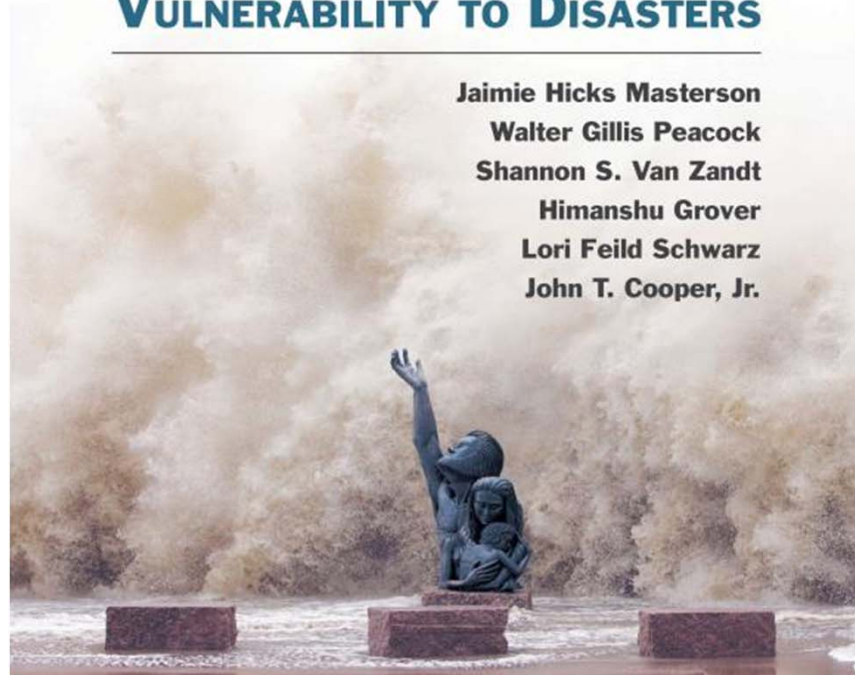
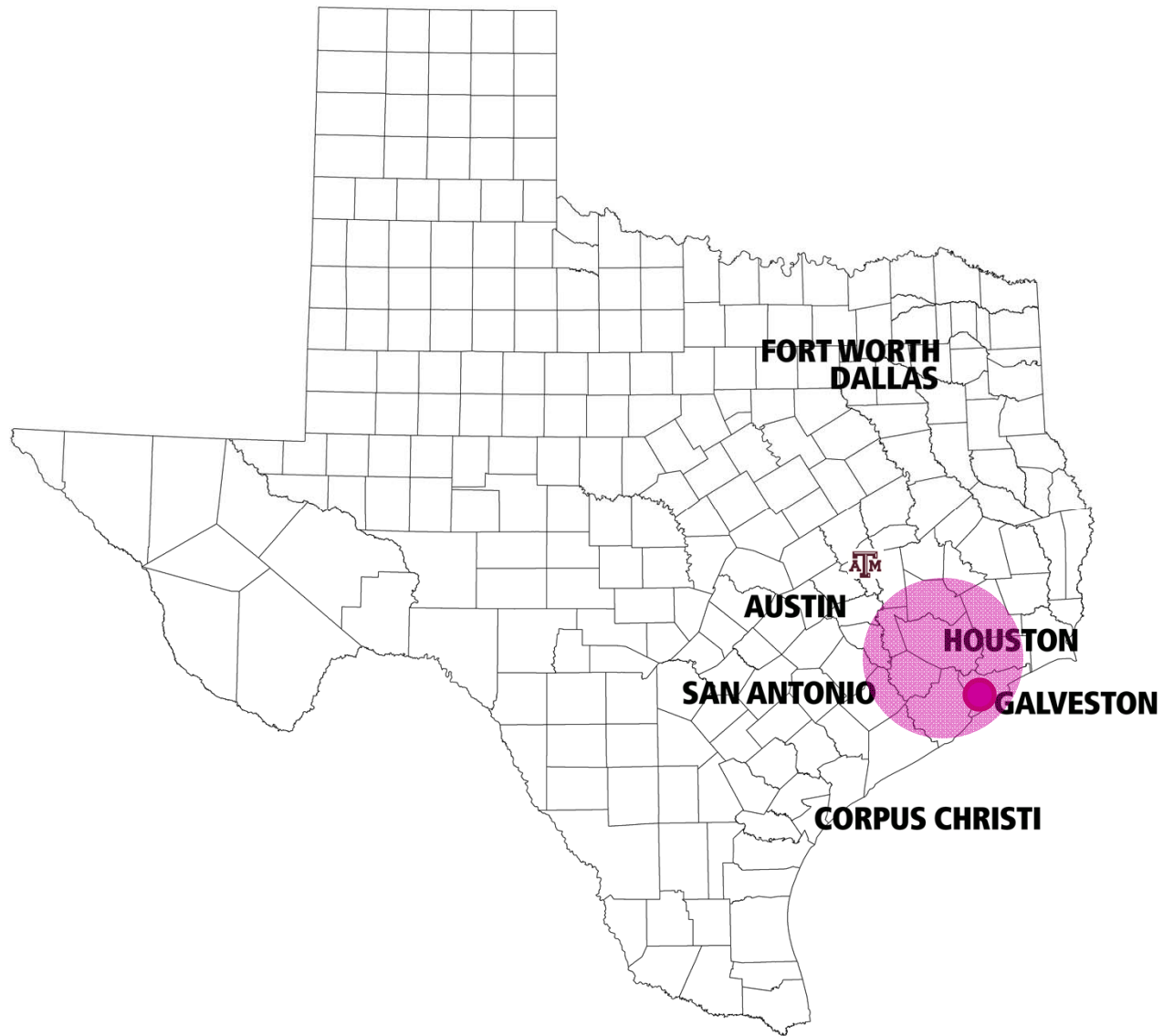


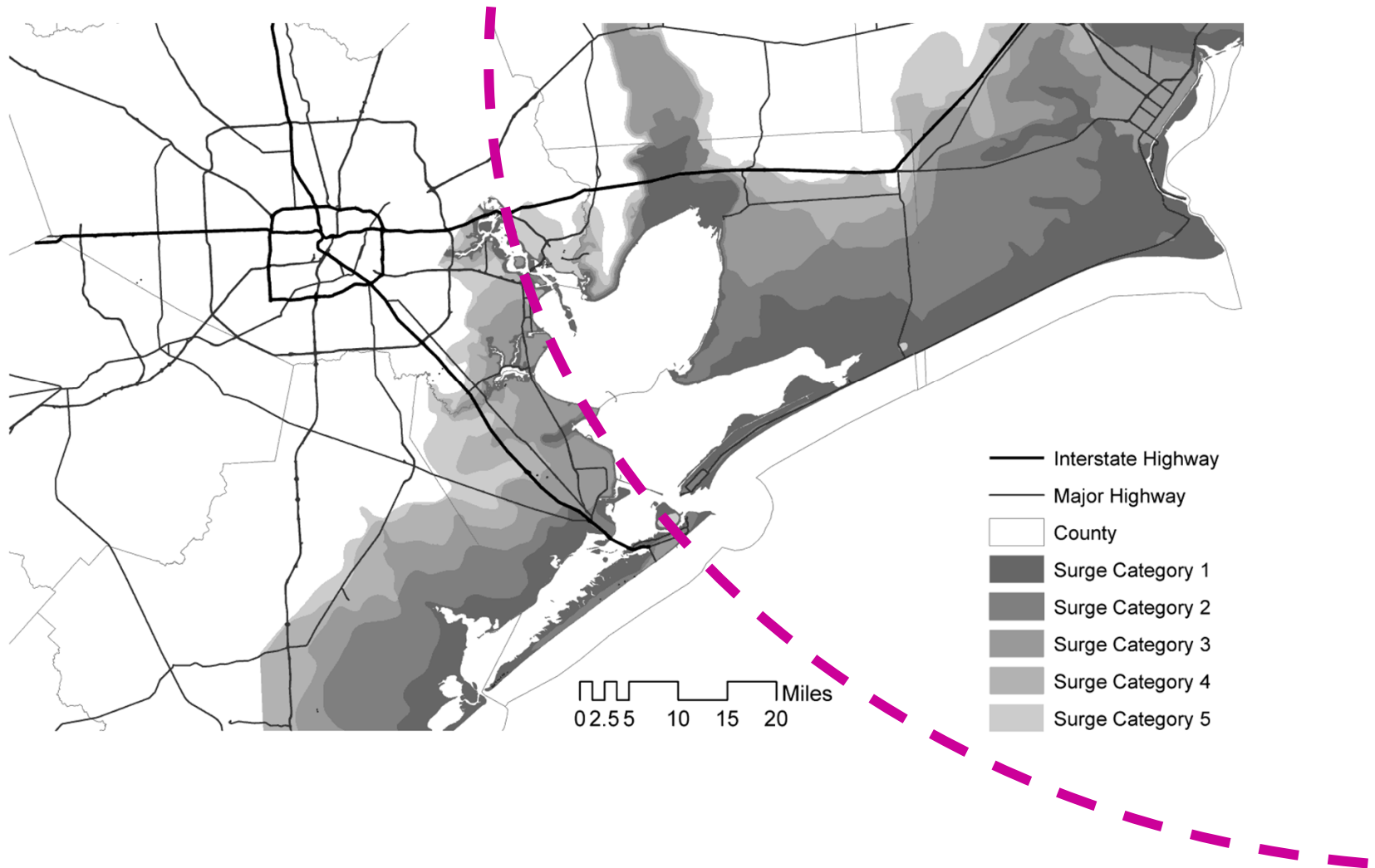
PLANNING for **COMMUNITY RESILIENCE**

**A HANDBOOK FOR REDUCING
VULNERABILITY TO DISASTERS**

**Jaimie Hicks Masterson
Walter Gillis Peacock
Shannon S. Van Zandt
Himanshu Grover
Lori Feild Schwarz
John T. Cooper, Jr.**







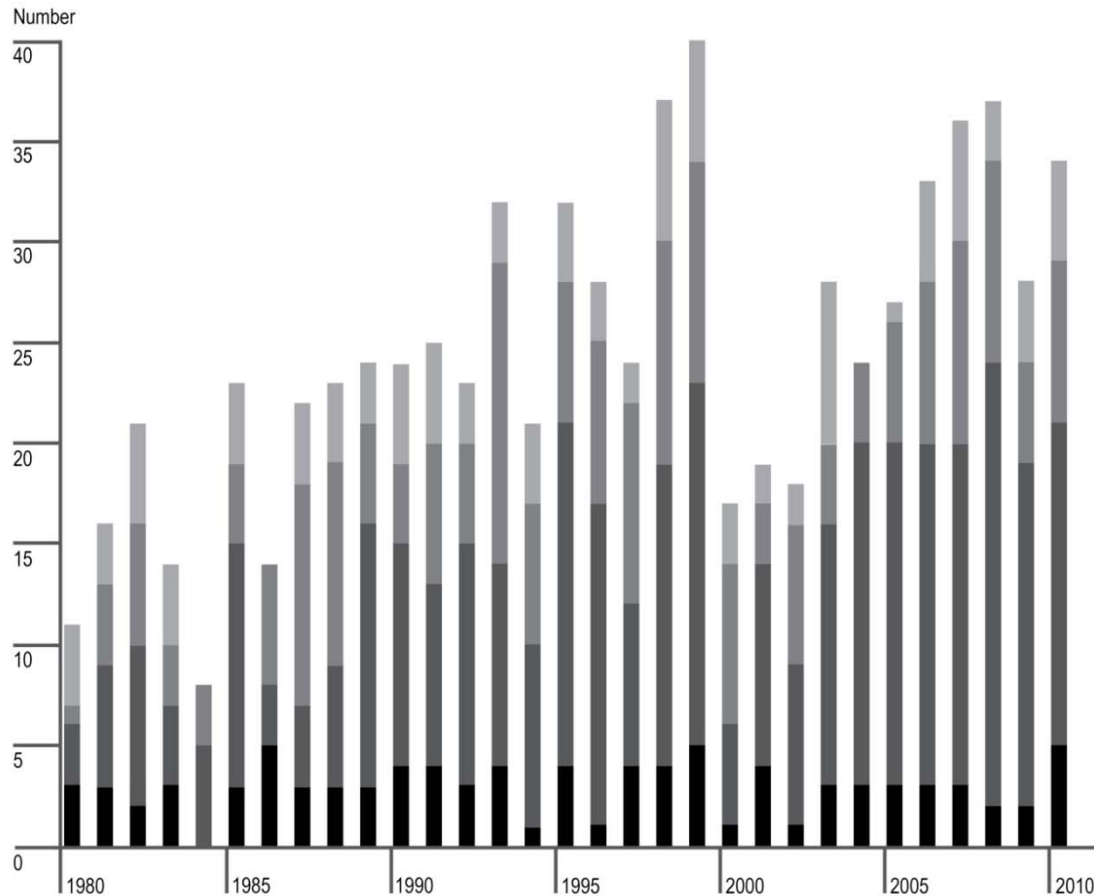




- 2008
- Category 2 (by wind speed-110mph)
- 22ft storm surge
- 100,000 homes flooded
- 2 mil people without power for weeks
- \$142 bil in damage
- 30 yrs worth of erosion



