

NORTHRIDGE *30*
1994  2024

The Northridge Earthquake - 30 Years Later

A Catalyst for Engineering Resilient Communities

Webinar Series

EarthquakeCountry.org/northridge/events



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1994  2024

The Northridge Earthquake - 30 Years Later *A Catalyst for Engineering Resilient Communities*

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The Northridge Earthquake - 30 Years Later
A Catalyst for Engineering Resilient Communities

Episode 1: The January 17, 1994 Northridge Earthquake – Science & Engineering Aspects

K. Hudnut, J. Stewart, C. Davis, D. Cocke

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Episode 2: Insurance Issues and Impacts Following the Northridge Earthquake

C. Scawthorn, J. Maffei

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The Northridge Earthquake - 30 Years Later
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Episode 3: 30 Years of Progress in Quantification of Seismic Hazards

Y. Bozorgnia

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Episode 4: An Unexpected Milestone in Real-Time Loss Estimation

R. Eguchi, D. Wald

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Episode 5: Legacies of the Northridge Earthquake in Disaster Recovery Planning & Policy

L. Johnson and R. Olshansky

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Episode 6: Northridge: The Catalyst for Resilience of Healthcare in California
M. Lew

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Episode 7: Lessons learned about business losses and economic recovery – The Northridge Earthquake as a catalyst for research and application

K. Tierney and C. Kroll

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The Northridge Earthquake - 30 Years Later

A Catalyst for Engineering Resilient Communities

Webinar Series

Episode 8: Rethinking Communication about Seismic Risk – Linking Knowledge to Action in Innovative Ways Since the 1994 Northridge Earthquake

Moderator: Louise K. Comfort, Visiting Researcher, University of California, Berkeley
Professor Emerita, Graduate School of Public & International Affairs, University of Pittsburgh

Speakers: Ronald T. Eguchi, President and CEO, ImageCat, Inc.
Lucy Jones, Founder and Director, Dr. Lucy Jones Center for Science and Society



Rethinking Communication about Seismic Risk – Linking Knowledge to Action in Innovative Ways since the 1994 Northridge Earthquake

Ronald T. Eguchi
Co-Founder & CEO
ImageCat, Inc.

www.imagecatinc.com



18 December 2024



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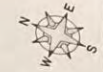


*You don't know how far
you've come until you
look back*



PLANNING SCENARIO
 For a Major Earthquake,
 San Diego-Tijuana Metropolitan Area
SEISMIC INTENSITY DISTRIBUTION
 1990

- < VII** SHAKING INTENSITY (Modified Mercalli Intensity Scale - strongest)
 No significant damage to structures. Less than or equal to 1/2" damage to plaster, masonry, or masonry tile or brick. Significant damage to unreinforced masonry. Fall of chimney stacks, or other masonry structures. Damage to some steel structures and high buildings.
- VII** SHAKING INTENSITY (Modified Mercalli Intensity Scale - strongest)
 Damage to plaster, masonry, or masonry tile or brick. Significant damage to unreinforced masonry. Fall of chimney stacks, or other masonry structures. Damage to some steel structures and high buildings.
- VIII** SHAKING INTENSITY (Modified Mercalli Intensity Scale - strongest)
 Damage to plaster, masonry, or masonry tile or brick. Significant damage to unreinforced masonry. Fall of chimney stacks, or other masonry structures. Damage to some steel structures and high buildings.
- IX** SHAKING INTENSITY (Modified Mercalli Intensity Scale - strongest)
 Damage to plaster, masonry, or masonry tile or brick. Significant damage to unreinforced masonry. Fall of chimney stacks, or other masonry structures. Damage to some steel structures and high buildings.



GROUND FAILURE

Areas with very high to high potential for ground failure, liquefaction, landslides, and other seismic effects.

Area subject to potentially induced subsidence.

GENERAL NOTES ON THE FOLLOWING INTENSITY DISTRIBUTION:

- 1. A SUMMARY OF FACTORS OF THE PLANNING AREA IS GIVEN IN THE APPENDIX.
- 2. THE INTENSITY DISTRIBUTION IS BASED ON THE ASSUMPTION THAT A MAJOR EARTHQUAKE OF APPROXIMATELY M=7.5 WILL OCCUR ON THE SILVER STRAND FAULT.
- 3. THE INTENSITY DISTRIBUTION IS BASED ON THE ASSUMPTION THAT THE EARTHQUAKE WILL BE A SHALLOW EARTHQUAKE WITH A HYPOCENTER AT A DEPTH OF APPROXIMATELY 10 KILOMETERS.
- 4. THE INTENSITY DISTRIBUTION IS BASED ON THE ASSUMPTION THAT THE EARTHQUAKE WILL BE A STRIKE-SLIP EARTHQUAKE.
- 5. THE INTENSITY DISTRIBUTION IS BASED ON THE ASSUMPTION THAT THE EARTHQUAKE WILL BE A NORMAL EARTHQUAKE.
- 6. THE INTENSITY DISTRIBUTION IS BASED ON THE ASSUMPTION THAT THE EARTHQUAKE WILL BE A THrust EARTHQUAKE.
- 7. THE INTENSITY DISTRIBUTION IS BASED ON THE ASSUMPTION THAT THE EARTHQUAKE WILL BE A TRANSVERSE EARTHQUAKE.
- 8. THE INTENSITY DISTRIBUTION IS BASED ON THE ASSUMPTION THAT THE EARTHQUAKE WILL BE A COMPLEX EARTHQUAKE.
- 9. THE INTENSITY DISTRIBUTION IS BASED ON THE ASSUMPTION THAT THE EARTHQUAKE WILL BE A MULTIFACETED EARTHQUAKE.
- 10. THE INTENSITY DISTRIBUTION IS BASED ON THE ASSUMPTION THAT THE EARTHQUAKE WILL BE A MULTIFACETED EARTHQUAKE.





PLANNING SCENARIO

For a Major Earthquake
San Diego-Tijuana Metropolitan Area

GENERAL ACUTE CARE HOSPITALS

and
SKILLED NURSING FACILITIES
(99 or more beds)

1990

EXPLANATION

B⁹

Base Hospital during area-wide emergencies
(Superscripts refer to number in Table)

H⁹

Hospital (see Table for facility and number of beds)

N

Skilled Nursing Facility

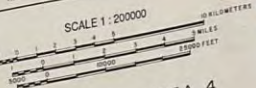


- HOSPITALS AND CARE FACILITIES**
- 1. HUNTINGTON MEMORIAL HOSPITAL
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 - 3. HUNTINGTON MEMORIAL HOSPITAL
 - 4. HUNTINGTON MEMORIAL HOSPITAL
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SCENARIO MAPS AND DAMAGE ASSESSMENTS
ARE PREPARED FOR THE FOLLOWING
HYPOTHESES:

- THEY ARE BASED UPON THE FOLLOWING HYPOTHESES:
 - 1. A PARTICULAR EARTHQUAKE OCCURS
 - 2. A PARTICULAR LOCATION IN THE PLANNING AREA EXHIBITS A SPECIFIC TYPE OF SHAKING OF PERIODIC NATURE
 - 3. CERTAIN CRITICAL FACILITIES UNDERGO DAMAGE
 - 4. CERTAIN CRITICAL FACILITIES DO NOT
- THE CONCLUSIONS REGARDING THE PERFORMANCE OF FACILITIES AND INFRASTRUCTURE ARE TO BE CONSIDERED AS SITE-SPECIFIC DAMAGE ASSESSMENTS FOR THE PART OF THE PLANNING AREA COVERED BY THE SCENARIO MAP DEVELOPMENT. DAMAGE ASSESSMENTS ARE NOT TO BE USED AS TO THE PERFORMANCE OF FACILITIES OR INFRASTRUCTURE IN OTHER PARTS OF THE PLANNING AREA. DAMAGE ASSESSMENTS ARE MOST PRELIMINARY AND SHOULD BE USED ONLY FOR PLANNING PURPOSES. DAMAGE ASSESSMENTS SHOULD BE USED ONLY FOR PLANNING PURPOSES. DAMAGE ASSESSMENTS SHOULD BE USED ONLY FOR PLANNING PURPOSES.
- THE DAMAGE ASSESSMENTS ARE BASED UPON THIS SCENARIO. SCENARIOS AN APPROXIMATE OF SEVERAL GREATELY DIFFERENT PATTERNS OF SHAKING AREA WOULD RESULT IN A VARIOUS DIFFERENT PATTERNS OF DAMAGE.

SCALE 1:200000



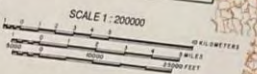
PLANNING AREA 4 SILVER STRAND FAULT



U.S. Geological Survey 100K Map Series and
Geological Survey 100K Map Series and
Geological Survey 100K Map Series

**SCENARIO MAPS AND DAMAGE ASSESSMENTS
AND ELECTRICAL FACILITIES PLANNING**

- THE L ARE BASED UPON THE FOLLOWING ASSUMPTIONS:
1. A PARTICULAR SCENARIO MAP COORDINATES LOCATED IN THE PLANNING AREA OR SPECIFIC TO A PARTICULAR SCENARIO OR SCENARIOS OF DAMAGE TO ELECTRICAL FACILITIES (DAMAGED DAMAGE) AND OTHERS DO NOT
- THE CONCLUSIONS REGARDING THE RECOMMENDATIONS CONCERNING THE REPAIRS AND RECONSTRUCTION OF THE ELECTRICAL SYSTEMS ARE BASED ON THE ASSUMPTIONS THAT THE ELECTRICAL SYSTEMS WILL BE RECONSTRUCTED TO THE ORIGINAL DESIGN OR TO A DESIGN THAT IS MORE RESILIENT AND MODERN. THESE RECOMMENDATIONS ARE BASED ON THE ASSUMPTIONS THAT THE ELECTRICAL SYSTEMS WILL BE RECONSTRUCTED TO THE ORIGINAL DESIGN OR TO A DESIGN THAT IS MORE RESILIENT AND MODERN. THESE RECOMMENDATIONS ARE BASED ON THE ASSUMPTIONS THAT THE ELECTRICAL SYSTEMS WILL BE RECONSTRUCTED TO THE ORIGINAL DESIGN OR TO A DESIGN THAT IS MORE RESILIENT AND MODERN.
- THE DAMAGE ASSESSMENTS ARE BASED UPON THE ASSUMPTIONS THAT THE ELECTRICAL SYSTEMS WILL BE RECONSTRUCTED TO THE ORIGINAL DESIGN OR TO A DESIGN THAT IS MORE RESILIENT AND MODERN. THESE RECOMMENDATIONS ARE BASED ON THE ASSUMPTIONS THAT THE ELECTRICAL SYSTEMS WILL BE RECONSTRUCTED TO THE ORIGINAL DESIGN OR TO A DESIGN THAT IS MORE RESILIENT AND MODERN.



**PLANNING AREA 4
SILVER STRAND FAULT**



Base Map by U.S. Geological Survey 100K Map Series and by Secretaría de Programación y Presupuesto 50K Map Series.

PLANNING SCENARIO
San Diego-Tijuana Metropolitan Area
ELECTRICAL POWER FACILITIES



- 1990
- E2** Location of damage assessment (see text for details)
- EXPLANATION**
- Major Transmission Routes
 - 500 Kilovolts
 - 230-267 Kilovolts
 - 138 Kilovolts
 - 69 Kilovolts (Selected)
 - Power Plant
 - Major Transmission Substation
 - Substation (Selected)



Drawbacks ...

- ❑ Took a long time to do the analysis and write the report
- ❑ Results were static, i.e., addressing different assumptions or parameters not possible
- ❑ Difficult to assess the possible effects at selected sites because you'd have to scale off of maps
- ❑ Format ---> hard copy reports only ... not well-suited for widespread distribution
- ❑ Not ideal for decision-making --- difficult to involve broad stakeholder groups in development of report





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*A Picture is Worth
a Thousand Words*

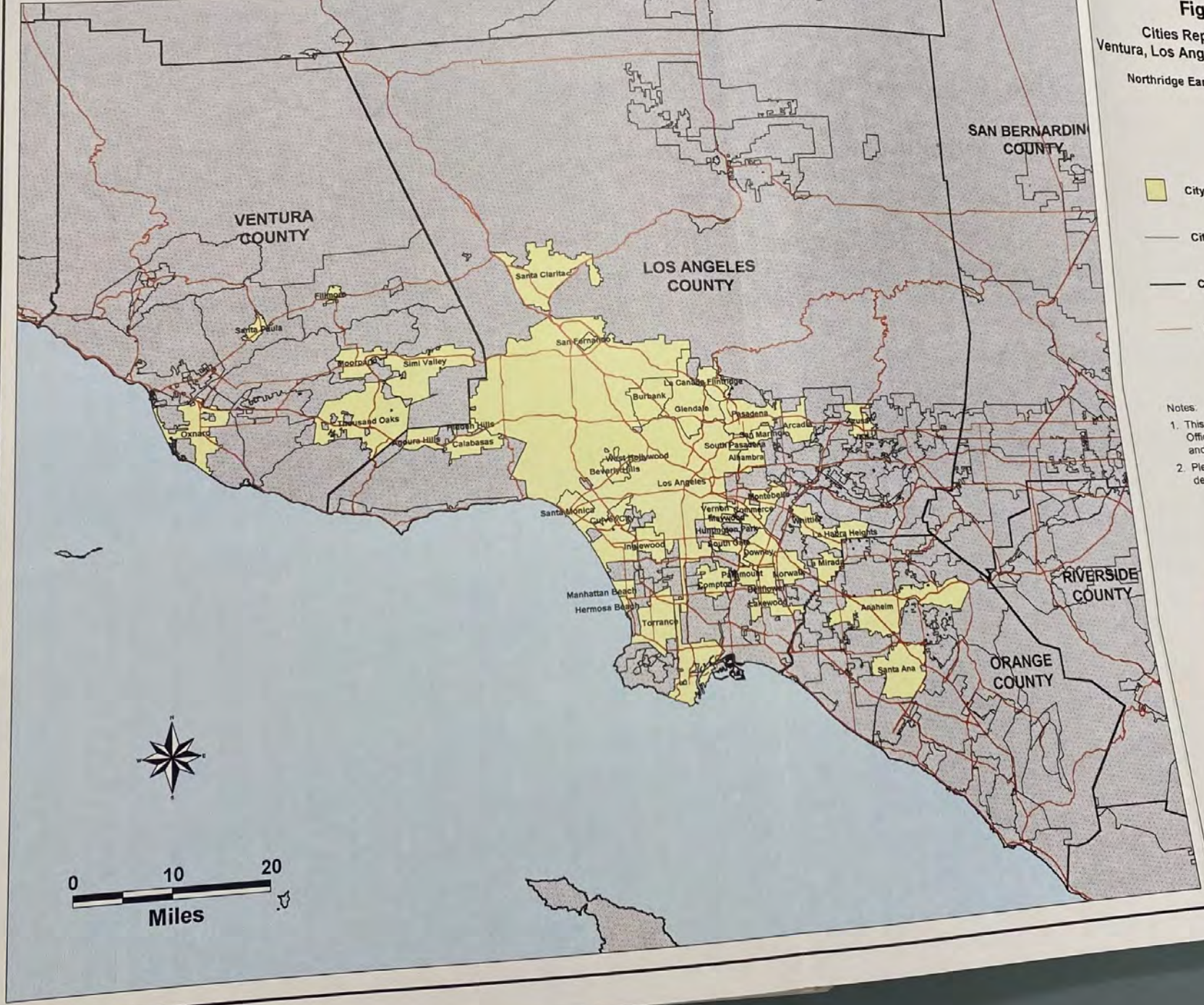






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*An Image is Worth
a Thousand Actions*

Figure 1-1:
Cities Reporting Damage in
Ventura, Los Angeles and Orange Counties

Northridge Earthquake Disaster DR-1008



-  City reporting damage
-  City boundary
-  County boundary
-  Major highway

- Notes:
1. This data reflects information as provided to the Office of Emergency Services by the Building and Safety Departments of the highlighted cities.
 2. Please refer to the table within the report for detailed information.



Joint OES-FEMA Disaster Field Office
 245 S. Los Robles Avenue, 4th floor
 Pasadena, California 91101
 (818) 583-7436
 OES Headquarters
 2800 Meadowview Road
 Sacramento, California 95832

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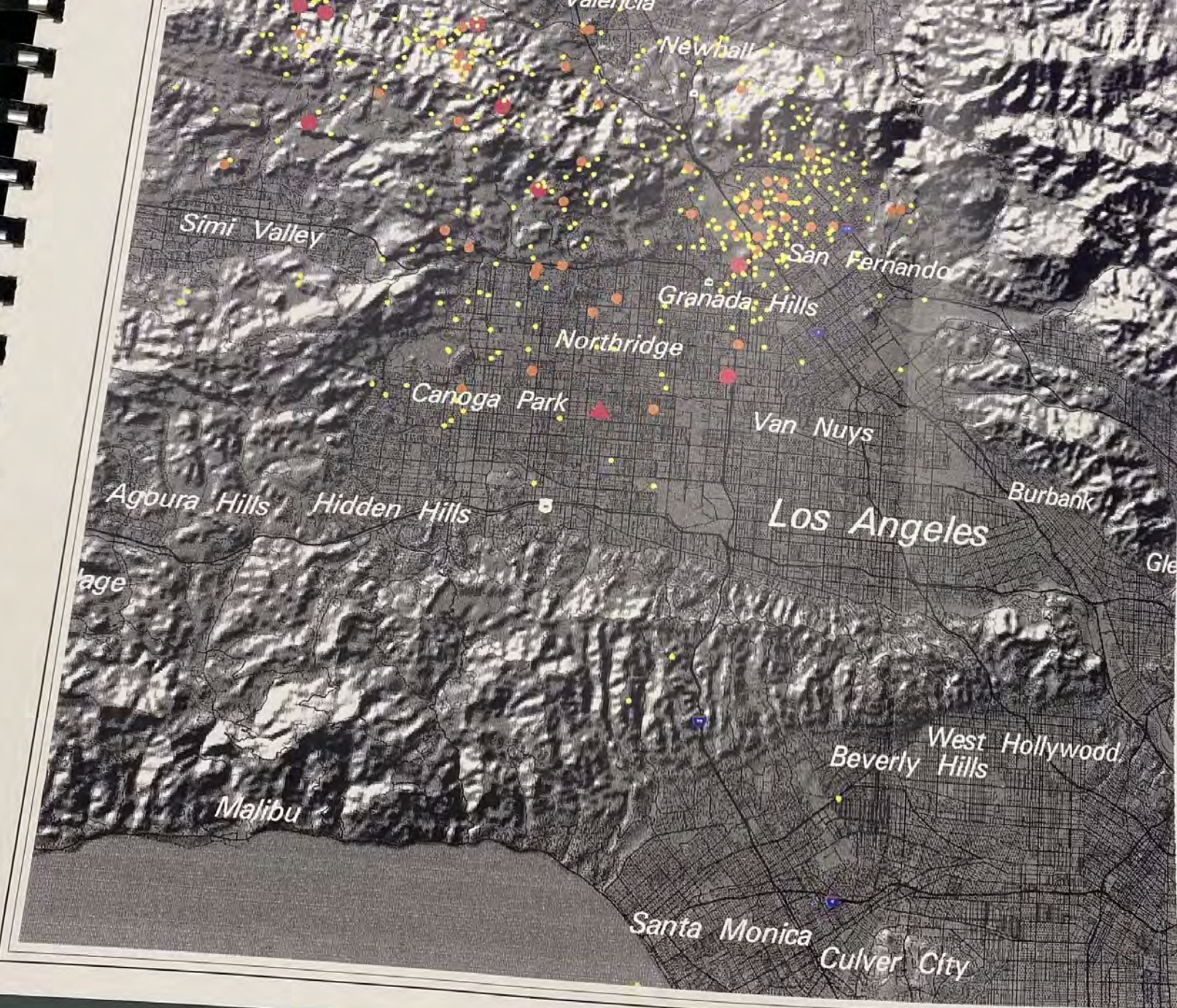






Figure 2-4: EARTHQUAKE EPICENTERS

January 1 through
 October 9, 1994
 Northridge Earthquake Disaster DR-1008

Epicenter Magnitudes

-  Initial 6.7 Magnitude Event
-  5.0 - 5.9
-  4.0 - 4.9
-  3.0 - 3.9

Data Sources:
 California Division of Earthquake Geomorphological Laboratory
 Epicenter Data
 United States Geological Survey
 Municipal Data
 Thomas Bros. Maps Co., 1986
 Power Network
 Public Buildings



AND (916) 444-1111, Central Field Office
 245 S. Los Robles Avenue, 8th Floor
 Pasadena, California 91101
 (818) 793-7426
 OES Headquarters
 2500 Massachusetts Road
 Sacramento, California 95833

Department of Earthquake Engineering
 300 New York Street
 Berkeley, CA 94710

Development Patterns of Structures in Los Angeles and Orange Counties with Modified Mercalli Shaking Intensities



Average Age of Structures

- Pre-1920
- 1921 - 1940
- 1941 - 1960
- 1961 - 1980
- 1981 - 1984

County Boundary

Highway

USGS Observed Shaking Intensities November 1994

MMI Intensities in blue for clarity

Notes:

The year built is determined by averaging the construction age within a 10,000 square meter cell.

