

SCIENCE IN SOCIETY

BRIDGING THE GAP

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SCIENTIST EMERITA, US GEOLOGICAL SURVEY



RESILIENCE BY DESIGN

Los Angeles seismic
safety plan

2014

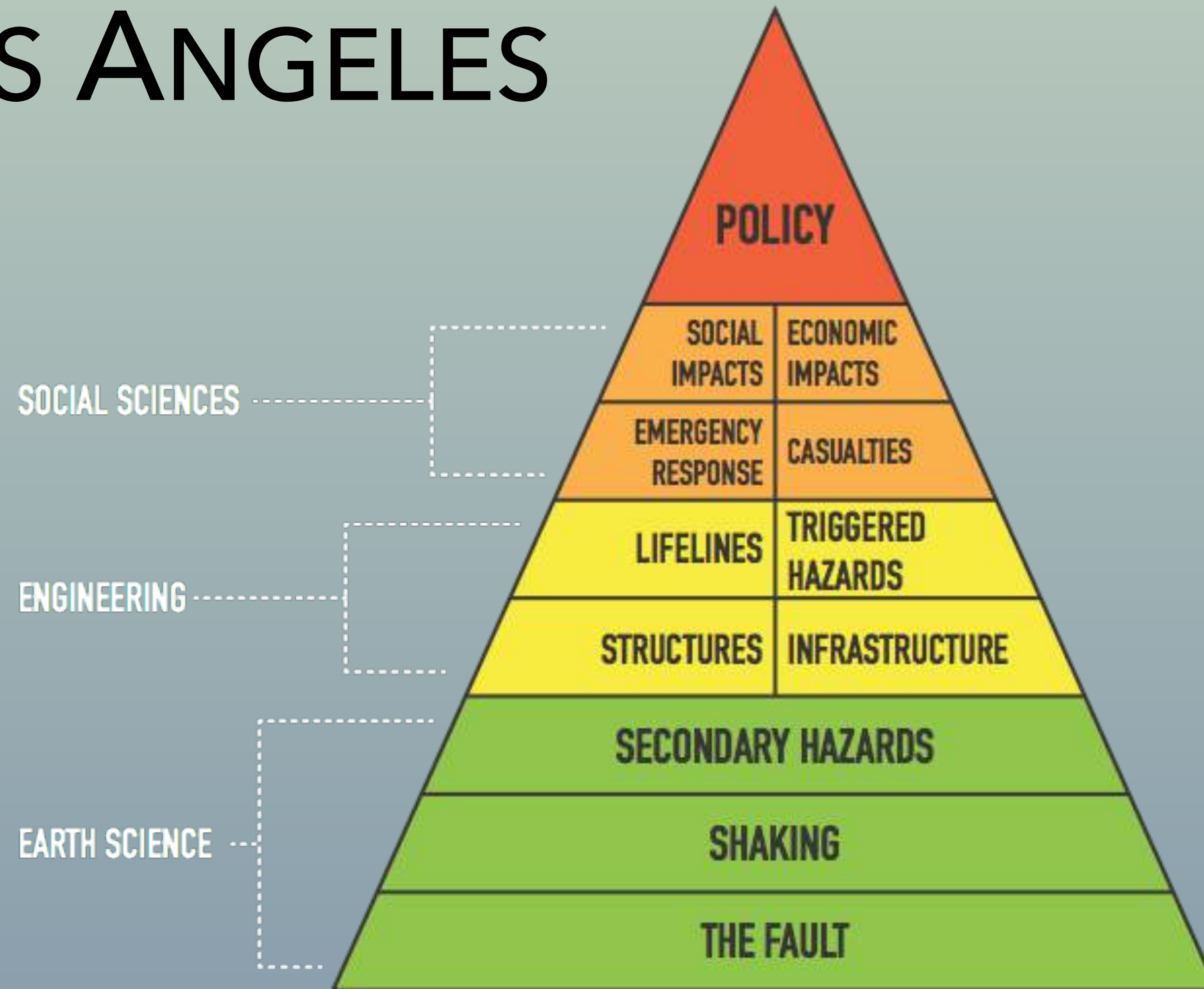


USGS-LOS ANGELES AGREEMENT

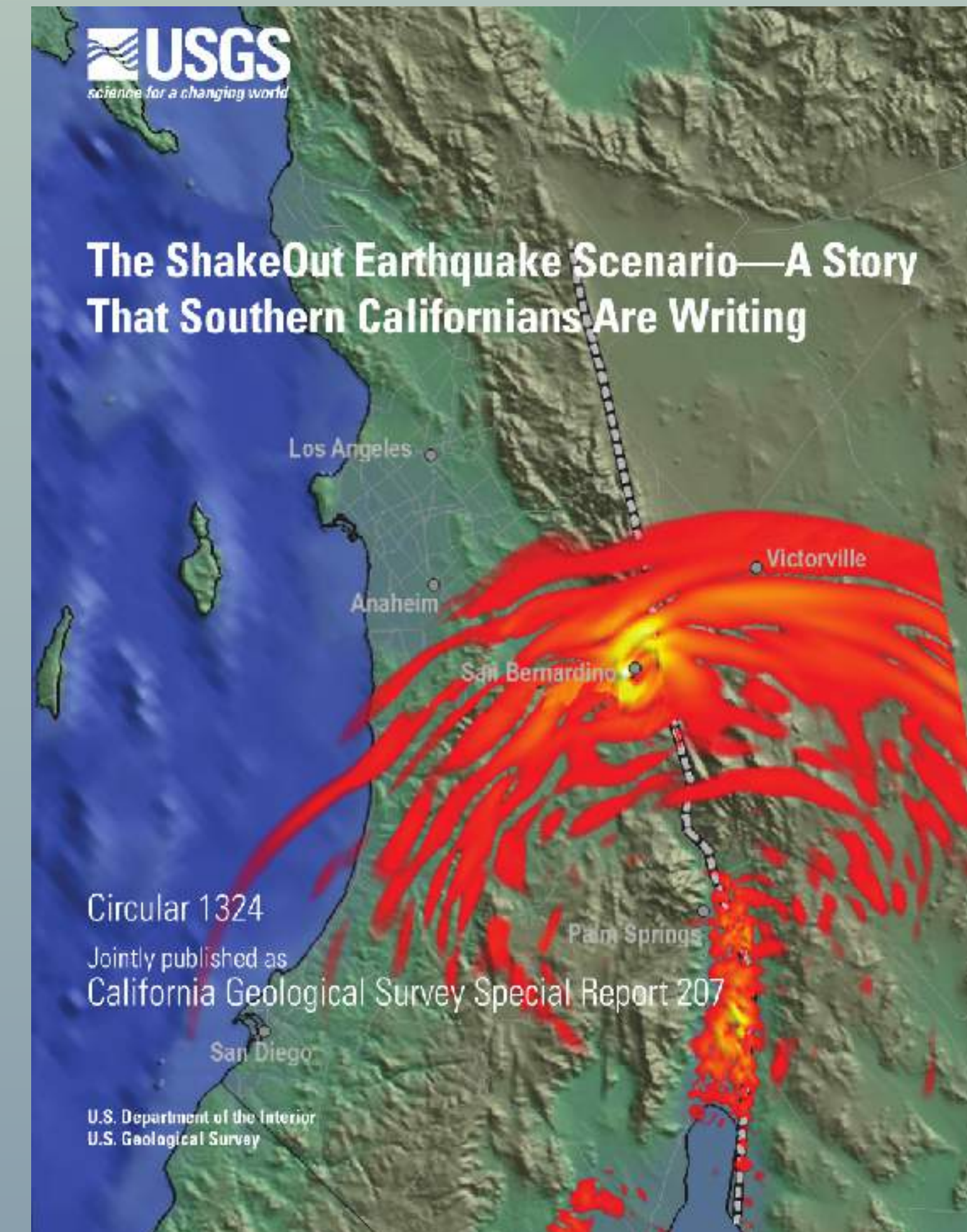
- Agreement for 2014
- Mayor's Science Advisor for Seismic Safety
- Address vulnerabilities in:
 - Old buildings
 - Water system
 - Telecommunications



THE SHAKEOUT SCENARIO: LOS ANGELES



BUILDING THE SCENARIO



WE ARE SoSAFE!



