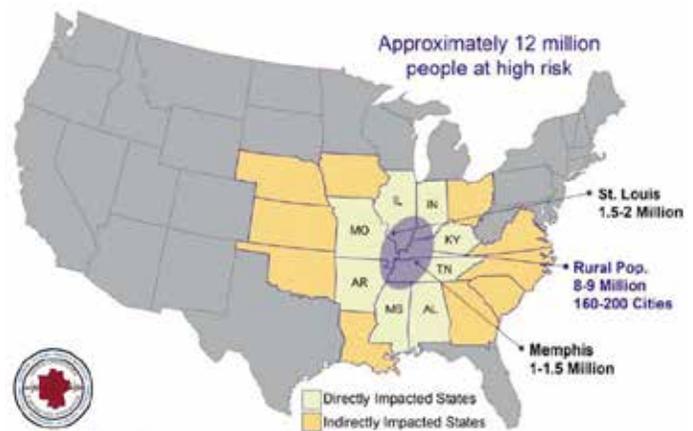


Figure 8: Modern-day population at risk in the New Madrid Seismic Zone

Many states and jurisdictions lack adequate enforcement. Some states are skipping code updates, including North Carolina and Minnesota, and Florida considered it in the last legislative session. There are strategic, subtle attempts to weaken the code and major seismic zones are in denial. In Memphis for example, approximately 12 million residents are at high risk. The case for seismic codes in Memphis is a strong one. There are considerations for life safety, economic vitality and development, interdependence, and the efficacy of the codes. Efforts to change the six-year banded requirement via statute were thwarted. The International Building Code is still intact. However, advocates remain concerned about the continuing, successful efforts to weaken the residential code. This trend also is leeching out to adjacent communities. FLASH will continue to drive awareness through DisasterSmart education to elected and appointed leaders.

It is important to formalize our public/private collaboration through corporate advocacy coalitions with subject matter expertise, develop a pilot effort to craft communications to bridge relevant areas of strength, and commit to seeing code adoption through to the finish line at the local level, or advocate for statewide codes.

[View the full presentation here.](#)

REDUCING RISK – THE ROLE INSURANCE PLAYS IN BUILDING RESILIENT COMMUNITIES



Glenn Pomeroy
CEO
California Earthquake
Authority (CEA)



Maiclaire Bolton
Senior Product Manager
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Laurie Johnson
Principal and Founder
Laurie Johnson Consulting

Half of the U.S. population in portions of 42 states are at risk of a damaging earthquake; 16 of which are at a very high risk. Standard homeowners or business insurance policies do not cover earthquakes. Coverage usually is only available as a separate policy. In 2015, 10 percent of U.S. homeowners had earthquake insurance, up from 7 percent in 2014 but below 13 percent in 2012. Of those who had insurance in 2012, 18 percent were in the Western U.S., 9 percent in the Northeast, 8 percent in the Midwest, 7 percent in the South, and 10 percent in California.

Only 15 percent of homeowners earning \$75,000 - \$100,000 annually had earthquake insurance in 2015, up from 6 percent in 2014. Only 8 percent of homeowners earning less than \$35,000 a year purchased earthquake insurance.

The insurance industry uses a probabilistic modeling system to determine the spectrum of risk for earthquakes in a given area. A model meant to provide a distribution of possible outcomes, meaning it describes all outcomes and provides some measure of how likely each is to occur. High-frequency events impact cash flow, whereas low-frequency events impact solvency. This analysis involves the evaluation of all possible loss-causing event occurrences, and their outcomes. These outcomes allow the cat model users to convert abstract hazard risk to probabilities associated with economic consequences – the same manner in which they address their other business risks.

Hurricane Katrina in 2005 left devastating impacts from flood and storm surge, totaling \$44 billion. Most of this damage was uninsured; 88 percent of it was in Louisiana. Large uninsured residential losses were due to inaccurate and outdated flood risk identification, variable penetration rates, and levee failures.

The Louisiana Road Home housing repair program provided more than \$10 billion in Community Development Block Grant (CDBG) funds. It took over one year to secure funding, another year to establish the program in the Office of Community Development and to launch and review applications. Actual repairs

REDUCING RISK – THE ROLE INSURANCE PLAYS IN BUILDING RESILIENT COMMUNITIES (CONTINUED)

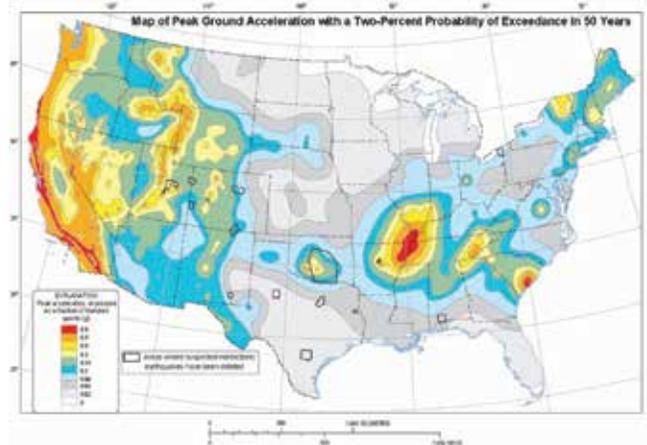
did not start until late in the second year and more in years three to four of recovery. 128,000 homeowners received more than \$8.5 billion of assistance (grants of up to \$150,000 of pre-storm value). More than 90 percent of homeowners repaired homes, but nearly 10,000 opted to sell their homes (almost half in New Orleans). A rental housing program provided more than \$150 million to repair 6,000 units and \$521 million to create 6,200 rental housing units. Eventually, Louisiana also received \$875 million in FEMA HMGP funds for home elevations/flood mitigation, but it came very late in the repair process.