The Los Angeles County Assessor database field which records the year built is only 2 characters wide. For these purposes, OES-GIS assumed that all structures less than 94 were built in the 1800s, and all structures 95 to 99 were built in the 1900s. The Orange County database field is 4 characters wide.

The georeferencing of Los Angeles County records produced a match rate of 97 percent from the entire Assessor's database. Orange County locations matched at a rate of 62.5 percent.

Sources:

- Observed Ground Shaking Intensities
 - As compiled by Jim Dewey
 - United States Geological Survey
- Assessor structure locations and age
 - Los Angeles County Assessor
 - Orange County Assessor
- County boundaries
 - Tera Data Center
- Highway Network
 - Thomas Brothers Maps
- Digital Elevation Model
 - United States Geological Survey



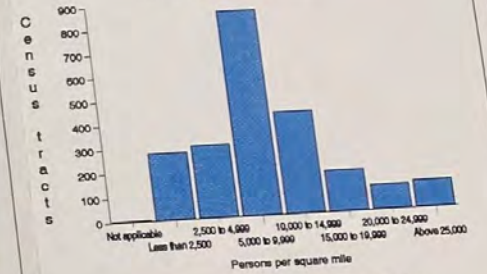
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74 N. Pasadena Avenue, West Annex, 9th Floor
Pasadena, California 91103-3878
(818) 431-2643
OES Headquarters
2800 Meadowview Road
Sacramento, California 95832

Population Density By Census Tract

Northridge Earthquake Disaster DR-1008
Persons Per Square Mile

- 25,000 and above
- 20,000 to 24,999
- 15,000 to 19,999
- 10,000 to 14,999
- 5,000 to 9,999
- 2,500 to 4,999
- Less than 2,500
- Not applicable
- ▣ MMI Intensity
- - - County Line
- Highways
- ▲ Epicenter

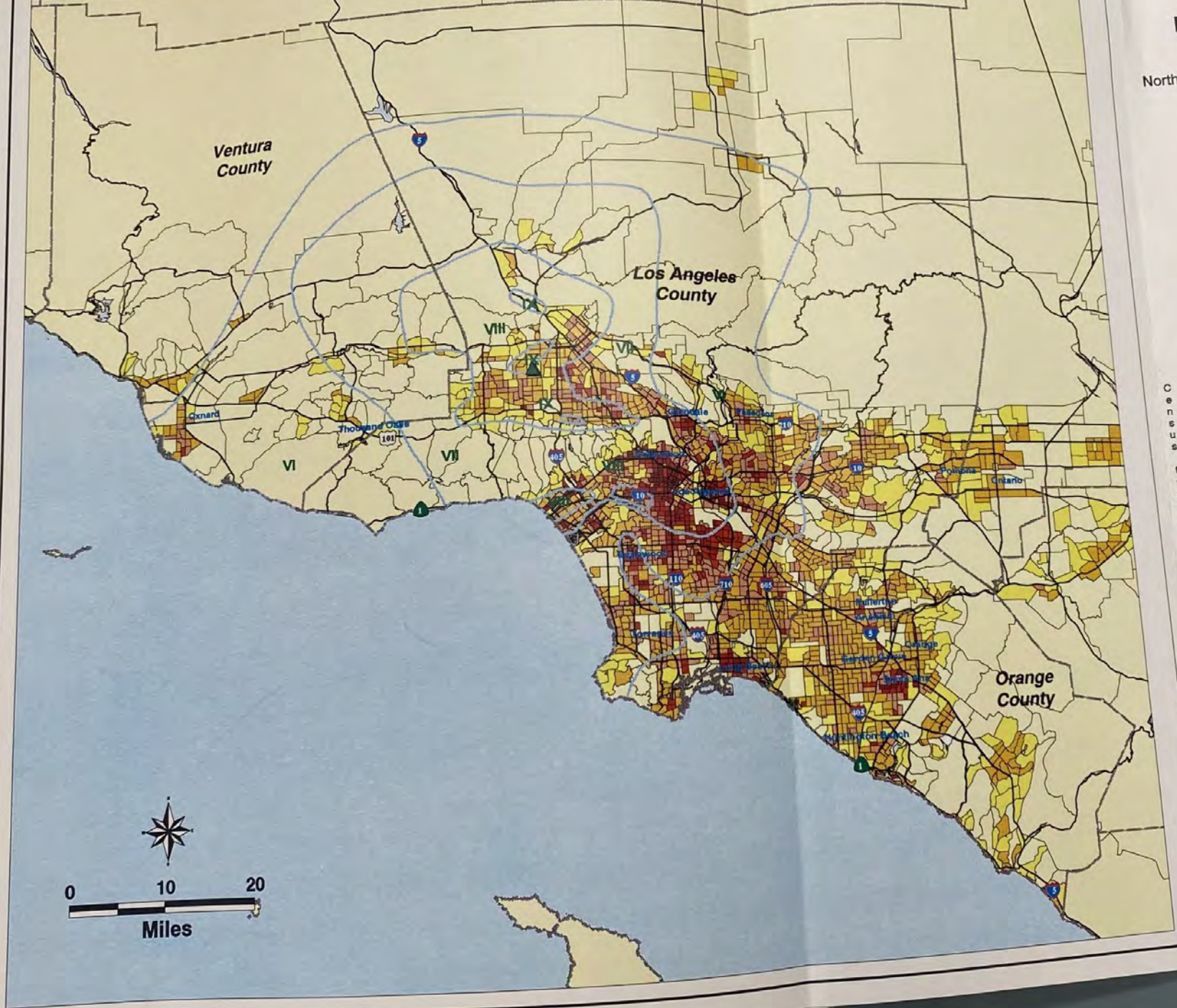
Distribution of census tract values for tri-county area.



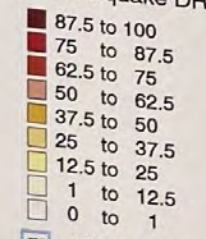
Source: 1990 Census of Population and Housing



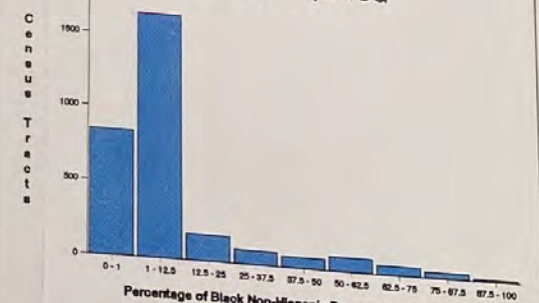
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 Pasadena, California 91102-6020
 (818) 431-3537
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 2800 Meadowview Road
 Sacramento, California 95832



Map 4-3: **Percentage of Black Non-Hispanic Persons By Census Tract**
 Northridge Earthquake DR-1008



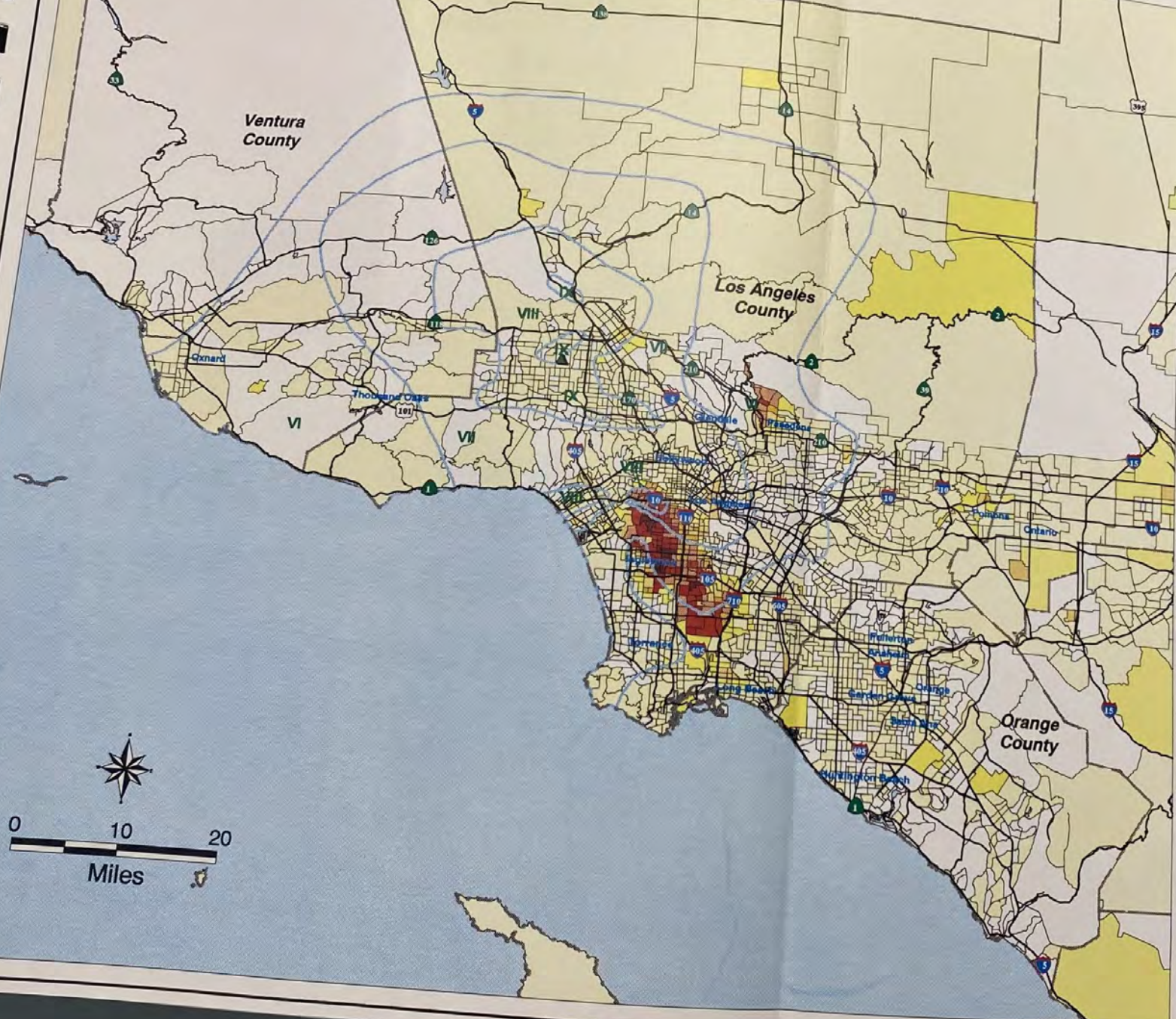
Distribution of Census Tracts Values For Tri-County Area



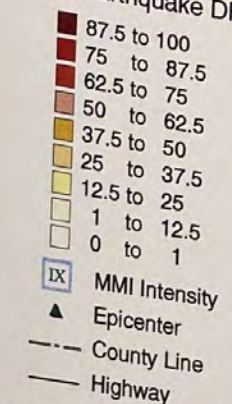
Percentage of Black Non-Hispanic Persons Per Census Tract
 Note: Thematic ranges are greater than or equal to the minimum percentage and less than the maximum percentage.
 Sources: Modified Mercalli Intensity data: US Geological Survey, 11-15-94
 Census data: Census of Population & Housing, 1990.



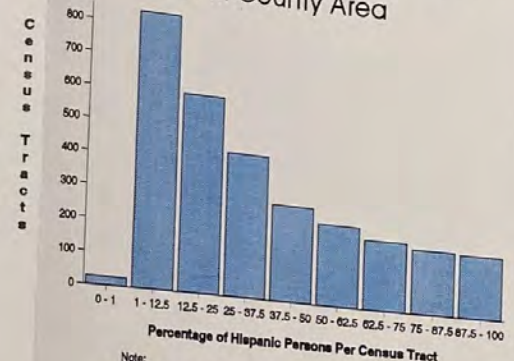
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 Pasadena, California 91102-6020
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 Sacramento, California 95832



Map 4-4: **Percentage of Hispanic Persons By Census Tract Northridge Earthquake DR-1008**

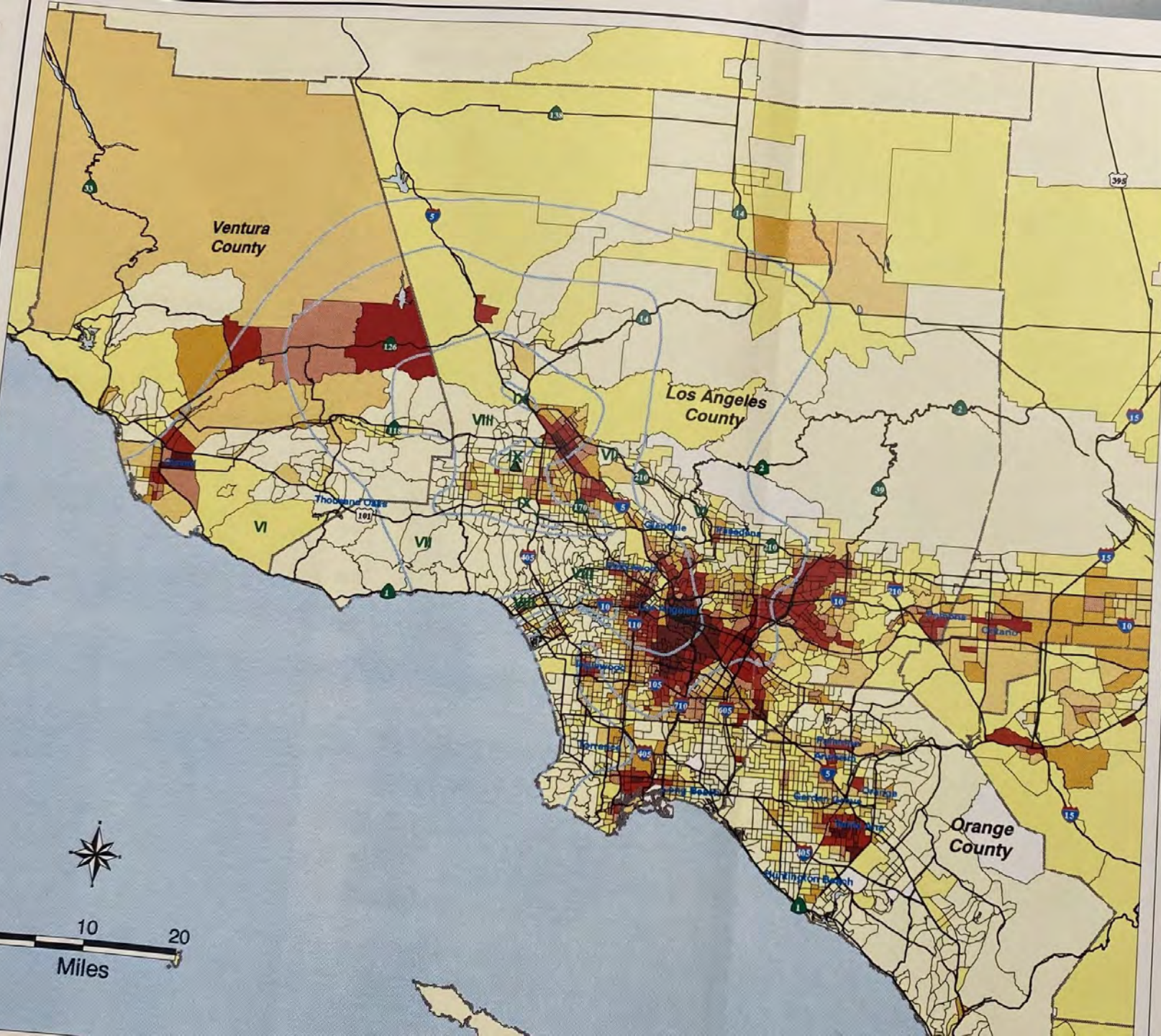


Distribution of Census Tracts Values For Tri-County Area



Note:
Thematic ranges are greater than or equal to the minimum percentage and less than the maximum percentage.

Sources:
Modified Mercalli Intensity data: US Geological Survey, 11-15-04
Census data: Census of Population & Housing, 1990.