Disasters are treated as acute events, instead of chronic conditions



773 events



Fatalities: 2 mil



Overall losses: US\$ 2,500bn



Insured losses: US\$ 600 bn



The number of GREAT and DEVASTATING natural catastrophes by event type

- Geophysical events:
Earthquake, volcanic eruption
- Meteorological events:
Tropical storm, winter storm, severe weather, hail, tornado, local storms
- Hydrological events:
Flash flood, river flood, storm surge, mass movement (landslide)
- Climatological events:
Heatwave, freeze, wildland fire, drought

Percentage distribution worldwide

Flooding

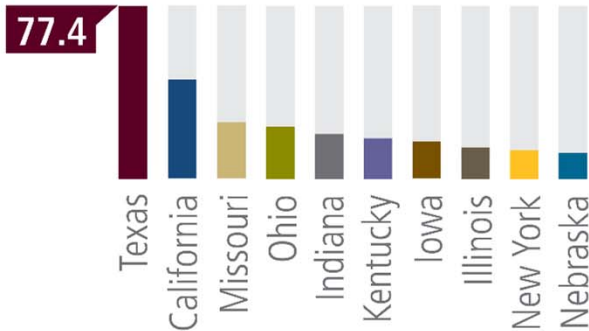
Texas “consistently *outranks all states in deaths, injuries, and property loss* resulting from flood events”

--Zahran, Brody, Peacock, Vedlitz, Grover, 2008

On average, Texas is impacted by *400 floods annually*, making it the *most vulnerable state to flooding*, outranking the second highest state by twofold

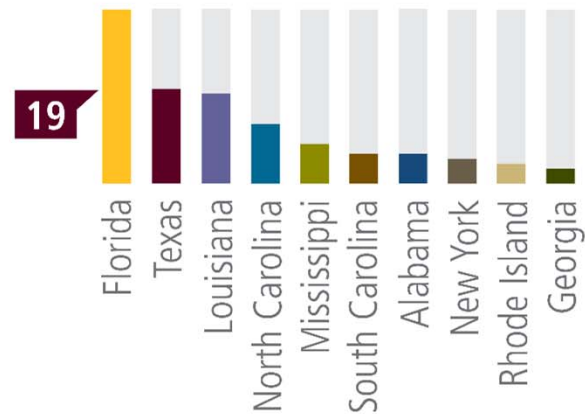
--State of Texas Hazard Mitigation Plan, 2010-2013

Median damage in millions of USD 1995
Reported from 1955-1978 and 1983-1999
University Corporation for Atmospheric Research



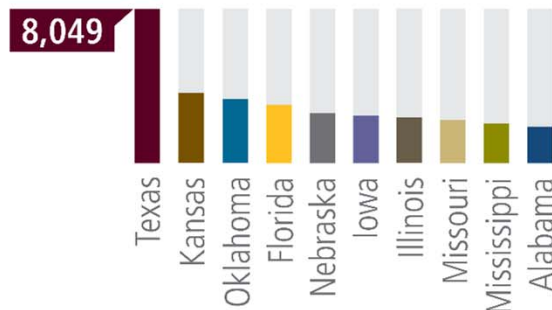
Hurricanes

Direct hits from 1851-2004
NOAA



Tornadoes

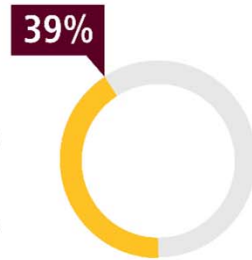
Frequency, reported from 1950-2009
National Climatic Data Center



Drought

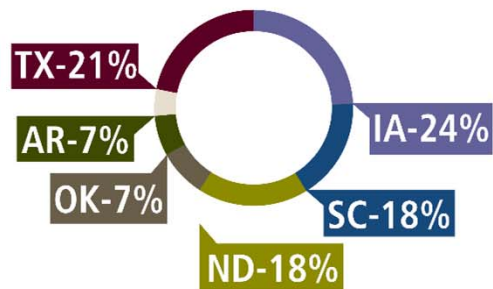
Percentage of moderate to extreme drought during 1896-2012 in the month of June

National Climatic Data Center and NOAA



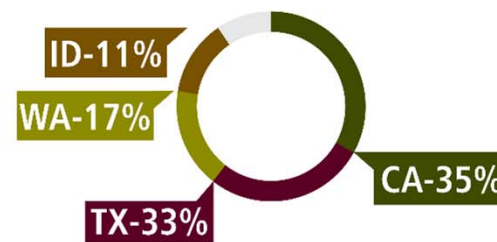
Percentage of property damage from drought among all states, 1950-2010

SHELDUS



Wildfires

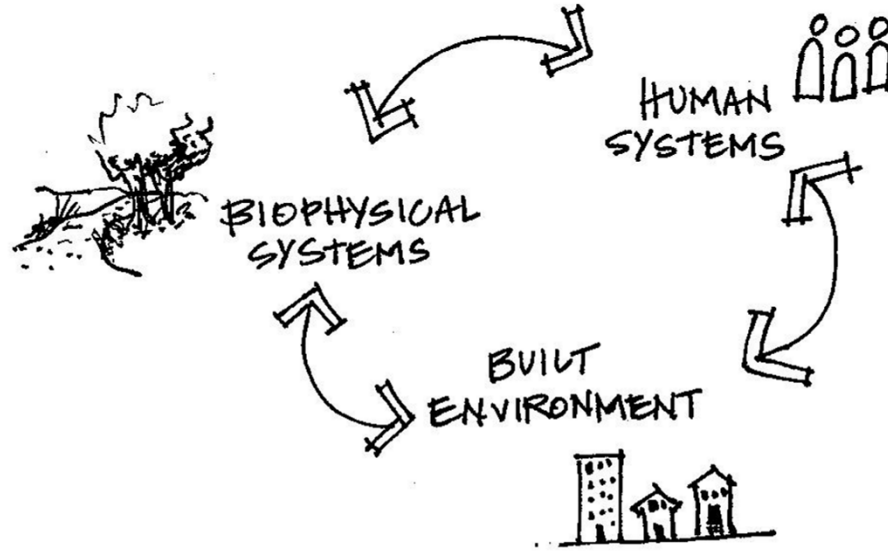
Percentage of crop damage 1950-2010
SHELDUS



Texas is ranked *4th* in wildfire *fatalities* and *5th* in *property damage* in the nation --SHELDUS



Natural disasters are far from natural phenomena



DISASTERS = (f) HUMAN ⁱⁿ ACTION

Come away with:

1

City and regional planning must be a part of disaster planning

2

Inclusive planning—involving the whole community must take place

3

There are already available tools to incorporate resilient practices in your community



What is resilience?

1



- Ecological definitions themes are a system's *capacity to*:
 - resist or absorb impacts
 - to maintain or return, more or less, to the same form, function, structure or qualitative state.

2



- Hazard/disaster literature themes:
 - Absorb, deflect or resist potential disaster impacts
 - *Mitigation is a key issue*
 - Rapid bounce back after being impacted and
 - *Recovery processes are key*
 - Learning from disaster experiences resulting in modifying the organization and structure of systems to adapt

3

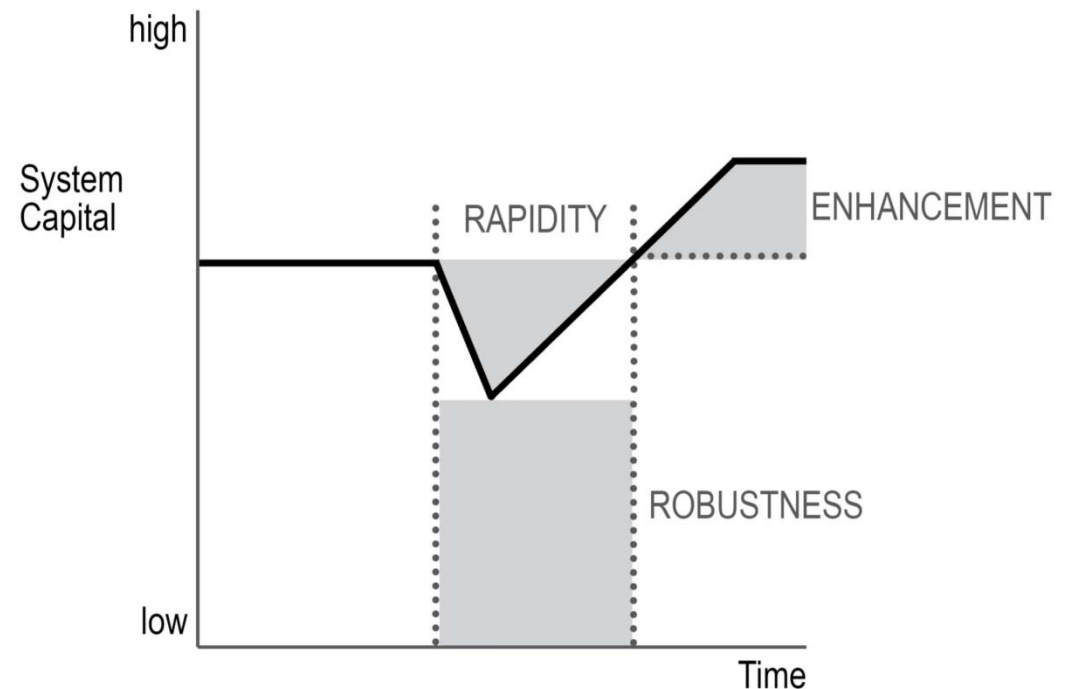


What is resilience?

1 The ability of a **Community** and the **Bio-physical systems** upon which they depend, to:

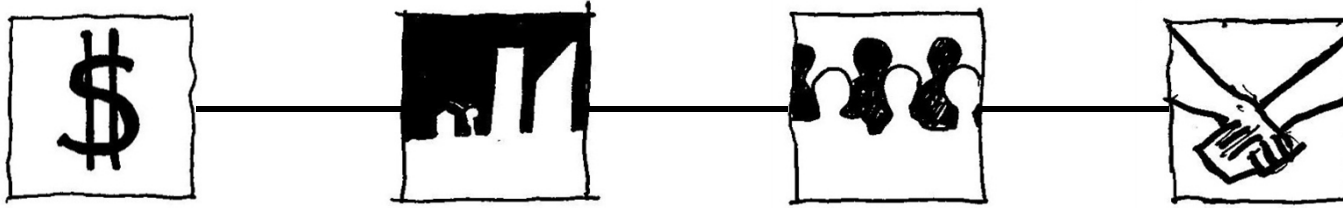
- *resist* or absorb the impacts (deaths, damage, losses, etc.) of natural hazards,
- *rapidly* recover from those impacts, and
- reduce future vulnerabilities through *adaptive strategies*

(Peacock et al. 2008 RAVON).