SoSAFE Workshop
Jan. 8-9, 2007 at SCEC

BASED ON SHAKEOUT SCENARIO

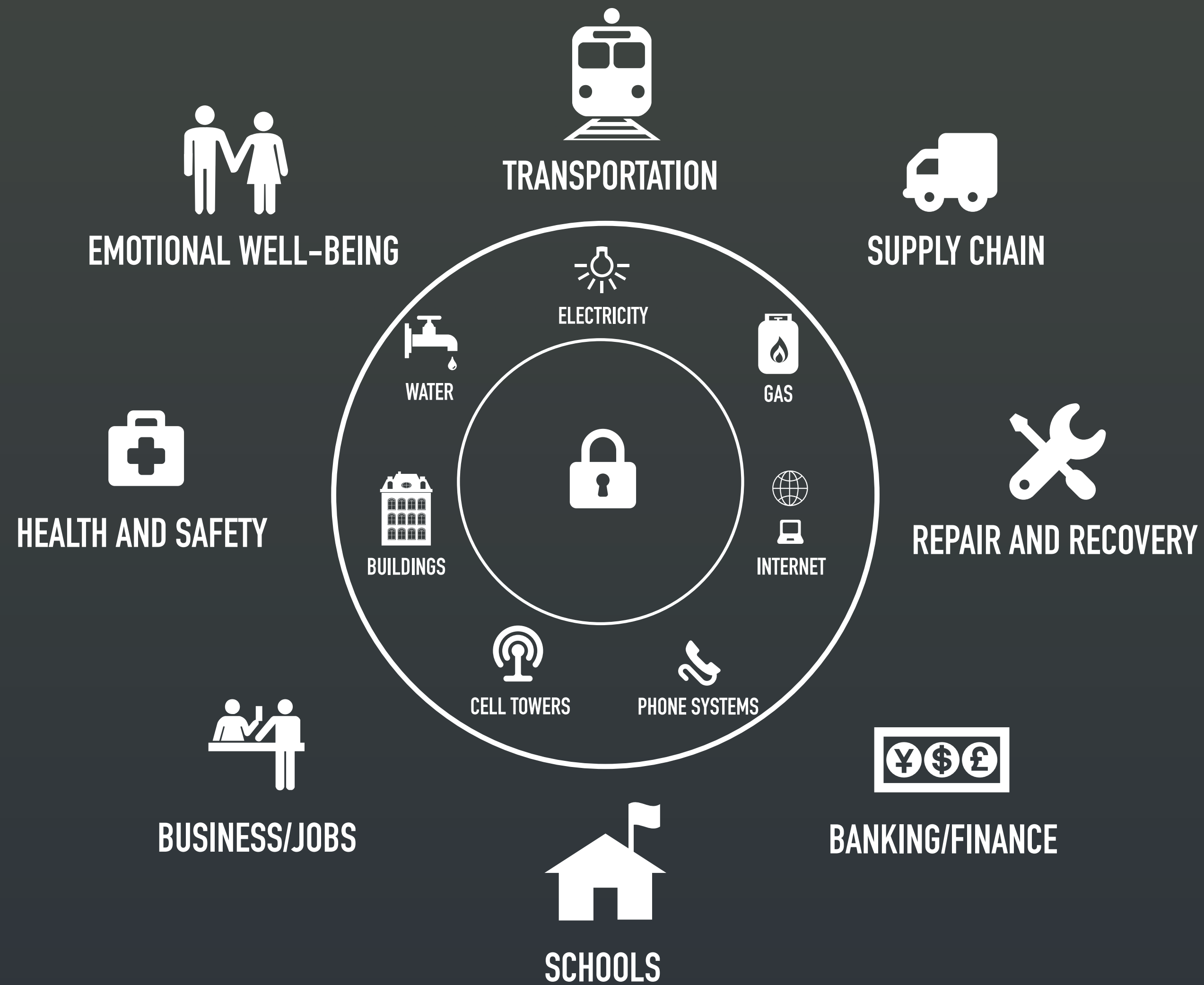
- Widespread Strong Ground Shaking
+Shaking of Long Duration + Landslides =
- 300,000 buildings significantly damaged – 1 in 16
 - 255,000 displaced households – 1 in 30
 - 53,000 injuries
 - 1,800 deaths
- Up to 6 months without water
 - Fires double the losses
- Business disruption doubles the losses
 - \$213 billion damages

Buildings

Water

Communications

NECESSARY SYSTEMS



BRING IN CITY CONSTITUENTS

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

130 MEETINGS WITH STAKEHOLDERS



20,000 DANGEROUS BUILDINGS WILL BE RETROFITTED






- **Strengthen Our Buildings**
- Mandatory retrofit of soft-first story buildings
- Mandatory retrofit of concrete buildings
- “Back to Business” inspection program
- Excessive Damage ordinance



ONE STALLED RECOMMENDATION

- Building rating system
 - Voluntary ratings available
- Lead by example from the City

Behind The Stars: USRC Earthquake Building Rating System

	SAFETY: Injuries and blocking of exit paths unlikely REPAIR COST: Minimal damage (<5% of building replacement) TIME TO REGAIN BASIC FUNCTION: Immediately to days
	SAFETY: Serious injuries unlikely REPAIR COST: Moderate damage (<10% of building replacement) TIME TO REGAIN BASIC FUNCTION: Within days to weeks
	SAFETY: Loss of life unlikely REPAIR COST: Significant damage (<20% of building replacement) TIME TO REGAIN BASIC FUNCTION: Within weeks to months
	SAFETY: Loss of life possible in isolated locations REPAIR COST: Substantial damage (<40% of building replacement) TIME TO REGAIN BASIC FUNCTION: Within months to a year
	SAFETY: Loss of life likely in the building REPAIR COST: Severe damage (>40% of building replacement) TIME TO REGAIN BASIC FUNCTION: More than one year

COMMITTS TO A FUTURE OF SEISMIC RESISTANT WATER SYSTEM

- **Fortify Water System**

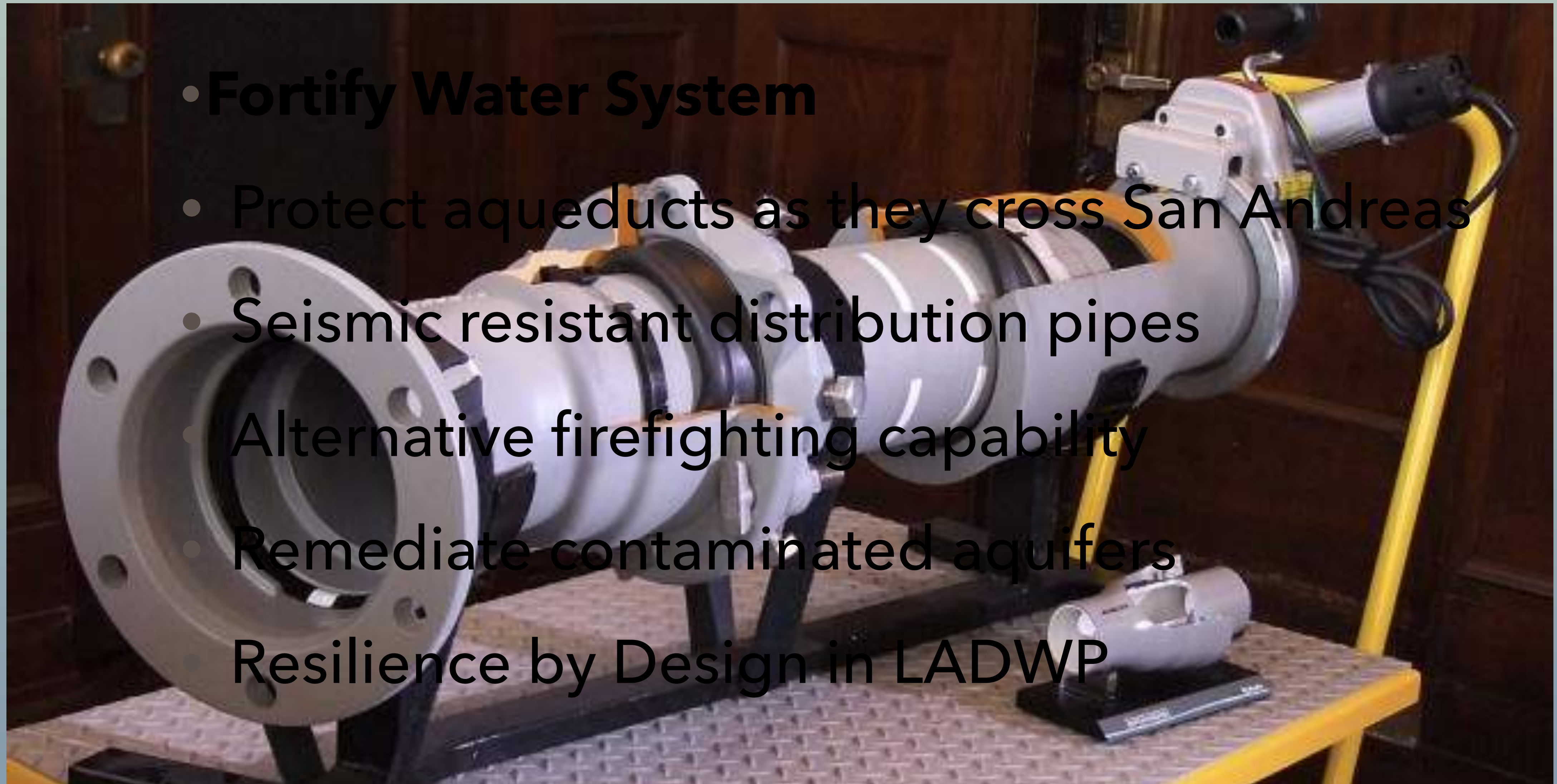
- Protect aqueducts as they cross San Andreas