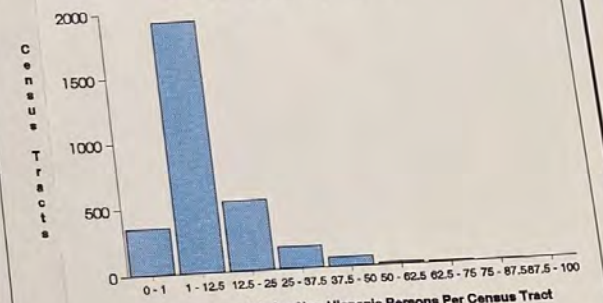


Map 4-5: **Percentage of Asian Non-Hispanic Persons By Census Tract**
Northridge Earthquake DR-1008



- IX MMI Intensity
- ▲ Epicenter
- County Line
- Highway

Distribution of Census Tracts Values for Tri-County Area



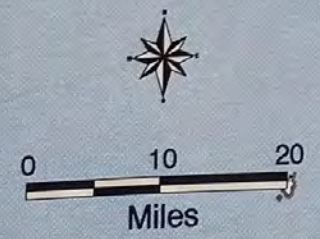
Percentage of Asian Non-Hispanic Persons Per Census Tract

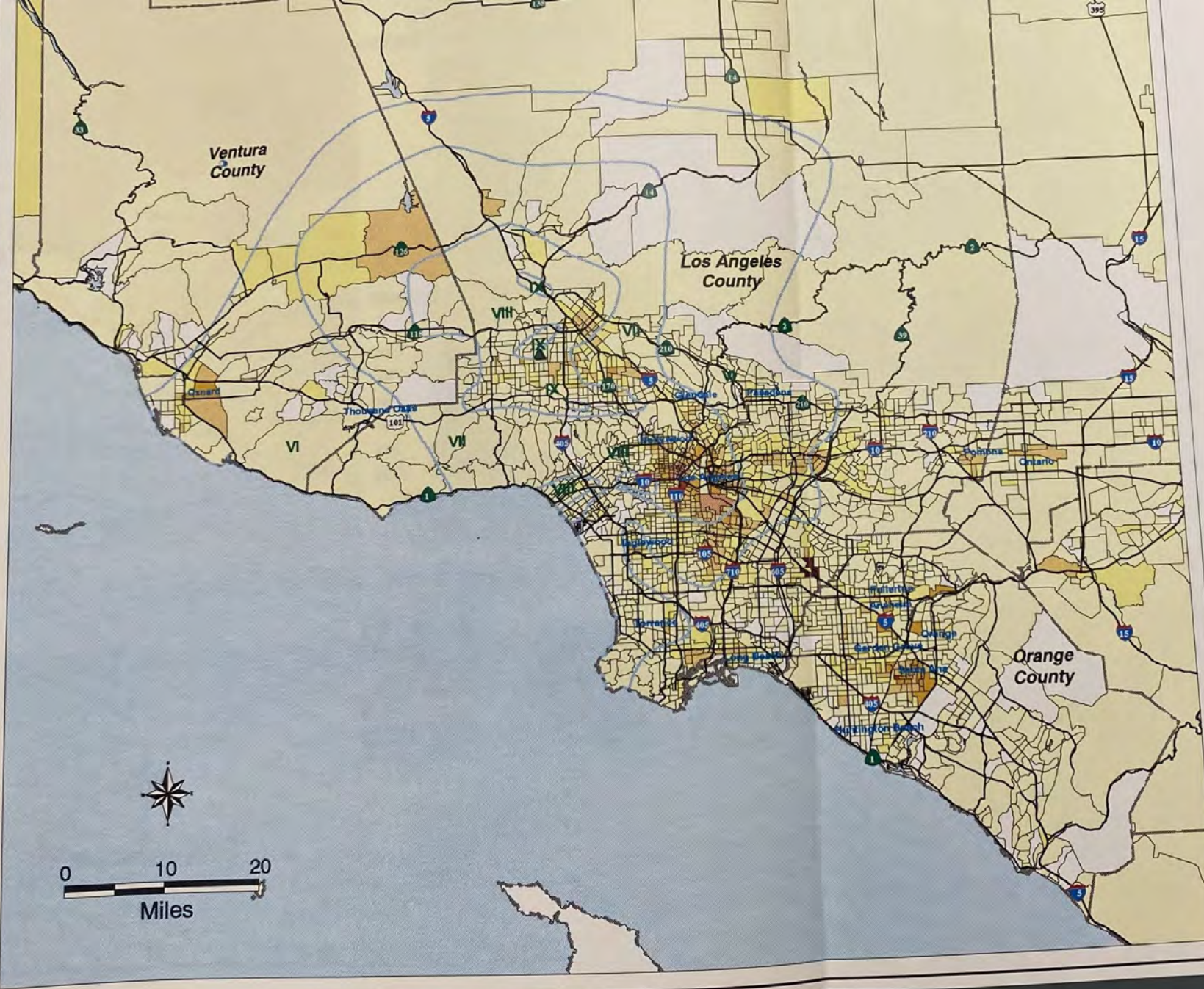
Note: Thematic ranges are greater than or equal to the minimum percentage and less than the maximum percentage.

Sources: Modified Mercalli Intensity data: US Geological Survey, 11-15-94
Census data: Census of Population & Housing, 1990.



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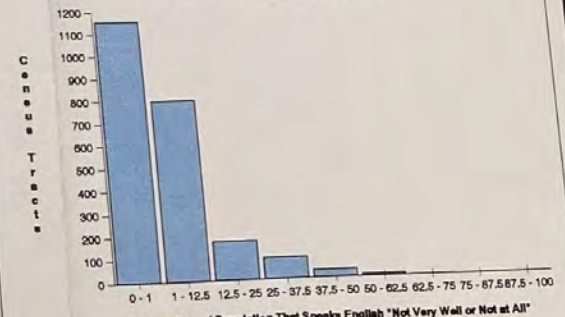




- 87.5 to 100
- 75 to 87.5
- 62.5 to 75
- 50 to 62.5
- 37.5 to 50
- 25 to 37.5
- 12.5 to 25
- 1 to 12.5
- 0 to 1

- IX MMI Intensity
- ▲ Epicenter
- County Line
- Highway

Distribution of Census Tracts Values for Tri-County Area



Percentage of Population That Speaks English "Not Very Well or Not at All"

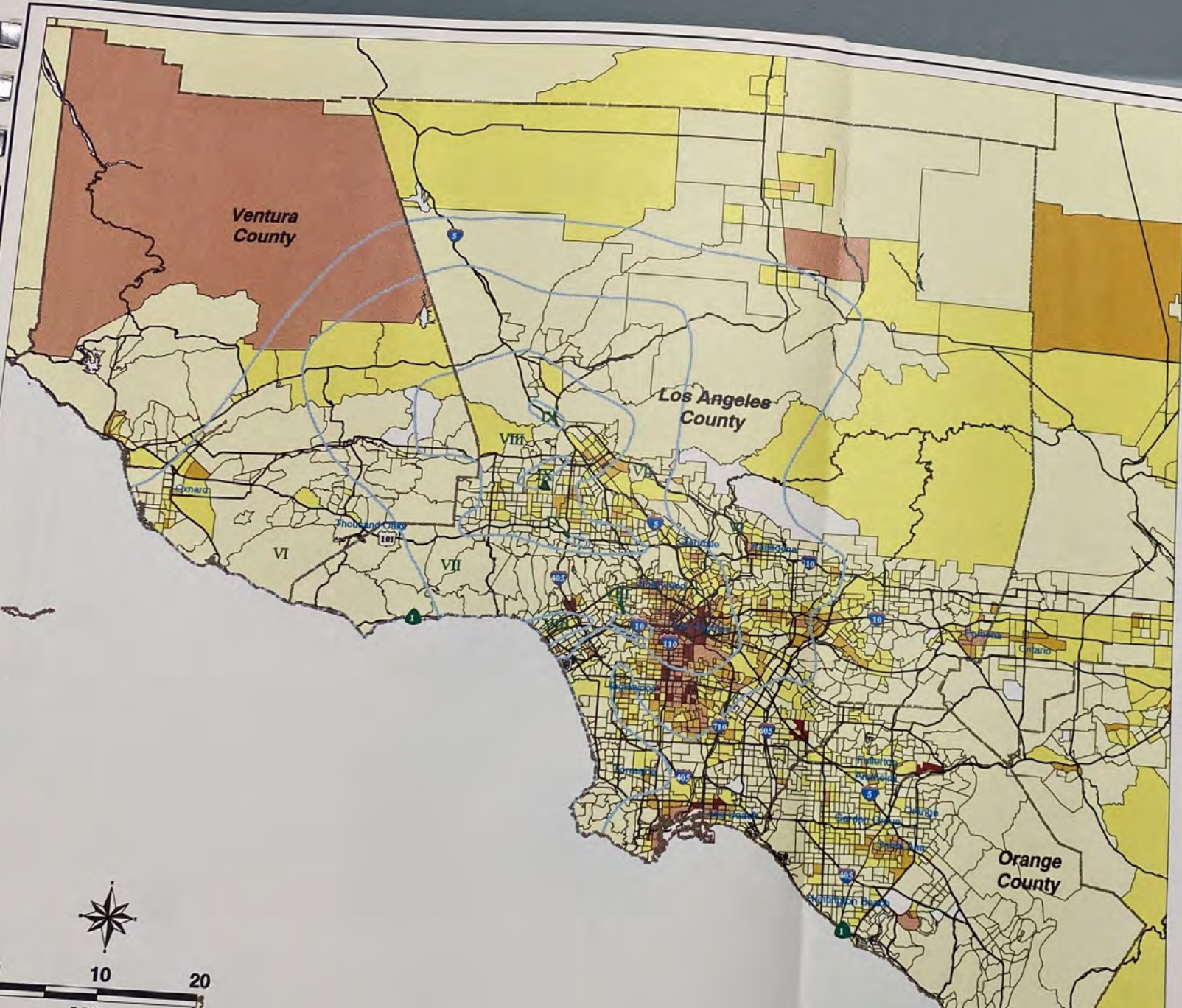
Sources:
 Modified Mercalli Intensity data: US Geological Survey, 11-15-94
 Census data: Census of Population & Housing, 1990.

Note:
 Thematic ranges are greater than or equal to the minimum percentage and less than the maximum percentage.
 Percentages calculated using population 5 years of age and older.
 The data presented on this map is subjective in nature. According to the 1990 Census of Population & Housing:

"The data on ability to speak English represent the person's own perception about his or her ability or, because census questionnaires are usually completed by one household member, the responses may represent the perception of another household member."



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Map 4-9

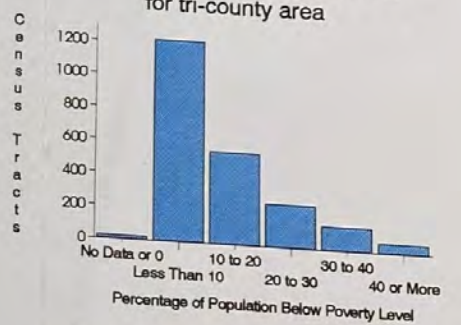
Percentage of Population Below Poverty Level

By Census Tract

Northridge Earthquake Disaster DR-1008

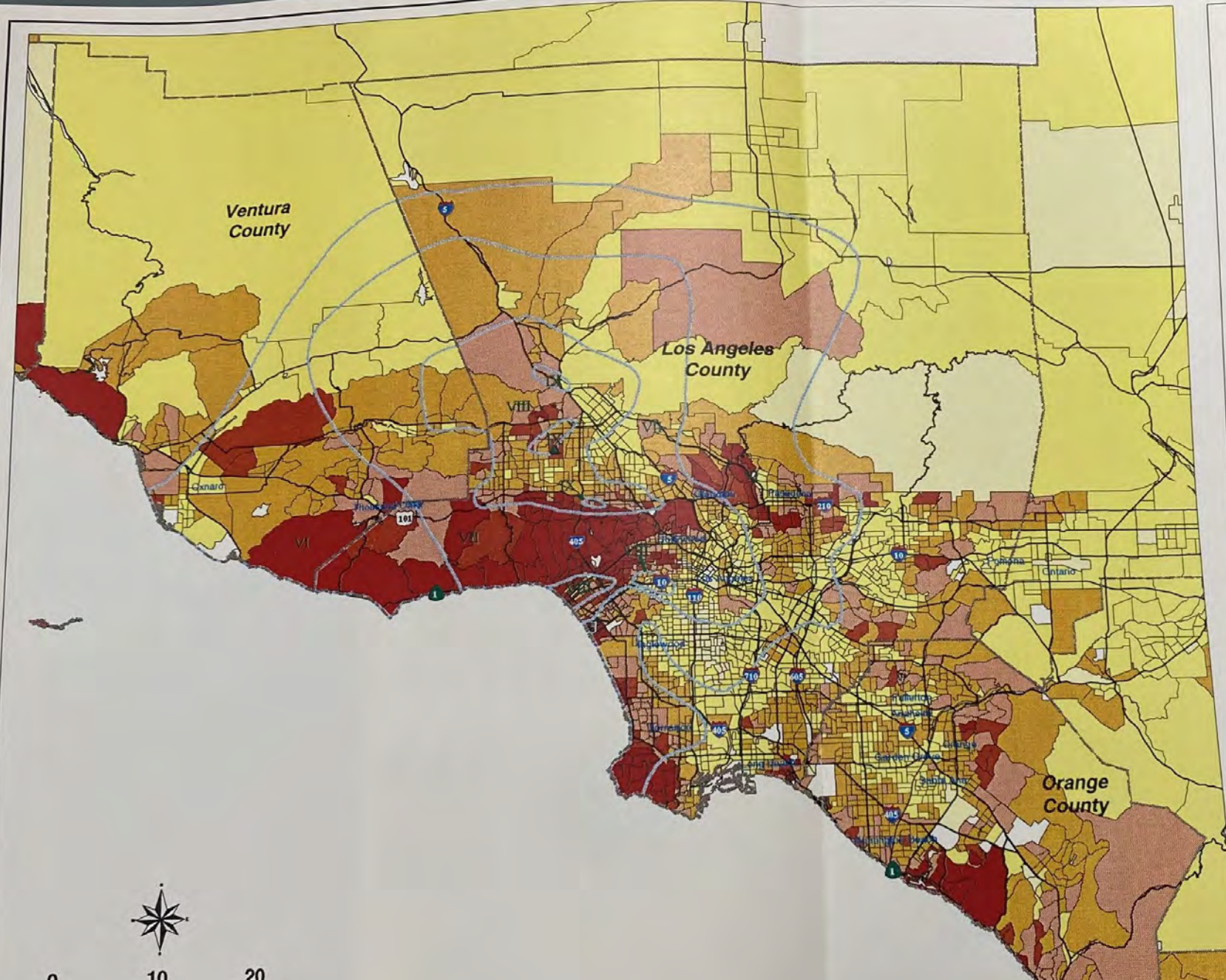
- 40 or more
- 30 to 39
- 20 to 29
- 10 to 19
- Less Than 10
- No Data
- MMI Intensity
- County Line
- Highways
- ▲ Epicenter

Distribution of census tract values for tri-county area



Source: 1990 Census of Population and Housing

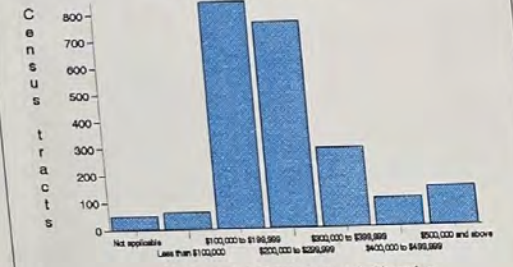




Map 4-11:
Median Value of Owner Occupied Housing
By Census Tract
 Northridge Earthquake Disaster DR-1008

- \$500,000 and above
- \$400,000 to \$499,999
- \$300,000 to \$399,999
- \$200,000 to \$299,999
- \$100,000 to \$199,999
- Less than \$100,000
- Not applicable
- MMI Intensity
- County Line
- Highways
- ▲ Epicenter

Distribution of census tract values for tri-county area.



Source: 1990 Census of Population and Housing



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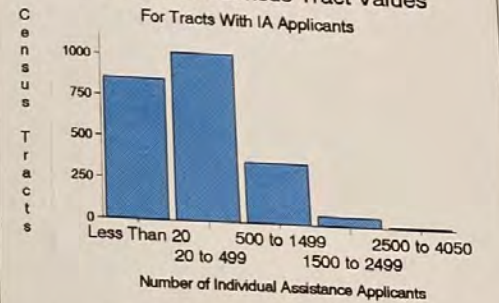
Map 4-12:
**Number of Individual Assistant Applicants
 By Census Tract**

Northridge Earthquake DR-1008

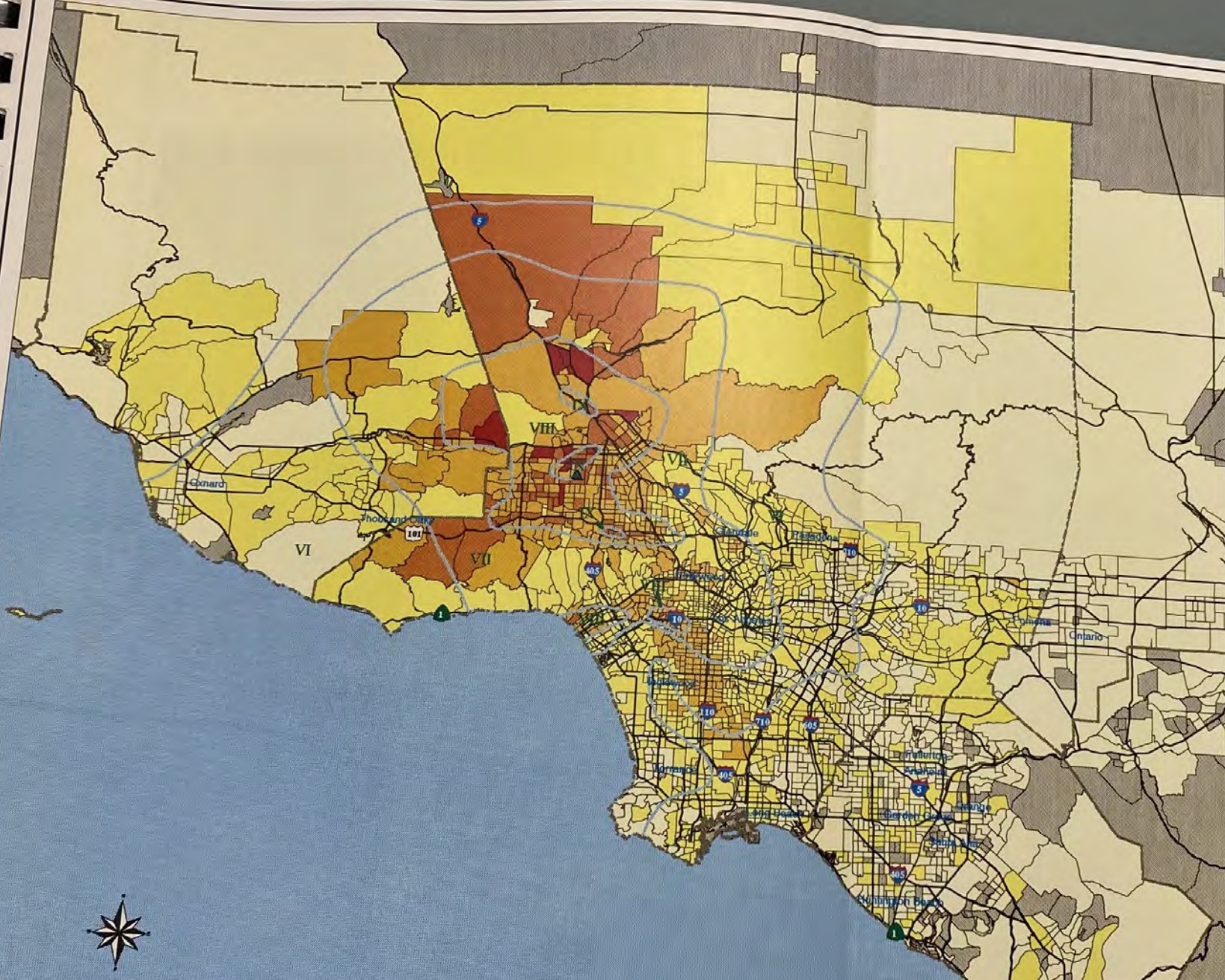
- 2500 to 4050
- 1500 to 2499
- 500 to 1499
- 20 to 499
- Less Than 20
- No Individual Assistance Applications