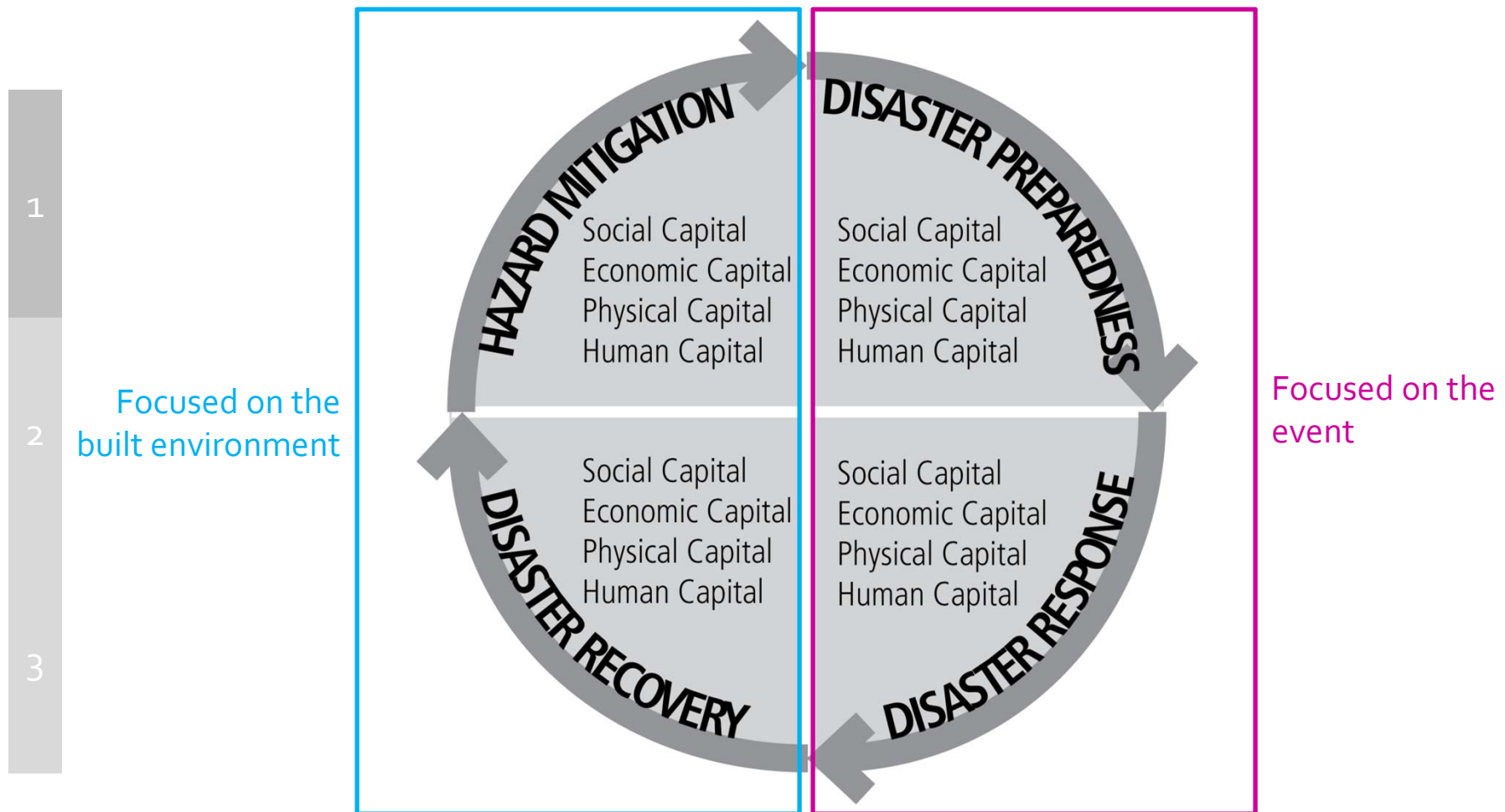
Adapted from Bruneau et al., 2003

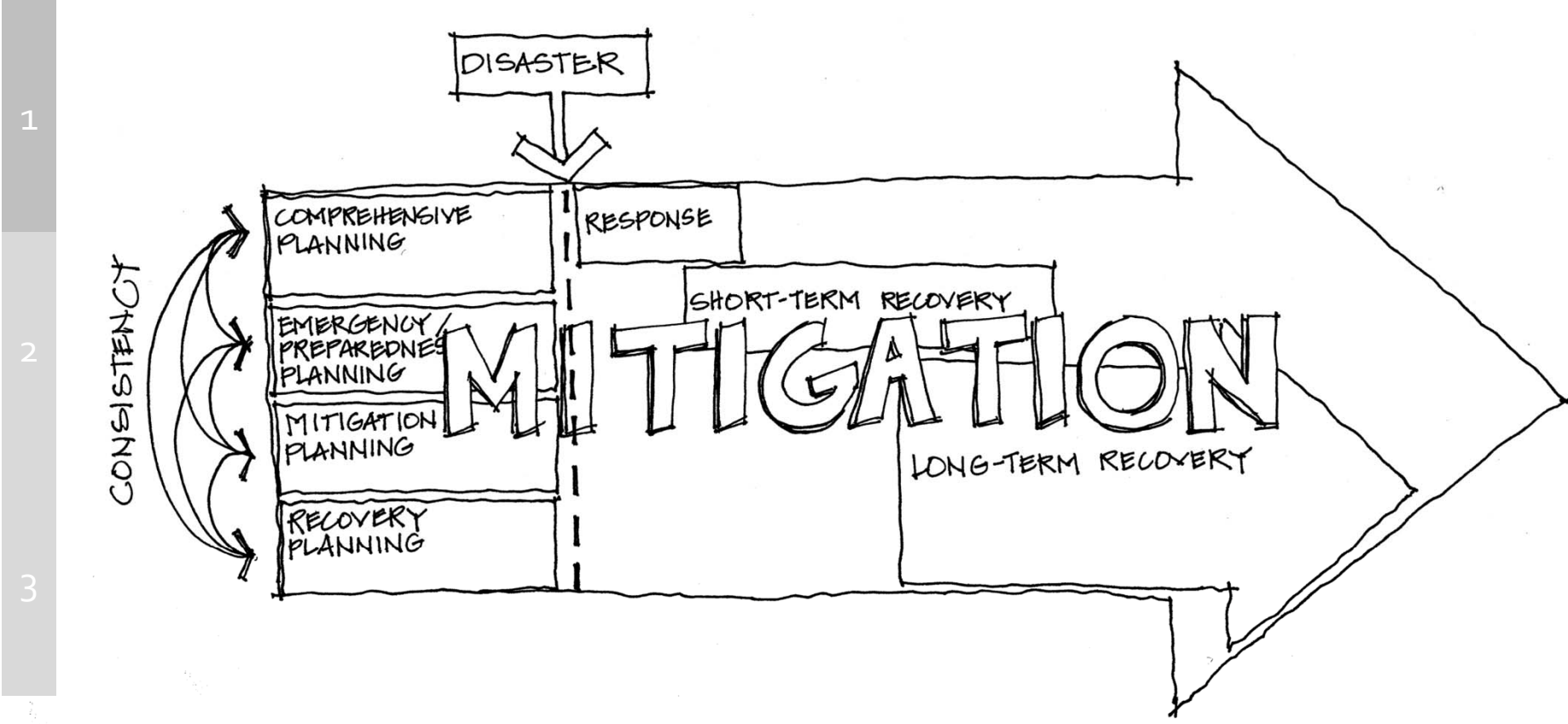
Increase resilience with community capacity

