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COASTAL ECOSYSTEMS CLIMATE CHANGE WORKSHOP
January 29, 2009

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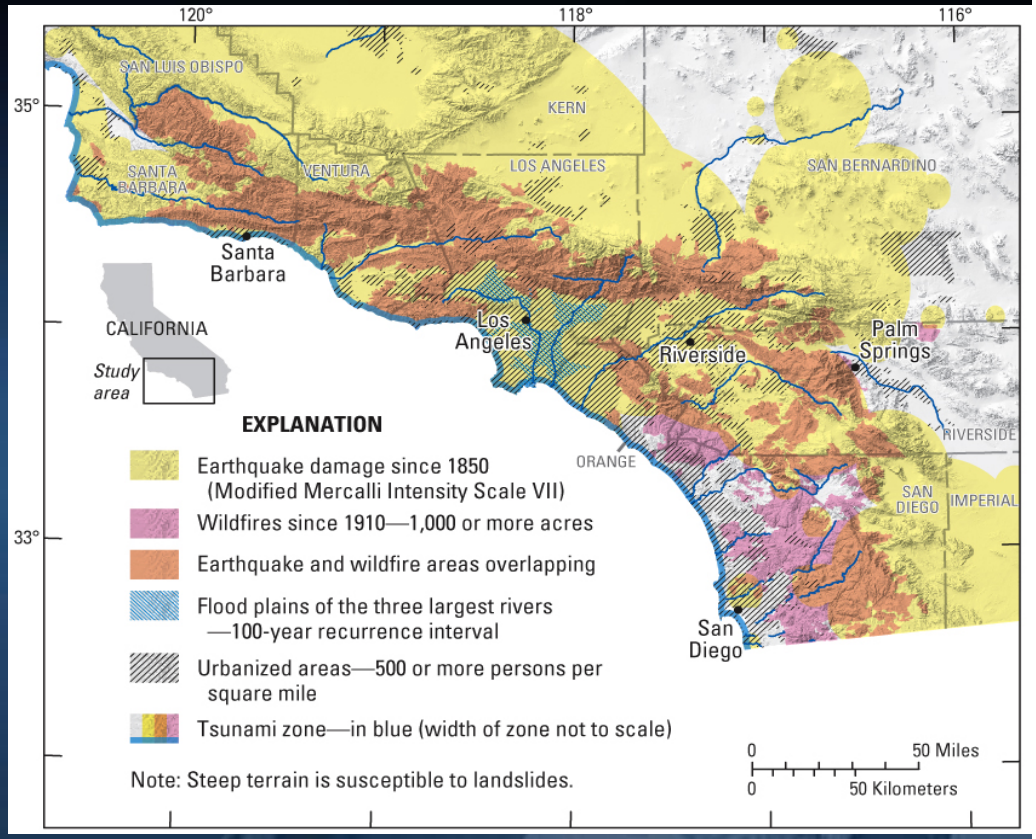
Proposal for economic consequences of a winter storm scenario in California: metrics and methods



Multi-hazards Initiative (Jones et al. 2007)

a new approach to hazards science

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Relevance of Winter Storms to Climate Change Coastal Issues

- Intersection of interests, research, data sources: issues for coastal consequences of storm overlap with coastal climate change issues
  - Climate variability: projecting more extreme weather (more severe storms)
  - Sea level rise: smaller storms will have greater impact on the coast
  - Hazards can drastically alter the coastal environment; robustness against storm event
  - Rising costs of coastal hazards

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Objective and outline

- Brief overview of earthquake and winter storm scenarios
- Demonstrate the process of developing the ShakeOut earthquake scenario and anticipate changes for the economic analysis of a Winter Storm scenario (WSS)
- Identify important coastal change for economic consequences that can be identified even now in these early stages