- MMI Intensity
- County Line
- Highways
- Epicenter

Distribution of Census Tract Values
 For Tracts With IA Applicants



Source: 1990 Census of Population and Housing



0 10 20

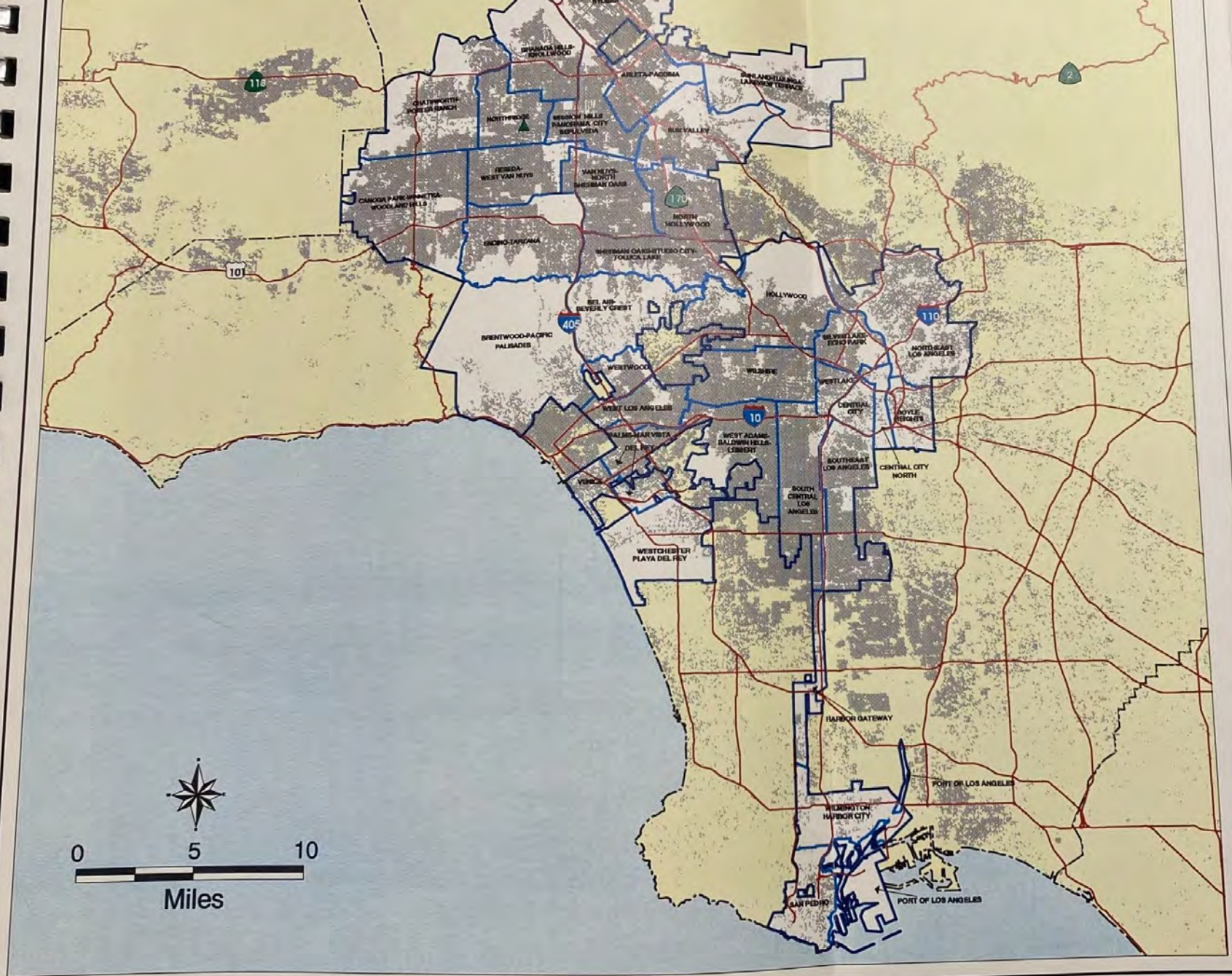
- ▲ Individual Assistance Application
- ▲ Epicenter
- - - County Boundary
- Highway
- Los Angeles City Boundary
- Community Boundary* (Planning Districts) within the City of Los Angeles

*Source: City of Los Angeles Land Development and Mapping Division

Los Angeles Community	Number of Applicants
ARLETA-PACIFICA	12,728
BEL AIR-BEVERLY CREST	2,225
BOYLE HEIGHTS	670
BRENTWOOD-PACIFIC PALISADES	2,780
CANOGA PARK-WINNETKA-WOODLAND HILLS	42,348
CENTRAL CITY	800
CENTRAL CITY NORTH	204
CHATSWORTH-PORTER RANCH	24,826
ENCINO-TARZANA	19,405
GRANADA HILLS-HOLLYWOOD	19,145
HARBOR-GATEWAY	609
HOLLYWOOD	21,370
MISSION HILLS-PANORAMA CITY NORTH	21,705
NORTH HOLLYWOOD	15,643
NORTHEAST LOS ANGELES	5,278
NORTHridge	23,889
PALMS-MAR VISTA DEL REY	4,833
PORT OF LOS ANGELES	2
REBEDEA-WEST VAN NUYS	27,385
SAN PEDRO	712
SHERMAN OAKS-ATLANTIC CITY-TOLUCA LAKE	22,289
SILVER LAKE-ERCHO PARK	1,827
SOUTH CENTRAL LOS ANGELES	30,915
SOUTHEAST LOS ANGELES	21,082
SUN VALLEY	7,138
SUNLAND-TULUNGA-LAKEVIEW TERRACE	4,718
SYLMAR	12,823
VAN NUYS-NORTH SHERMAN OAKS	29,239
VENICE	1,298
WEST ADAMS-BALDWIN HILLS LEMERT	34,281
WEST LOS ANGELES	8,425
WESTCHESTER-PLAYA DEL REY	1,230
WESTLAKE	2,972
WESTWOOD	1,305
WILMINGTON-HARBOR CITY	484
WILSHIRE	18,674
TOTAL	443,001



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County Boundary
 Highway

Notes:
 Analysis shows normalized concentrations of dollar amounts awarded by the Individual Assistance Program (IFEMA, IFG, SBA). All applicant sites were converted to cells for raster analysis.
 Original cell size: 40,000 sq. meters
 Values were normalized by total dollar amount for each cell.
 Focalsean (average of each cell based on neighboring values) was run to generalize the data and to highlight patterns of occurrence. Neighborhood of 15 cells on a side.
 Total number of applicant points in analysis: 471,395
 Applicant sites with a dollar value of zero were dropped from analysis. A determination could not be made as to whether dollars were not awarded or simply not recorded.

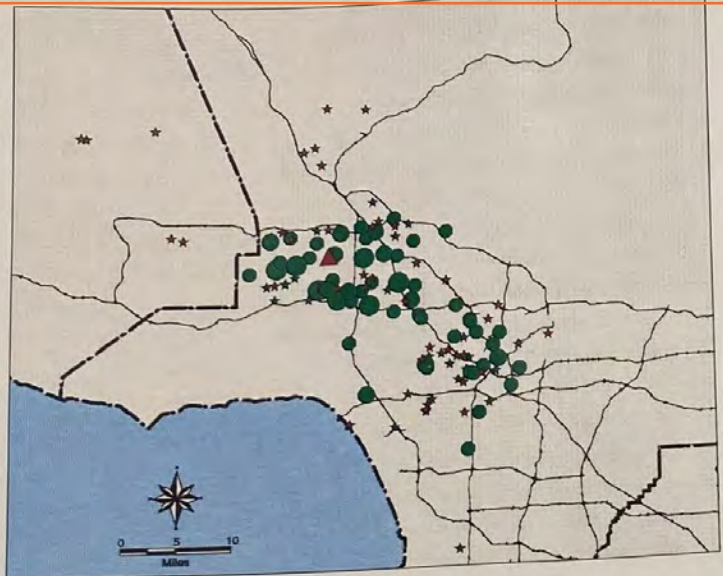
Sources:
 Individual Assistance Applications - Federal Emergency Management Agency
 County boundaries - Teale Data Center
 Highway Network - Thomas Brothers Maps
 Digital Elevation Model - United States Geological Survey



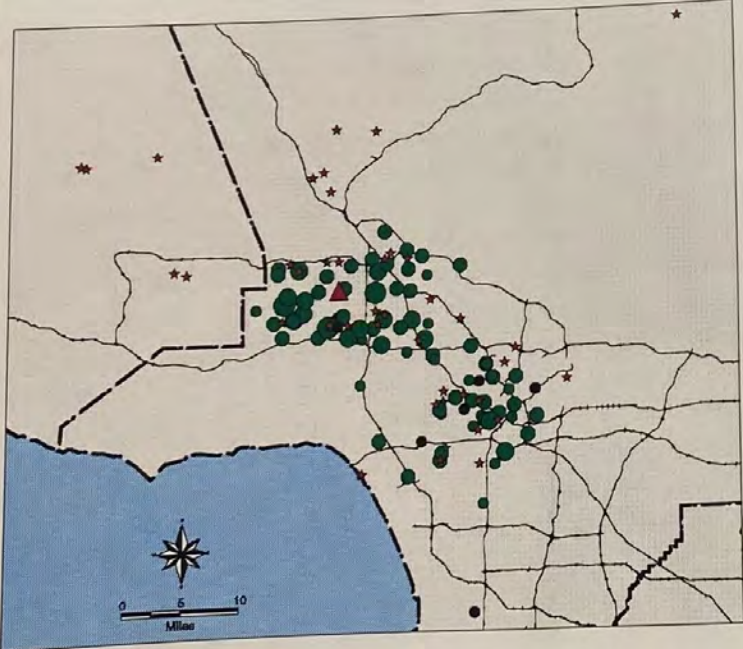
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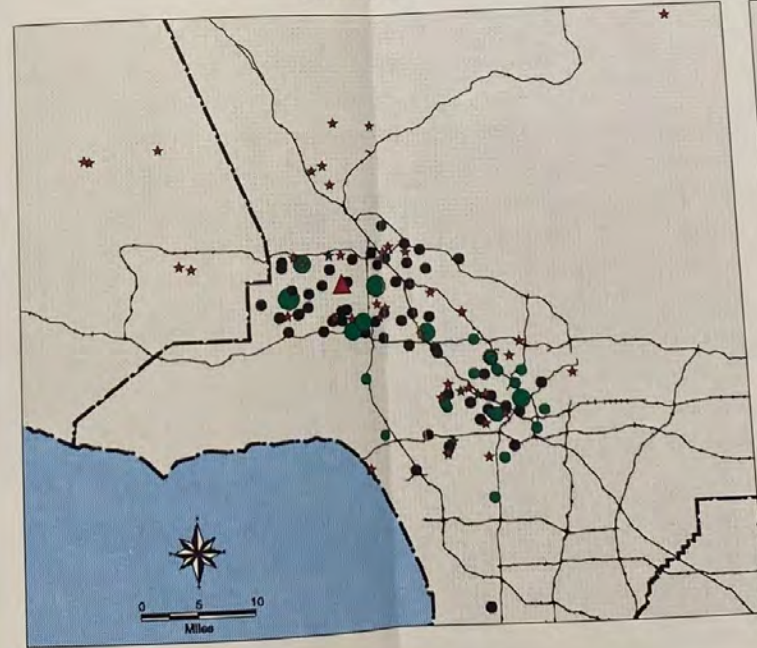
January 17



January 19



January 20



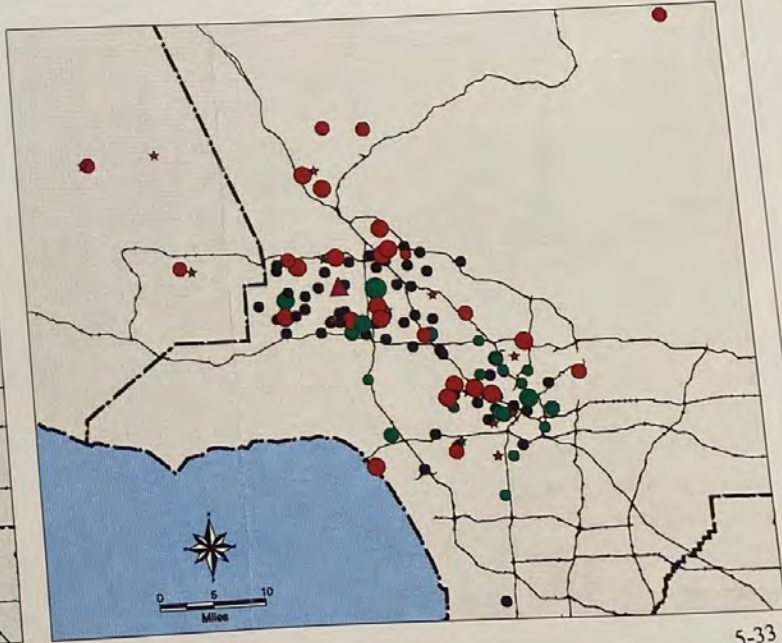
Timeline of Shelter Populations January 17, 1994 to January 21, 1994 Northridge Earthquake DR-1005

- ▲ Epicenter
 - County Boundary
 - Red Cross Shelter
 - ★ Red Cross Shelter - Population Unknown
 - City of Los Angeles Parks & Recreation Shelter
 - ★ City of Los Angeles Parks & Recreation Shelter Population Unknown
 - Salvation Army Shelter
 - ★ Salvation Army Shelter - Population Unknown
 - Closed Shelter
- Shelter Population**
- 1000 to 5000
 - 200 to 999
 - 1 to 199
 - 0



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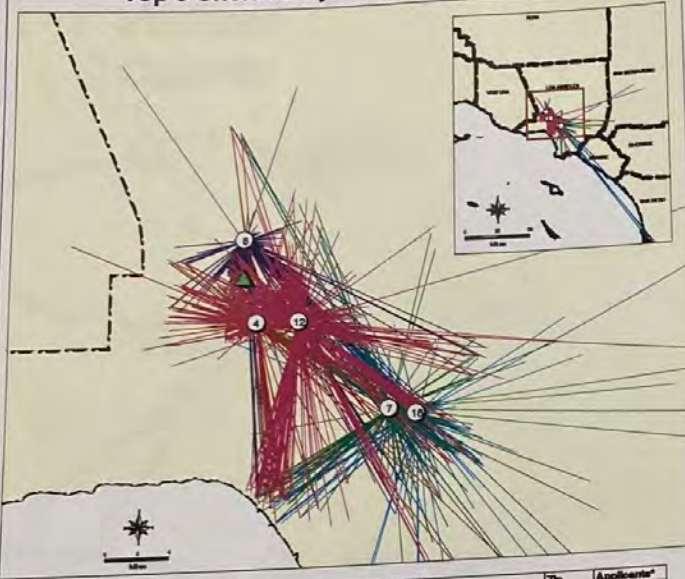
January 21



Preliminary Red Cross Shelter Registrations

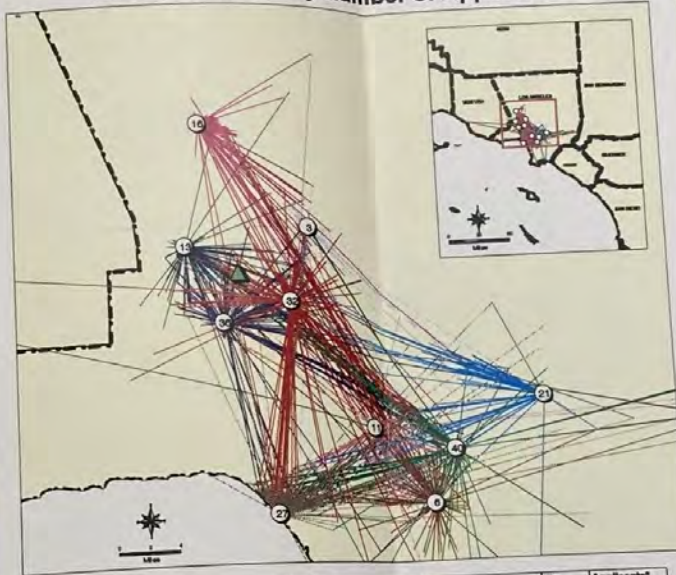
Northridge Earthquake Disaster DR-1008

Top 5 Shelters By Number of Applicants



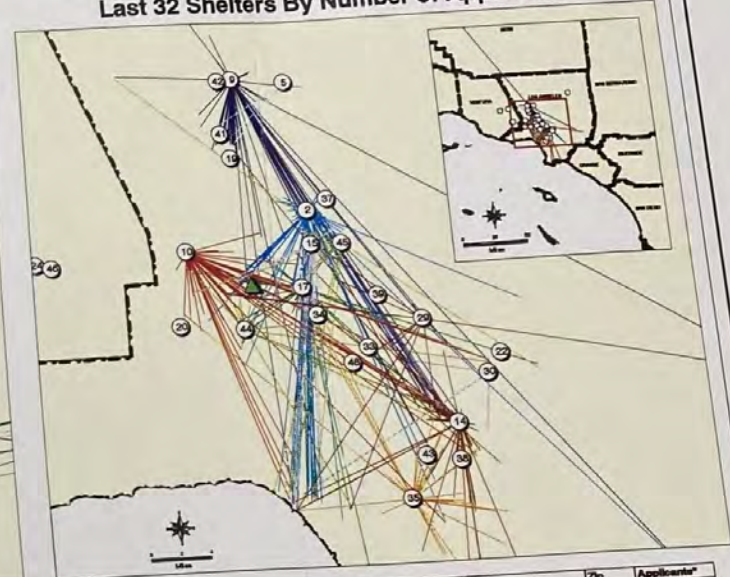
Shelter No.	Shelter	Address	City	Zip	Applicants*
1	Birmingham HS	17000 Hayes St	Van Nuys	91406	435
4	Birmingham HS	17000 Hayes St	Hollywood	90028	403
7	Hollywood HS	1521 N. Highland Ave	Granada Hills	91344	403
6	Granada Hills HS	10535 Zaitch Ave	Van Nuys	91411	1120
12	Van Nuys HS	6525 Cedros Ave	Los Angeles	90008	412
18	La Conite Jr. HS	1318 N Bronson Ave	Los Angeles	90008	412

Next 10 Shelters By Number of Applicants



Shelter No.	Shelter	Address	City	Zip	Applicants*
3	San Fernando Rec. Center	208 Park Ave	San Fernando	91340	154
5	Manual Arts HS	4131 S. Vermont Ave	Los Angeles	90046	183
11	Fairfax HS	7850 Melrose Ave	Los Angeles	91311	160
13	Mason Rec. Center	10400 Mason Ave	Chatsworth	91321	222
19	Boys and Girls Club	24825 Newhall Ave	Santa Clarita	91206	270
16	Wilson Jr. HS	1221 Monterey Rd	Glendale	91206	331
21	Santa Monica Community College	1900 Pico Blvd	Santa Monica	90405	336
27	Fullon Jr. HS	7477 Kastler Ave	Van Nuys	91408	336
32	Reese Rec. Center	8411 Victory Blvd	Reese	91335	228
40	Baltimore HS	1575 W 2nd St	Los Angeles	90732	310

Last 32 Shelters By Number of Applicants



Shelter No.	Shelter	Address	City	Zip	Applicants*
2	Sylmar HS	13250 Borden Ave	Sylmar	91342	115
5	Canyon HS	19000 W. Nadal St	Santa Clarita	91351	0
9	Saugus HS	21900 W. Centurion Way	Santa Clarita	91351	120
10	Shepherd of the Hills	19700 Rinaldi St	Chatsworth	91311	82
14	Los Angeles Community College	855 N Vermont Ave	Los Angeles	90029	110
15	San Fernando HS	11133 O'Malley Ave	San Fernando	91340	82
17	Sagehuda Rec. Center	8801 Kastler Ave	Sagehuda	91321	1
19	Newhall Senior Center	22900 Market St	Santa Clarita	91321	0
20	Caroga Park HS	6850 Topanga Canyon Blvd	Caroga Park	91303	0
22	Glendale Armony	100 Colorado Blvd	Glendale	91740	109
23	San Cayetano Jr. HS	514 Mountain View St	Fillmore	93016	0
24	Royal HS	1402 E Royal Ave	Simi Valley	93065	0
25	Veterans Memorial	88th Street	Los Angeles County	93552	0
26	Jackie Robinson Park		Los Angeles County	93552	0
28	Santa Monica Park		Los Angeles County	93552	8
29	McCambidge Rec. Center	1515 Glenoaks Blvd	Burbank	91504	21
30	Hoosevelt Jr. HS	1017 S Glendale Ave	Glendale	91205	66
31	Piru Elementary School	3811 E Center St	Ventura County	93040	0
33	North Hollywood HS	5231 Colfax Ave	N. Hollywood	91601	0
34	Church on the Way	14218 Sherman Way	Van Nuys	91504	0
35	Jim Gilliam Rec. Center	4000 S La Brea	Los Angeles	90008	62
37	El Cariso Rec. Center	19100 Hubbard St	Los Angeles	91342	0
38	Berendo Jr. HS	1157 S Berendo	Los Angeles	90006	1
39	Sun Valley Rec. Center	8133 Vineland Ave	Sun Valley	91352	0
41	Picoerita Jr. HS	25015 Newhall Ave	Santa Clarita	91321	0
42	Anoyo Sazo Jr. HS	27171 Vista Delgado Dr	Santa Clarita	91354	0
43	Los Angeles HS	4650 W. Olympic Blvd	Los Angeles	90019	0
44	Reese HS	18230 Kiltidge	Reese	91335	36
45	Masley Jr. HS	12540 Pierce St	Pacoima	91331	24
47	Hillside Jr. HS	2222 E Fitzgerald Rd	Simi Valley	93065	0
48	Fillmore Middle School	1100 Shells Dr	Fillmore	93015	0
49	Studio City Rec. Center	128321 Rye St	Studio City	91509	0

- Shelter Location
- ▲ Epicenter
- County Line

* Number of located registrations per Red Cross Shelter (A zero value does not necessarily mean the shelter was vacant).

