



Los Angeles Resilience By Design



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Resilience by Design

Towards More Resilient Cities
3rd UC Lifelines Week
Critical Infrastructure and Urban Resilience
April 21, 2015

<http://www.lamayor.org/earthquake>

Presentation Scope and Content

Los Angeles

- What we are doing
- Where we are going
- How we got here



Roma Resiliente Key Questions

- Evaluating exposure and vulnerability
- Critical Assets and Infrastructure – and their selection
- Challenges for urban resilience oriented governance
- Best strategies for mapping infrastructure, collecting and sharing data



ROMA CAPITALE

Resilience by Design

- Mayor Garcetti
- Dr. Lucy Jones, USGS
 - Mayor's Science Advisor for Seismic Safety
- Address vulnerabilities in
 - Old buildings
 - Water System
 - Telecommunications
- Announced December 8, 2014





Resilience by Design

Lucy Jones


**Mayor's Science Advisor for
Seismic Safety
City of Los Angeles**

**Science Advisor for Risk
Reduction
US Geological Survey**

Develop Resilience in Los Angeles

- LA is at risk to numerous extreme events, several periodically strike
 - Earthquake
 - Fire (urban and wild land - interface)
 - Flood
 - Landslides and debris flow
 - Climate change effects
 - Drought
 - Tsunami
 - Extreme heat
 - Infectious Disease and Pandemic
 - Hazardous material Incidents
 - Security threats
 - Even volcanic hazards (for water supply in N. California)
- Cascading and multihazard events
- Local and regional strikes
- For regional events, LA City must help lead resilience development for the greater Megacity area
 - “We are all in this together”

Start with Seismic Resilience

- Start with known widespread risk – Regional Earthquakes
- Address issues improving multihazard resilience
- Integrate sustainability, multiple hazards, address infrastructure issues (deterioration, renewal, improvement), system dependency relationships
- **Integration highlights**
- Develop resilience culture through education, involvement, messaging, etc.
- Focus on maintaining economy and population security
 - After a major event, we want to maintain an LA as we know it!
- Long-term view, develop program to include other hazards over time

Resilience through a Seismic Lens

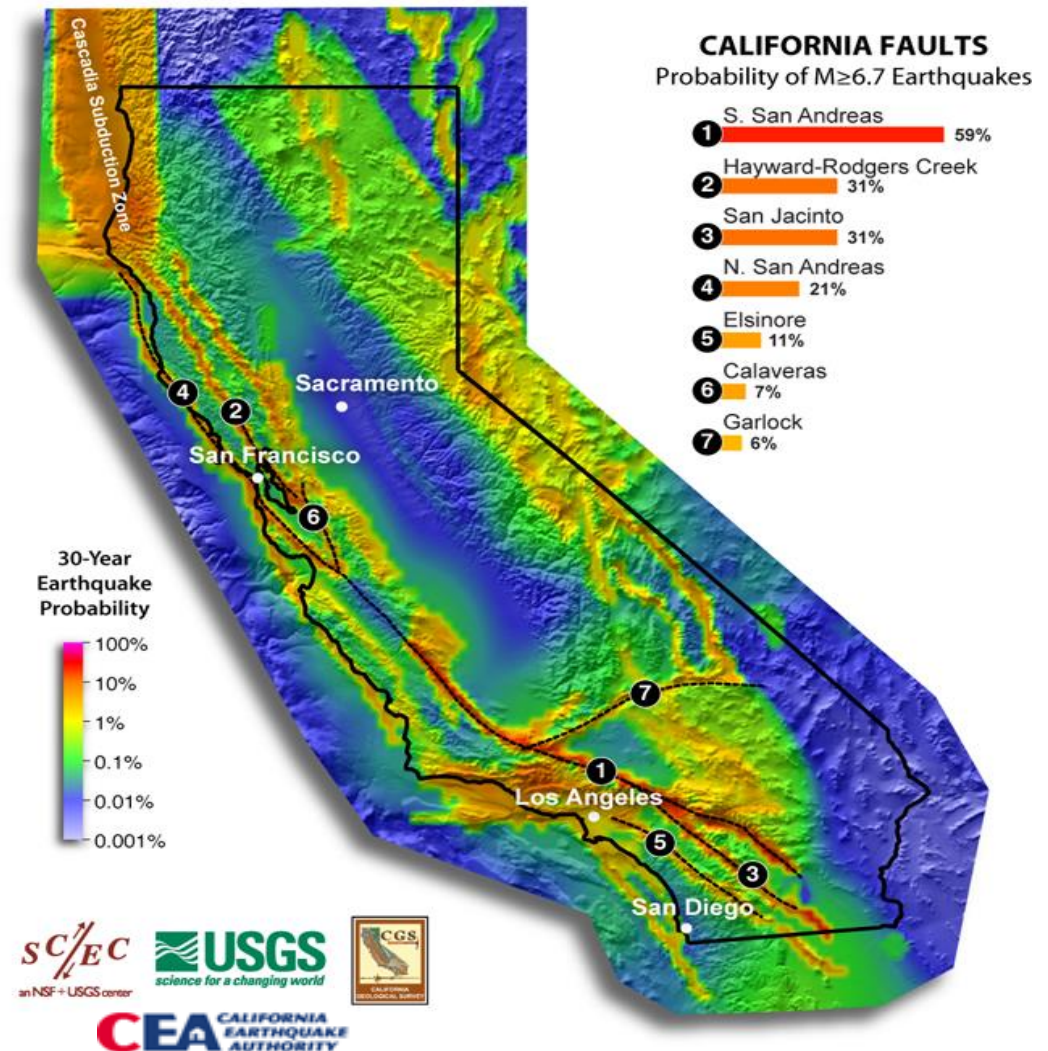
- Initiate Resilience activities through a seismic lens
- Seismic risk in Los Angeles is an obvious springboard
 - Helps improve risks from other hazards
 - Helps move toward a more resilient city
- Choose activities critical to resilience regardless of the hazard
- Do as much as possible with limited resources
- Use earthquakes as a way to initiate and move forward