Hurricane Sandy on October 30, 2012, impacted the Northeastern U.S. with significant uninsured flood losses due to outdated flood risk mapping. A Congressional appropriation of \$16 billion in CDBG-DR grants provided part of the \$50.5 billion disaster aid package to New Jersey, New York, New York City, Connecticut, Maryland, and Rhode Island.

In the Canterbury, New Zealand, earthquakes of 2010 – 2011, the government-backed residential earthquake insurance covered up to NZ\$100,000 for structural damage, up to NZ\$250,000 for content damage, and the costs to reinstate damaged residential land. Private insurers provided over-cap coverage. Thus, almost every household has a combination of government-backed and private market insurance. Private insurance companies offer commercial earthquake insurance. Homeowners were paid more than NZ\$9,155 billion to date. There were 167,020 properties with building damage claims (more than 425,000 actual claims due to repetitive damage), more than 187,000 contents claims, and more than 142,000 land damage claims.

What's likely to happen in a big U.S. earthquake disaster? More than likely, the government will issue a federal disaster declaration. State emergency management will work with FEMA to execute the Individual/Household Assistance, Public Assistance, and Hazard Mitigation Grant programs. Insurers will assist their clients with claims management. Under insurance, limits on coverage and lack of coverage, may ignite lawsuits and public/political pressure for state insurance commission intervention and reforms. A large uninsured loss likely would motivate Congressional appropriation of CDBG-DR funds leaving states and housing agencies to handle the details of payment/repair programs. To be better prepared for the next event, states could develop scenarios of potential disaster losses (insured and uninsured).

They can establish state-level working groups to understand post-earthquake recovery resource availability and gaps, promote the purchase of earthquake insurance, develop funding resources and programs for obvious gaps—uninsured homeowners, small rental market, small businesses—and ground-failure related land remediation.



View the full presentation [here](#).

EARTHQUAKE PROTECTIVE ACTION: GUIDANCE AND MESSAGING – TWEAKING THE MESSAGE



Mark Benthien
*Director for Communication, Education
and Outreach, SCEC and Executive
Director, Earthquake Country Alliance*



Jacqueline Snelling
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FEMA Individual and Community
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Kimberley Shoaf
*Preventive Medicine
Associate Professor, University
of Utah School of Medicine*

The words we use matter when it comes to the messaging for protective actions during any disaster. The question is, “how do we validate the steps we advise to the public?” The color-coded “stoplight” validation assessment identifies three levels of validation. When creating a clear statement of impact, you need to take into account what the primary causes of death or injuries are. In earthquakes, falling from shaking, individual movement, household and nonstructural debris, structural collapse, and post-event cleanup cause most injuries and deaths. The study, *Protective Actions for Earthquake*, was issued in 2015 validating protective actions such as “Drop, Cover, and Hold On”.

The study summary indicates that individuals must believe in personal impact from the risk, must believe they have personal responsibility for themselves and family because over half (51 percent) of Americans believe that help will arrive in less than



one hour. There is a need to believe that there are effective actions available. Individuals must have the confidence to take actions that will work. There must be community plans and solutions in place to address barriers, and community members must know and believe the time to act is now.

The study revealed:

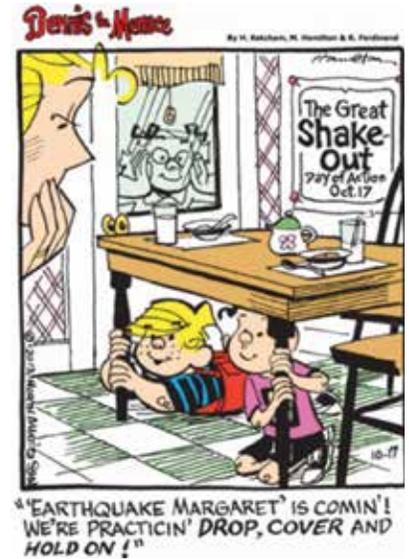
- Five out of eight people surveyed living in earthquake risk areas have taken steps to reduce potential flying and falling items in homes.
- Three out of eight have participated in a drill or exercise in the past year.
- Over half say that they know how to get real-time alerts and warnings.
- Almost two-thirds reported having enough supplies set aside for three days.