Note:

This map illustrates how people utilized the Red Cross shelters following the Northridge Earthquake. 10,882 victim registration forms were obtained from the Red Cross. Of those forms, approximately 8,767 had the registrant's home addresses. 6,367 of these addresses were able to be geolocated.

Colored lines were drawn from each registrant's home address to the Red Cross shelter they had registered at to represent the extent of the shelter's outreach and the distance registrants may have traveled. This data is preliminary. This data illustrates the information available to date and should be used only with an understanding of its limitations.



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INLET

The Internet-based Loss Estimation Tool

Simulate Event Earthquake Impacts Map Options Tools Help

Search



▼ About InLET

InLET (Internet-based Loss Estimation Tool) is a web-based loss estimation modeling platform used to perform rapid assessment of the impact of earthquake disaster in California.

InLET performs loss/impact simulations using USGS earthquake ground motion data and FEMA HAZUS damage estimation technology. The damage and loss values generated are only approximations of the impacts caused by an earthquake in the affected region. In the case of an actual earthquake event, the damage and losses could be different.

Results are appropriate for planning purposes and for early-post event response only, when more detailed data is not available.

Developed by [ImageCat Inc.](#)



Map Zoom Level:



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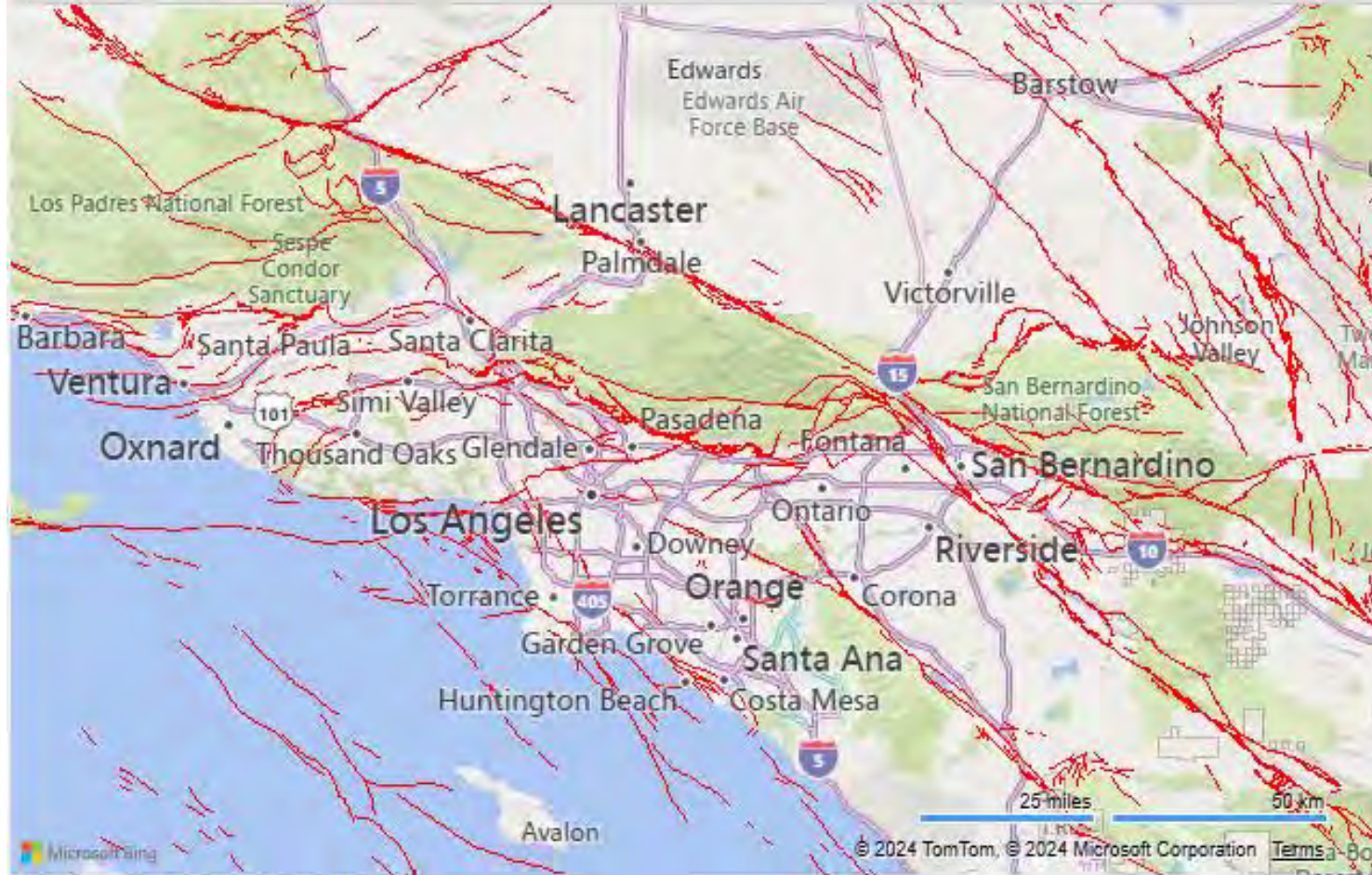


INLET

The Internet-based Loss Estimation Tool

Simulate Event Earthquake Impacts Map Options Tools Help

Search








Map Background

Layers

Hazard

Faults i

Facilities

-  Emergency Operations Centers
-  Police Stations
-  Schools
-  Care Facilities
-  Fire Station

Result Layers

Thematics

Toggle Layer to shown on map

Map Zoom Level:



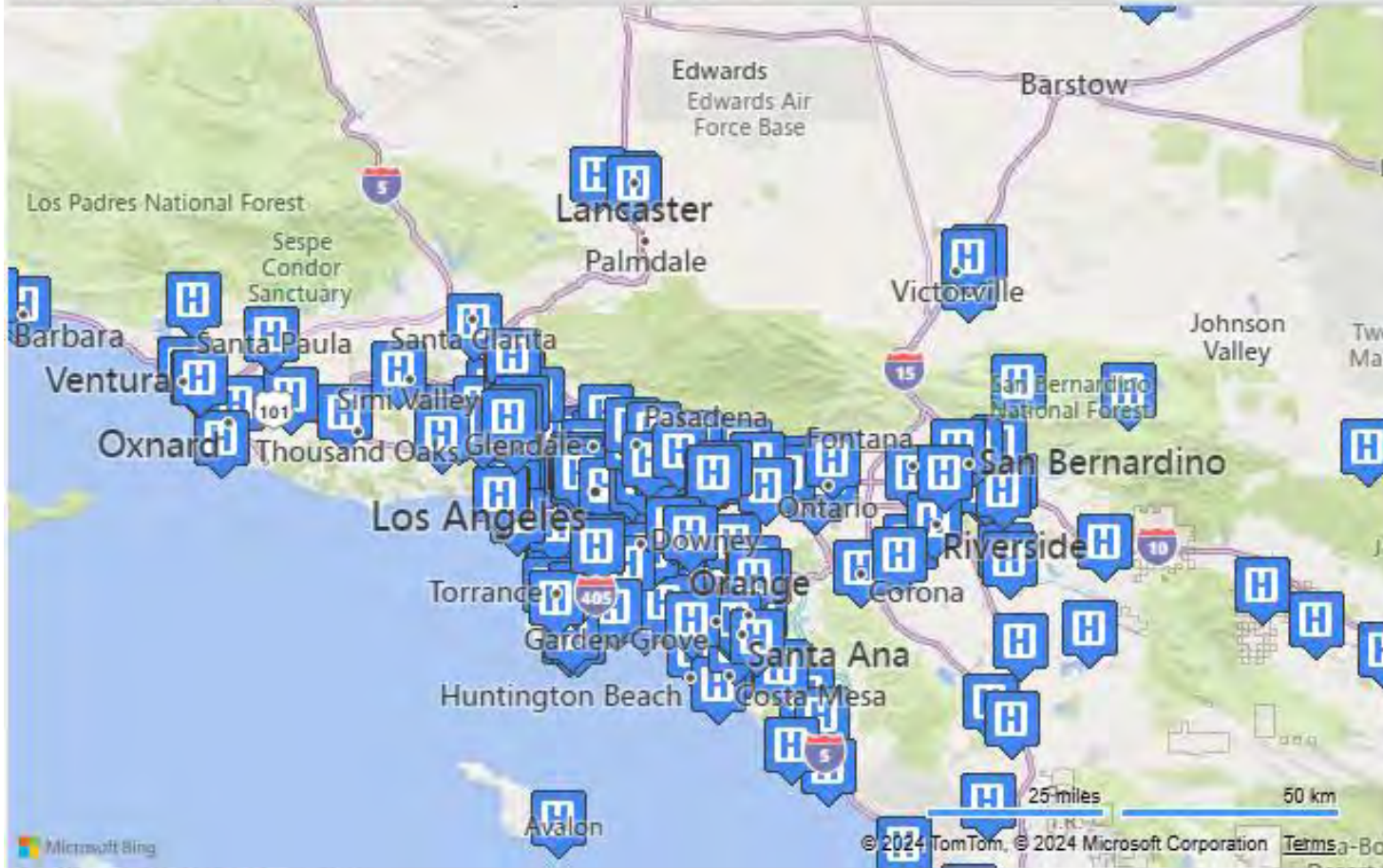


INLET

The Internet-based Loss Estimation Tool

Simulate Event Earthquake Impacts Map Options Tools Help

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Map Background

Layers

Hazard


Faults

Facilities

 Emergency Operations Centers

 Police Stations

 Schools

 Care Facilities i

 Fire Station

Result Layers

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Microsoft Bing

Toggle Layer to shown on map

Map Zoom Level:



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INLET

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Search



▼ Pick Fault

Fault

- Little Lake
- Los Alamos-W. Baseline
- Los Osos
- Maacama Central
- Maacama North
- Maacama South
- Malibu Coast
- Mendocino fault zone
- Mission Ridge-Arroyo Parida-Santa Ana
- Montalvo-Oakridge
- Monterey Bay - Tularcitos
- Newport-Inglewood**
- Newport-Inglewood Offshore
- North Channel Slope
- North Frontal Fault zone east
- North Frontal Fault zone west
- Northridge
- Oakridge offshore
- Oakridge onshore
- Ortogonalita

Select fault to simulate

Map Zoom Level:



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Simulate Event Earthquake Impacts Current Event Map Options Tools Help

Search



Scenario Defined

Scenario	Newport-Inglewood
Epicenter Longitude	-118.1257
Epicenter Latitude	33.7982
Magnitude	7
Depth	10.0 (mi)
Simulated on	Dec 17 2024, 03:12PM

Number of Damaged Buildings

Total	
Slight	956,037
Moderate	305,901
Extensive	59,184
Complete	13,546

Injuries and Casualties

I - Basic Medical Aid	13,332
II - Requires Medical Technology	2,318
III - Life threatening	64
IV - Mortally Injured	26

Result loaded Successfully

Ground Shaking: Instrumental Intensity



Map overlay opacity:



May the Force be with You

”



Licensed from Adobe Stock Photos

2 Characterizing Economic Disruption with the 3 Global Economic Disruption Index (GEDI)

4 Charles K. Huyck¹, Marina T. Mendoza², Paul Amyx², ZhengHui
5 “Z” Hu², Yajie Lee², Melisa Huyck¹, Michael Eguchi², Shubharoop
6 Ghosh², Georgiana Esquivias², Ronald Eguchi²

7 ¹ ImageCat, Inc., 122 South Churton St, Suite 203, Hillsborough, NC, 27278, U.S.A.

8 ² ImageCat, Inc., 400 ~~Oceanstate~~, Suite 1050, Long Beach, CA, 90802, U.S.A., 90802, U.S.A.

9 HIGHLIGHTS

- 10 • The paper introduces the Global Economic Disruption Index (GEDI) as a new approach to
11 measure economic recovery following disasters. Additionally, it presents the GEDI
12 framework, which incorporates hazard intensity, exposure, vulnerability, and resilience to
13 predict GEDI values for specific events. The GEDI framework demonstrates substantial
14 agreement with interpreted GEDI values.
- 15 • Potential applications of GEDI and the GEDI framework include integration with
16 advisories, prioritizing mitigation efforts, supply chain impacts, ESG reporting, and
17 diversification of real estate investments. An illustrative example that traces the global
18 supply chain impacts of the 2011 Thailand floods is provided.



(In press)

Wall Street Journal

Thai Floods Disrupt Car Production - WSJ

BANGKOK—Thailand's auto exporters are being hit by supply-chain ... Prior to the floods, Thailand's National Economic and Social Development Board forecast ...

Oct 12, 2011



BBC News

Thailand floods disrupt production and supply chains

Factories and supply chains are facing disruption as some of the worst flooding in decades starts to affect Thailand's economy. Western Digital, Honda Motor ...

Oct 13, 2011



Computerworld

Thailand floods spur rush to SSDs

Thailand floods spur rush to SSDs ... products, including PCs, smartphones and tablet PCs, continued to drop because of sluggish economic conditions. Another ...

Dec 1, 2011



Wall Street Journal

Thai Authorities, Companies Blamed for Extent of Flood Damage

Some experts say yes, and that the international impact of Thailand's floods should ... the monsoon rains turned into such a devastating setback for the economy.

Nov 3, 2011

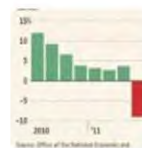


Wall Street Journal

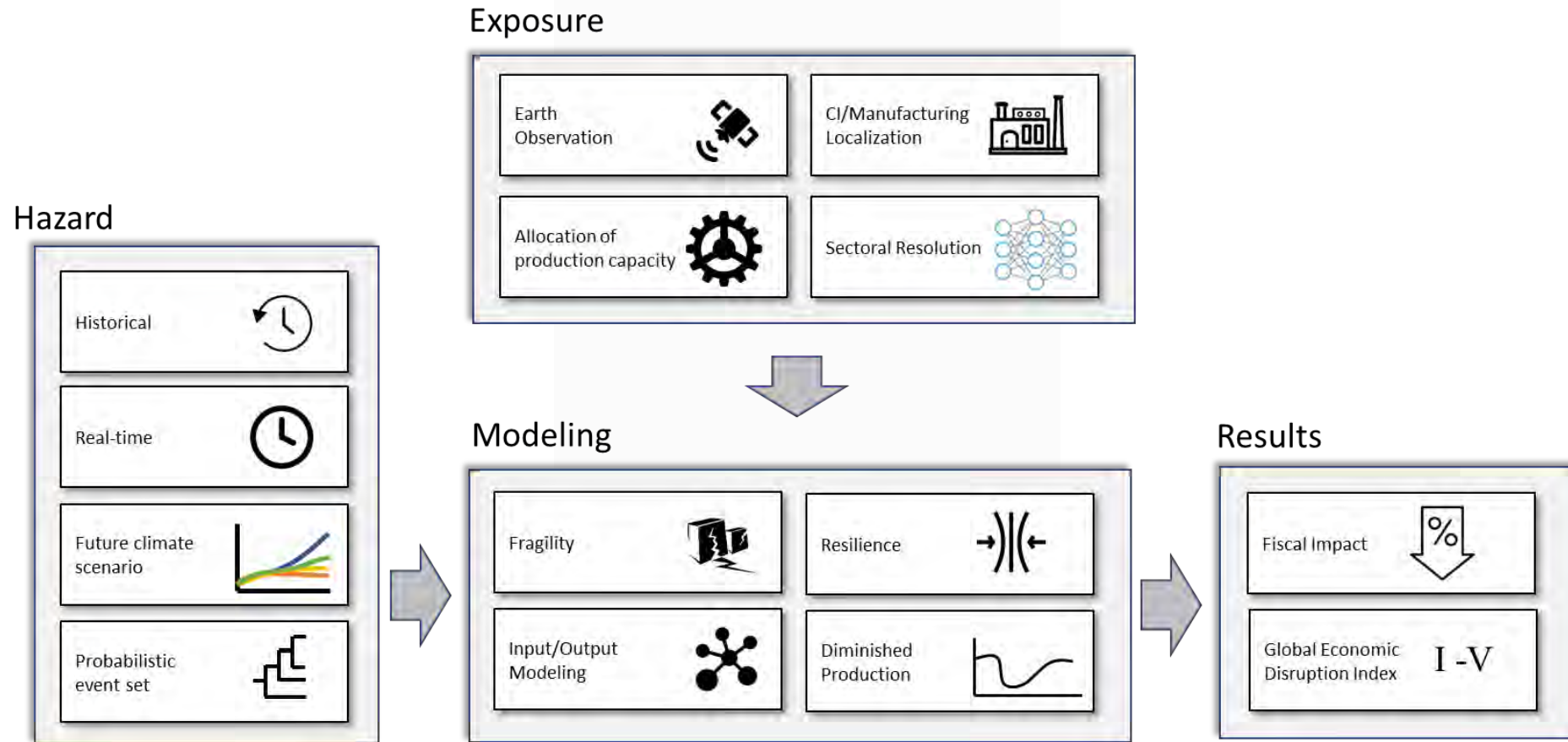
Thailand GDP Shrinks 10.7%

BANGKOK—Thailand's economy contracted more than expected in the fourth quarter of last year as the country was hit by its worst floods in decades, pulling ...