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Natural Hazard Scenarios

ShakeOut Earthquake	Winter storm
Exceed adequate preparation	
Mag 7.8 earthquake on southern San Andreas fault	In design stage. Storm will develop over days
8 county region in Southern California	Northern & southern California
Areas of critical infrastructure Two community studies	Focus areas? E.g., Southern California Coastline

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Importance for coast: ShakeOut had few coastal effects

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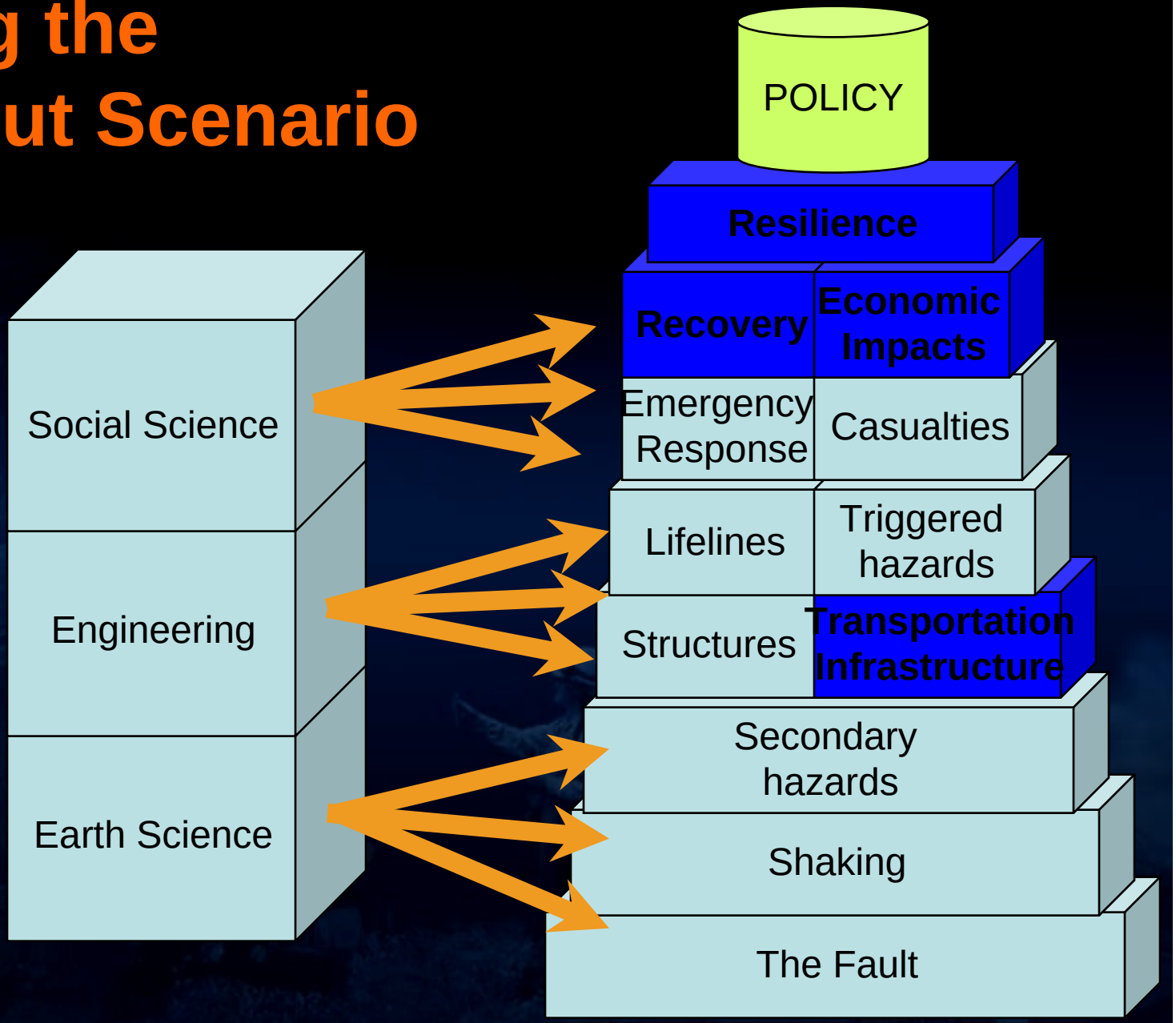
Building the ShakeOut Scenario



Jones et al, 2008.