- Seismic resistant distribution pipes

- Alternative firefighting capability

- Remediate contaminated aquifers

- Resilience by Design in LADWP



SOUTHERN CALIFORNIA LIFELINES COUNCIL WILL WORK TOGETHER TO STRENGTHEN LIFELINES

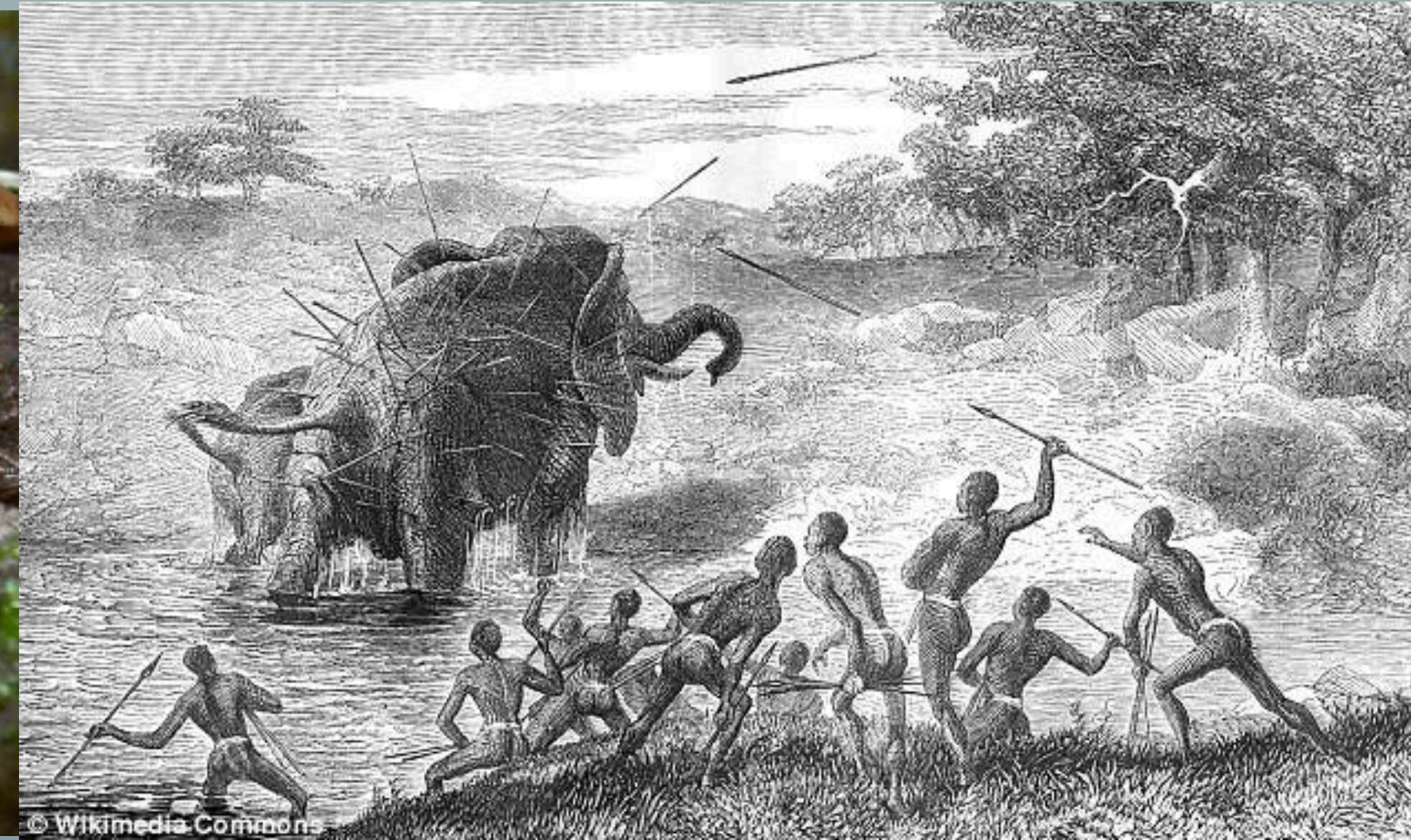
- 
- An aerial photograph showing a wide valley. In the foreground, there's a city with a grid-like street pattern and some industrial areas. The middle ground shows a river or a dry riverbed winding through the valley. The background is dominated by a range of rugged, blue-toned mountains under a clear sky. The wing of an airplane is visible in the top left corner.
- **Enhance Telecommunications**
 - MOU with service providers to manage emergencies
 - More resilient power
 - Promote City-wide Wifi access
 - Stronger towers

EVERY CITY COUNCIL ORDINANCE PASSED UNANIMOUSLY

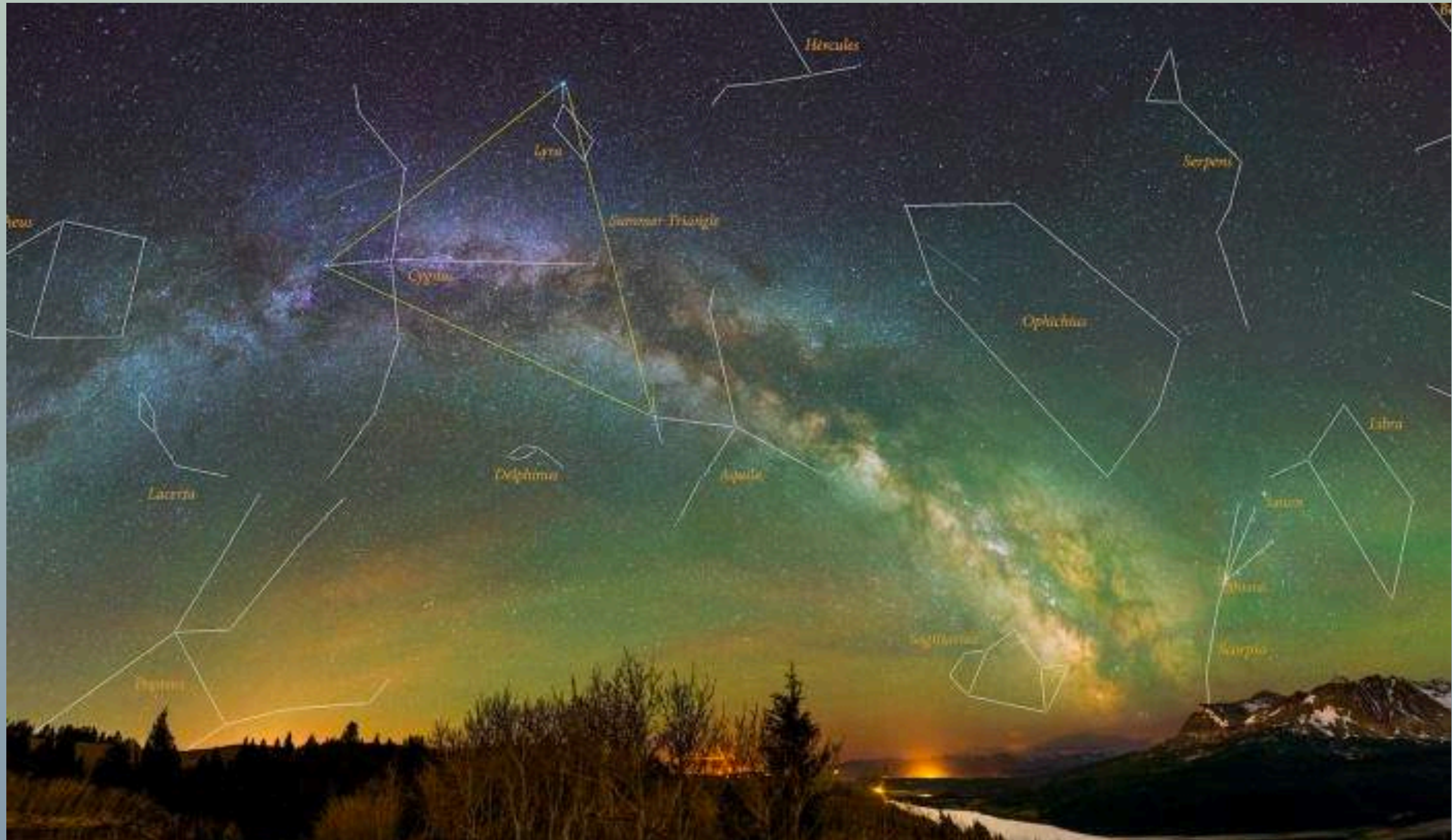


EVOLUTIONARY CONSTRAINTS ON HUMAN INTELLIGENCE

- Our intelligence evolved to make us safer in a primitive world
- Creating patterns to theorize about the risks

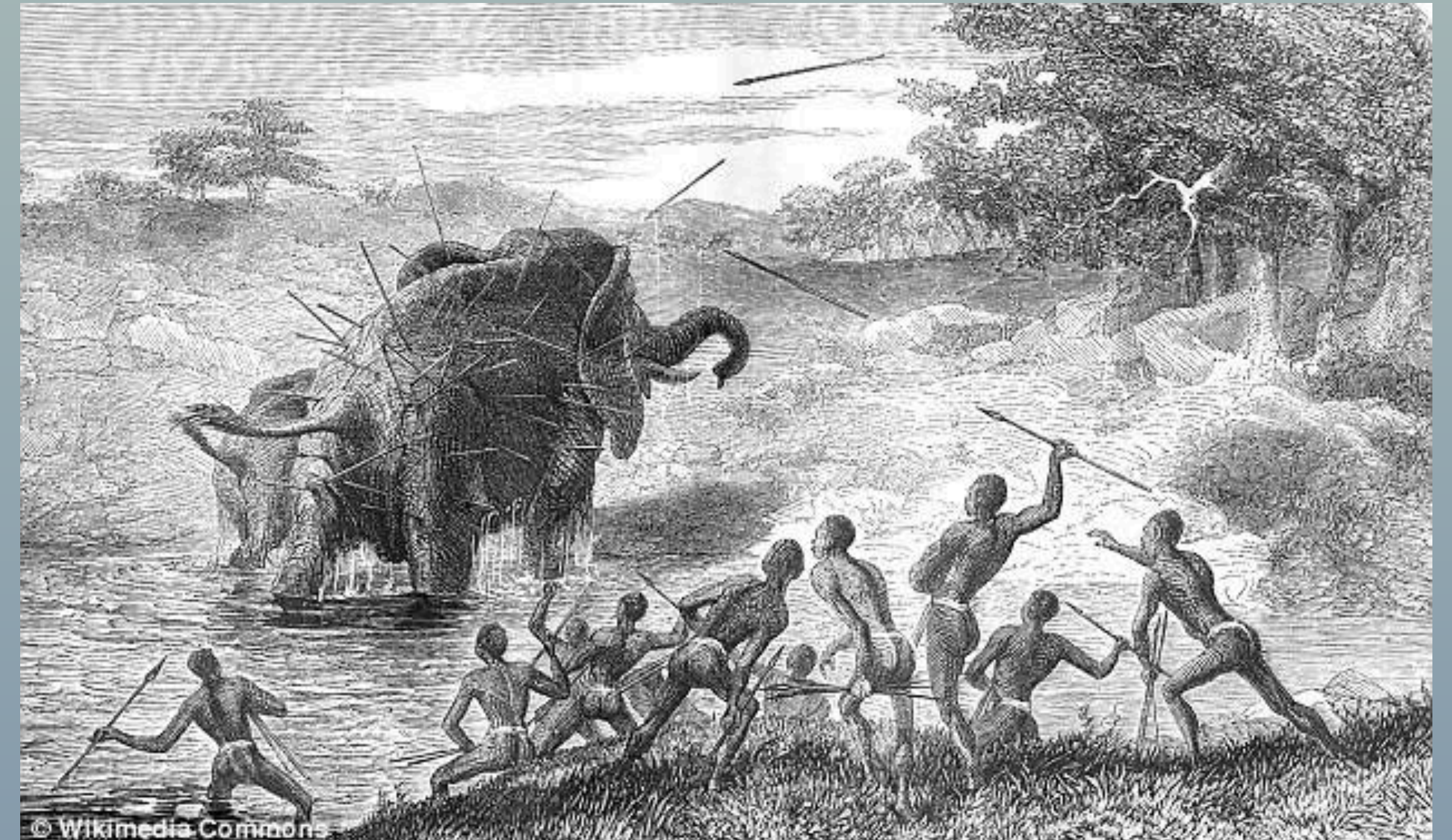


FINDING PATTERNS



HUMANS ARE NOT LOGICAL: CONFIRMATION BIAS

- Reason evolved to facilitate hyper socialization
 - Rewarded winning arguments, not being right
- Confirmation bias
- How we make decisions
 - An internal "yes-man"