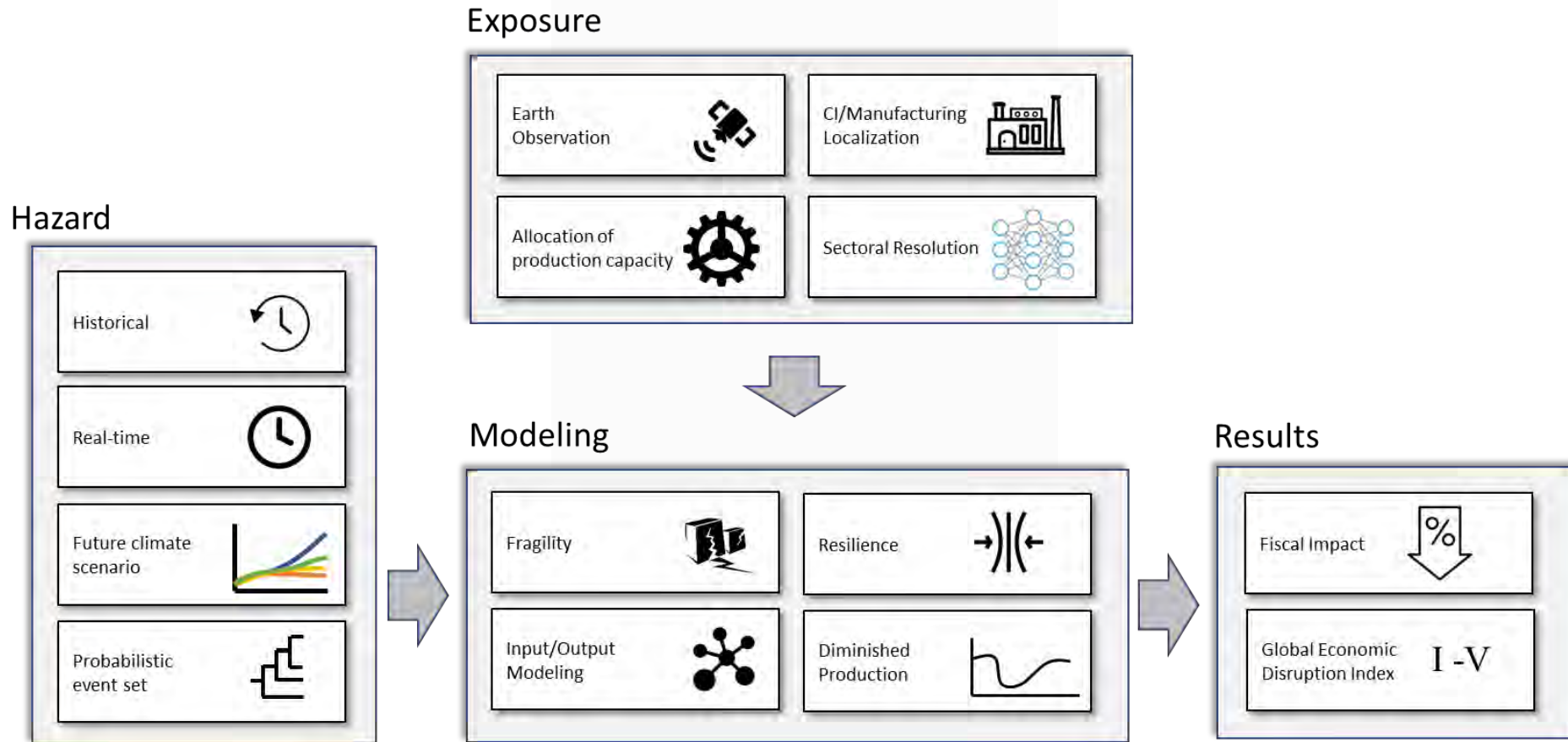
Feb 20, 2012



GEDI is a framework designed to find the tipping point

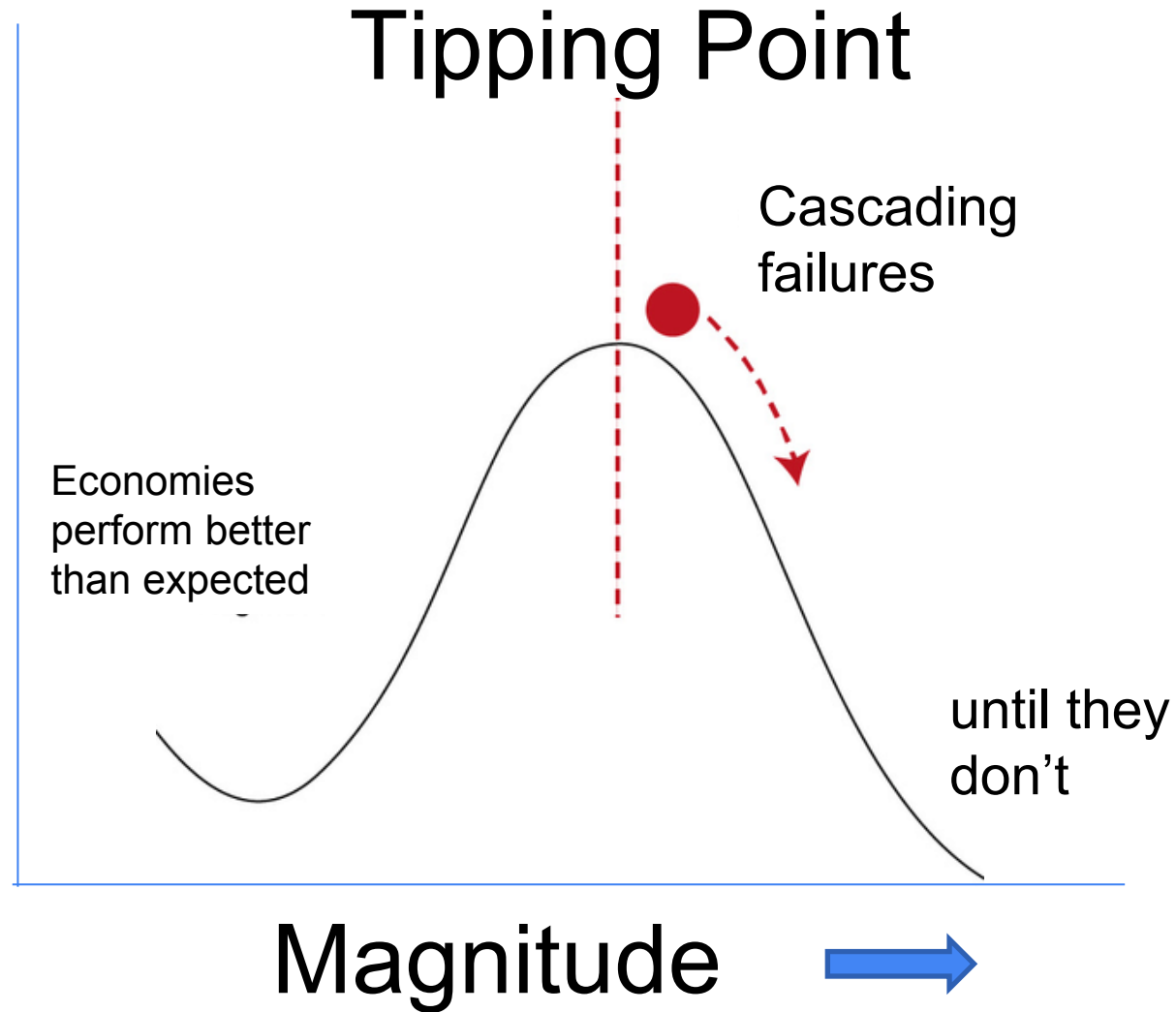


GEDI is a framework designed to find the **tipping point**



Disasters
have a
“tipping
point”

Resilience ↑



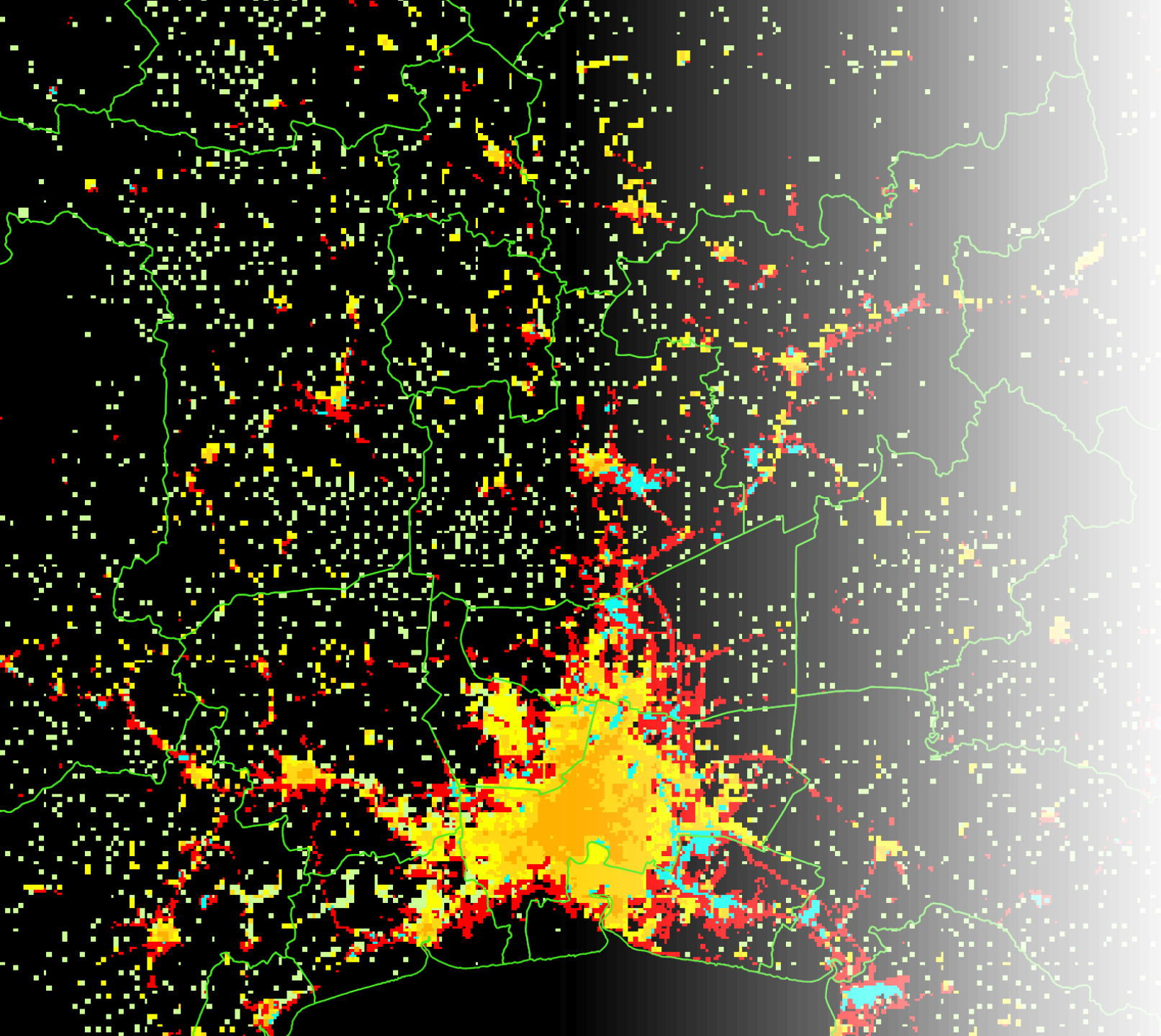
Can EO be used to characterize the potential for long term economic disruption?

Global Economic Disruption Index (GEDI)

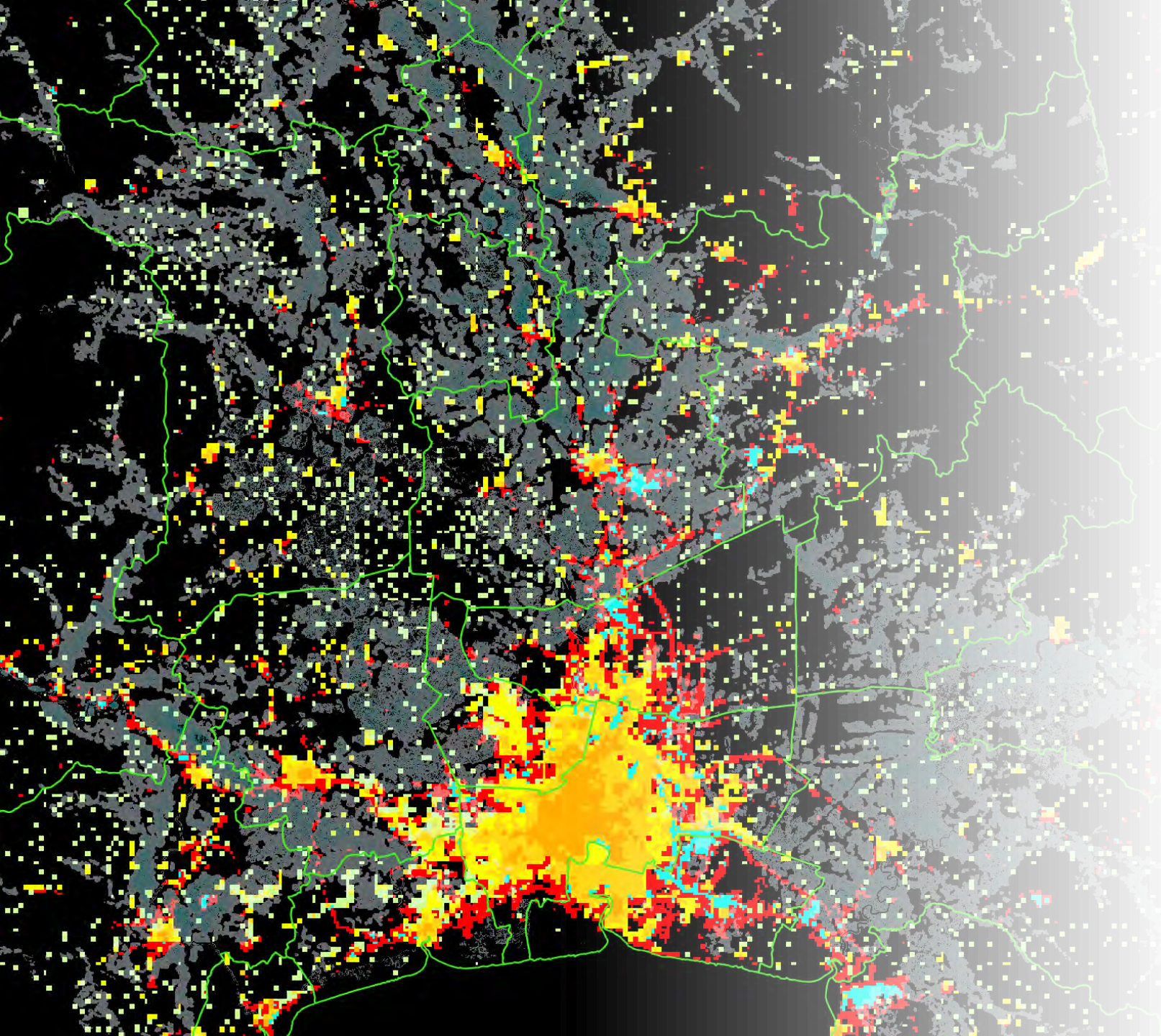
<i>Rank</i>	<i>Description</i>	<i>Restoration</i>
<i>I</i>	Slight	Rapid restoration on the order of a few hours to a few days expected
<i>II</i>	Moderate	Economic activities typically resume in less than a week
<i>III</i>	Major	Economic activities are likely to rebound on the order of weeks.
<i>IV</i>	Severe	Economic rebound expected after months of restoration.
<i>V</i>	Catastrophic	Major disruption in economic activity requires years of recovery.



Regions of
production are
generally visible



are detectable
through image
segmentation



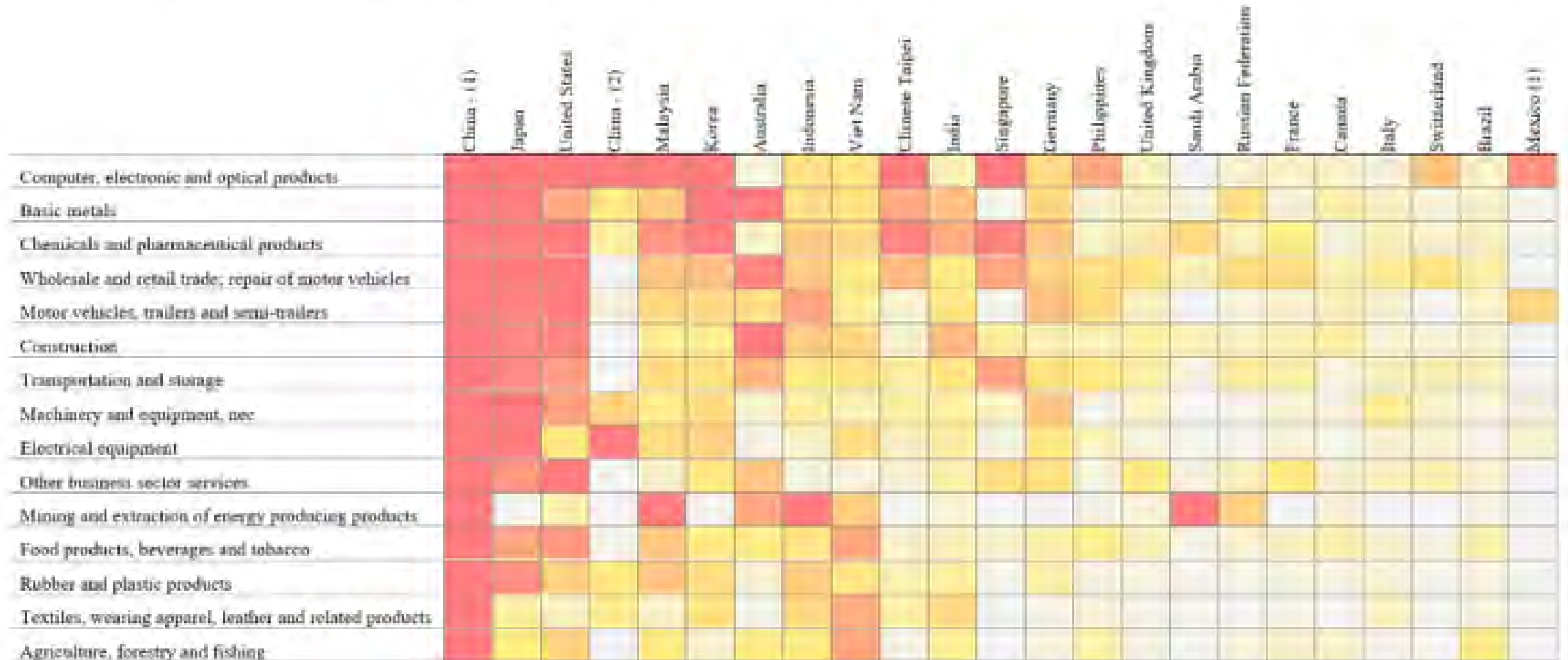
can then be
overlaid
with global hazard
datasets to identify
problematic areas



Reduced production can be fed into regional economic models to identify where localized losses may trigger cascading impacts.

		INDUSTRIES										
		Agric	Constr	Mfg	Trans	Trade	Serv	PCE	PFI	Net Exports	Govt	Total
COMMODITIES	Agriculture							Final Use				Total Gross Output
	Construction											
	Manufacturing							GDP				
	Transportation											
	Trade											
	Services											
	Compensation	Value Added										
	Taxes											
	Gross surplus											
	Total	Total Gross Output										

Figure 2: Heat Map of Supply Chain Disruption from the 2011 Thailand Floods by Country and Sector (Excerpt)



Applications

- Real time advisories (i.e. USGS Shakecast)
- Global corporate risk- CRE, investment portfolios
- Extension of CAT modeling tools
- Prioritization of infrastructure hardening and development projects

Global Economic Disruption Index (GEDI)

<i>Rank</i>	<i>Description</i>	<i>Restoration</i>
<i>I</i>	Slight	Rapid restoration on the order of a few hours to a few days expected
<i>II</i>	Moderate	Economic activities typically resume in less than a week
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<i>IV</i>	Severe	Economic rebound expected after months of restoration.
<i>V</i>	Catastrophic	Major disruption in economic activity requires years of recovery.