CGS CALIFORNIA GEOLOGICAL SURVEY

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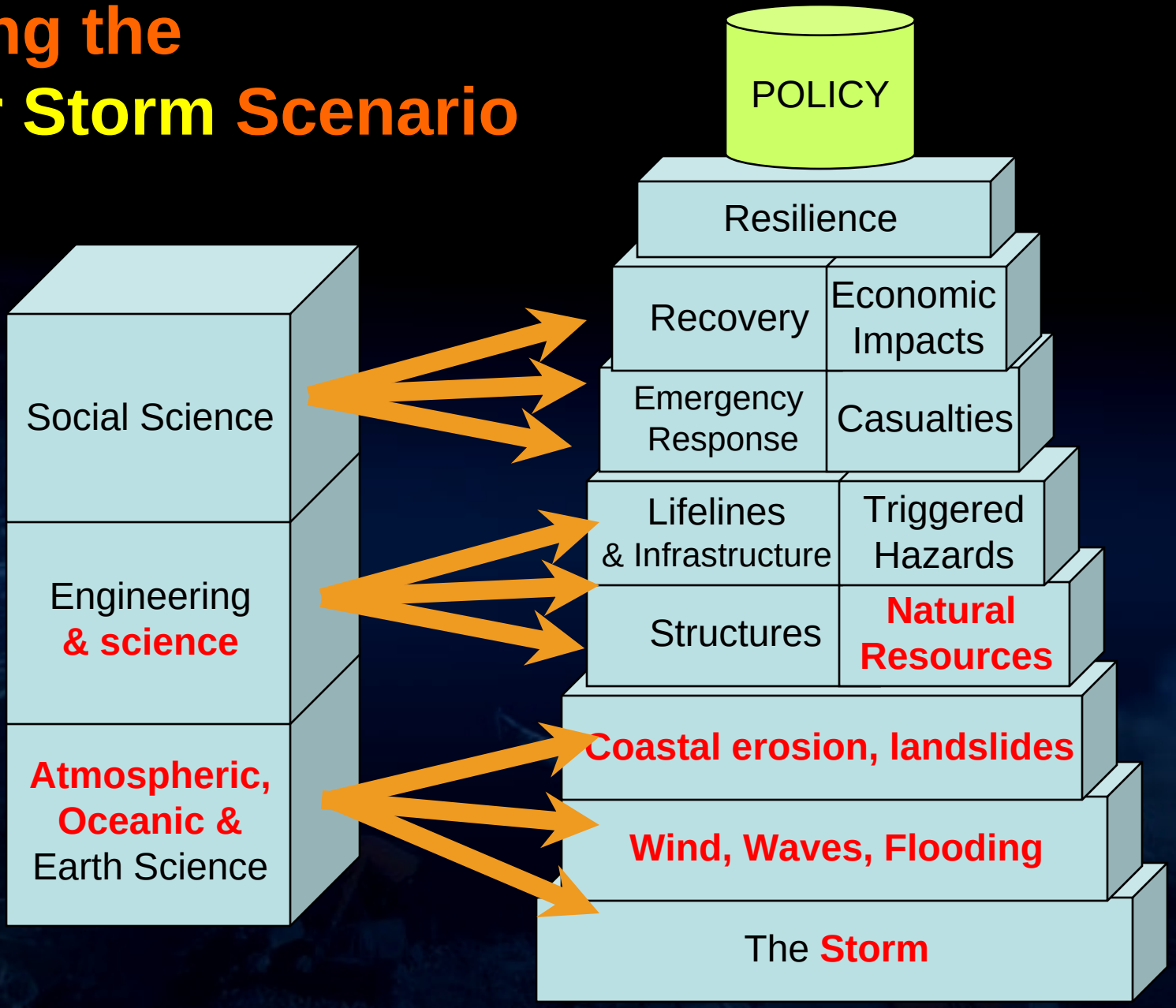
Building the Winter Storm Scenario