EARTHQUAKE PROTECTIVE ACTION: (CONTINUED) GUIDANCE AND MESSAGING – TWEAKING THE MESSAGE

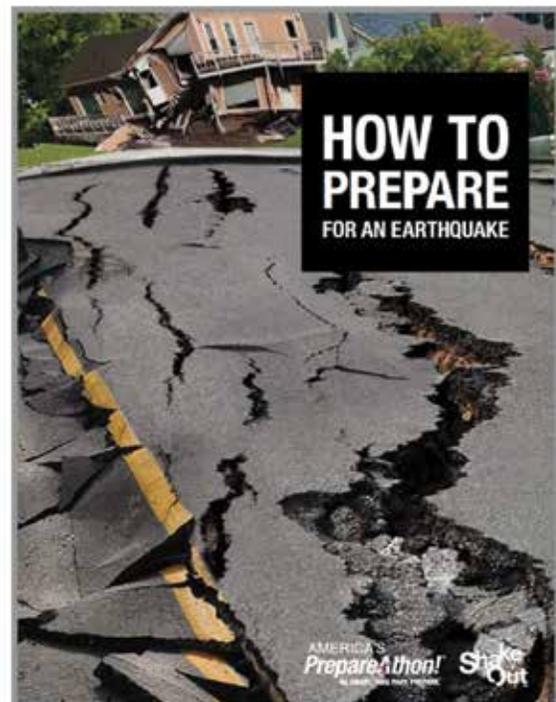
The ShakeOut messaging has evolved over the years from “Duck, Cover, and Hold” to “Drop, Cover, and Hold On”. Since the ShakeOut exercise in 2008, the messaging and imaging has gone global and even infiltrated pop culture in cartoons and television shows such as *Jimmy Kimmel Live*.

The ShakeOut Earthquake Drill has become a part of the *America’s PrepareAthon!* along with online registration of preparedness actions, events calendar, preparedness resources, and branding and promotional resources.

Different messaging was developed for the safety maneuver for different situations and for the access and functional needs community. Resources for international guidance developed by USAID and GeoHazards International in 2015, include the overarching messaging, wherever you go, look for the safest place you could reach within five seconds after the shaking starts. Regularly updated ShakeOut resources are available at www.shakout.org.



[View the full presentation here.](#)



COMMUNICATING WITH THE PUBLIC DURING AN EARTHQUAKE SEQUENCE



Anne Wein
Decision Scientist, USGS

*“Anne Wein of @USGS describes **#aftershock** risk communications challenges after the **#ChCh #NZ #earthquake** at **#NEC2016**”*

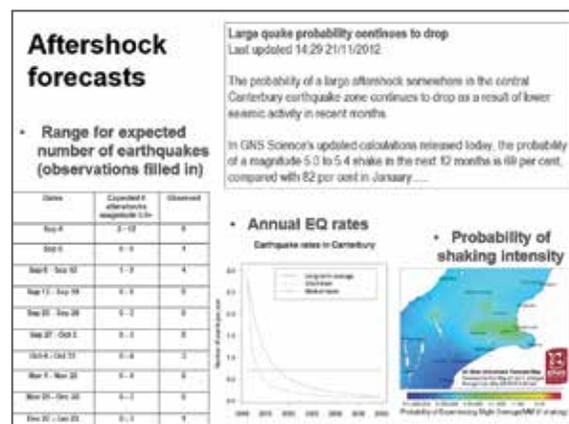
Effectively communicating the level of risk before, during, and after a disaster is complicated. When you are attempting to communicate with the public in the event of a disaster, there are two different audiences you are trying to reach—people who are quantitative-rational and those who are experiential-intuitive. Researchers used the 2011 Christchurch earthquake sequence in an aftershock information communication study. The study covered research questions about the need for, interpretations of, and responses to aftershock information.

Qualitative research revealed a range of experiences and opinions in the context of crisis/risk communications literature. There were semi-structured focus groups and interviews conducted in May 2013 about experience with the earthquake sequence, forecasts, and feedback was gathered on aftershock forecast products. The study participants (21 female, 34 male) came from diverse roles in the community including critical infrastructure, public and elected officials, communications, emergency response, emergency management, and science.

The study revealed probabilities in aftershock forecasting were not useful or ignored, misused, misinterpreted, and disliked by some. Psychological and psychosocial influences play a role in how individuals process information.

This includes:

- Psychological state;
- Different ways of dealing with anxiety;
- Risk normalization;
- Political influences; and
- Different ways of coping.



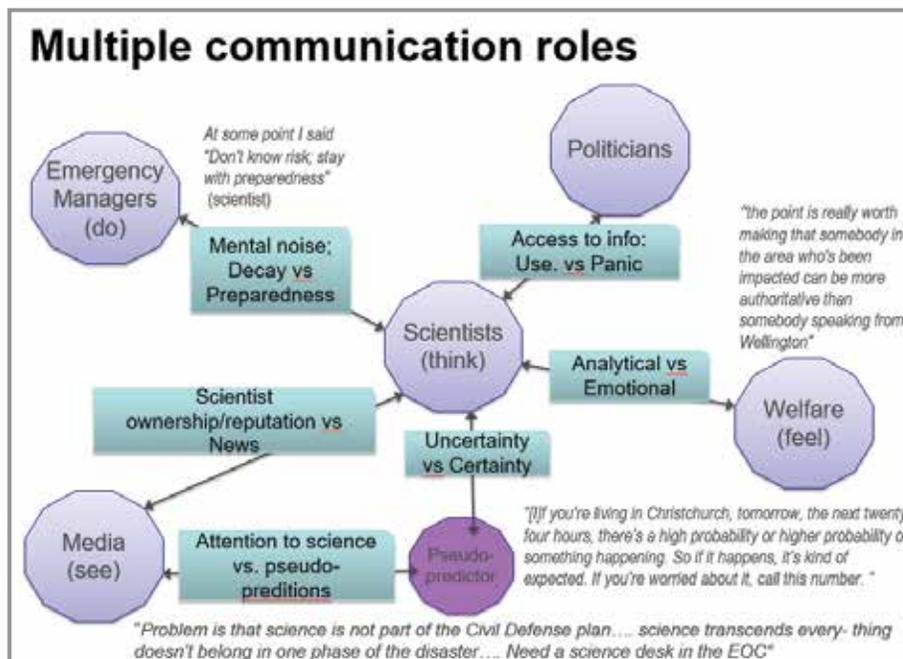
COMMUNICATING WITH THE PUBLIC DURING AN EARTHQUAKE SEQUENCE (CONTINUED)