Known Regional Threat – San Andreas Fault

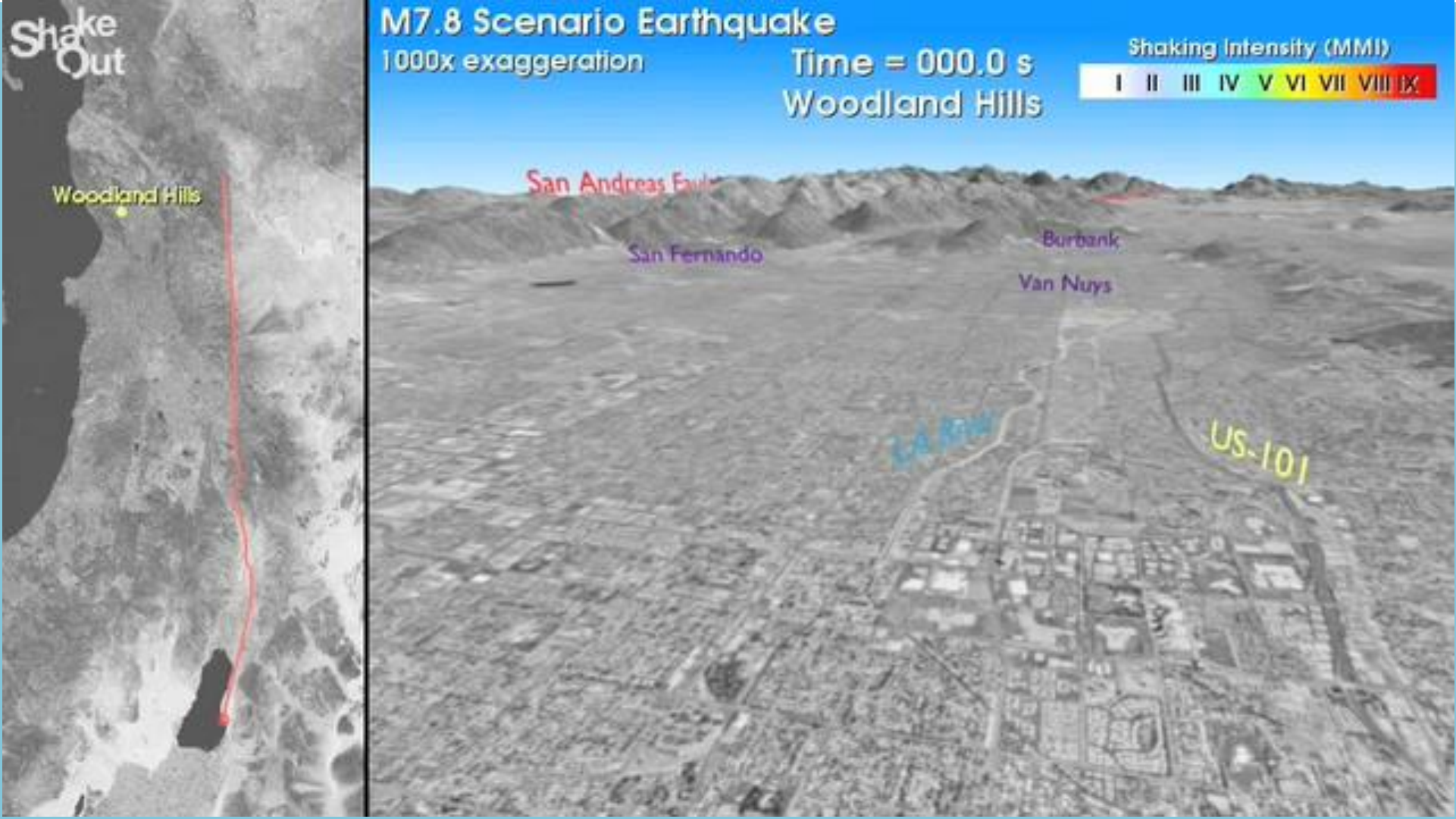
Hundreds of faults

San Andreas is longest
and fastest

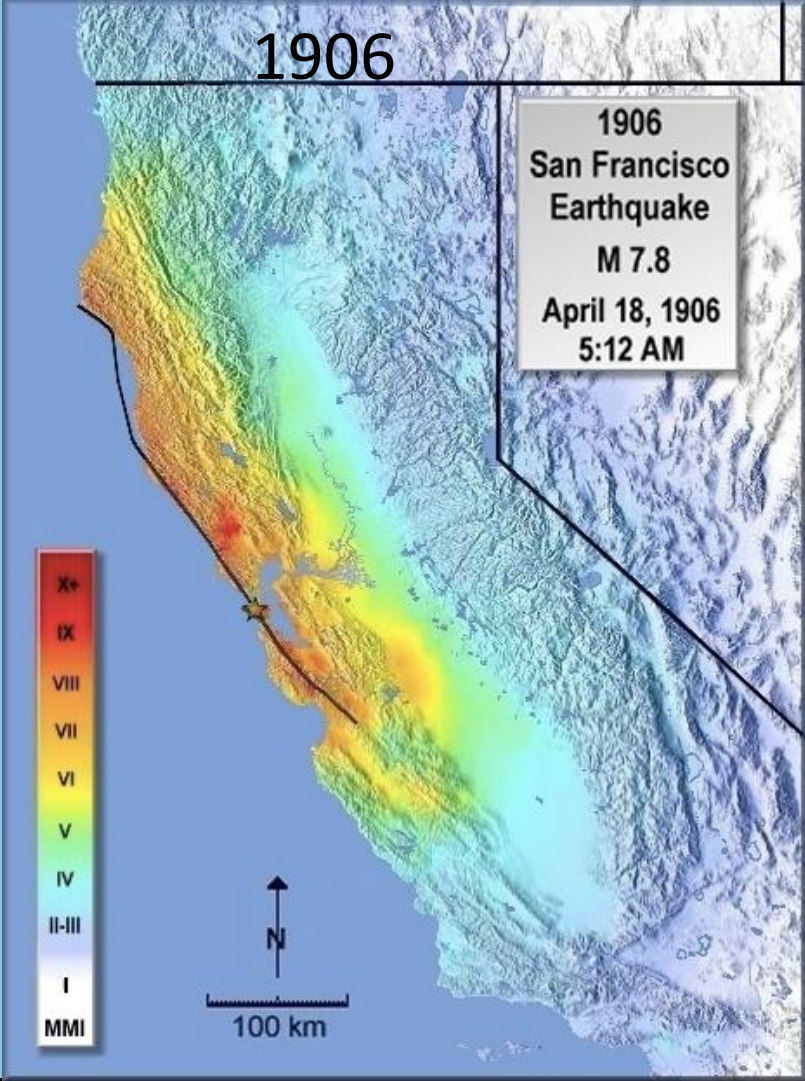
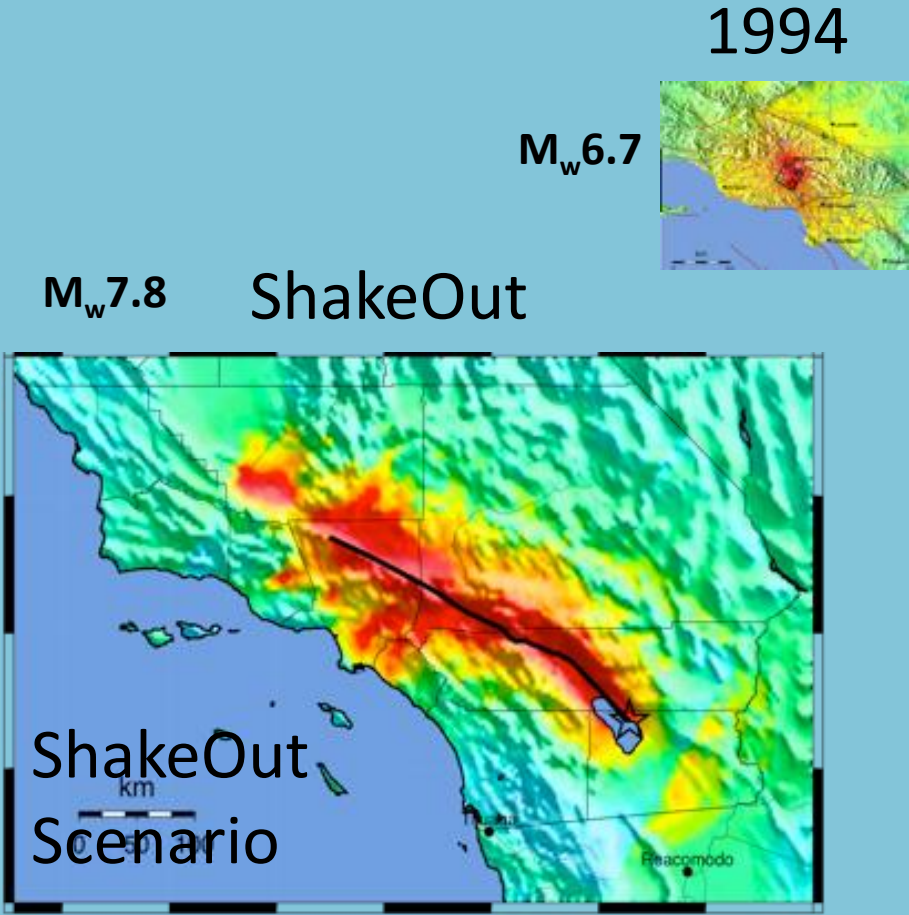
2008 ShakeOut
Scenario on Southern
San Andreas Fault



THE SHAKEOUT SCENARIO



NORTHRIDGE VS SAN ANDREAS EARTHQUAKES



Identifying the Critical Infrastructure Based on the ShakeOut Scenario:

Widespread Strong Ground Shaking
+Shaking of Long Duration + Landslides =

300,000 buildings significantly damaged – 1 in 16

255,000 displaced persons – 1 in 60

53,000 injuries

1,800 deaths

Up to 6 months without water

Fires double the losses

Business disruption doubles the losses

\$213 billion damages

BUILDINGS

WATER

COMMUNICATIONS

OUR URBAN SOCIETY IS AT RISK

Goals:

- Protect lives during the earthquake
- Improve the City's ability to respond
- Improve the City's capacity for recovery