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NOAA

Anticipated Winter Storm Damages (Coastal)

- Property
  - Buildings
  - Agricultural lands, crops and livestock
  - Privately own land
- Public and private infrastructure
  - Lifelines and transportation systems
  - Ports and harbors, seawalls and levees, coastal roads, sewage and water treatment plants, coastal structures
- Natural resources
  - Beaches, cliffs, mountains
  - Marine life/fisheries, wildlife, habitats, forests, wetlands
  - Delayed response (e.g., wetland nurseries)
- Fire Following

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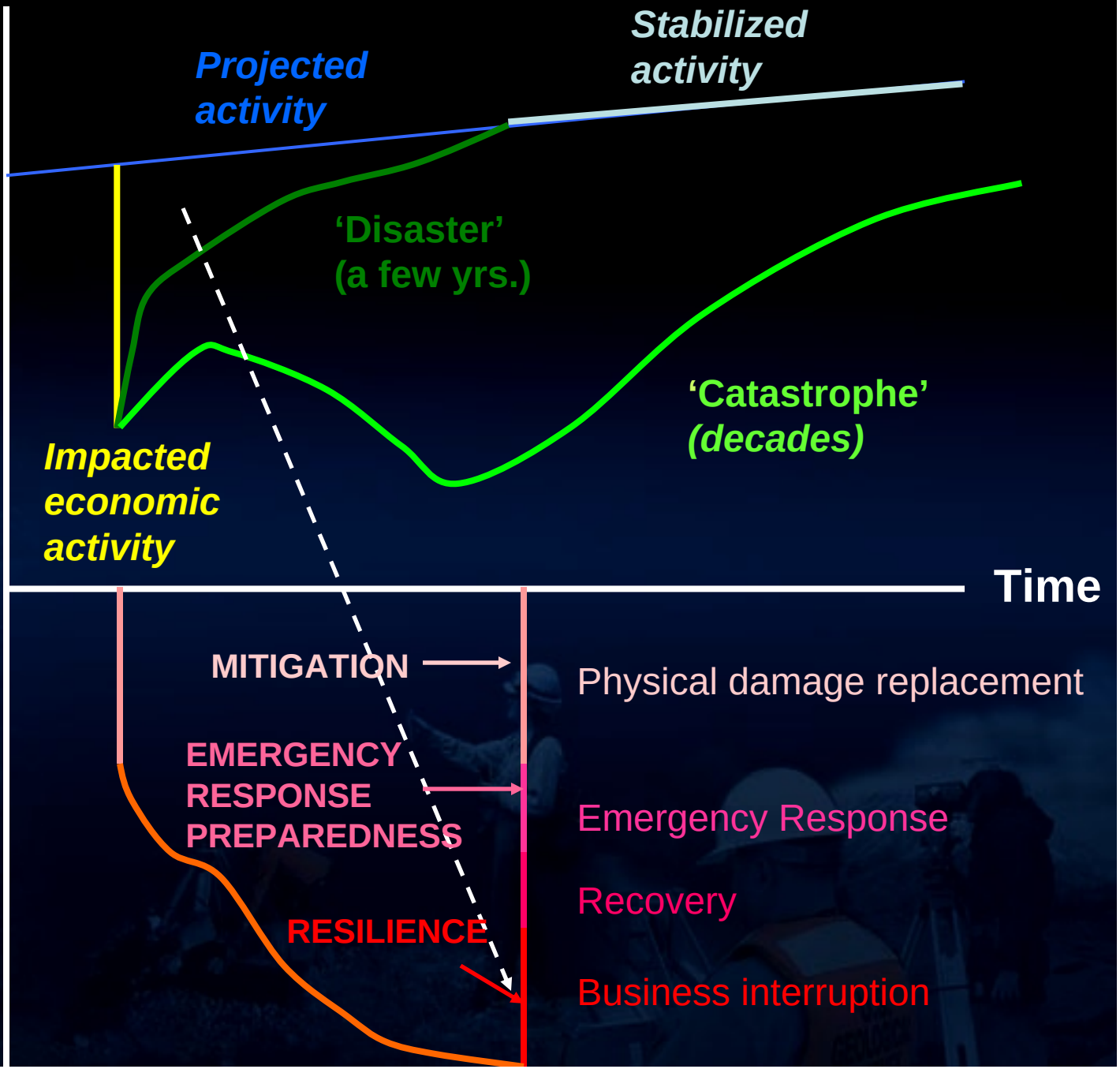
Economics of a Natural Disaster