Findings of the study concluded:

- Mental noise from stress limited people’s cognitive processing capacity of aftershock forecasts after a large earthquake, at the very time that the risk is greatest.
- Risk normalization occurs in survivors of a large earthquake reducing attention to aftershock forecasts.
- Different ways of coping polarize the need for scientific information by the public, with “monitors” actively seeking all available information and “blunters” appreciating minimal information.
- Some people understood or learned to appreciate the scientific process and limitations; for others, the uncertainty of deterministic pseudo-predictions for earthquakes was distracting.
- Concerns that aftershock forecasts may cause mass panic results in a potential for censoring or withholding aftershock forecasts.

The lessons learned will be used by science agencies to understand audience needs better, to develop crisis and risk communication products and processes, and evaluate communication strategies.

View the full presentation [here](#).



CLEARINGHOUSE: BUILDING SUPPORTIVE RELATIONSHIPS BETWEEN SCIENCE AND EMERGENCY RESPONSE



Anne Rosinski
Senior Engineering Geologist
California Geological Survey

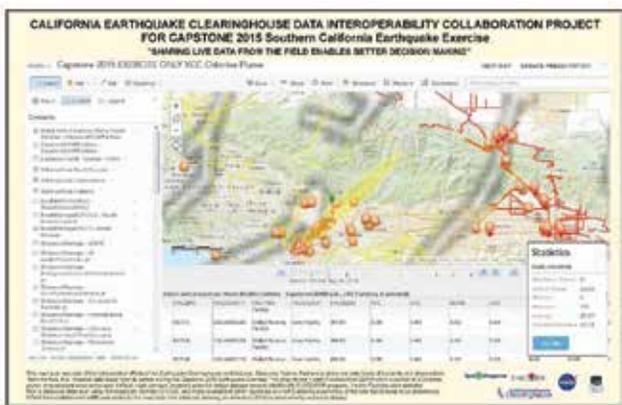


Maggie Ortiz-Millan
Program Manager
EERI

President Ronald Reagan, while serving as California's governor, called for the first clearinghouse after the 1971 San Fernando Earthquake. The idea of the clearinghouse is to share information, coordinate personnel, and communicate critical information to emergency responders. It creates coordination and collaboration between scientists and engineers, and state, federal, and local response managers.

This practice was successful in the 2014 Napa Earthquake by effectively coordinating field investigations with more than 100 visitors from 40 different organizations at the same physical location. Putting together a multi-agency, state-federal-private partnership to acquire airborne LiDAR in the areas critically affected by the earthquake, and having nightly briefings with researchers and emergency managers to communicate the situation as it was unfolding. The clearinghouse concept contributes to community resilience by keeping everyone informed on the latest updates of the disaster. This program can be applied to support any state or territory during any natural or man-made disaster.

View the full presentation [here](#).



EFFECTIVELY COMMUNICATING SEISMIC RISK



Michelle Kam-Biron
Past President
Structural Engineers Association
of Southern California



Victoria Wigle
Project Engineer
Thornton Tomasetti

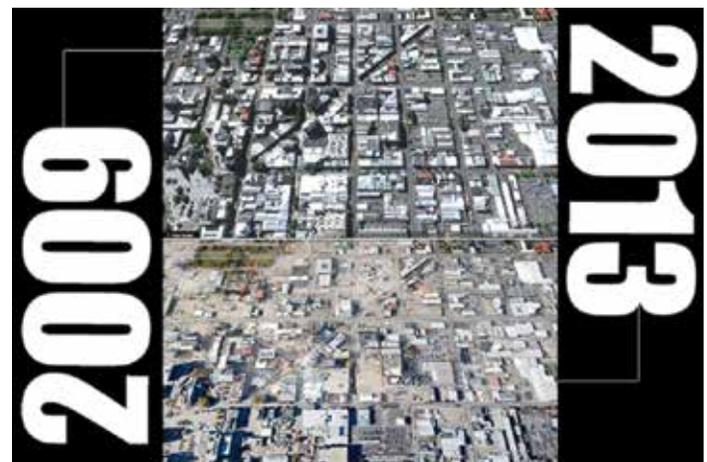


Ross Stein
CEO and Co-Founder
temblor.net

To communicate seismic risk, there needs to be a partnership with structural engineers. The economic repercussions of any natural disaster can be catastrophic. The estimated time for recovery after the 2011 Christchurch earthquake is 50 – 100 years, and requiring \$35 billion to do so. Structural engineers are a valuable resource when determining if you and your structure will survive after an earthquake. Engineers can answer a variety of questions from site soil conditions to the potential nonstructural damage in the building. There are various tools used to understand and communicate risk: a Probable Maximum Loss (PML) report, USRC Earthquake Building Rating System, and ASCE 41, Seismic Evaluation and Retrofit of Existing Buildings.

To establish effective client-engineer communication, you need to bring every piece of the industry together—communication experts, real estate investment and management companies, structural engineers, and vendors.

Temblor, a free app, provides the seismic hazard rank of your location, as well as the faults, quakes, landslides, and liquefaction zones around you. The app can assist homebuyers in evaluating the seismic risk for a particular property before purchasing a home.