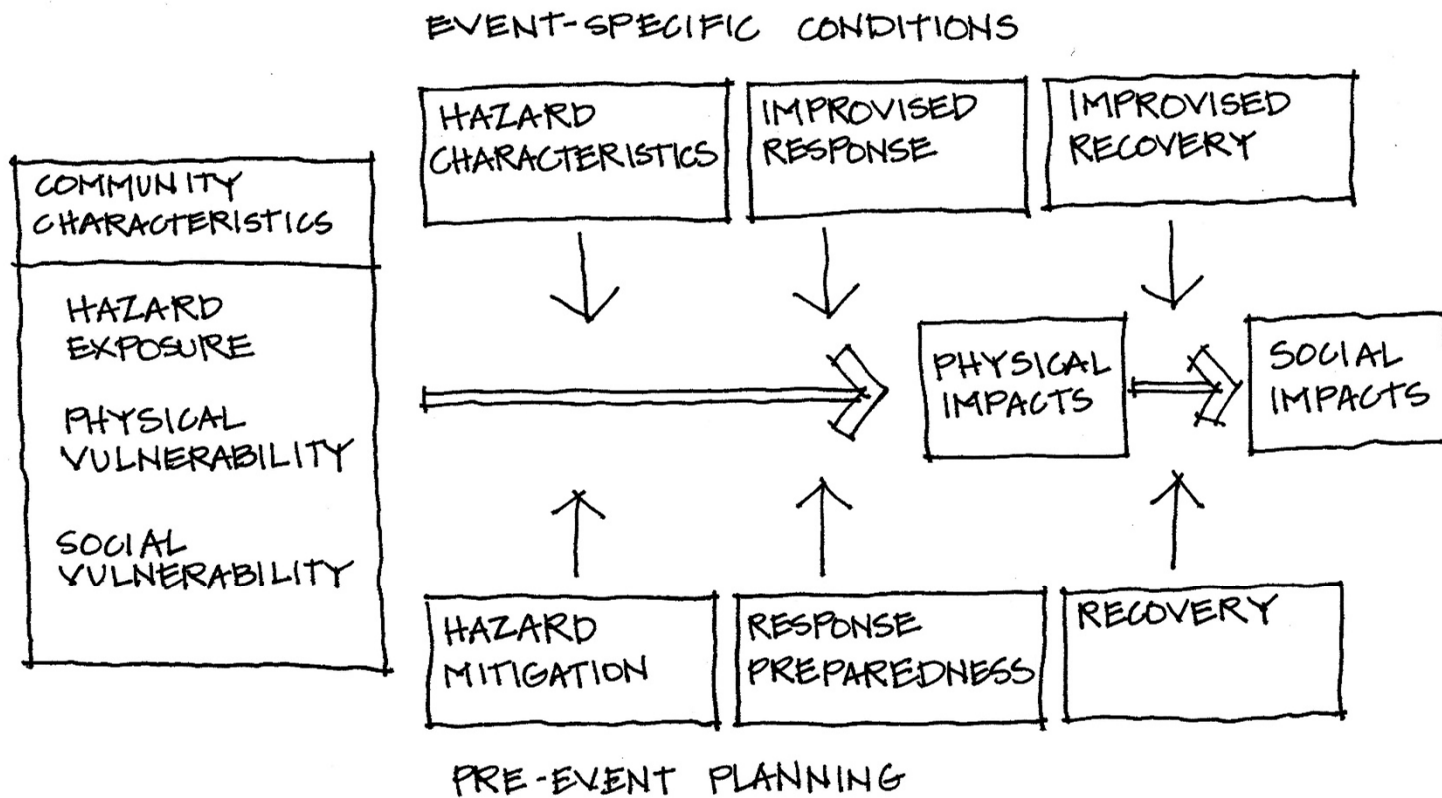


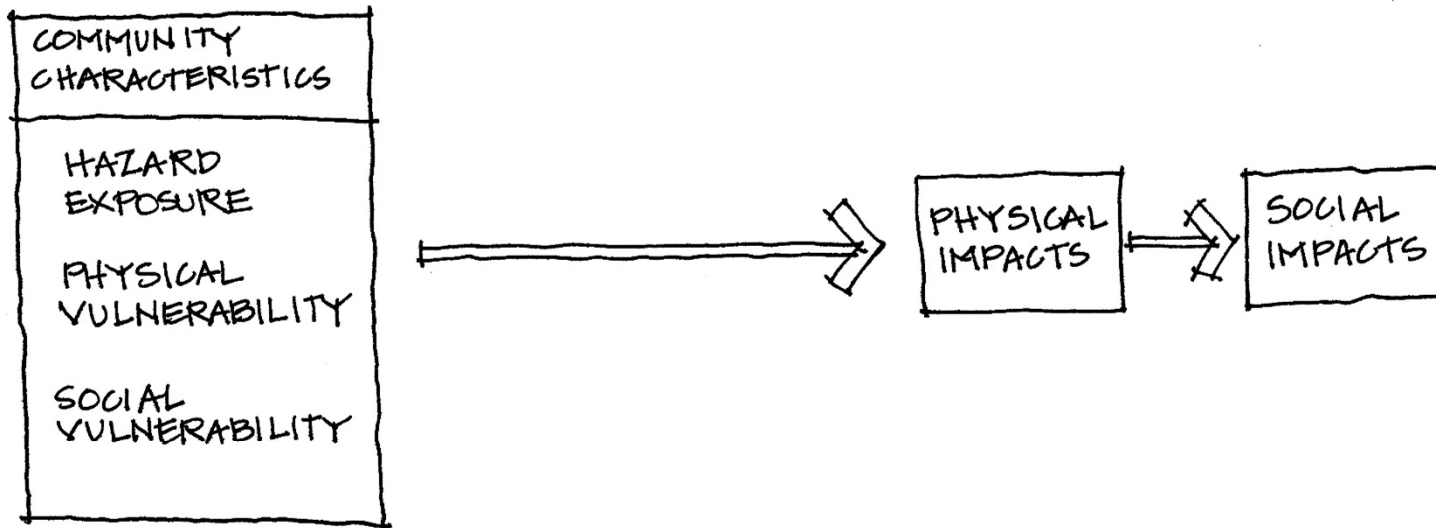
- Economic capital
 - Financial resources
- Physical capital
 - Quality of the built environment
- Human capital
 - Type and diversity of workers
- Social capital
 - How connected residents are to other residents

Increase resilience in the disaster phases









Physical Impacts

- Casualties
 - Deaths
 - Injuries
 - Illnesses
- Property destruction
 - Buildings
 - Contents (furniture, equipment, supplies)
 - Vehicles
 - Infrastructure (water/sewer, power/fuel, telecommunications, transportation)
 - Animals and crops
- Environmental degradation / habitat loss



Social Impacts

– Psychological impacts

- PTSD, Anxiety, Depression, Substance Abuse, etc.

– Demographic impacts

- Population displacement, dislocation, and loss, etc.

– Economic impacts

- Business loss, interruption, market instability, etc.

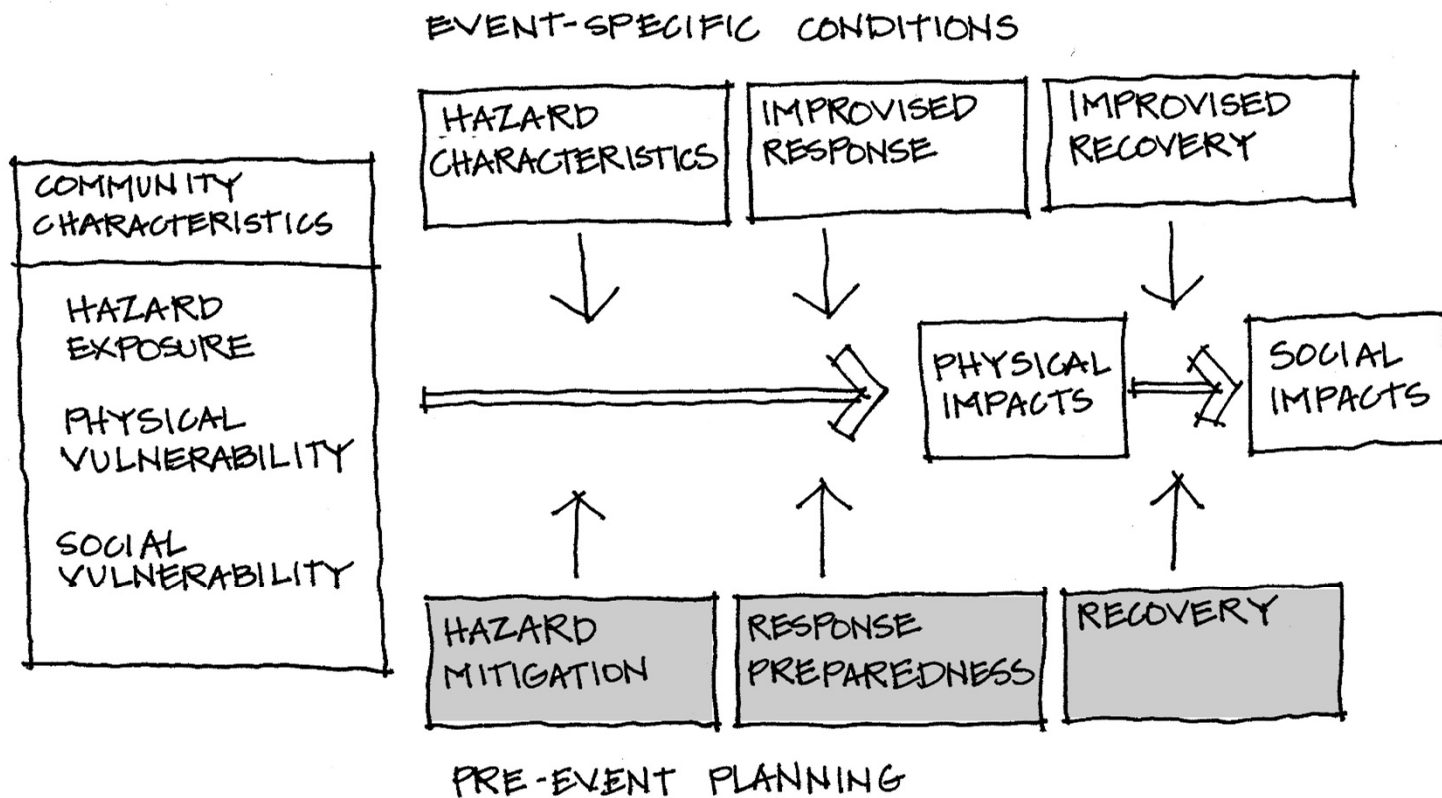
– Political impacts

- Leadership loss & change, violence, instability, etc

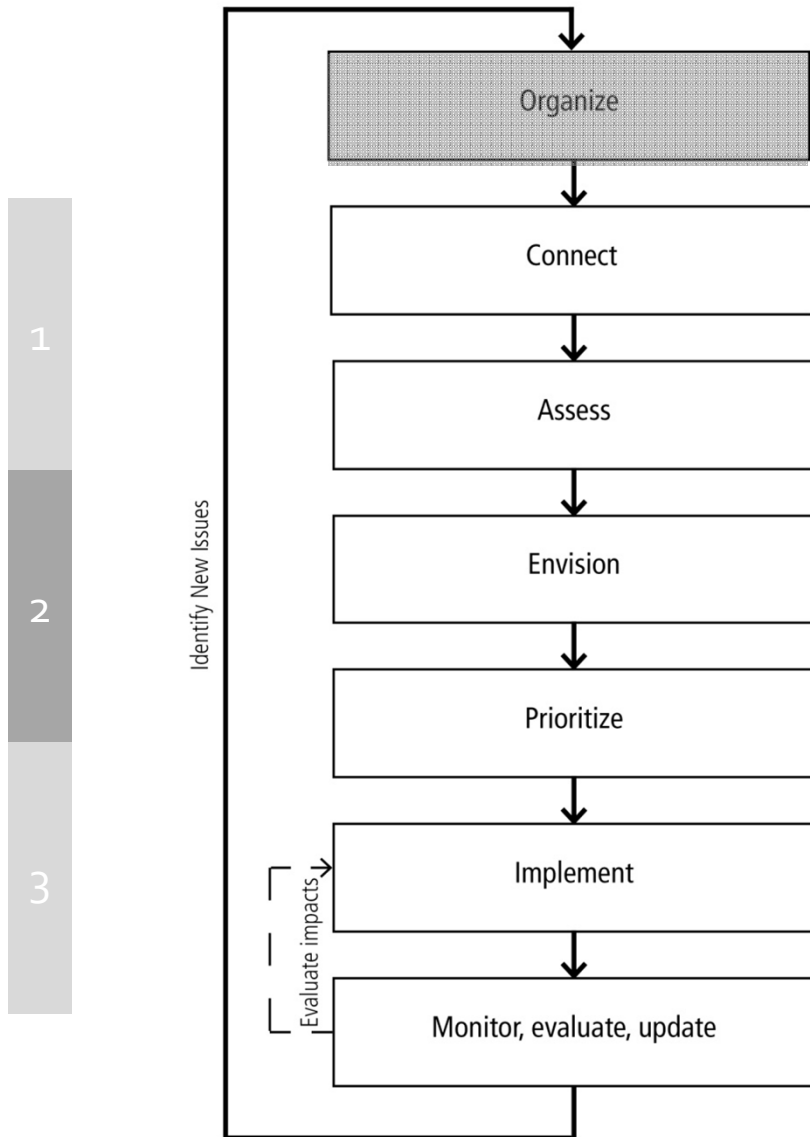
– Resiliency Outcomes:

- » Recovery (speed and quality)
- » Adaptation





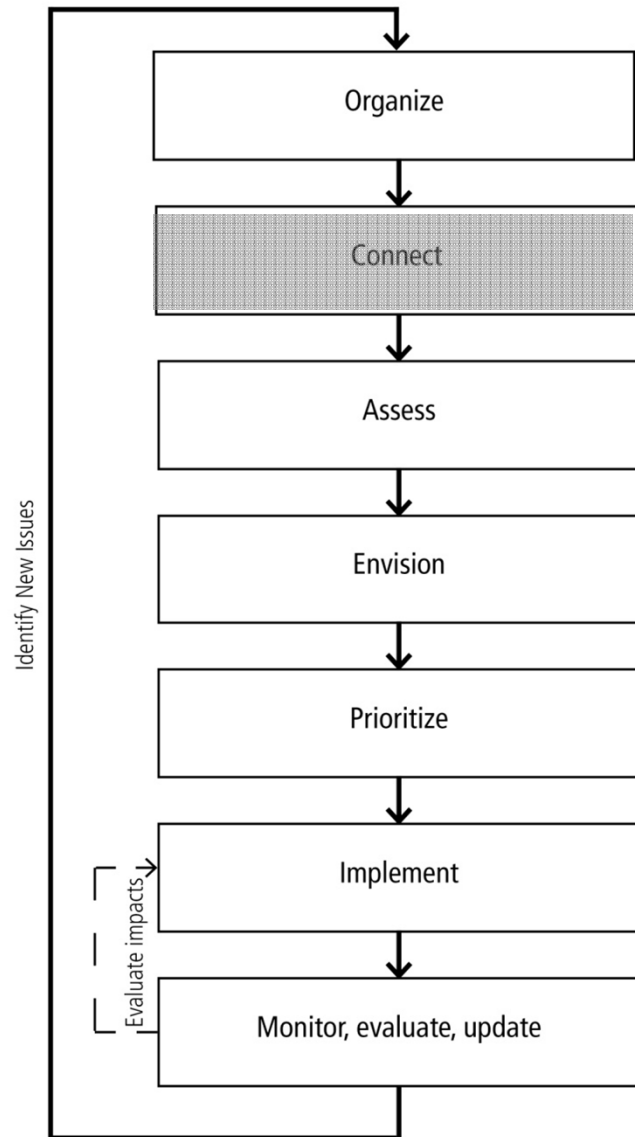
Inclusive Plan Making Process



Increase resilience through planning

- Get together a core team of stakeholders who are likely to have the most capacity, whether in time, interest, ability, resources, or networks
- Inclusive planning—involving the whole community must take place