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Anticipated Coastal Policy Issues and Decisions for Winter Storms

- **Mitigation options**
  - **Structures: building codes, levees, seawalls, off-shore structures, dams** (water storage vs. flood conditions)
  - **Warnings and Evacuation**
  - **Ecosystem services (natural processes for flood and storm protection, water quality, and soil formation)**
  - **Coastal development policies and practices**
- **Emergency response functions**
- **Recovery issues**
  - **Damage assessment and repair**
  - **Infrastructure and public services recovery**
  - **Restoration path for lifeline services**
    - **Restoration path for lifeline services**
  - **Housing and social recovery**
  - **Business and economic recovery and resilience**
  - **Recovery management and financing**
  - **Natural resource recovery**

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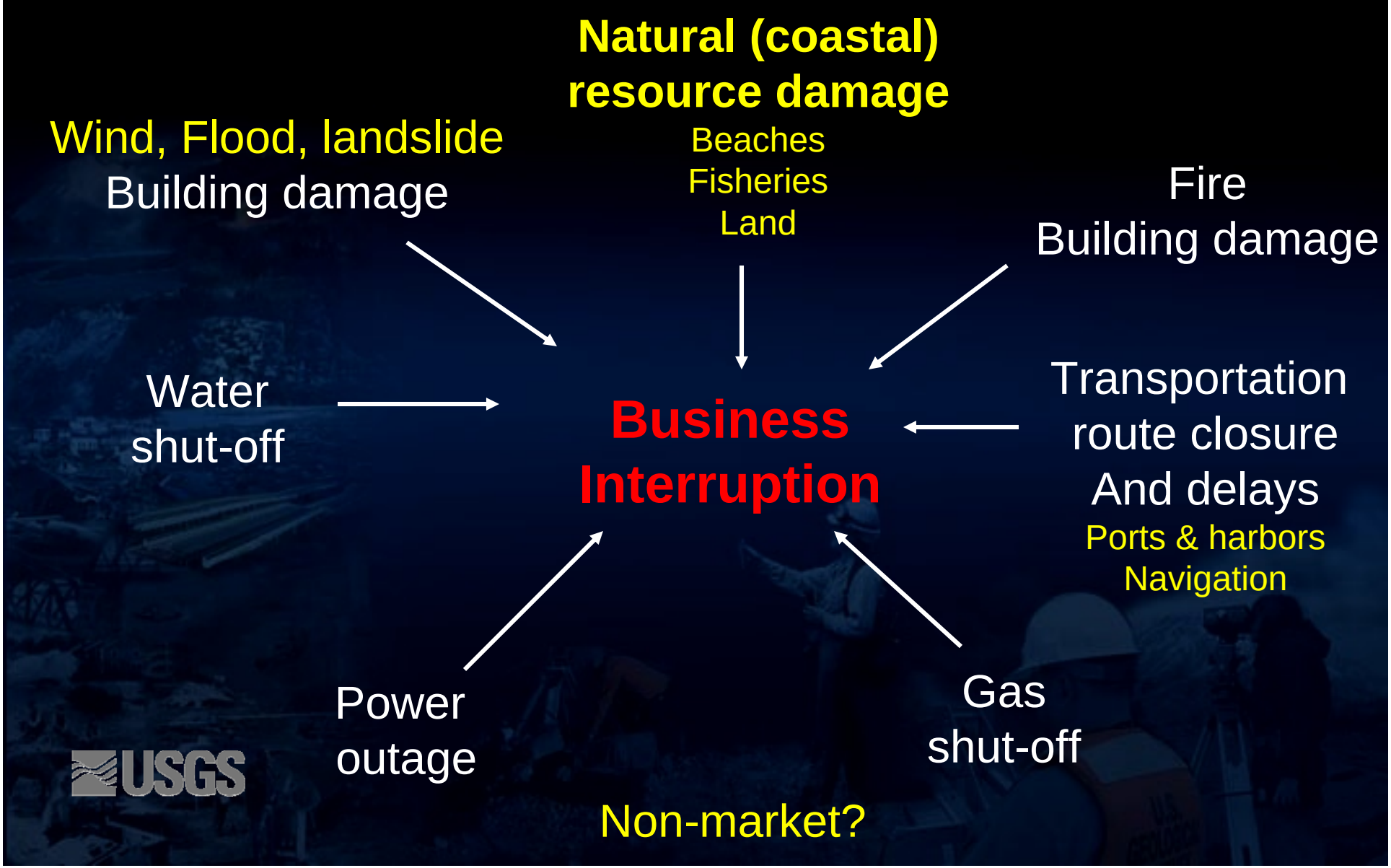
Anticipated Sources of Economic Shock