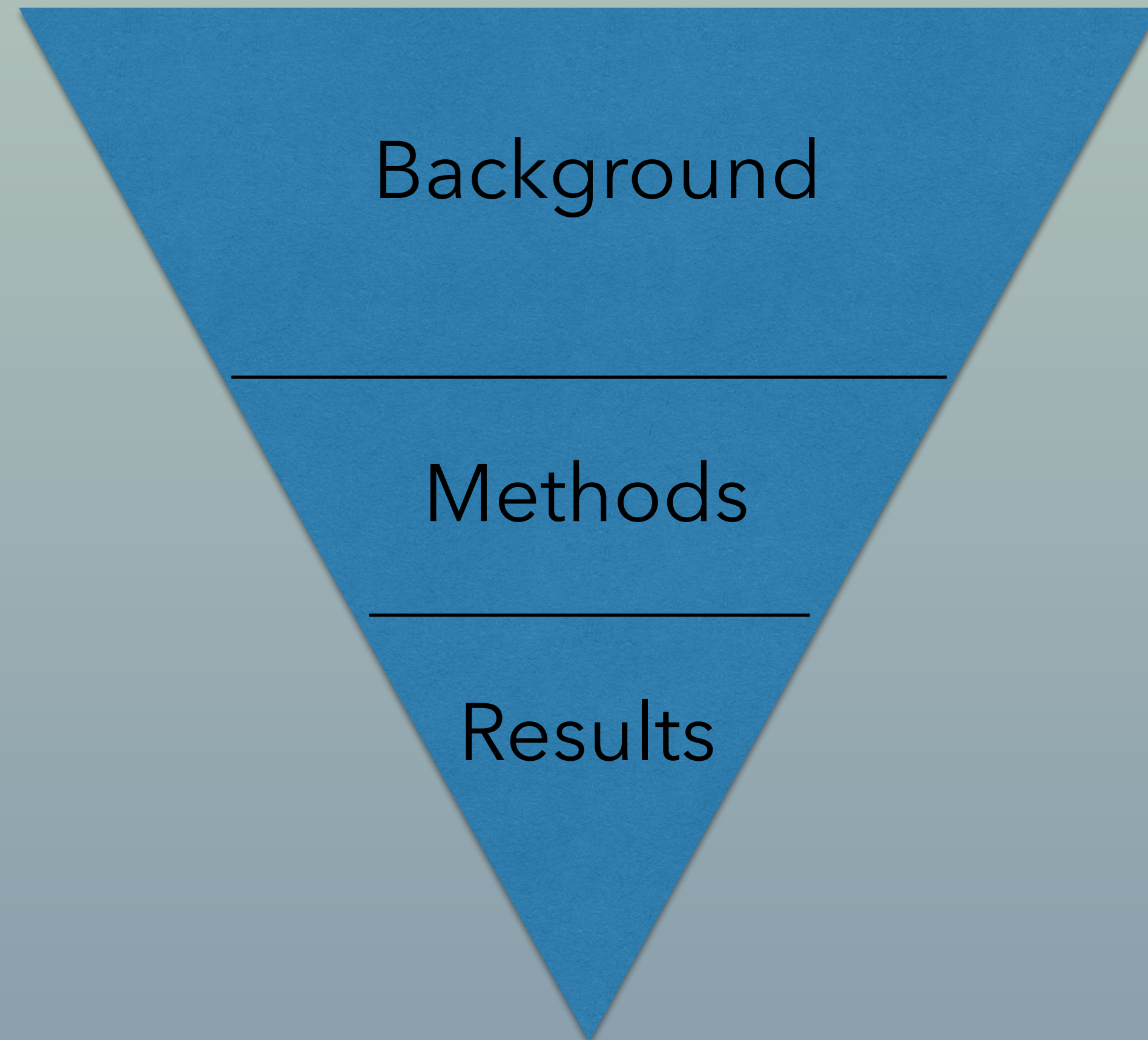


"SCIENTIFIC METHOD" - HOW IT OFTEN WORKS

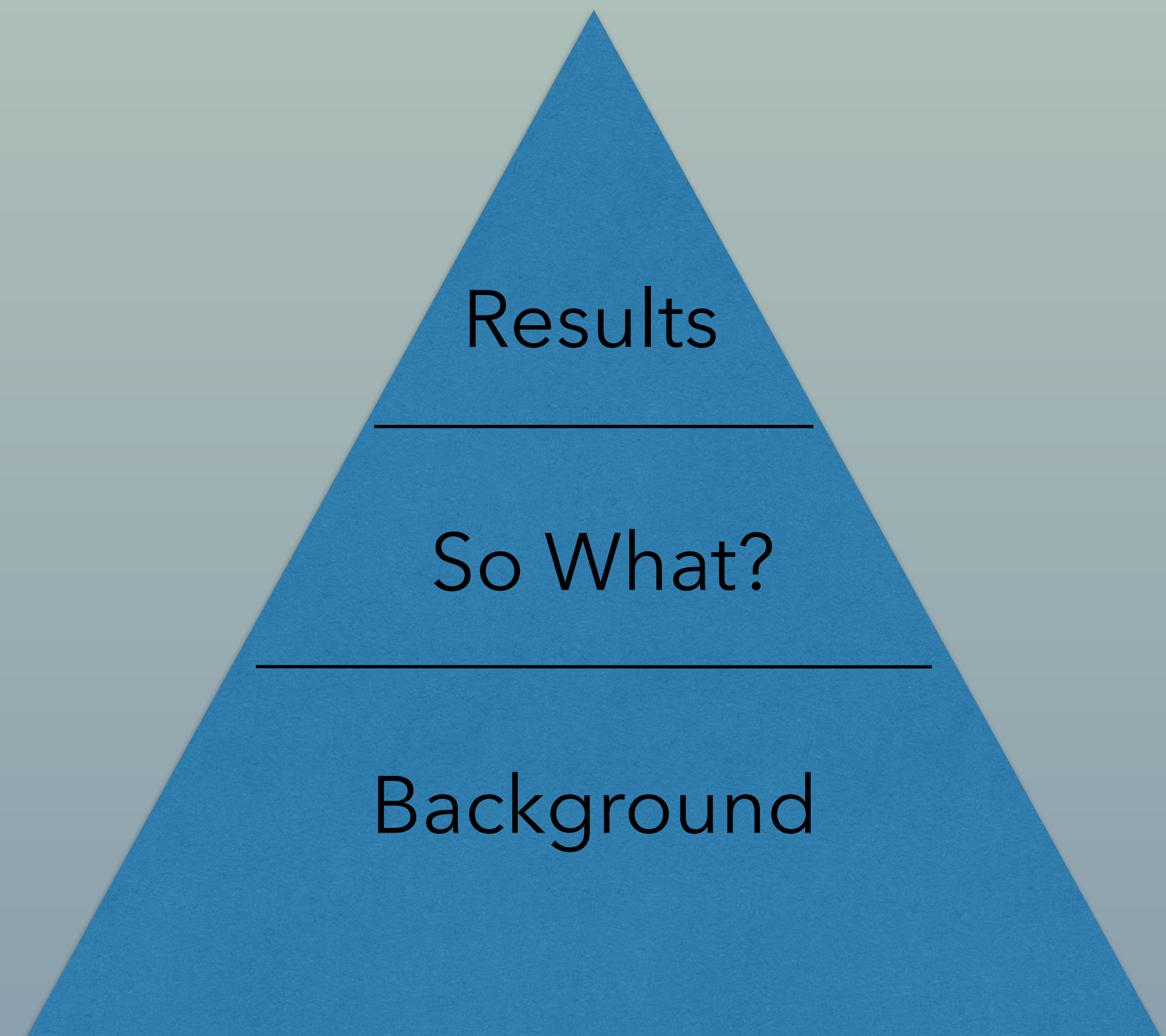
- Notice a coincidence
- Test if it is coincidental
- Create a model consistent with known phenomena to explain result
- Make predictions from that model and test the predictions using statistics
- Present results of tests to colleagues
- Get ripped to shreds by colleagues