NATIONAL SEISMIC HAZARD MAPS USABILITY STUDY WORKSHOP



Christina Zarcadoolas
Sociolinguist
The City University of New York (CUNY)
School of Public Health



Wendy Vaughn
Doctoral Student
CUNY School of Public Health

Emergency planners working closely with local officials can play a significant role in helping communities prepare for earthquakes, mitigate the risk, and foster greater resiliency. This interactive discussion provided examples of map usability, a presentation of the simplified map, and challenges of interpreting the map. The new version of the National Seismic Hazard Map (NSHM) designed for emergency managers, officials, and the public helps to more easily understand the risk.

One example of a usability study was The Harlem Study in August and September of 2006. It surveyed 178 residents of varying ages in response to the Manhattan Hurricane Evacuation Zones map.

The study found the following outcomes:

- 83 percent of less-educated participants could not correctly identify which evacuation zone they lived in.
- High school and higher educated participants were 9.4 times more likely to be able to correctly identify their zones.
- 83 percent of less-educated participants said they did not know how to get to the evacuation center closest to their home.
- Even before residents determined that the map was not clear and decipherable, 40 percent said they did not trust emergency directions from city officials.

A real-world usability study on the NSHM maps was conducted. The analysis of the map showed there were several problems with the maps usability. The main piece of information to remember when creating map for the public is to know your audience and to remember t you are not the user. Based on the study's findings, the new map is easier to read and it is easy to determine the function of the map without having prior knowledge.

SHAKECAST: AUTOMATED POST-EARTHQUAKE EVALUATION FOR CRITICAL FACILITIES



Kuo-Wan Lin
Development Geophysicist
USGS

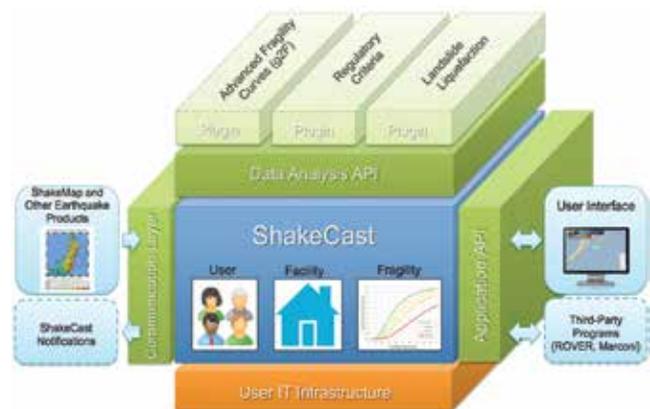
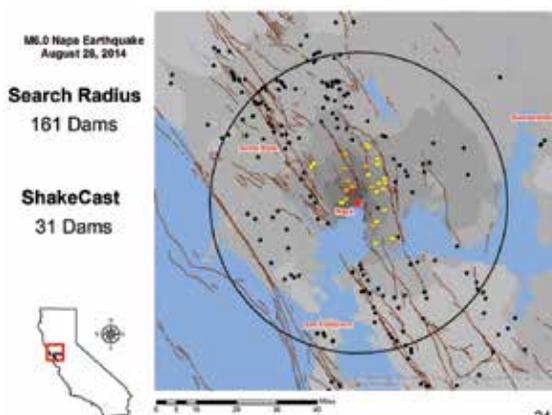


David Wald
Seismologist
USGS

Numerous critical facility, utility, business, and government agencies employ the USGS ShakeCast System. ShakeCast is an open-source USGS software. It automatically retrieves ShakeMap and compares shaking levels with unique facility fragilities. It generates web pages and hierarchical lists to map the likely impacted facilities, sends notifications to specified personnel and responders, and raises post-earthquake situational awareness by representing key information in the first minutes to hours following an event.

ShakeCast is intended for major utilities and companies, such as Caltrans, that have major exposure and need to prioritize response. ShakeCast runs entirely in the background, automatically downloading the ShakeMap, and computing the shaking and likelihood of damage at the users' facilities. It also sends out notifications to the users' response team.

*“Dave Wald of @USGS describes ShakeCast cloud workflow for rapid post **#earthquake #damage #assessment** at **#NEC2016**”*



INSPIRING CHANGE IN A DIGITAL WORLD



Jason Ballmann
Communication Specialist
SCEC



Kristin Hogan
Government Affairs Manager
San Francisco Department
of Emergency Management



Savannah Brehmer
Digital Media Manager
FEMA Region 10

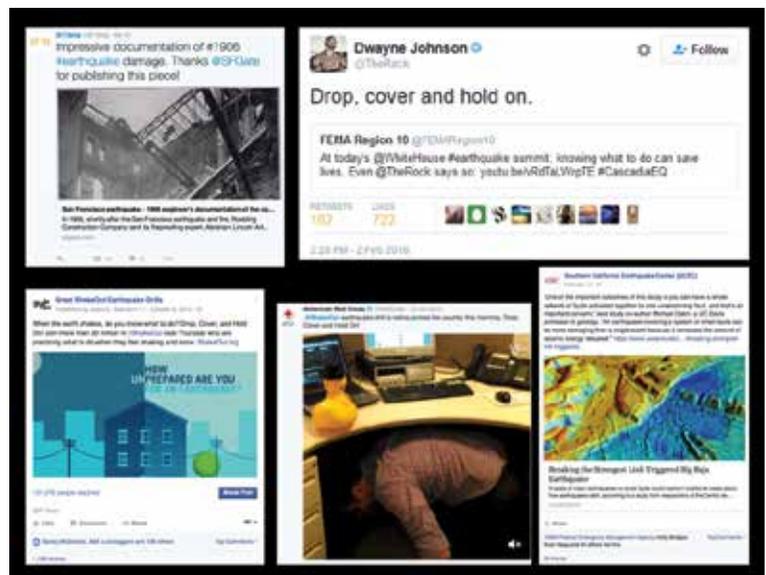


Jordan Scott
Social Engagement Specialist
American Red Cross

Using social media to communicate with the public before, during, and after disasters is important, but getting the message correct is essential. If local authorities don't speak, the public is likely to make up stories to fill the gap in information following events. The message must be credible, or the public will look elsewhere for information.