Happy
Holidays





Search & Rescue
Debris removal
Evacuation Routes
Rebuilding Costs





From Risk to Action

The role of emotions in decision making

Dr. Lucy Jones

Dr. Lucy Jones Center for Science & Society

Caltech

Fast and slow thinking



THINKING,
FAST AND SLOW



DANIEL
KAHNEMAN

Risk Perception

Affective & Analytical

Slovic et al, 2004
Risk as Analysis and Risk as
Feelings: Some Thoughts
about Affect, Reason, Risk,
and Rationality

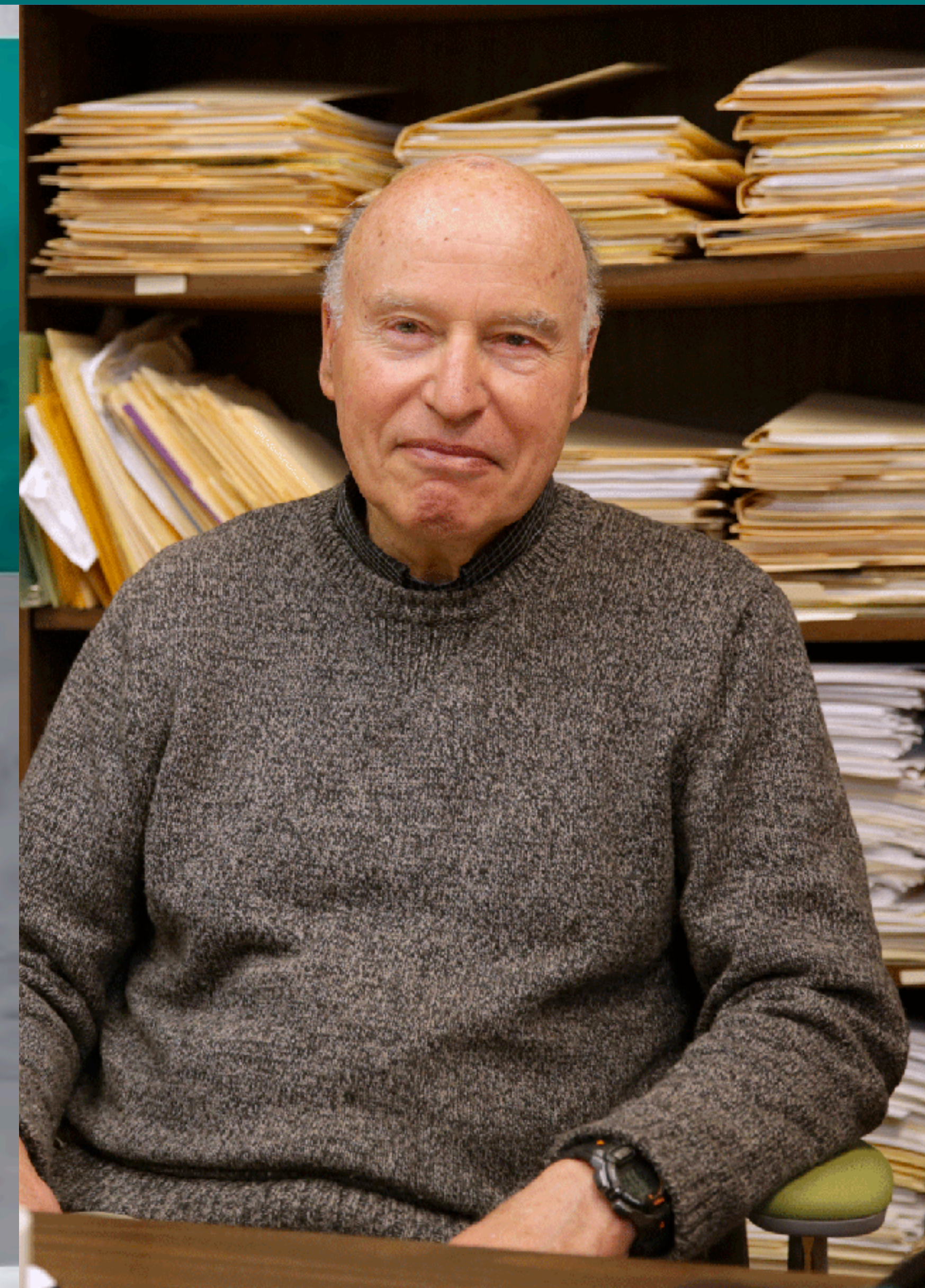
THE FEELING OF RISK

New Perspectives on Risk Perception

Paul Slovic



earthscan
from Routledge



Two Modes of Thinking

Affective System

Analytical System

Affective: what feels bad?

Logical: reason oriented (what is sensible)

More rapid processing: oriented toward immediate action

Slower processing: oriented toward delayed action

Self-evidently valid: “experiencing is believing”

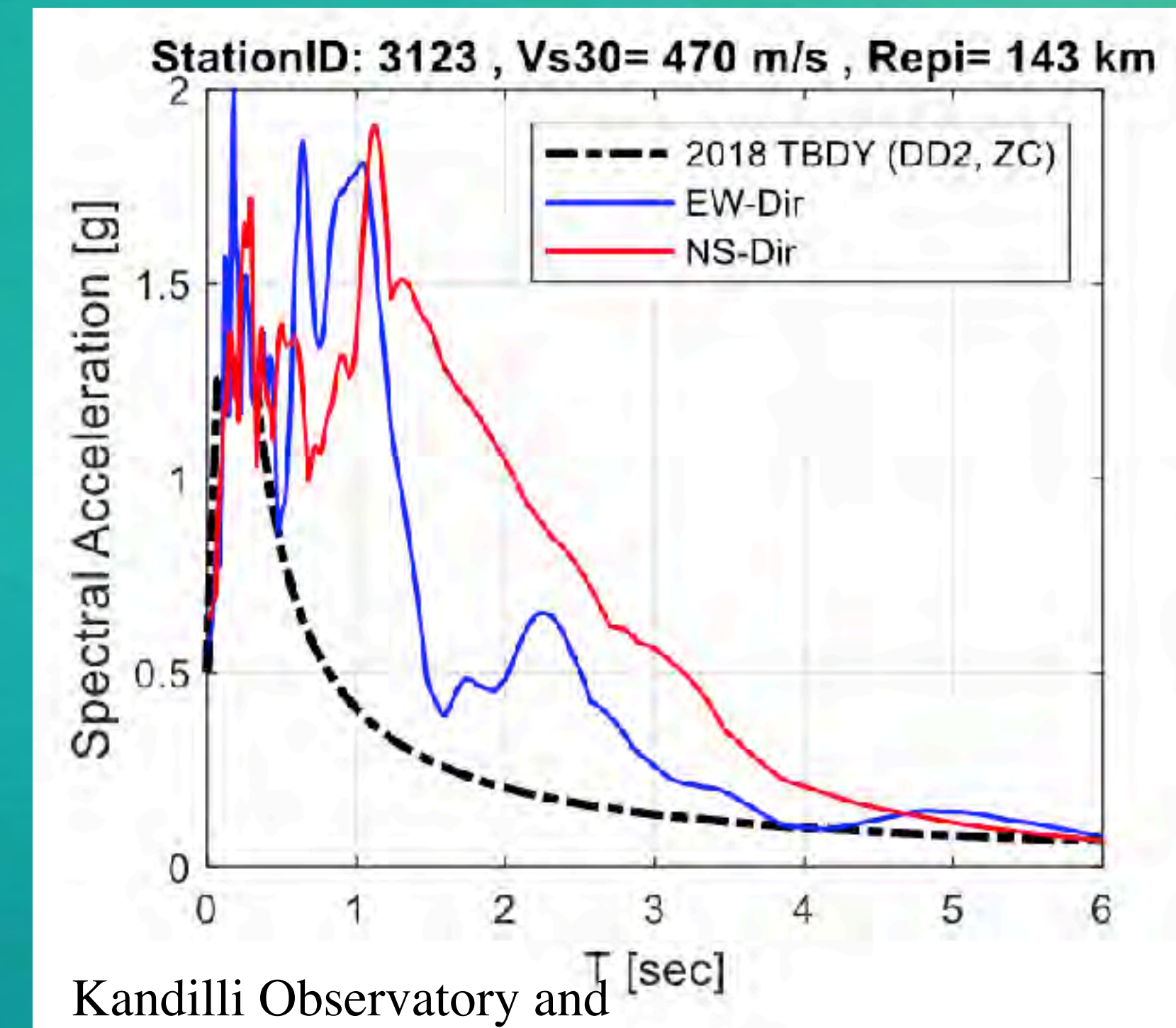
Requires justification via logic and evidence

Controls the decision to act

More accurate

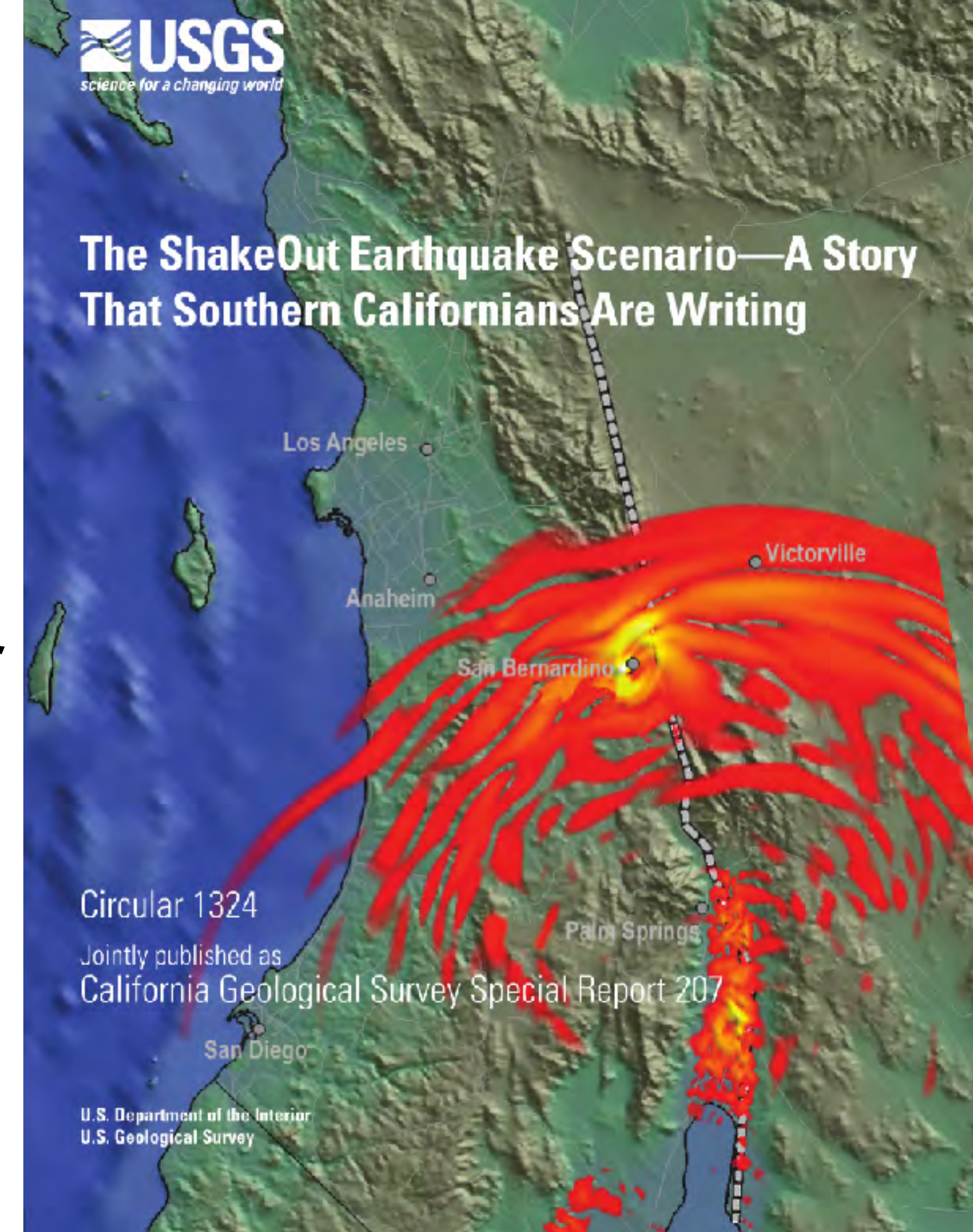
Risk perception vs Decision to act

- The decision to act requires engagement of the affective system
- Decision to act collapses probability to 0 or 1



ShakeOut scenario and policy initiatives

- A scenario tells a story
- Emphasized financial outcomes which directed attention away from awfulness of disaster
- Emphasized consensus
 - Focus on uncertainty increases feelings of inefficacy



Beyond rational factors in risk decisions

- Perceived risk is affective response
- Actions must feel useful
- Risk must be personal
- Imminent risk is always more actionable

Tempo: Music for Climate Action

TEMPO

Music for climate action

What is Tempo?

The Tempo Project brings together climate scientists and engineers, social scientists, and musicians to explore the ways in which music can be used to change the emotional climate of the current emotional climate crisis and an emotional response to the evidence of the climate problem and the communities together.

The Tempo

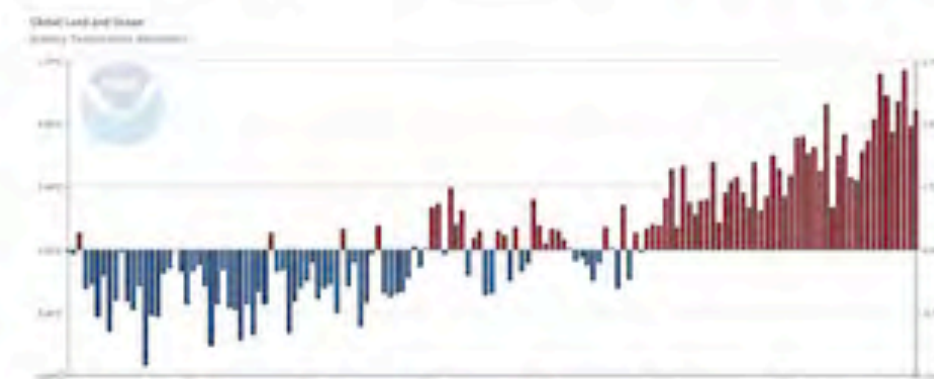
In April 2023, the Tempo Project was awarded for the climate action. We inspire the emotional toolkit is a synopsis of the climate crisis that there are lyrics, in multiple languages, awarded for the a

What Can Climate Science Tell Us?

The problem with CO₂

Due to its molecular structure, CO₂ absorbs and emits infrared radiation, warming the Earth's surface and the lower levels of the atmosphere, acting like a blanket to trap in more heat. Over the last 150 years, human activity has brought the amount of carbon dioxide in our atmosphere up to levels that have not been seen for hundreds of thousands of years.

Almost a hundred years ago, scientists first proposed that increasing levels of CO₂ would increase the temperature just like putting extra blankets on the bed. In the 1980s, scientists were able to measure old air that was trapped in bubbles in the ice of Antarctica and Greenland and they showed that the temperature of the air and the levels of CO₂ changed together. We have now put more CO₂ in the atmosphere than ever before in the last million years and the temperature is rising because of it.



[ready.gov](https://www.ready.gov): Hurricane Preparedness

Prepare for Hurricanes

Know Your Hurricane Risk

Hurricanes are not just a coastal problem. Find out how rain, wind, water and even tornadoes could happen far inland from where a hurricane or tropical storm makes landfall. [Start preparing now.](#)

Make an Emergency Plan

Make sure everyone in your household knows and understands [your hurricane plans](#). Include the [office, kids' day care, and anywhere else you frequent](#) in your hurricane plans. Ensure your business has a [continuity plan](#) to continue operating when disaster strikes.

Know your Evacuation Zone

You may have to evacuate quickly due to a hurricane if you live in an evacuation zone. [Learn your evacuation routes](#), practice with your household and pets, and identify where you will stay.

Those with Disabilities

Identify if you may need additional help during an emergency if you or anyone else in your household is an [individual with a disability](#).

Review Important Documents

Make sure your [insurance policies and personal documents](#), such as ID, are up to date. Make copies and keep them in a secure password-protected digital space.

Strengthen your Home

De-clutter drains and gutters, bring in or furniture, and consider hurricane shutters.

Get Tech Ready

[Keep your cell phone charged](#) when you hurricane is in the forecast and purchase charging devices to power electronics.

- Follow the instructions from local emergency managers, who work closely with state, local, tribal, and territorial agencies and partners. They will provide the latest recommendations based on the threat to your community and appropriate safety measures.

Recognize Warnings and Alerts

Have several ways to receive alerts. [Download the FEMA app](#) and receive real-time alerts from the National Weather Service for up to five locations nationwide. [Sign up for community alerts](#) in your area and be aware of the Emergency Alert System (EAS) and Wireless Emergency Alert (WEA), which require no sign up.

Help your Neighborhood

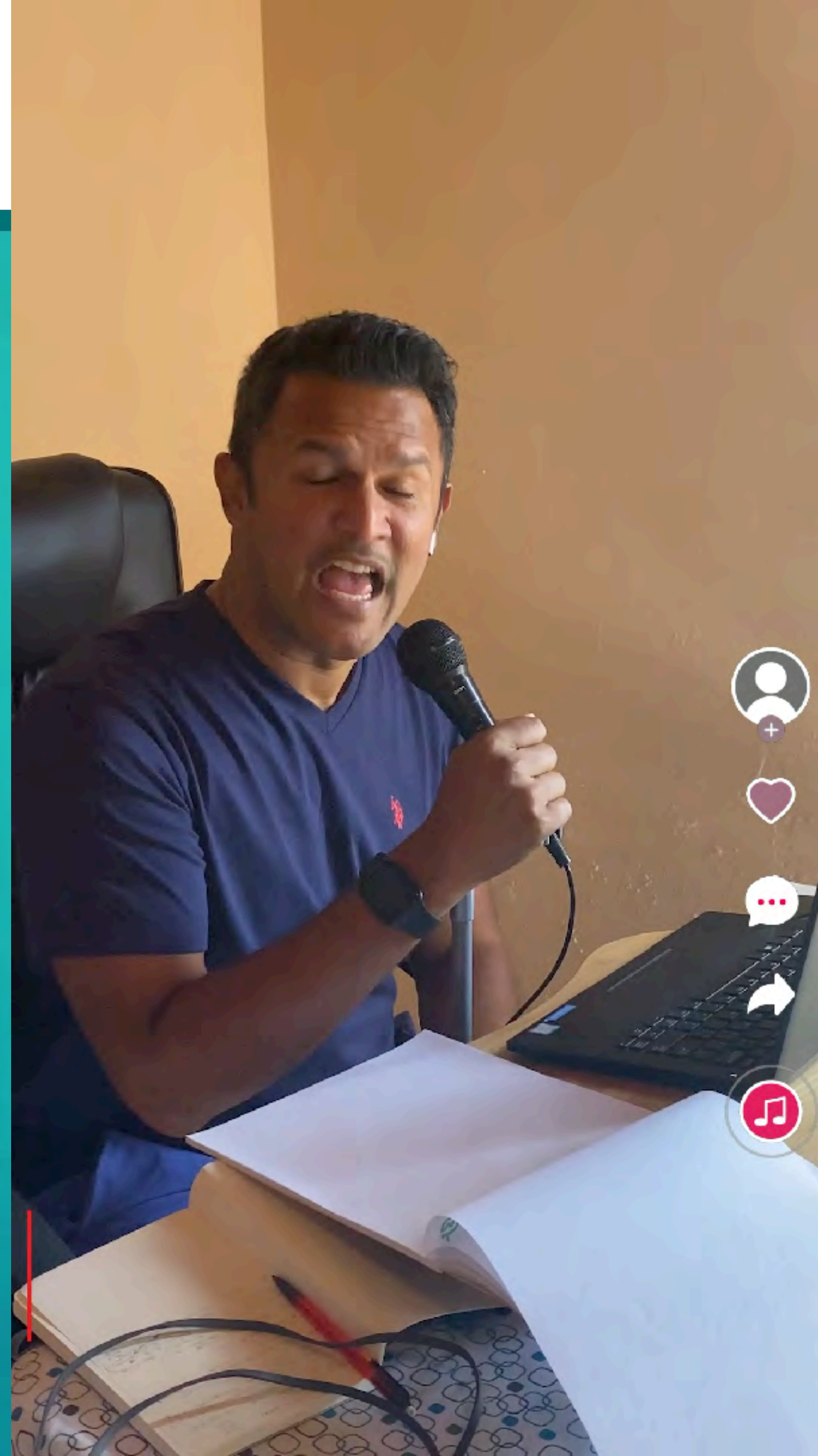
Check with neighbors, [senior adults](#), or those [who may need additional help](#) securing hurricane plans to see how you can be of assistance to others