HOW WE COMMUNICATE

Scientists

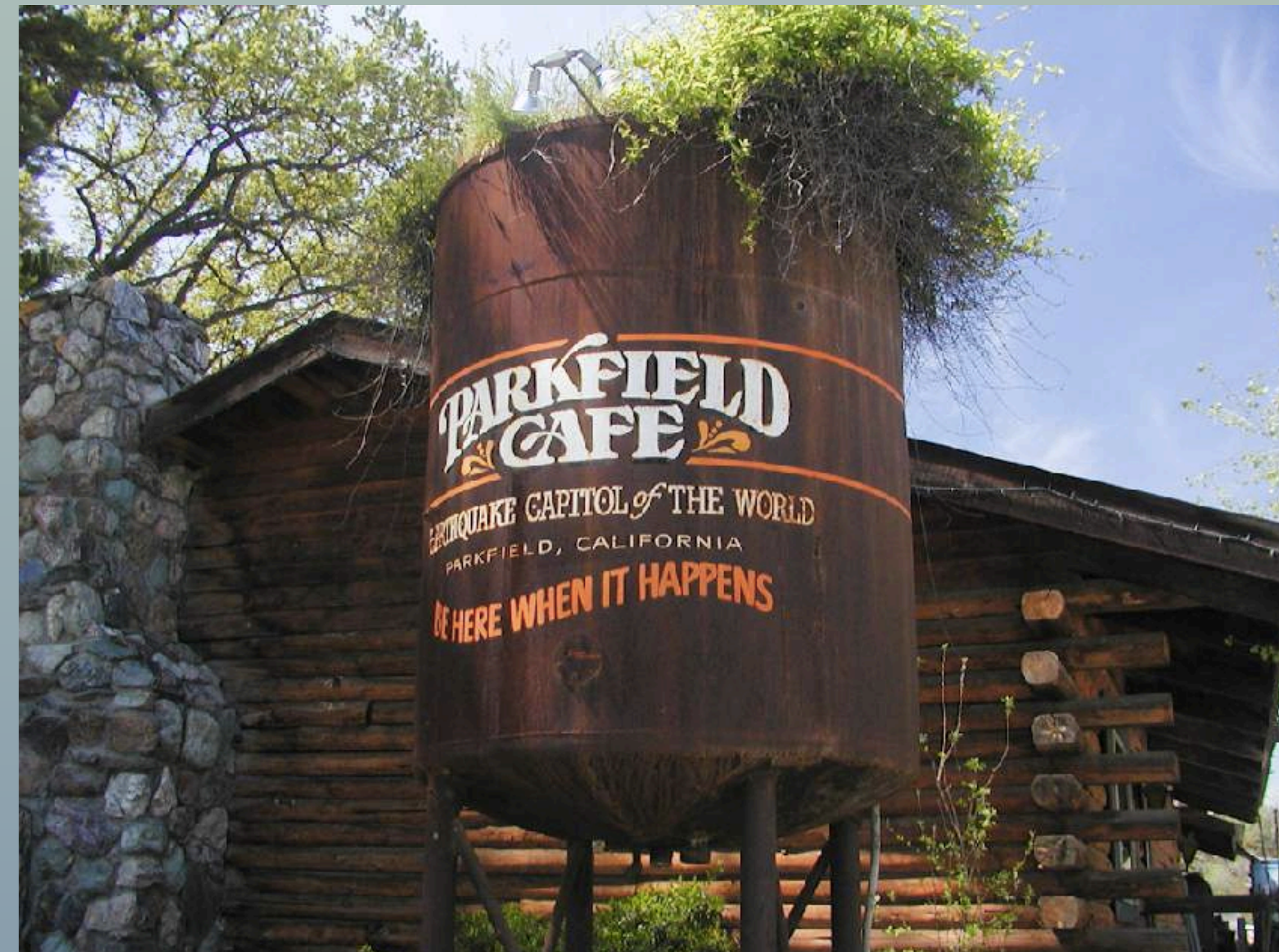


Journalists



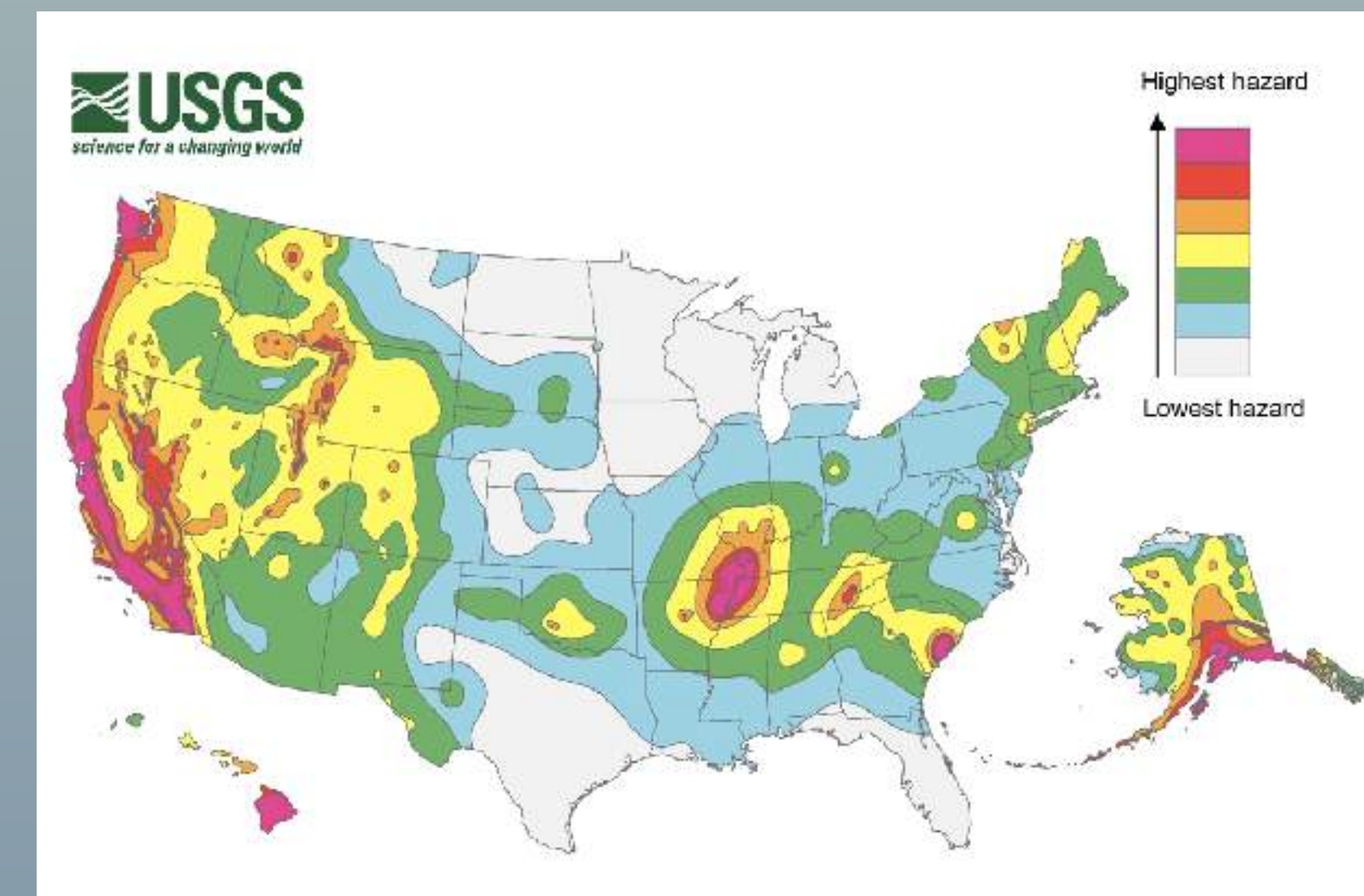
PARKFIELD EARTHQUAKE EXPERIMENT

- A shared confirmation bias kept us from recognizing that the statistics were not valid



IS OUR MODEL BETTER THAN A RANDOM DISTRIBUTION?

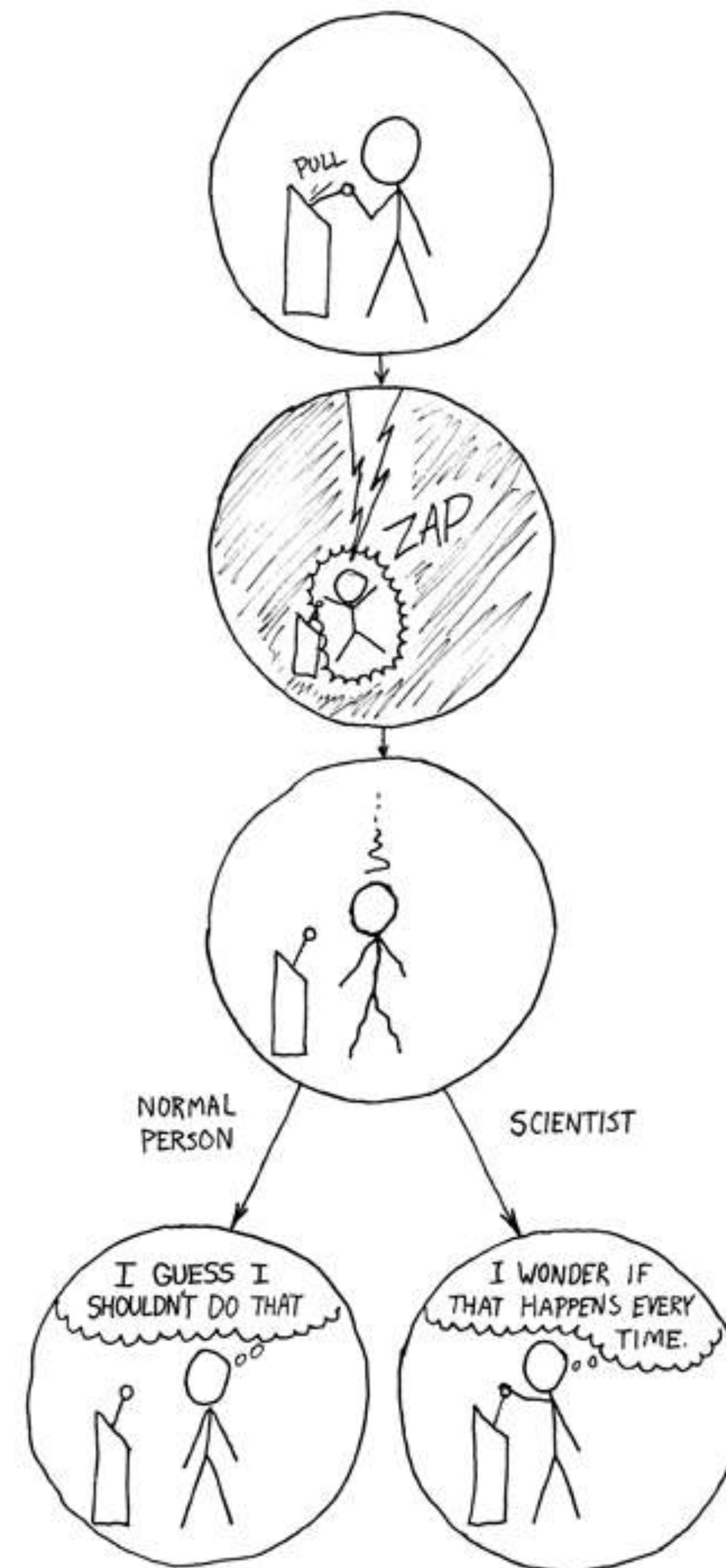
- We believe our model is correct.
- As scientists, we know there is a possibility that we are wrong.
- Statistics can tell us if we have fooled ourselves. If our model does better than assuming it is random