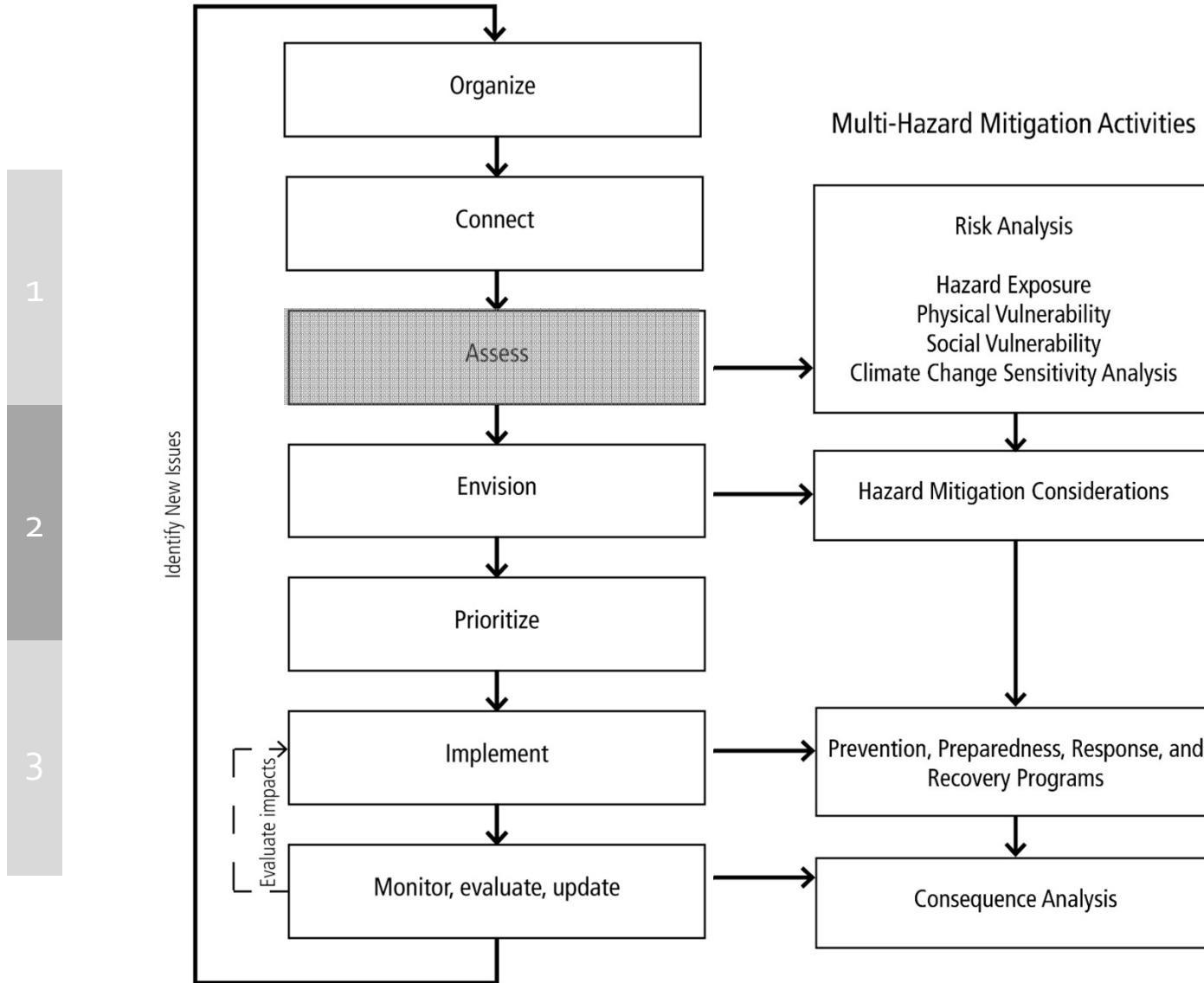
Inclusive Plan Making Process



- Reach out to community members to form a planning task force that can act as a information brokers to the entire community



Inclusive Plan Making Process



- Collect pertinent data to be used as the foundation of decisions going forward



Assess Hazard Exposures

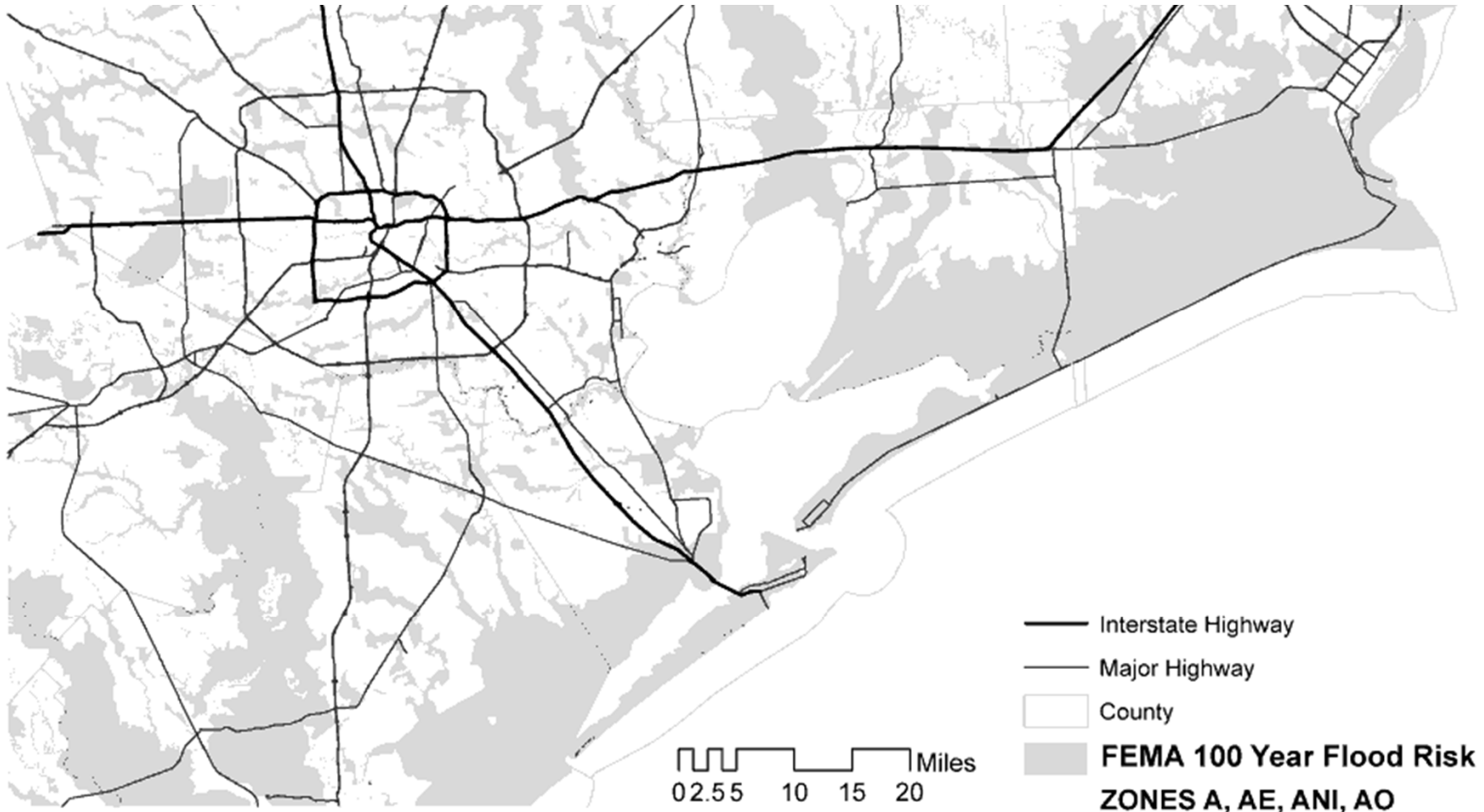
1

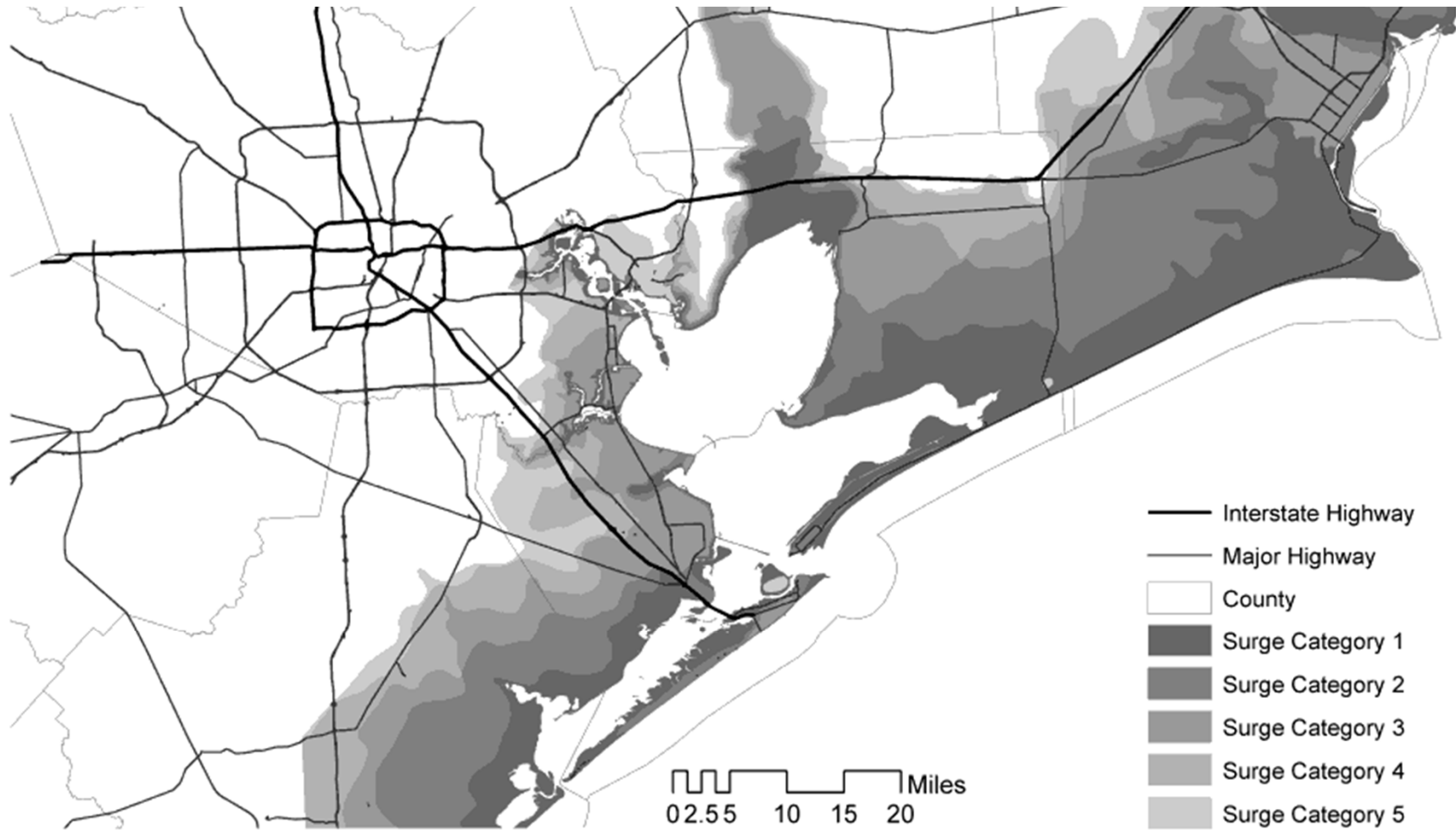
- Hurricane risk zones
- Surge zones
- Tsunami risk zones
- Flood zones
- Seal level rise
- Coastal erosion and accretion
- Seismic hazards and fault lines
- Hazardous material sites
- Wildfire risk zones
- Drought-affected zones
- Landslide risk
- Fog risk
- Avalanche risk zones