Effective social media messaging is about telling a story and painting a picture of what you want people to do to motivate them to action. More and more people depend on social media channels for news and communication.

Social media can be used for emergency and preparedness messaging, so the messaging is available where people communicate. New technologies such as virtual reality can be effective tools for promoting safety actions such as the "Drop, Cover, and Hold On" earthquake safety maneuver.



TAKING IT TO THE STREETS



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CEO
Pearce Global Partners



Mark Benthien
Director for Communication,
Educations and Outreach,
SCEC and Executive Director,
Earthquake Country Alliance



Tim Smail
SVP of Engineering and
Technical Services, FLASH



Janiele Maffei
Chief Mitigation Officer
CEA

The 2016 ShakeOut Day of Action was October 20. Events were held worldwide when millions of people practiced the earthquake safety maneuver to “Drop, Cover, and Hold On”. Supporters of the program include FEMA, CEA, NEHRP, Cal OES, CUSEC, NSF, and the USGS. The ShakeOut is a major activity of America’s PrepareAthon. The drill, based on the ShakeOut Scenario research study led by Dr. Lucy Jones with the USGS, involved more than 300 partners in 2008. The scenario based on an M7.8 earthquake on the San Andreas Fault was the basis of a comprehensive emergency management exercise organized by the state of California. The ShakeOut mission is, “Everyone, everywhere should know how to protect themselves during earthquakes.”

The goals for the program are:

- Encourage people worldwide to practice earthquake safety and register to participate at www.ShakeOut.org.
- Shift the culture about earthquakes and preparedness to inspire discussions about being prepared to survive and recover.
- Increase earthquake readiness at all levels to include the whole community: family, school, business, and government.

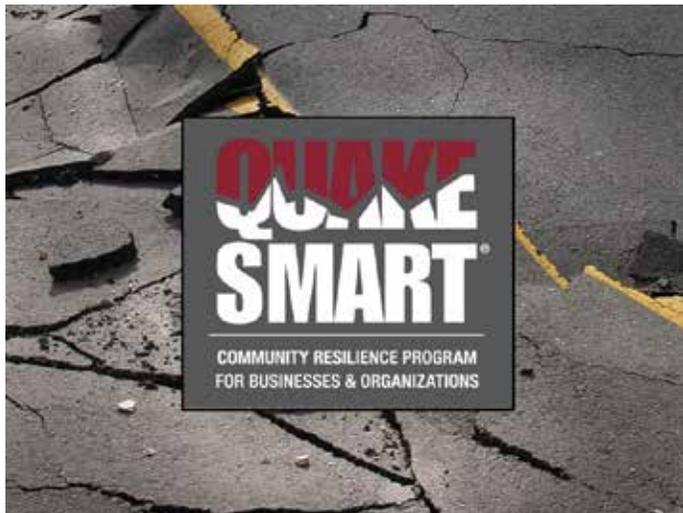
Participation in the drill has grown from 5.4 million in 2008 in the Southern California Great ShakeOut Earthquake Drill to more than 43 million worldwide in 2015. The ShakeOut also has implications such as earthquake early warning (EEW) to provide cues to take



TAKING IT TO THE STREETS (*CONTINUED*)

protective actions learned through participation in the drill. Registration for the ShakeOut and resources such as drill manuals, flyers and posters, and videos are available at www.shakout.org.

The QuakeSmart Community Resilience Program for Businesses and Organizations was created in 2013 to promote business continuity and mitigation among small, medium, and large businesses and organizations. Business preparedness is important to communities because immediately after a natural disaster 40 percent



of small businesses will not reopen and within three years, 75 percent of those without business continuity planning will fail. Small businesses account for 99 percent of all companies and employ 50 percent of all private-sector employees.

The parent document for the QuakeSmart Program is the FEMA QuakeSmart Toolkit (FEMA P-811) and the mitigation guidance included in the program is from the FEMA E-74 Reducing the Risk of Nonstructural Earthquake Damage Guide.

The program helps businesses and organizations follow a three-step process to identify risk, develop a plan, and take action to prepare and mitigate.

Components of the program include the Back-to-Business Self-Assessment to determine and prioritize the specific areas to address and mitigate risk. Project plans and cost assessment worksheets for STAFF, SPACE, SYSTEMS, STRUCTURE, and SERVICE determine the return on investment. The program directs businesses to the Disaster Resistant Business (DRB) Toolkit and FEMA resources for business continuity planning.

The program also contains a recognition component for organizations completing the program and submitting an application. Promotion and outreach for the program are through in-person workshops. More than 400 businesses have participated in nine workshops held across the country. Information about the program and upcoming workshops are available at www.quakesmartcommunity.org.

It's not *if* but *when* the next damaging earthquake will strike in California. Most Californians live within 30 miles of an active fault, and there is a 99 percent chance of an M6.7 or larger earthquake sometime in the next 30 years somewhere in the state.