Gather Supplies

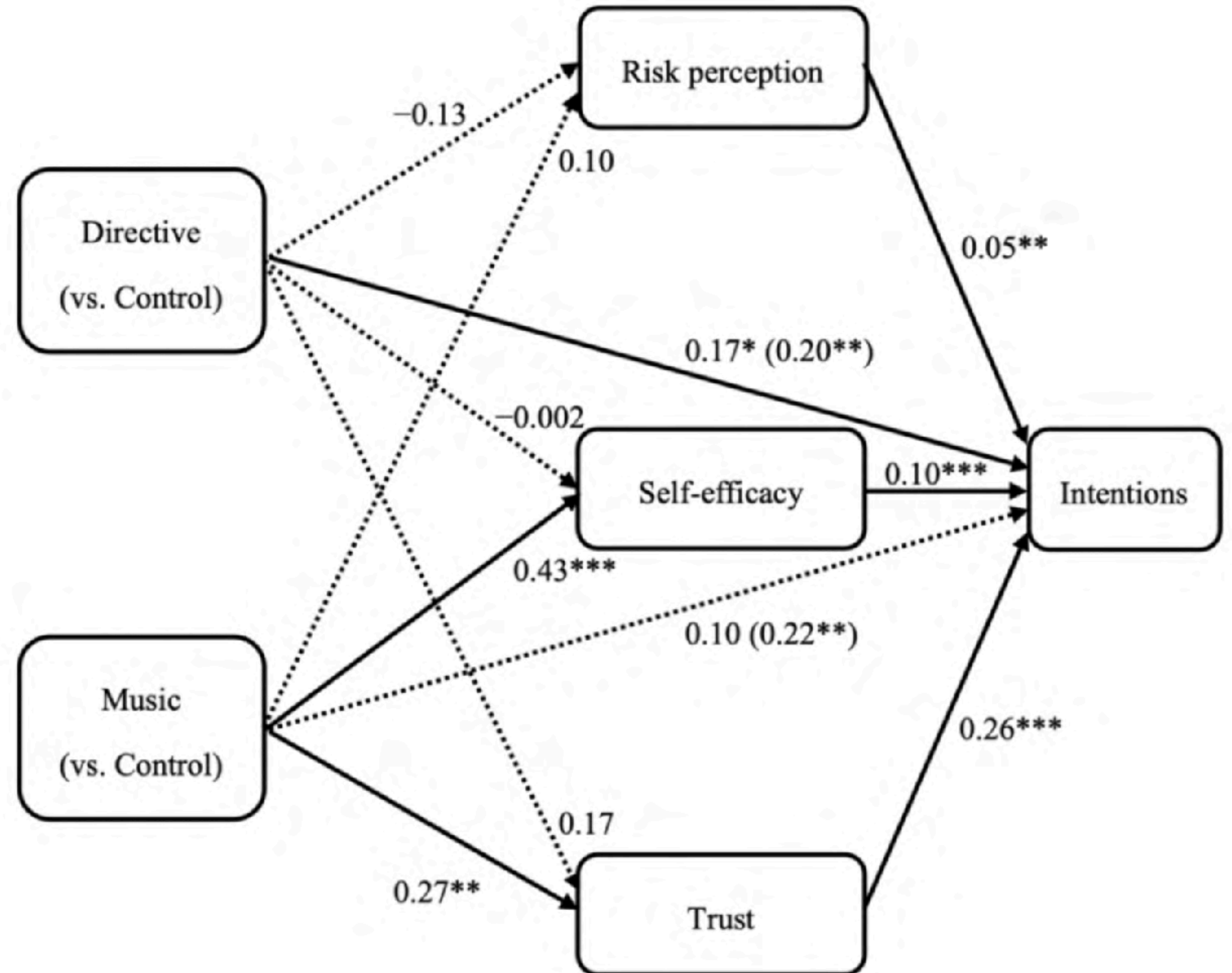
[Have enough supplies](#) for your household, include medication, disinfectant supplies and [pet supplies](#) in your go bag or car trunk. You may not have access to these supplies for days or even weeks after a hurricane.

Disaster Fighters

Created by Pacifico,
Buenos Aires, Argentina
Emiliano Rodriguez Neusch

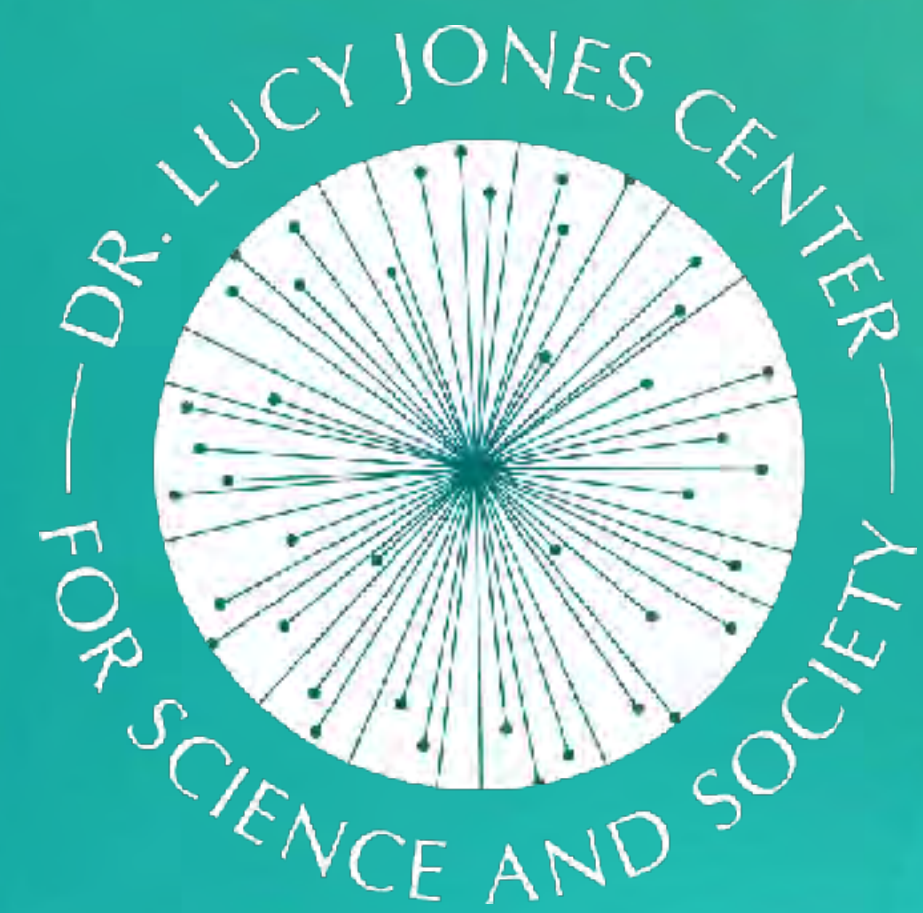


Impact of music on risk perception



CONTACT

drlucyjonescenter.org

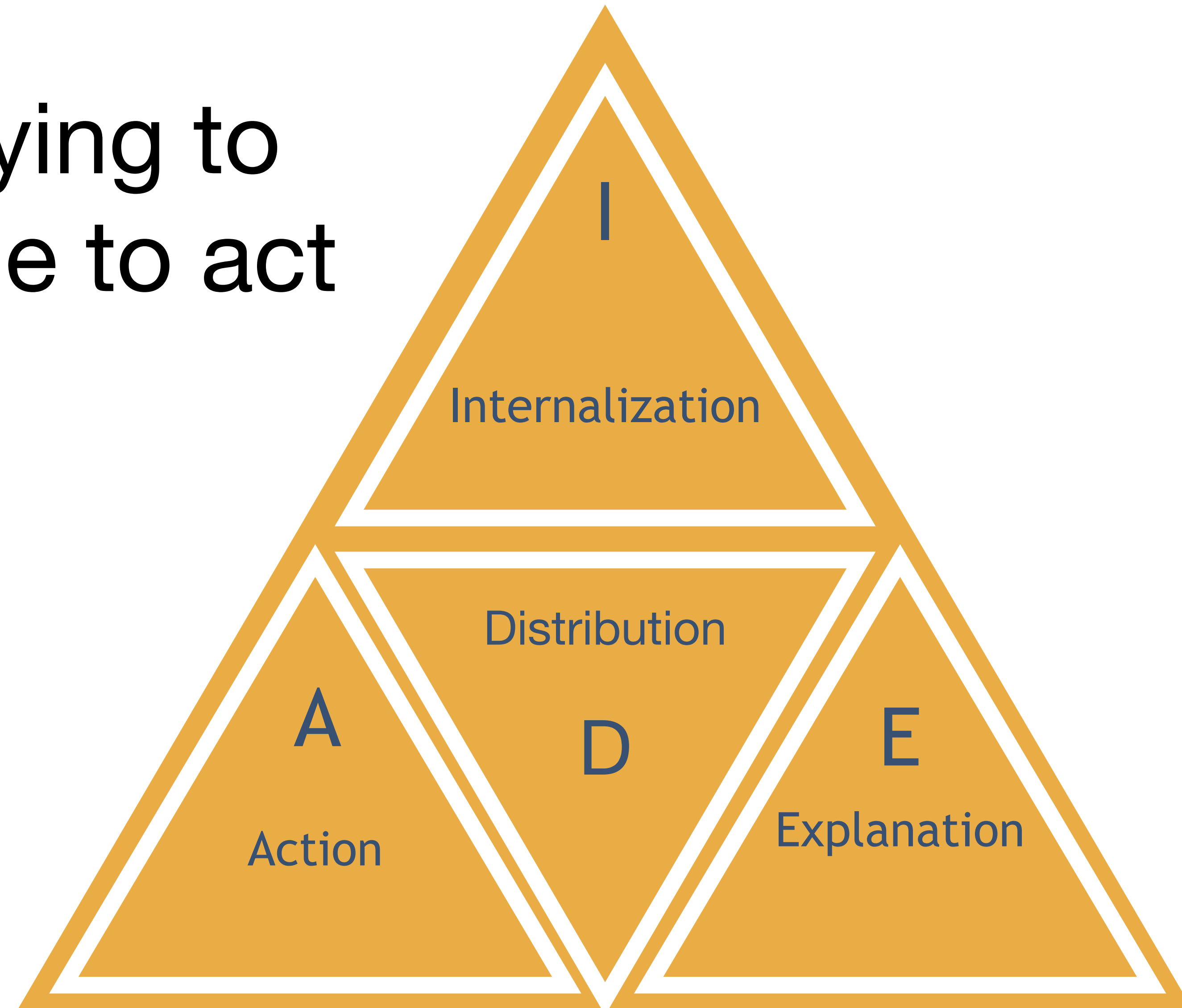


Caltech

Insights from Crisis Communications

IDEA Model

- We are trying to get people to act

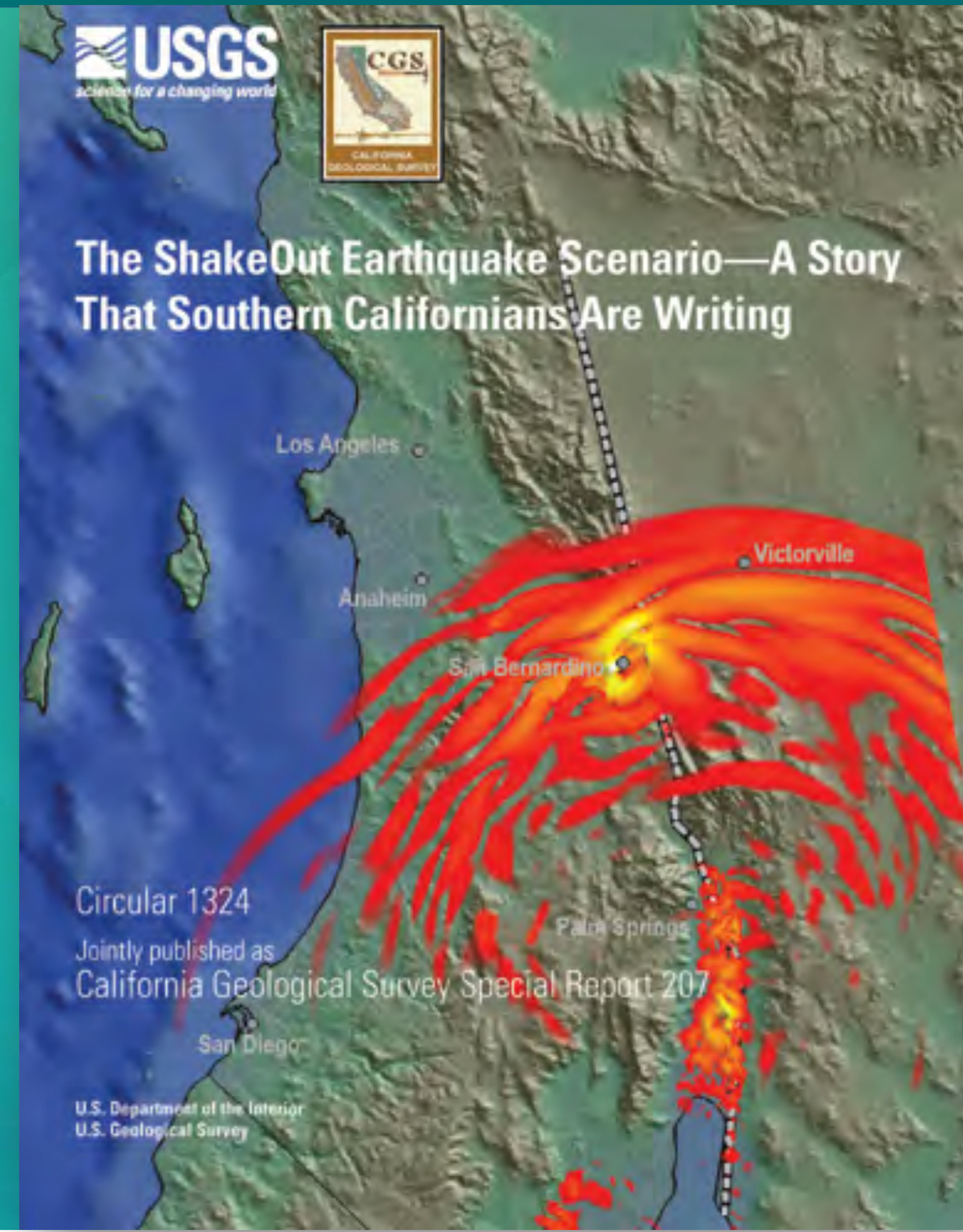


Sellnow et al., 2017,
in
*Communication
Studies*



I: Internalization

- It needs to apply to me
- Focus on the concrete consequences (not probabilities)
- Focus on local application



D: Distribution



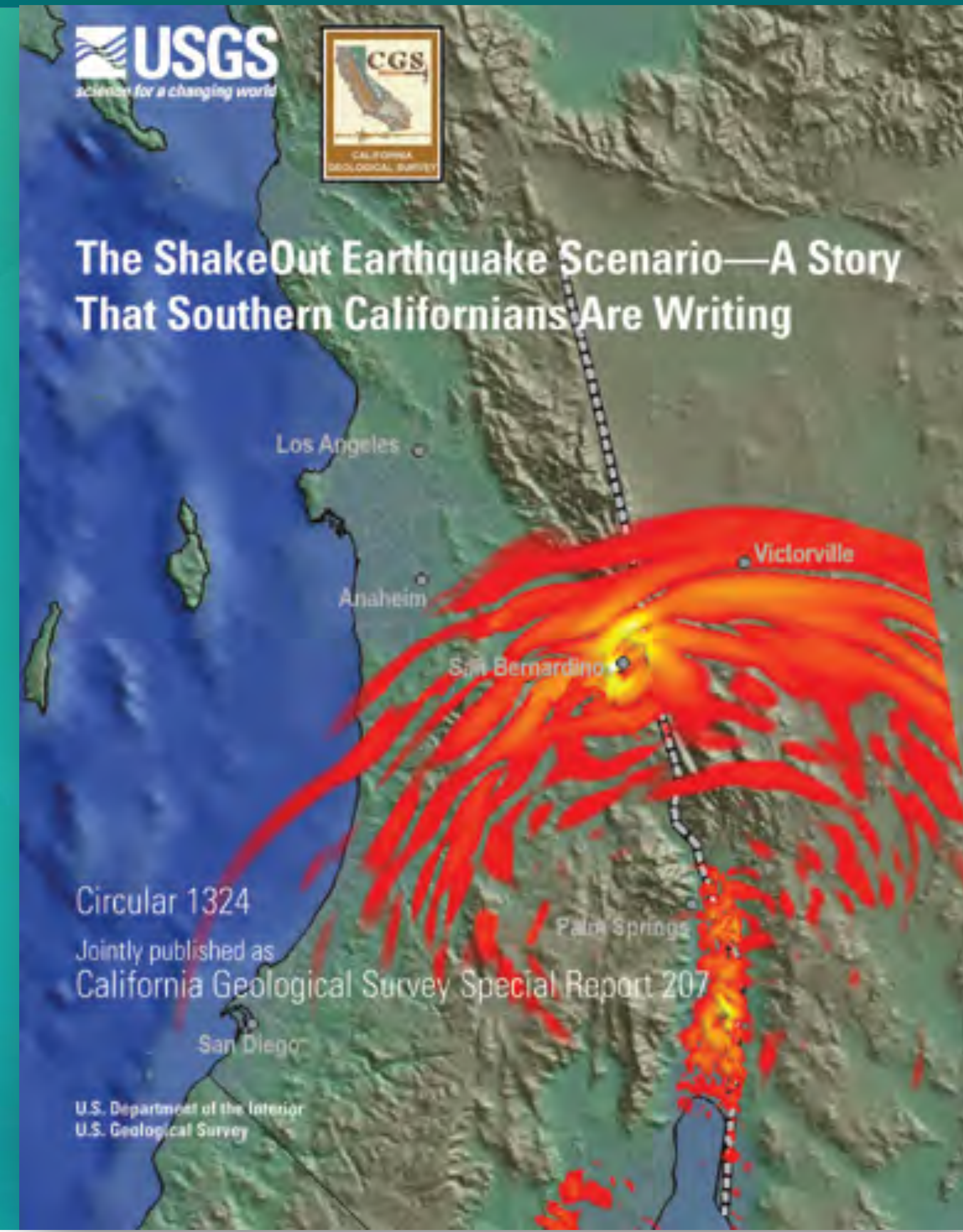
- Consistent messages from multiple sources
- Multiple modalities reinforce the message





E: Explanation

- Why is this true? We need to decide to believe the warning
- Science matters!
- We need to confirm with others we trust





A: Action

- A problem without a solution encourages despair and decreases action

What to do during an Earthquake:



DROP!



COVER!



HOLD ON!

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Out**TM

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www.ShakeOut.org

The Northridge Earthquake - 30 Years Later
A Catalyst for Engineering Resilient Communities
Webinar Series

Q&A

The recording of today's webinar will be posted within a week at
EarthquakeCountry.org/northridge30-webinar8
and SoCal.EERI.org