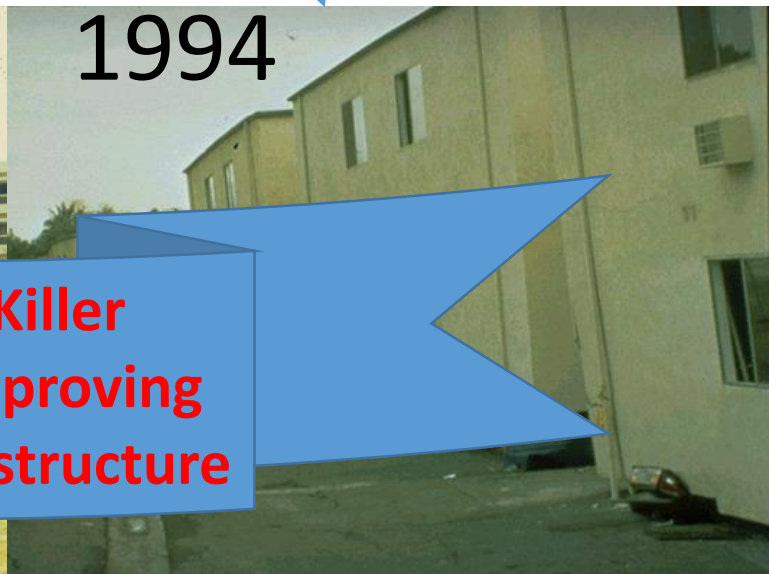
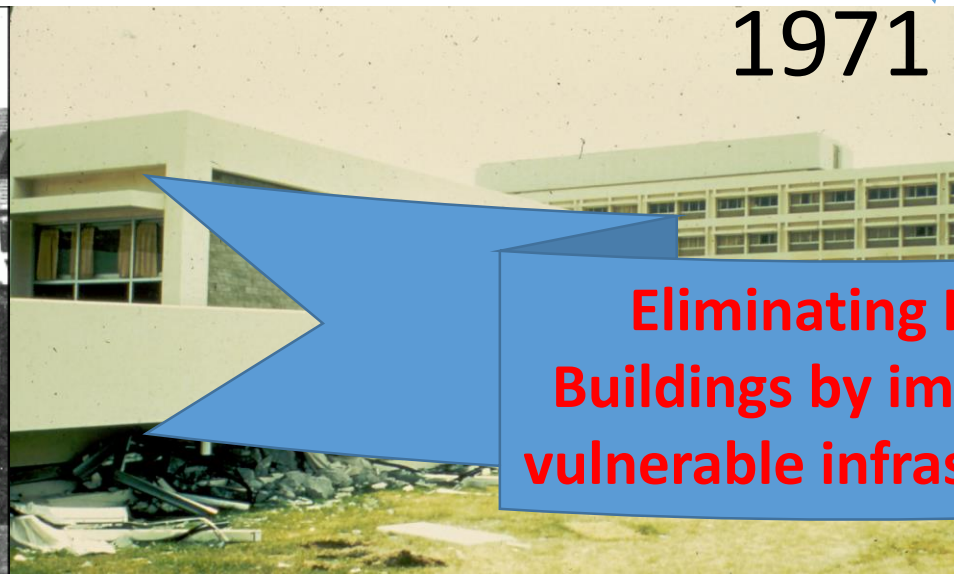
URBAN DISASTER RESILIENCE IS A SOCIETY THAT
FUNCTIONS AFTER THE DISASTER

BRING IN CITY CONSTITUENTS

- Mayor's Technical Task Force
 - Engineers from SEAOSC, Concrete Coalition, Tall Building Council, DBS
- LADWP Water Task Force
 - DWP design team
- Telecommunications Task Force
 - Four major cellular service providers