XKCD: THE DIFFERENCE

We know stories
mislead you

The greater the
belief in the value of
data, the greater the
myside bias



LISBON EARTHQUAKE M8.7

ALL SAINTS DAY, 1755

"God has decided how much the people of Lisbon should suffer and it is not our place to change what God has decreed."



LIFE

1923 KANTO EARTHQUAKE M7.9



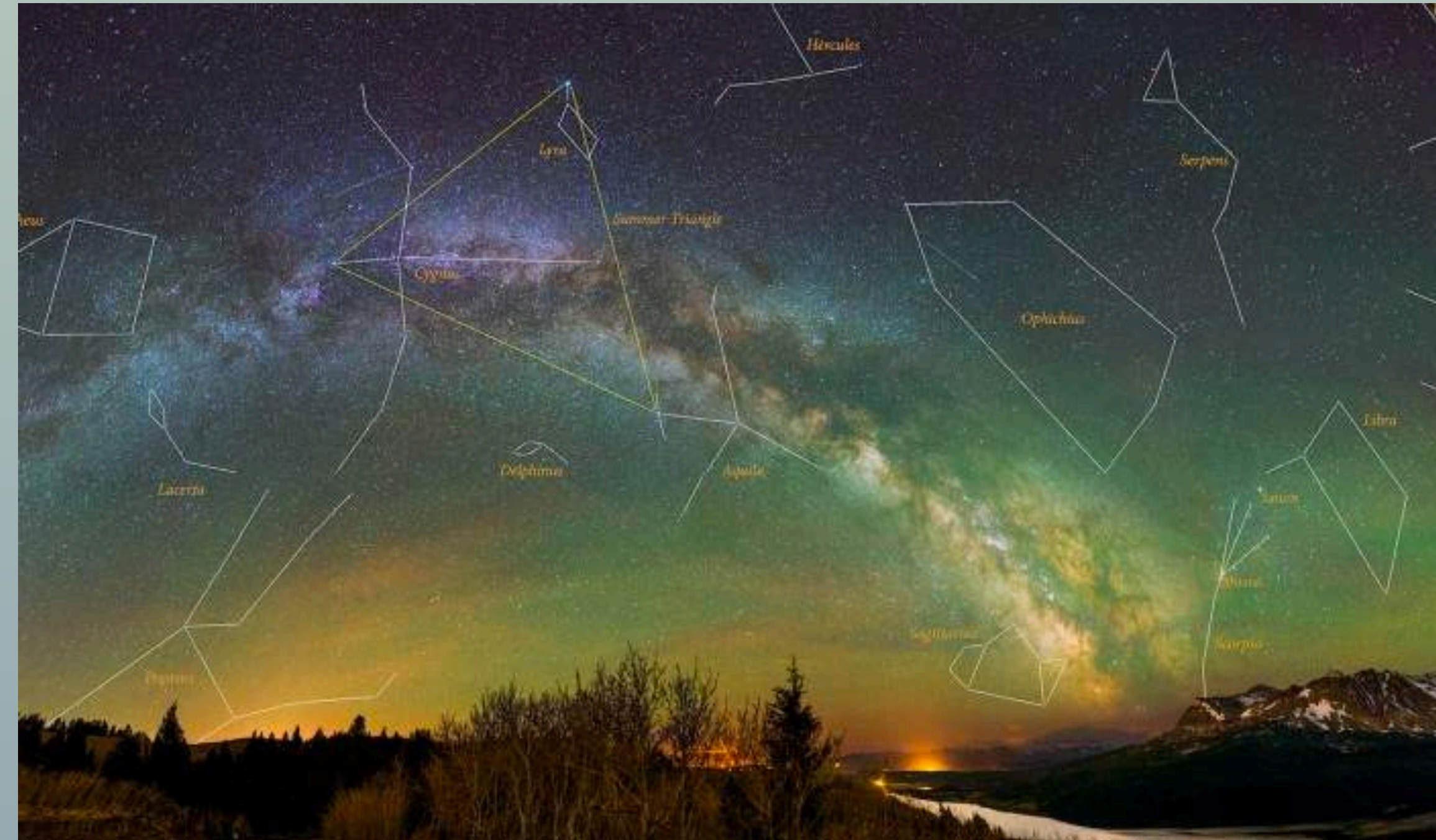
Photograph from T. A. Jaggar

THE BUSINESS SECTION OF TOKYO AFTER THE EARTHQUAKE

This photograph shows in the foreground, by the side of a canal crossing the city, the new shacks occupied by refugees, a go-down, or "safe-house," in the middle distance, and the Mitsukoshi department store (with turret). Most of the buildings that resisted the quake were gutted by fire. Thousands of parked automobiles contributed their gasoline to the flames. The property loss to the nation has been estimated at more than five billion dollars.

MAKING PATTERNS TO BE SAFE

- Demand for prediction
- Earthquake weather
- Blaming the government
- Blaming the victim