In 1984, the legislature passed AB2865 requiring insurers to notify policyholders that their homeowner's policies do not cover earthquake peril. Insurers were required to offer earthquake insurance in writing and describe coverage, deductibles, and premiums. The insured had 30 days from the date of the mailing to accept the offer. In 1994, the Northridge earthquake caused \$20 billion of residential property damage.

TAKING IT TO THE STREETS (*CONTINUED*)

Most companies writing earthquake insurance left the state. The state in 1966 created the California Earthquake Authority (CEA) as a publically managed, privately financed, nonprofit insurer to provide earthquake insurance. The Loss Mitigation Fund was included in the 1996 CEA statute and is funded by 5 percent (up to \$5 million) of investment income annually. The fund is intended for all Californians and grew to \$25 million in 2010.

The CEA strategic plan is to educate (what is the earthquake risk), mitigate (how to reduce risk), and insure (how to protect families financially). California has more than 1.2 million cripple-wall houses vulnerable to collapse from earthquake shaking. CEA implemented a mitigation program for these homes following the ATC-110 prescriptive retrofit plans and provided financial incentives and insurance discounts for retrofits.

The Loss Mitigation Fund provided \$3 million for the program, the California Residential Mitigation Program (CRMP) for all Californians and the CEA Risk Reduction Program (RRP) for CEA policyholders. The first CRMP reimbursed up to \$3,000 to qualifying homes for seismic retrofits. The 2016 program covers 18 cities and more than 100 ZIP codes. Funding for the CRMP includes \$1.8 million from the CEA Loss Mitigation Fund, \$300,000 from the FEMA Hazard Mitigation Grant Program, and \$3 million from the State of California budget. The RRP funding is \$12 million.

Insurance companies in California must offer CEA earthquake insurance. The premiums are calculated on replacement costs, not on the estimated value of the home. The CEA product offers a separate content deductible, a five to 25 percent deductible, and up to 20 percent hazard reduction discount.

View the full presentation [here](#).



For more information on the Earthquake Brace + Bolt Program please visit or contact us at EarthquakeBraceBolt.com.

IMPLEMENTATION AND POLICY

DAY 3



WELCOME AND KEYNOTE PRESENTATION



Mark Ghilarducci
Director, California Governor's
Office of Emergency Services

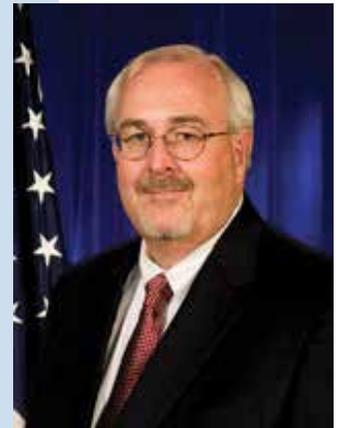
Director Ghilarducci welcomed attendees to the Friday sessions and spoke about the worldwide impact of a major California earthquake. Each earthquake should teach communities to build stronger buildings, but there is more work to be done. Director Ghilarducci said, "It's time for a national strategy," to address earthquake resilience.

FEMA Administrator Craig Fugate shared concerns about the failure of communities to enact tough building codes in pursuit of keeping building costs low leaving homeowners with greater losses in the event of an earthquake or another disaster. Fugate charged the attendees with figuring out how to change the language, it's not all about affordability, do not build homes that are not insurable. Fugate said, "We have to stop subsidizing risk below the point that it benefits society." Personal responsibility and preparedness are keys to a more resilient future. If communities plan for what they can handle rather than what could happen, then that's where we fail. Unfortunately, it takes a fairly significant



event to change behavior; but change of behavior needs to occur before the event.

The maximum FEMA payout for individual disaster assistance is \$33,000. The average payout from the Napa earthquake was \$5,000. These amounts are not enough to replace personal belongings or cover loss of use after a damaging earthquake. Good policy equals sustainability.



Craig Fugate
Former Administrator,
FEMA

View the full presentation [here.](#)

PANEL: BUILDING COALITIONS TO BREAK DOWN OBSTACLES



David Eisenman
Professor in Residence
David Geffen School of Medicine, UCLA



John Bwarie
Founding Partner
Stratiscope



Charles K. Huyck
Executive Vice President
ImageCat

What does it take to make a coalition? There must be a fundamental driver that brings people together to move the agenda forward and to tap into emotions around the issue at hand. For our purpose, the topic is community resilience and communities, and emergency managers are asking the same “how to” questions.

The Los Angeles County Community Disaster Resilience Project (LACCDRC) partners include the County of Los Angeles Public Health Department, Los Angeles Office of Emergency Management, Centers for Disease Control, Community Partners, Voluntary Organizations Active in Disasters Emergency Network for Los Angeles, Robert Wood Johnson Foundation, Rand Corporation, UCLA Center for Health Services and Society, and the USGS.

The LACCDRC is a collaborative effort that aims to promote community resilience in the face of public health emergencies, such as pandemics and disasters. Wellness, access, education, engagement, self-sufficiency, partnership, quality, and efficiency are a part of community resilience. LACCDRC focused on four levers:

1. Partnership – community and governmental organizations across diverse sectors identify shared strategies and resources for response and recovery; organizations integrate resilience into routine activities.
2. Engagement – broad inclusiveness, planning with, not for access and functional needs; building social connections; and cohesion in a neighborhood.
3. Education – informed about preparedness, community resources, vulnerabilities, and the connection between community well being and resilience.
4. Self-sufficiency – ensuring a sense of personal responsibility, neighbor-to-neighbor reliance, coping skills, ties to community organizations, and linking civic activities with preparedness and recovery.

