LIFE SAFETY IN THE CITY
WHEN THERE IS MORE TO LIFE THAN NOT BEING CRUSHED

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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

THE FAULT

SECONDARY HAZARDS

SHAKING

INFRASTRUCTURE

TRIGGERED HAZARDS

LIFELINES

EMERGENCY RESPONSE

SOCIAL IMPACTS

ECONOMIC IMPACTS

POLICY

EARTH SCIENCE

ENGINEERING

SOCIAL SCIENCES
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
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
MEET WITH STAKEHOLDERS

• About 5-10 presentations each month
• Emergency services
  • Red Cross, government, corporate - partisans
• Building owners
  • BOMA, AAGLA, CAA, LA Conservancy
• Business leaders
  • Central City Association, ULI, Chambers of Commerce
• Community groups
  • Neighborhood councils
OUR URBAN SOCIETY IS AT RISK

URBAN DISASTER RESILIENCE IS HAVING A SOCIETY THAT FUNCTIONS AFTER THE EARTHQUAKE
DAMAGED WATER SUPPLY NETWORK

- All aqueducts cross the San Andreas to get to southern California and will be broken.
  - 18 months to repair
- Widespread damage to pipes in the ground
  - 6 months to restore all service
DAMAGED WATER SUPPLY NETWORK

CAUSES
- Earthquake shaking
- Fault offset
- Chemical accidents

SHORT-TERM CONSEQUENCES
- Damaged water supply
- Impaired medical response
- Life loss
- Damage to buildings and property
- Mass evacuation
- Loss of shelter

NEEDED FOR REPAIRS
- Transportation
- Purification systems
- Internet for water companies
- Manpower

LONG REPAIR TIME CONSEQUENCES
- Business closure
- Business disruption
CRITICAL INFRASTRUCTURE

- Electricity
- Gas
- Water
- Buildings
- Cell towers
- Phone systems
- Internet
NECESSARY SYSTEMS

- Transportation
- Emotional Well-Being
- Supply Chain
- Health and Safety
- Buildings
- Internet
- Cell Towers
- Phone Systems
- Business/Jobs
- Banking/Finance
- Schools
- Electricity
- Water
- Repair and Recovery
ECONOMIC CONSEQUENCES

NEW ORLEANS VS NASHVILLE ECONOMIC GROWTH

REAL GROSS DOMESTIC PRODUCT (in Billions of Dollars)

YEAR


NEW ORLEANS

NASHVILLE

-$80 BILLION

-$105 BILLION
SOCIAL REPERCUSSIONS
SOCIAL REPERCUSSIONS

NEW ORLEANS POPULATION GROWTH
THE MAYOR’S PLAN

- **Fortify Water System**
  - Protect aqueducts as they cross San Andreas
  - Seismic resistant distribution pipes
  - Alternative firefighting capability
  - Resilience by Design in LADWP

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

- **Enhance Telecommunications**
  - MOU with service providers to manage emergencies
  - More resilient power
  - Promote City-wide Wifi access

- **Stronger towers**
SANTA MONICA

- Initiated ordinances after Northridge
- City staff is working with City Council to develop new approaches
- Holding community meetings
- Several ordinances to be considered in winter
WEST HOLLYWOOD

- Initiated by City Council
- Staff brought in consultants
- Established expert advisory committee
- Took about a year to come to Council
- Council asked for more outreach

weho.org/seismic
New partnership with the Southern California Association of Governments

Take the science to the 191 other cities of southern California

Focus on risk and policy approaches of other jurisdictions
I use logical reasoning to make decisions.

A. True
B. False
HUMANS ARE NOT LOGICAL: CONFIRMATION BIAS

- Reason evolved to facilitate hyper socialization
  - Rewarded winning arguments, not being right
- Confirmation bias “myside bias”
  - How we make decisions
  - An internal “yes-man”
• We know stories mislead you
“SCIENTIFIC METHOD” - HOW IT OFTEN WORKS

- Notice a coincidence
- Test if it is coincidental
- Create a model consistent with known phenomena that could explain result
- Make predictions from that model and test the predictions
- Present results of tests to colleagues
- Get ripped to shreds by colleagues
HOW SCIENTISTS TALK TO EACH OTHER

- Background
- Methods
- Results
DIFFERENCES IN HOW WE WRITE

Scientists

Background

Methods

Results

Journalists

Results

So What?

Background

From Escape from the Ivory Tower, Nancy Baron, p. 30
DO YOU THINK DATA IS VALUABLE IN MAKING DECISIONS?

A. Not at all
B. A little
C. A lot
D. The only thing that matters
We know stories mislead you.

The greater the belief in the value of data, the greater the myside bias.
HUMANS ARE NOT LOGICAL: RISK PERCEPTION

- Risk Perception examines how people understand risk (Paul Slovik, University of Oregon)

- More afraid of:
  - Unseen
  - Uncertain
  - Unknowable
HUMANS ARE NOT LOGICAL: NORMALIZATION BIAS

- How we process risk
- We are afraid of the most recent peril
- Need a story, so only remember for ~100 years
ILLUSION OF EXPLANATORY DEPTH

- Humans share information
- We think we know more than we do
HUMAN FACTORS IN ADOPTING NEW APPROACHES

- Confirmation bias
- Illusion of explanatory depth
  - Ask participants to develop solutions
- Normalization bias
- Risk perception
  - Emphasize impacts, not probabilities
WHAT IS THE OBJECTIVE OF THE IBC?

A. Protect life safety
B. Provide habitability
C. Provide functionality
D. I don’t know
CURRENT BUILDING CODE

- In worst earthquake, 90% probability of not collapsing
- 10% probability of collapse = 10% of new buildings collapsing
CHRISTCHURCH 2010
HOW MANY CITY OFFICIALS KNOW THE BUILDING CODE IS A LIFE SAFETY STANDARD?

A. 10%
B. 25%
C. 50%
D. 80%
MOST PEOPLE DON’T KNOW WHAT THE CODE PROVIDES

What does the code provide?

Survey of 814 people by Keith Porter, U. Colorado:

Life safe: 25
Occupiable: 20
Functional: 15
I don’t know: 35
Other: 5
IMPAIRED BUILDINGS ARE ECONOMIC LOSS
IN CALIFORNIA, MANY MORE BUILDINGS IMPAIRED

- Average of Loma Prieta & Northridge
  - For each collapse
    + 13 red tags
  - For each red tag,
    + 3.8 yellow tags
- = 63 impaired per collapse

Check: Napa 2014 had 57 impaired per collapse

Courtesy, Keith Porter
University of Colorado
CAN WE SURVIVE "THE "BIG ONE"?

- 49% USABLE BUILDINGS AFTER EARTHQUAKE
- 1% COLLAPSED
- 10% UNSAFE
- 40% LIMITED USE
WHAT SHOULD THE CODE PROVIDE?

A. Life safe
B. Occupiable
C. Functional
D. Other/I don’t know
MOST PEOPLE WANT MORE THAN THE CODE PROVIDES

What should the code provide?

Survey of 814 people by Dr. Keith Porter, U. Colorado:
HOW DO WE ACHIEVE IMMEDIATE OCCUPANCY STANDARDS?

- It can’t be voluntary
- Focus on financial impacts
- Our job is to provide information, not make policy
- Engage constituents:
  - Building owners,
  - Corporate leaders,
  - Public officials
WE ARE ALL IN THIS TOGETHER