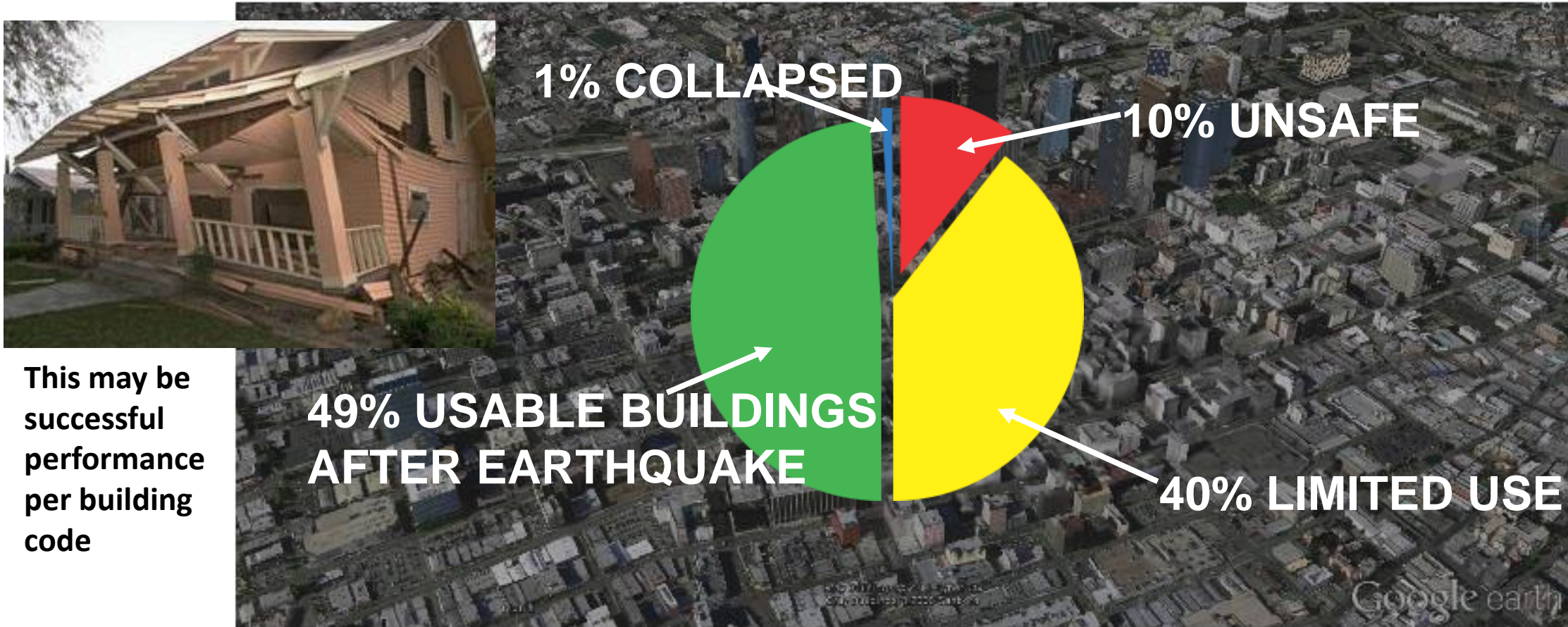
STRENGTHEN OUR BUILDINGS

- Mandatory retrofit of soft-first story buildings
- Mandatory retrofit of concrete buildings
- Voluntary rating system
- “Back to Business” inspection program
- Excessive Damage Mandate



**Eliminating Killer
Buildings by improving
vulnerable infrastructure**

Building Stock Not functional



- Need to go beyond current building code requirements to prevent collapse in major events
- Resilient communities must have buildings for shelter and resuming business as usual

Start with Volunteer Building Resilience Rating System (US Resiliency Council)

Fortify Our Water System

- Water for fire fighters, protect against cascading fire hazards
- Protected fault crossings for the aqueducts
- Less dependence on imported water
- Seismic resistant pipes
- Resilience By Design Program