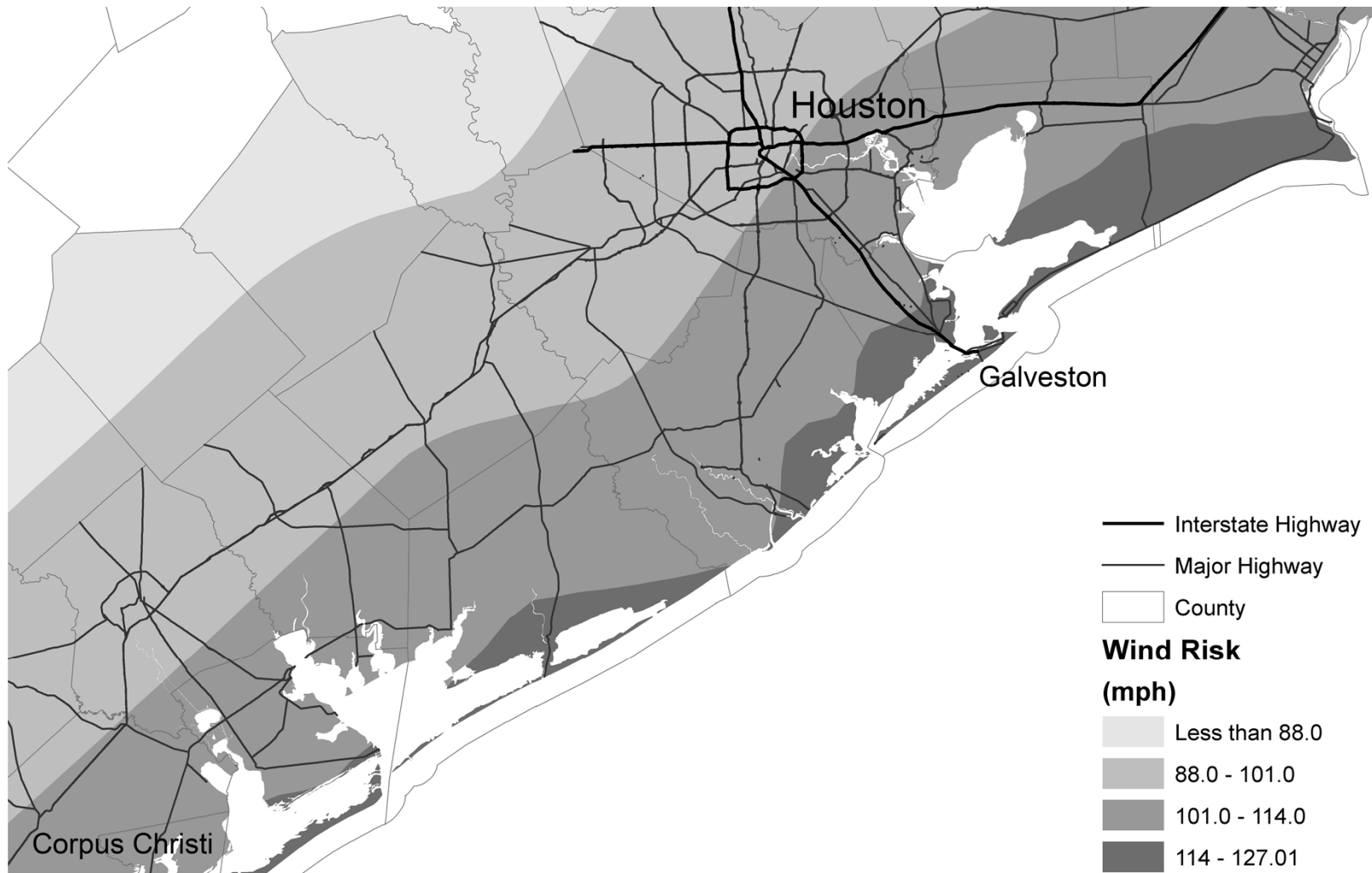
2

3



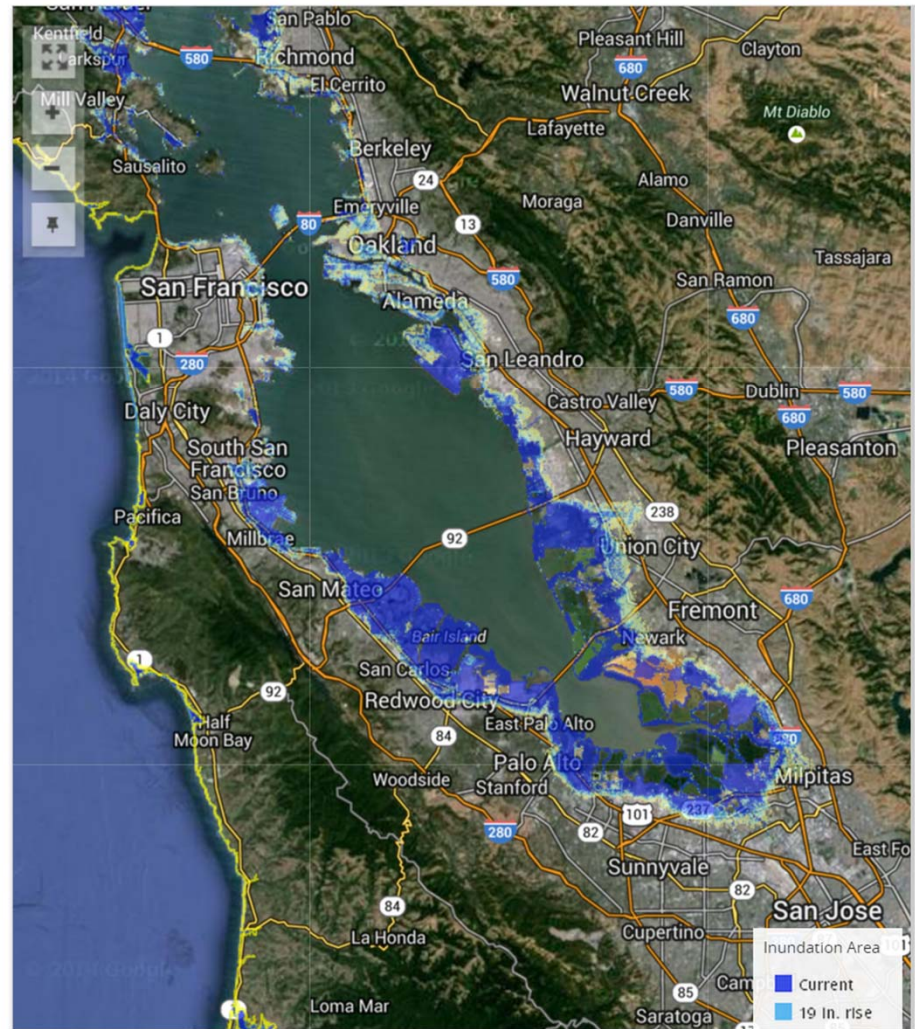




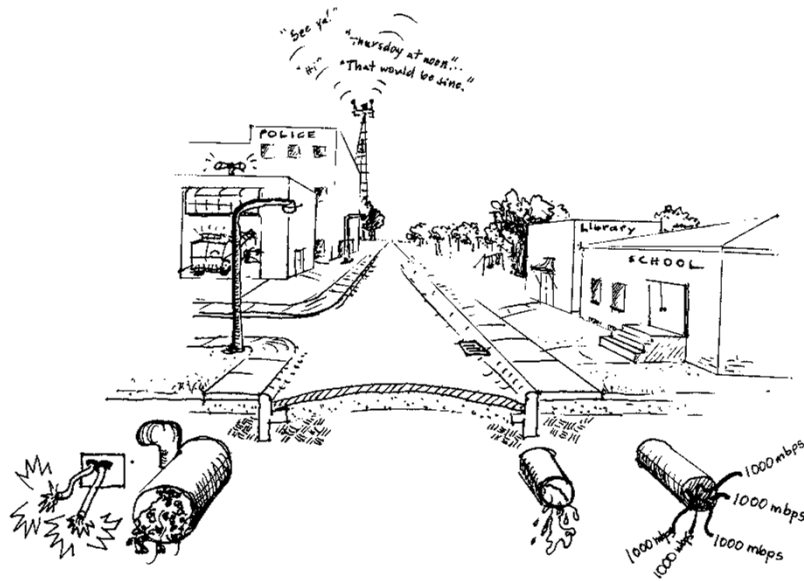


SEA LEVEL RISE: THREATENED AREAS MAP

- 1
- 2
- 3



Assess Physical Vulnerability

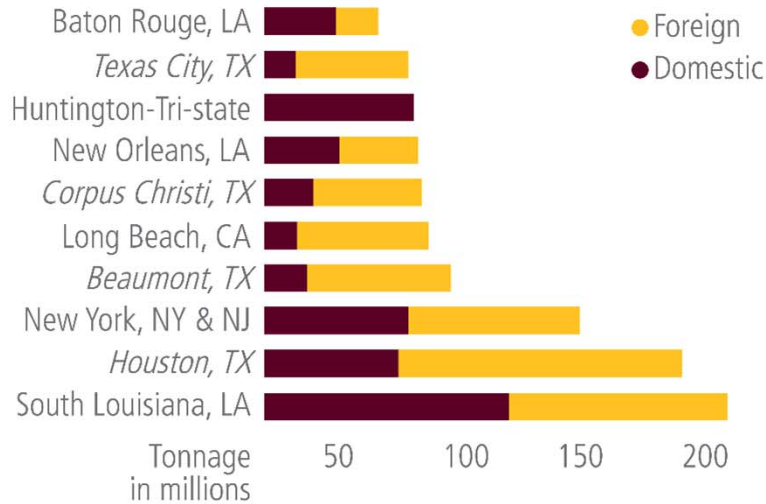


- Roads, bridges
- Dams, levees
- Electricity
- Energy infrastructure
- Water
- Phone, internet
- Hospitals
- Schools
- Fire stations
- Police stations
- Nursing homes
- Emergency shelters
- Historic structures
- Key commercial/industrial bldgs
- Residences
- Wetlands
- Freshwater sources
- Large stands of trees
- Oyster reefs and coral reefs
- Conservation areas
- Dunes and barrier islands