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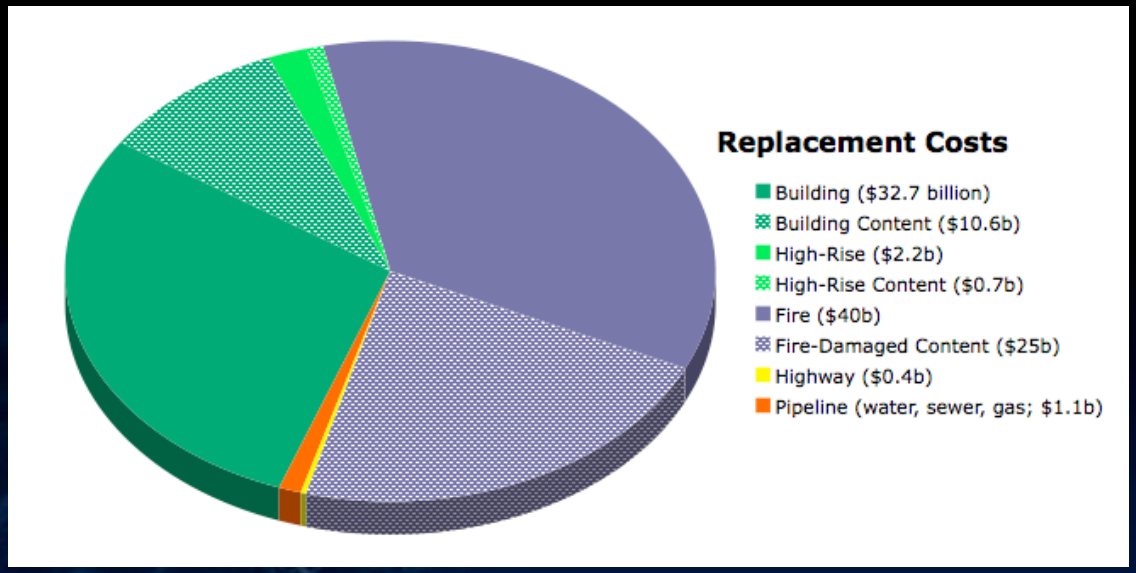
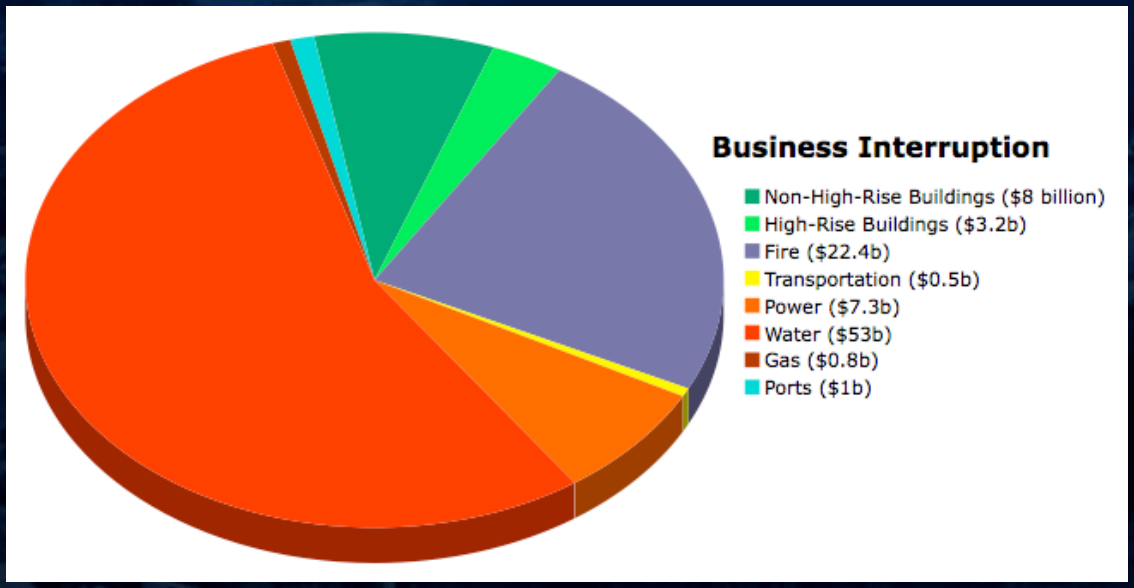
ShakeOut Economic Impacts