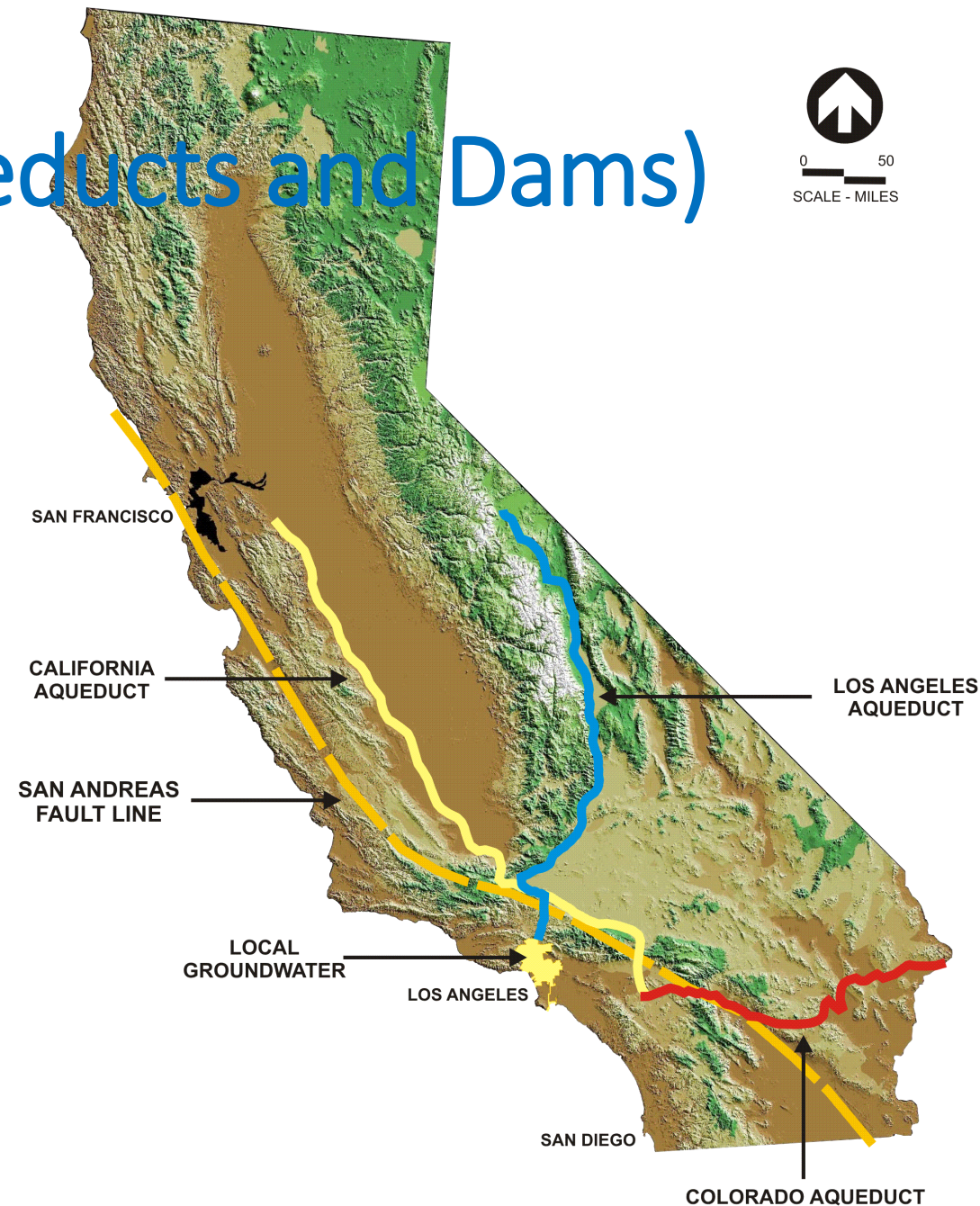
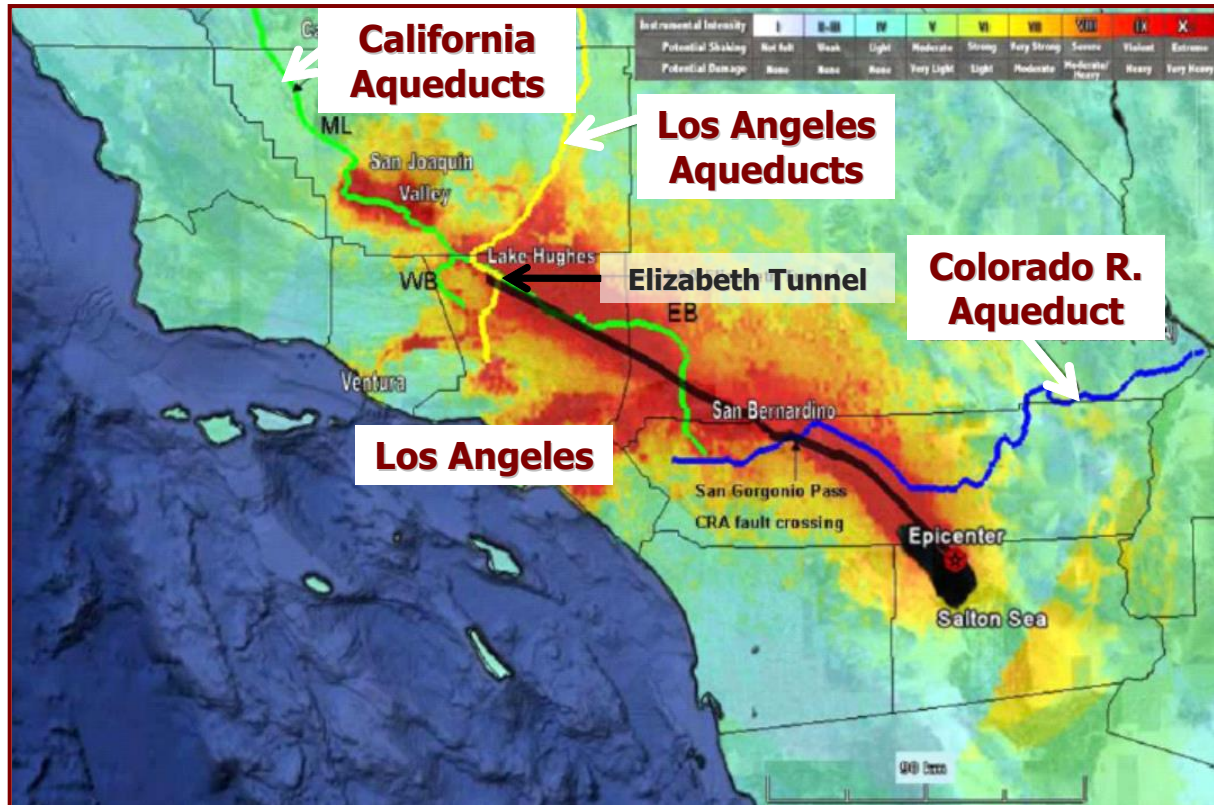
**Multihazard:
Earthquake, drought,
fire**