ENGAGING STAKEHOLDERS CREATES OWNERSHIP

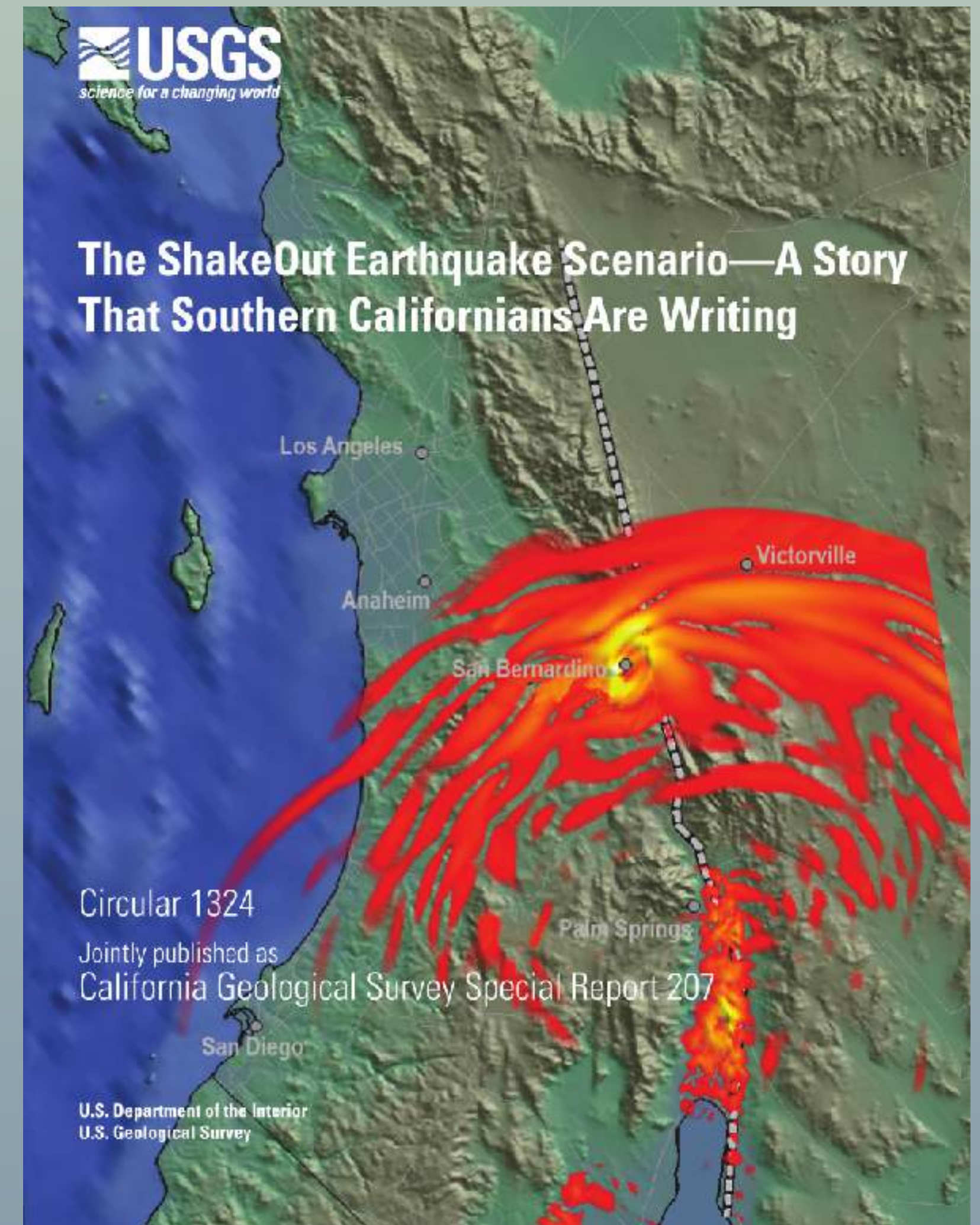


KEEP SCIENCE AND POLICY SEPARATE



VALUE OF SCENARIO APPROACH

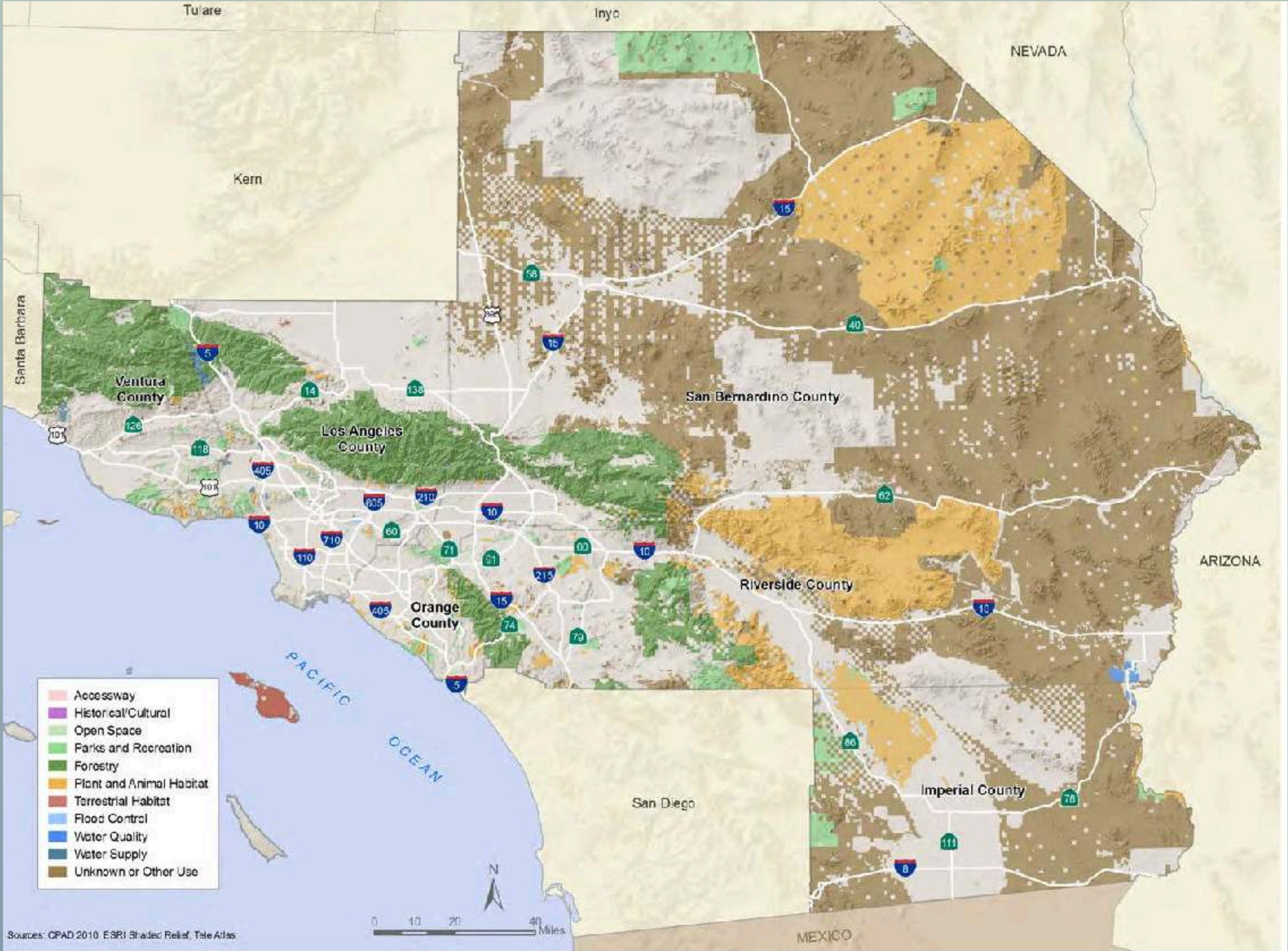
- A scenario tells a story
- A scenario avoids probabilities
- Emphasized consensus
- Emphasized financial outcomes which directed attention away from awfulness of disaster