1
2
3

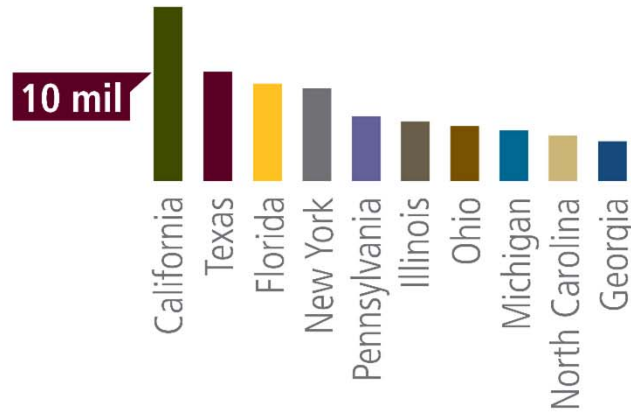
Port tonnage, 2004

US Corps of Engineers, Navigation Data Center



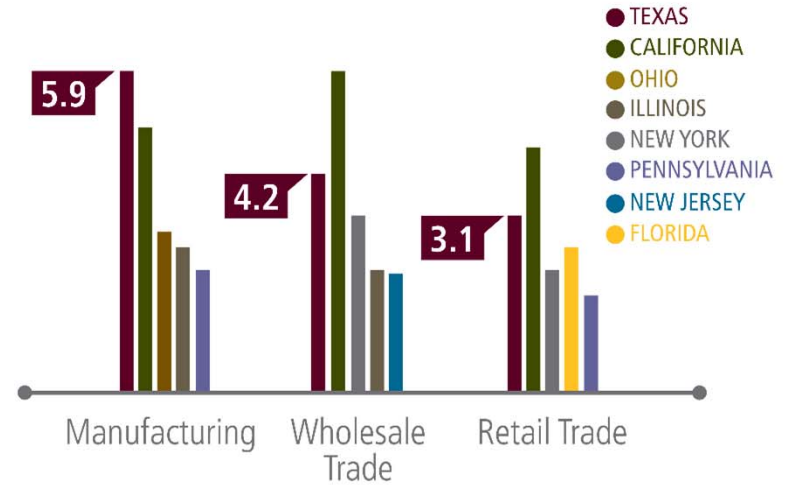
Housing units

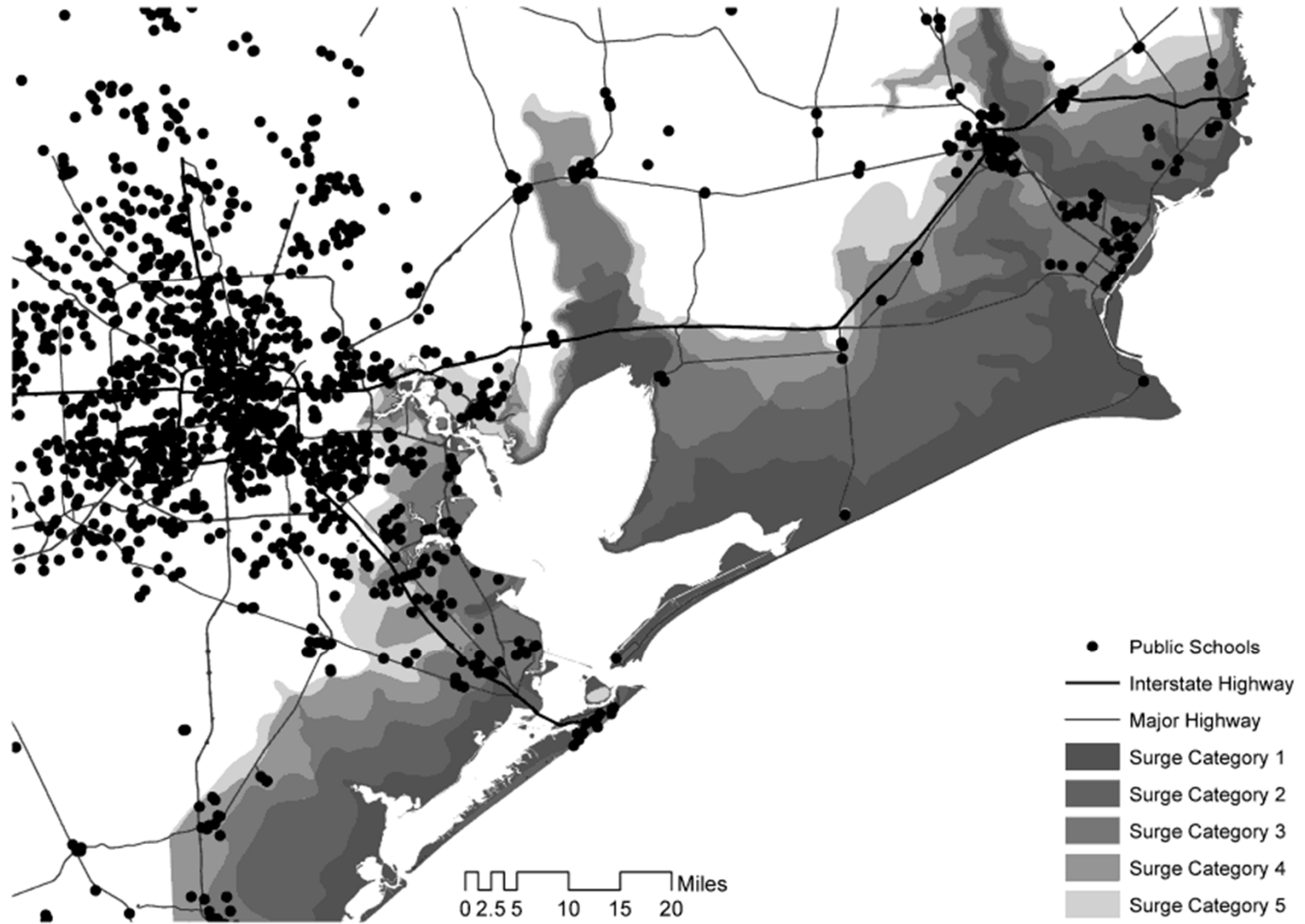
US Census Bureau 2010

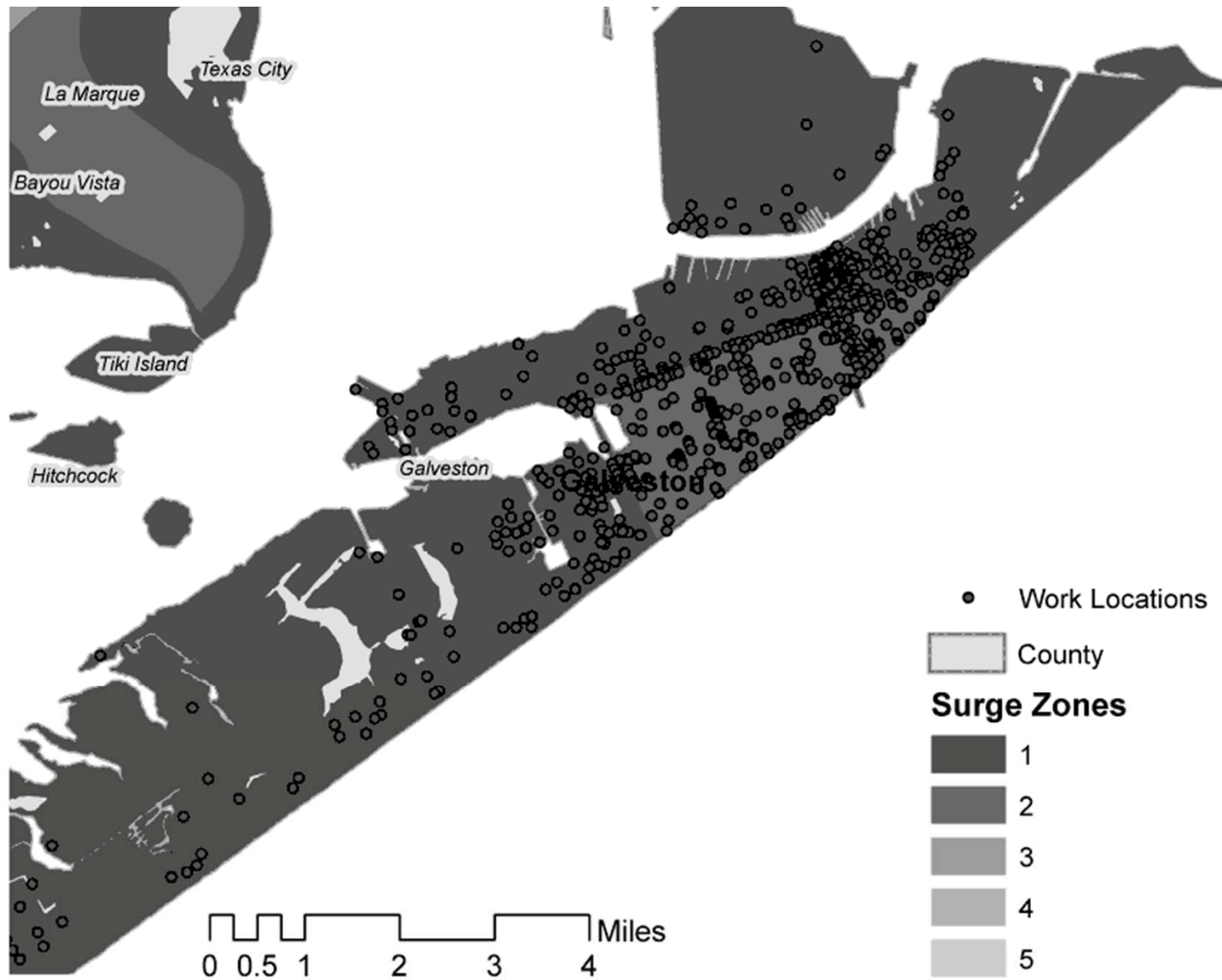


Top 5 states by industry value in billions of USD

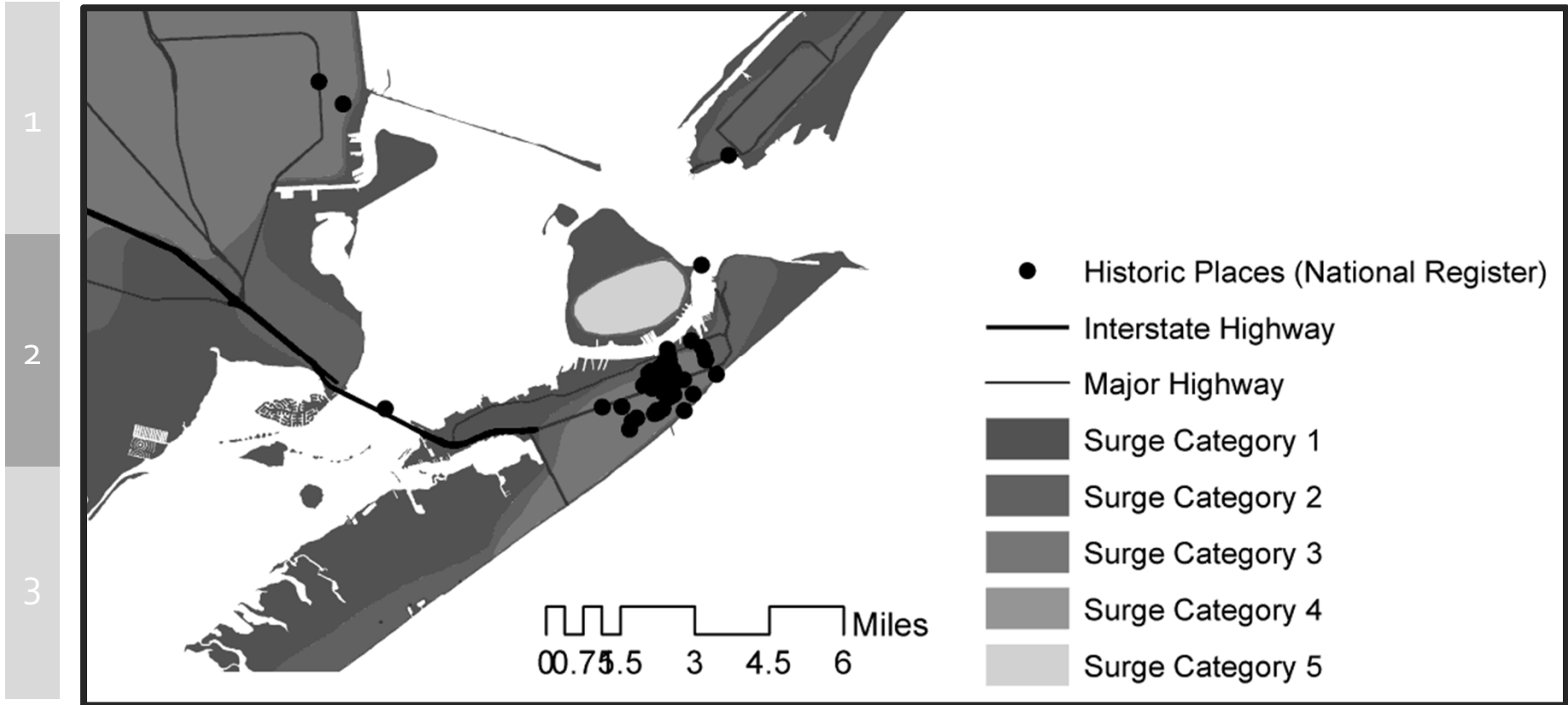
US Census Bureau, Economic Census 2007



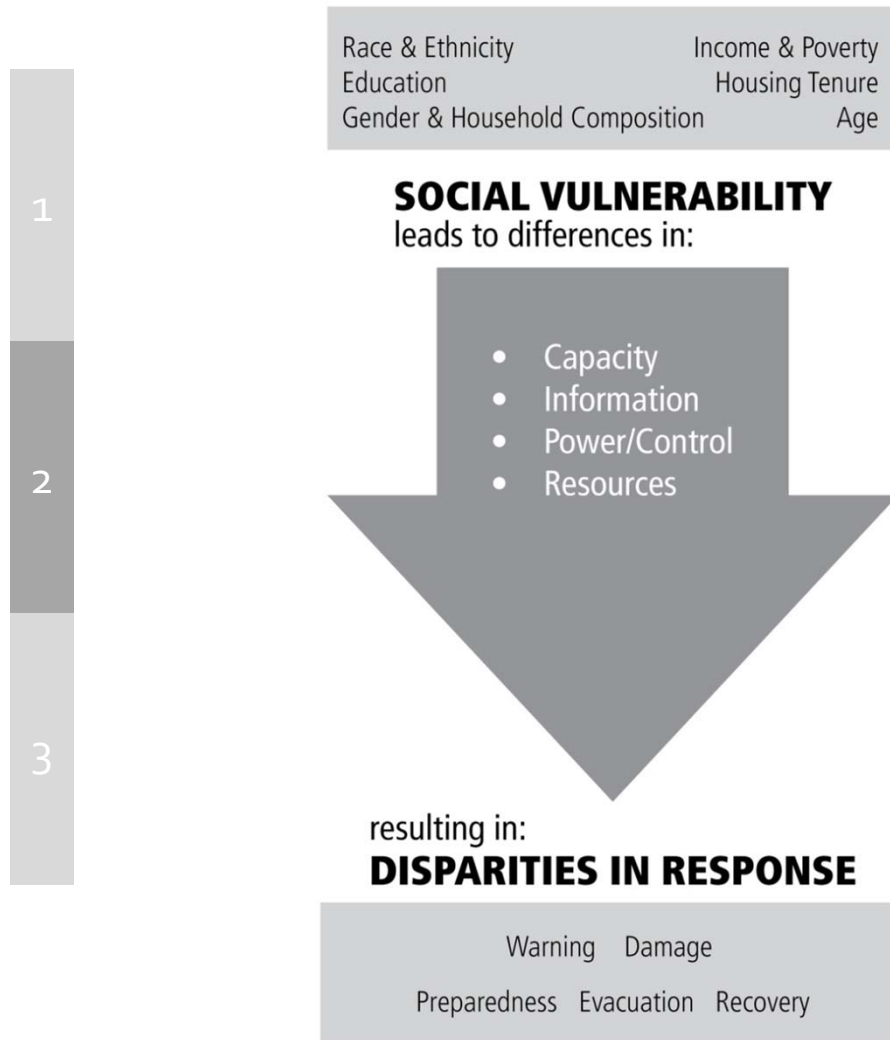




Assess Physical Vulnerability

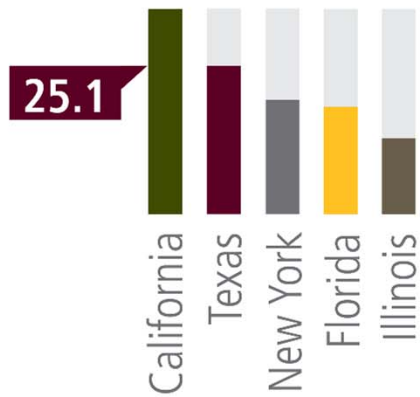


Assess Social Vulnerability

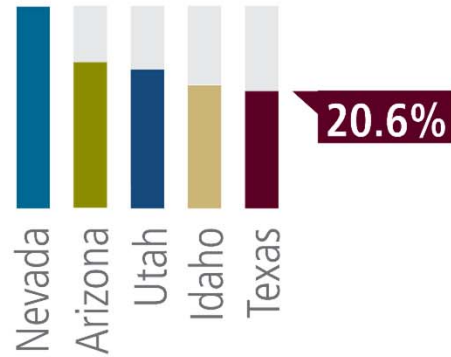


- Much like physical vulnerability, except focused on social units
- Focus is on social factors and processes that generate vulnerability in terms of a person's or group's capacity to anticipate, cope with, resist and recover from the impact of a natural hazard
 - These factors include:
 - Race/ethnicity, gender, education, poverty, age, and housing tenure
- Social vulnerability will rarely be uniformly distributed among the individuals, groups, or various populations comprising social systems
 - As a consequence we can develop mapping tools to identify areas with higher concentrations of socially vulnerable populations

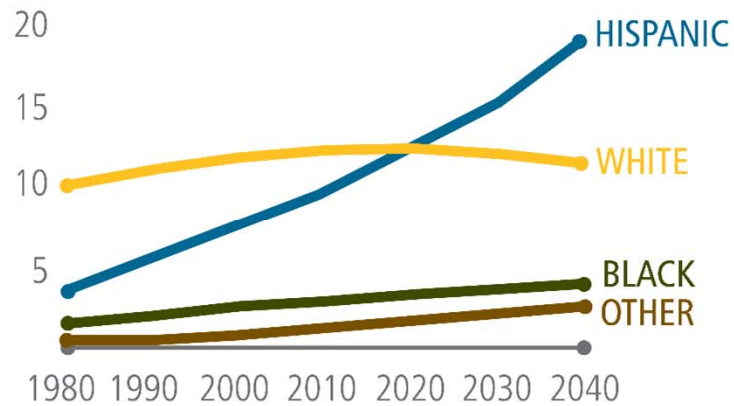
Top 5 states' population in millions
US Census Bureau 2010



Top 5 states' percent population change
US Census Bureau 2000-2010



Texas population growth by race in millions
Texas State Data Center



Texas is the 9th most impoverished state
US Census Bureau 2010



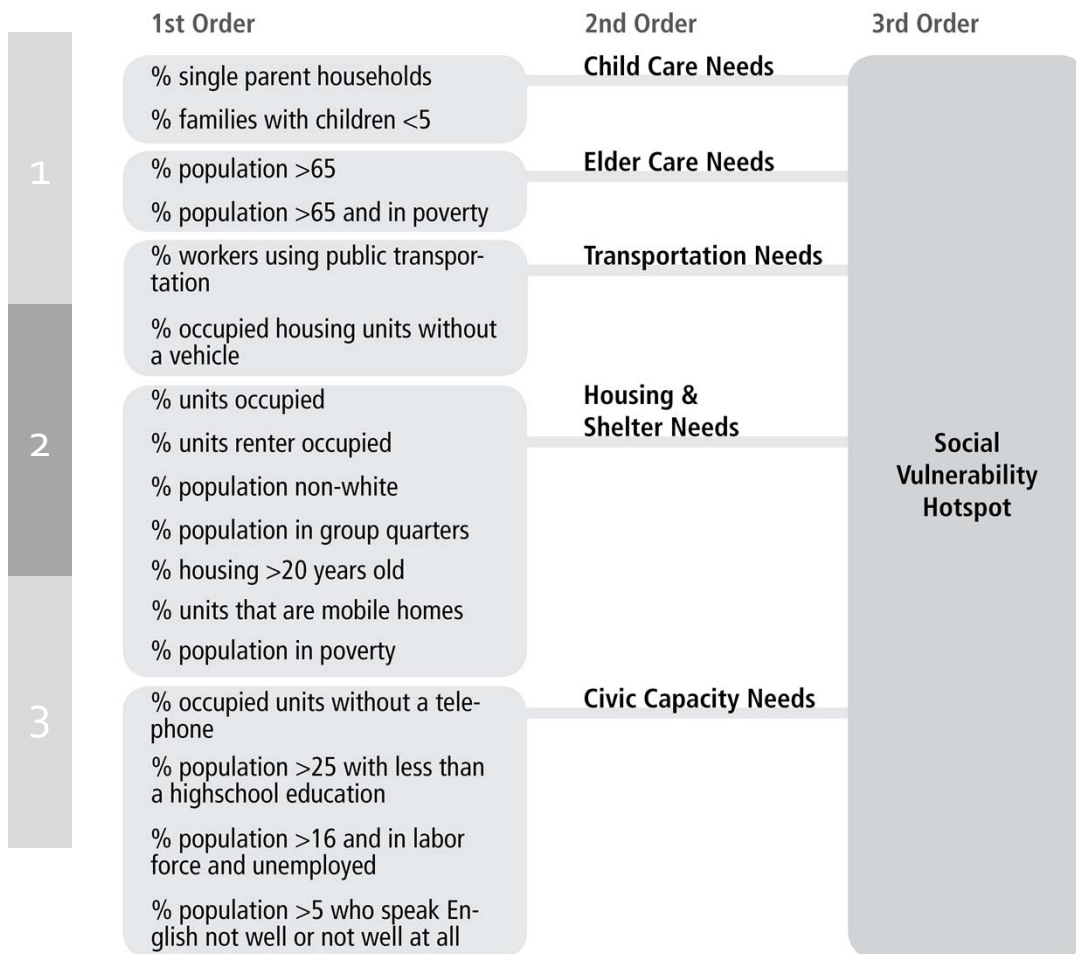