- Damage to Structures and Contents ($112.7b)
  - Fire is biggest shock
- Business Interruption ($96.2b)
  - Water is biggest shock
- Additional Costs
  - Relocation ($0.1b)
  - Traffic Delay ($4.3b)

ShakeOut Engagement of Stakeholders:

Did they listen, think, act?

Level	Type of Decision-making		
	Emergency Response	Resilience (effective post disaster)	Mitigation (effective pre disaster)
Federal	GG	GG	
State	GG	GG	
Region		SW GG	SW
County	GG	GG	
Local	GG PS	SW GG	SW
District	PS	PS	
Economic Sector	SW GG	SW GG	SW
Business	PS	SW	
Individual	PS		

SW: ShakeOut Scenario Workshops, GG: Golden Guardian, PS: Public ShakeOu

Strengths of Scenarios

(Not risk analysis)

- **A story**
- **Interdisciplinary research advancements**
- **Collaboration and Stakeholder participation**
- **Communication of science**

Starting today: feedback please

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References

- Jones et al. 2007. Increasing Resiliency to Natural Hazards—A Strategic Plan for the Multi-Hazards Demonstration Project in Southern California, U.S. GEOLOGICAL SURVEY Open-File Report 2007–1255, http://pubs.usgs.gov/of/2007/1255/
- Jones et al, 2008. The ShakeOut Scenario, USGS, OFR 2008-1150, CGS Preliminary Report 25, V 1.0, http://pubs.usgs.gov/of/20081150/
- Perry et al, 2008. The Shakeout Earthquake Scenario – A story that Southern Californians are writing, USGS Circular 2008-132, http://pubs.er.usgs.gov/usgspubs/cir/cir1324

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