PANEL: (CONTINUED)

BUILDING COALITIONS TO BREAK DOWN OBSTACLES

The group took a community resilience approach rather than a traditional preparedness approach that relies on individual actions and first responders. The group developed eight resilience communities across Los Angeles over a multi-year timeline. Researchers identified eight preparedness communities. Tactics included the development of a resilience toolkit. Facilitated discussions were held contrasting community resilience with traditional preparedness. The LACCDR reached 18,098 Angelinos with 144 resilience activities. It also reached 20,175 with 141 preparedness activities for a total of 38,599 people reached.



Preliminary results found increased numbers in the following actions or beliefs:

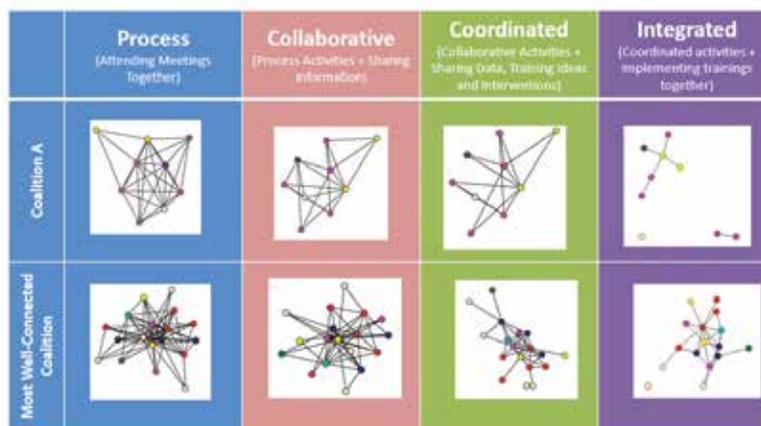
- Talked with a neighbor about preparing for disaster or emergency (39 percent vs. 35 percent).
- The belief that planning with neighbors for disasters is important (23 percent vs. 17 percent).
- Recall messages reminding that emergencies happen (74 percent vs. 65 percent).

Risk is poorly understood, so enabling a spiral of optimism and action to develop tools to effectively communicate risk online and to harness communities as sensors can be helpful.

Other programs to employ are Hazus: FEMA's preeminent loss estimation software, CSN – Community Stakeholder Network, and Inlet: Internet-based Loss Estimation Tool. Communities can be harnessed as sensors through the use of mobile phones as a sensing device. Other examples of community sensors are the USGS: Did you feel it? and USGS: ShakeMaps. Other sensors are open social media channels and crowd sourcing.

View the full presentation [here](#).

Coalition variation



DEVELOPING A STRATEGY FOR MOVING RESILIENCY FORWARD – REAUTHORIZATION OF THE NATIONAL EARTHQUAKE HAZARDS REDUCTION ACT



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Disasters are often focusing events for agenda setting and policy making. Key seismic provisions for building codes, infrastructure standards, and public policy occur in the wake of major earthquakes. However, it has been more than 20 years since a major damaging earthquake has struck in the U.S. resulting waning interest and support for NEHRP.

While other natural disasters and national priorities have necessitated attention and competition for limited resources, the question is “what can we do to enhance our advocacy for earthquake hazard reduction policy and funding, especially at the national level”? Priorities identified were the reauthorization of the National Earthquake Hazards Reduction Program and the National Science Foundation. The NEMA subcommittee on earthquakes is working to synchronize emergency management and frame issues with outreach to federal partners.

The goal is to elevate the National Earthquake Program at the federal level as funding NEHRP will support meaningful work.

The earthquakes and tectonics will not stop. Oklahoma now has more seismicity than California. The U.S. may be in for a wake-up call on the Eastern seaboard as well. Funding for earthquake early warning, ShakeMap, better instrumentation, National Seismic Hazard Maps, and Urban Seismic Hazard Maps based on local geology and topography are needed. Currently, demand exceeds the capability of the USGS. The U.S. must face these challenges and build a national strategy to deal with the threat.

View the full presentation [here](#).

EARTHQUAKE RESILIENCE: FULFILLING OUR ROLE IN CREATING AN EARTHQUAKE RESILIENT FUTURE



Leslie Chapman-Henderson
President and CEO, (FLASH)

As the conference concluded on May 6, the wrap-up thoughts and call to action included:

- **Coordination:** Leverage existing assets and programs showcased at the NEC. Many of these assets and programs are little known outside the conference.
- **Innovation:** Be open to new ideas, new programs, even if there doesn't seem to be time or needed resources, and foster innovation.
- **Stakeholders:** Need passion, perseverance, and grit to get everyone onboard with a new national strategy.

As the 2016 NEC came to a close, the work and the opportunities revealed at the conference continue. Through additional support from FEMA and NEHRP, the National Earthquake Resiliency Coalition will continue to work toward a more earthquake-resilient future. NEC presentations and findings are available in a public YouTube channel, [Earthquake Community](#), and along with a bi-monthly newsletter highlighting earthquake research, programs, and initiatives for the NEC stakeholders.

There is much more work to be done to increase safety and resiliency across the U.S, and we have a responsibility and an obligation to get involved, to educate, and to advocate in our communities.

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