Protect Water Supply (Aqueducts and Dams)



88% of LA's water crosses the San Andreas Fault



Develop Local Water Supply

- Reduce reliance on imported water during disasters
 - Groundwater cleanup
 - Recycled water
 - Storm water capture

**Resilience and Sustainability
Enhancements**



Multihazard resilient infrastructure

Seismic Resilient Pipe Network

- Long term goal is to replace all pipes in the City with seismic resistant pipes
- Begin with most strategic locations
- Develop funding/implementation plan

Tsunami erosion



LA Seismic Improvement



Resilience Enhancements with reduced life cycle costs, water loss, & increased pipe longevity and personal safety, while renewing infrastructure



Landslide from Monsoon

Enhance Reliable Telecommunications

- MOU with service providers to manage emergencies
 - In an emergency, providers will
 - share bandwidth
 - open wi-fi hotspots
 - The City will facilitate access and repairs
- More resilient power
- Promote City-wide Wifi access
 - Wifi needs less power than cell towers
 - Solar-powered City-wide Wifi provides an alternative communications
- Stronger towers

**Applicable to
all hazards**

**Improving communications
using green-power**

Cell tower in Tokyo after
March 2011 M9



Moving Forward

- Engaging LA communities
- Engaging broader Megacity region (neighboring Cities)
- Implement recommendations
- Expand over time to include other infrastructure, systems, and hazards



Evaluating Exposure and Vulnerability

- Perform Threat and Hazard Identification and Risk Assessment
- Identify and map the hazards which may provide critical shocks and stresses
- Overlay infrastructure
- Assess infrastructure fragility to hazards
 - Plausible scenario events are essential, coupled with probability
 - Damage assessment to events
- **Assess consequence** of damage to community(ies)
 - Include dependency relationships between urban, infrastructure, political, economic, and other systems

Identifying Critical Assets and Infrastructure

- Assemble Critical Asset and Key Resources catalog
- Perform capability assessments and gap analyses
- Identify those which present the greatest opportunity for largest consequences to critical systems
 - Economic
 - Social
 - Infrastructure
- Prioritizing
 - Identify greatest risks
 - Develop solutions
 - Implement solutions when funding and other resources available
- Implementation
 - Make strategic investments of limited resources (funds, labor, technical capabilities, time, etc.)
 - Invest based on highest priority and available funds/resources

Challenges

- Limited resources
 - Funding
 - Knowledge
 - Personnel and technical capabilities
- Creating a Culture of Resilience
 - Social
 - Institutional
 - Systemic
- Creating partnerships and common vision
 - Consistent objectives
- Leaders and Champions for Resilience

Strategies and Tools

- Lifelines Council(s)
- Working Groups and agreements for sharing information and data
- GIS
- Data repositories
- Policies and regulations fostering resilience activities (instead of hindering)
- Commitment from infrastructure owners and operators

Questions?