RELATIONSHIPS MATTER



SPREADING TO 191 OTHER CITIES

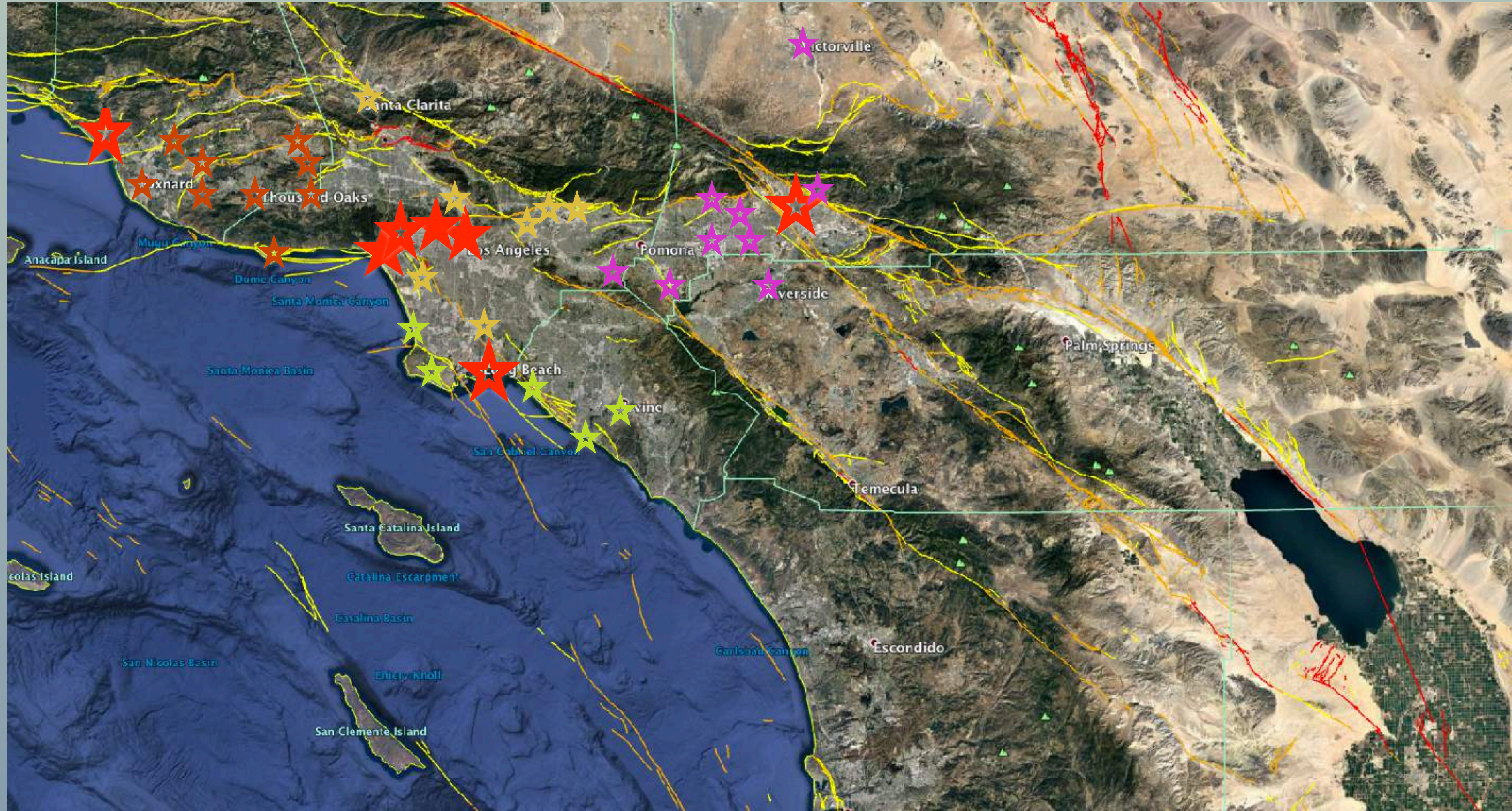


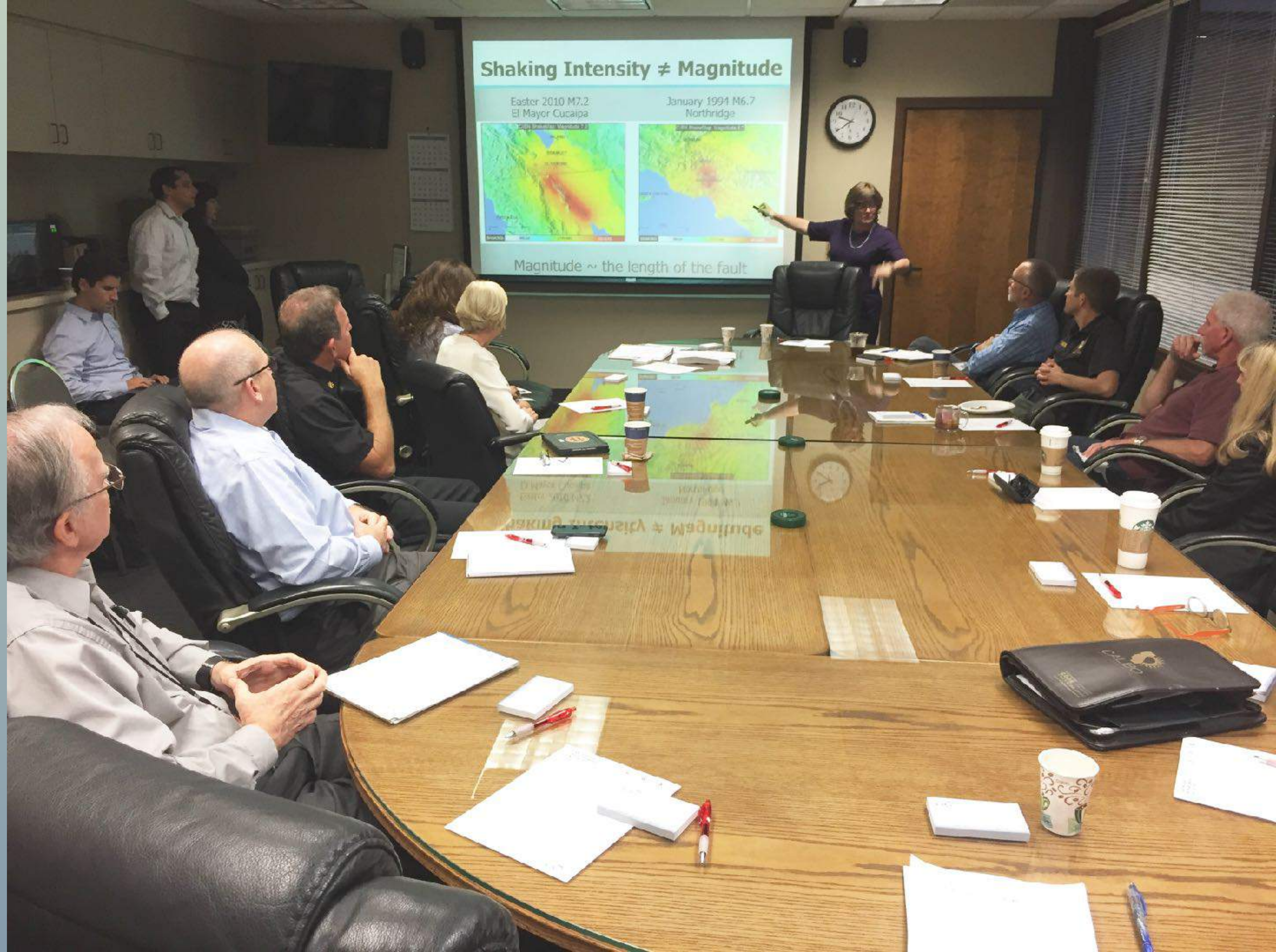
MOVING FORWARD

★ Retrofit legislation passed

★ In cohort & retrofit legislation at Council

★ In cohort







Seismic Risks for the Inland Empire Cohort

Dr. Lucy Jones
Founder, Dr. Lucy Jones Center for
Science and Society

Center
for Science and Society

SCAG
Southern California
Association of Governments

SCAG Earthquake Initiative

Inland Empire Cohort
September 6, 2014

CITY OF
ONTARIO

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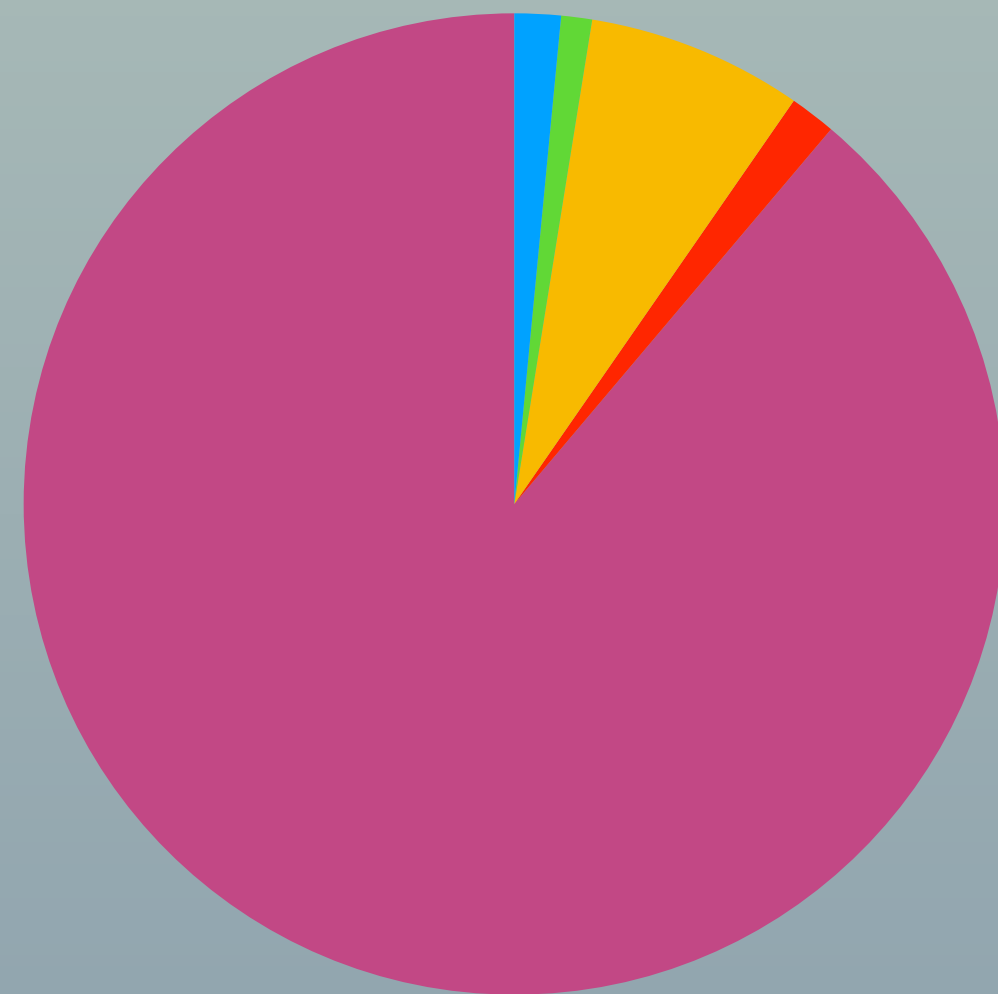
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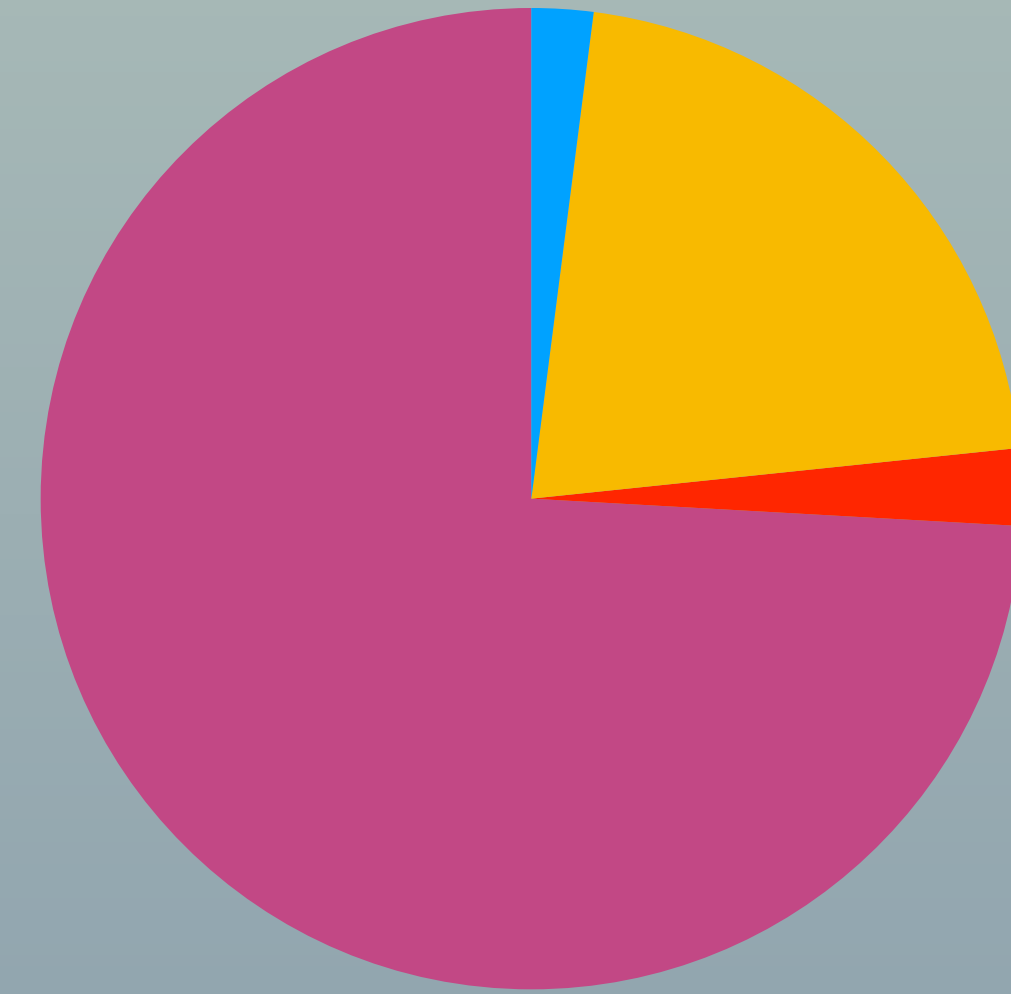
SOUTHERN CALIFORNIA CITIES CONSIDERING SOFT FIRST STORY RETROFITS

2016



- Mandatory
- Voluntary
- In discussion
- In development
- Nothing

2017



COMMUNICATING EFFECTIVELY



COMMUNICATING EFFECTIVELY IN EARTH SCIENCE

- Create usable products
- Focus on what we know, not the uncertainties
- Spend time on relationships
- Value the contributions of the scientists who spend the time with users
- Don't make decisions for others
- Recognize people need stories and emotions to make decisions

OTSUCHI



WE ARE ALL IN THIS TOGETHER