34% of Texans do not speak English at home, while 14.5% of Texans speak English less than very well
--US Census Bureau 2010



A few examples of social vulnerability measures

| | |
|-------------------------------|--|
| Household structure | Larger families, particularly those with high number of dependents, relative to wage/salary earners are more vulnerable, as are single parent, particularly female headed households. |
| Socioeconomic Status | Higher levels of wealth, income, prestige, and political power insures enhanced ability to ability to prepare for, mitigate against and cope with physical impacts. Often have much higher resources base to draw from to overcome |
| Gender | Women have more difficult time in recovery because of constrained employment opportunities and lower wages; often must take primary responsibility for child care and households activities. |
| Race/ethnicity | Language, culture, and discrimination |
| Age (elderly and children) | Both young and old are at higher risk due to reduce mobility, economic constraints, legal constraints. Households with these higher risk groups can be limited due to time and resource constraints. |
| Tenure | Renters more transient, fewer resources, less-control, more dependent on owner for improvements, repair, mitigation, etc. |
| Urban/Rural | Rural residents are more vulnerable due to isolation, tend to have fewer employment opportunities, are poorer, etc. |
| Special Needs populations | Sick, infirmed, etc. |
| Employment status | Those who are un- or under-employed have reduced resources from which to draw from. |

Assess Social Vulnerability

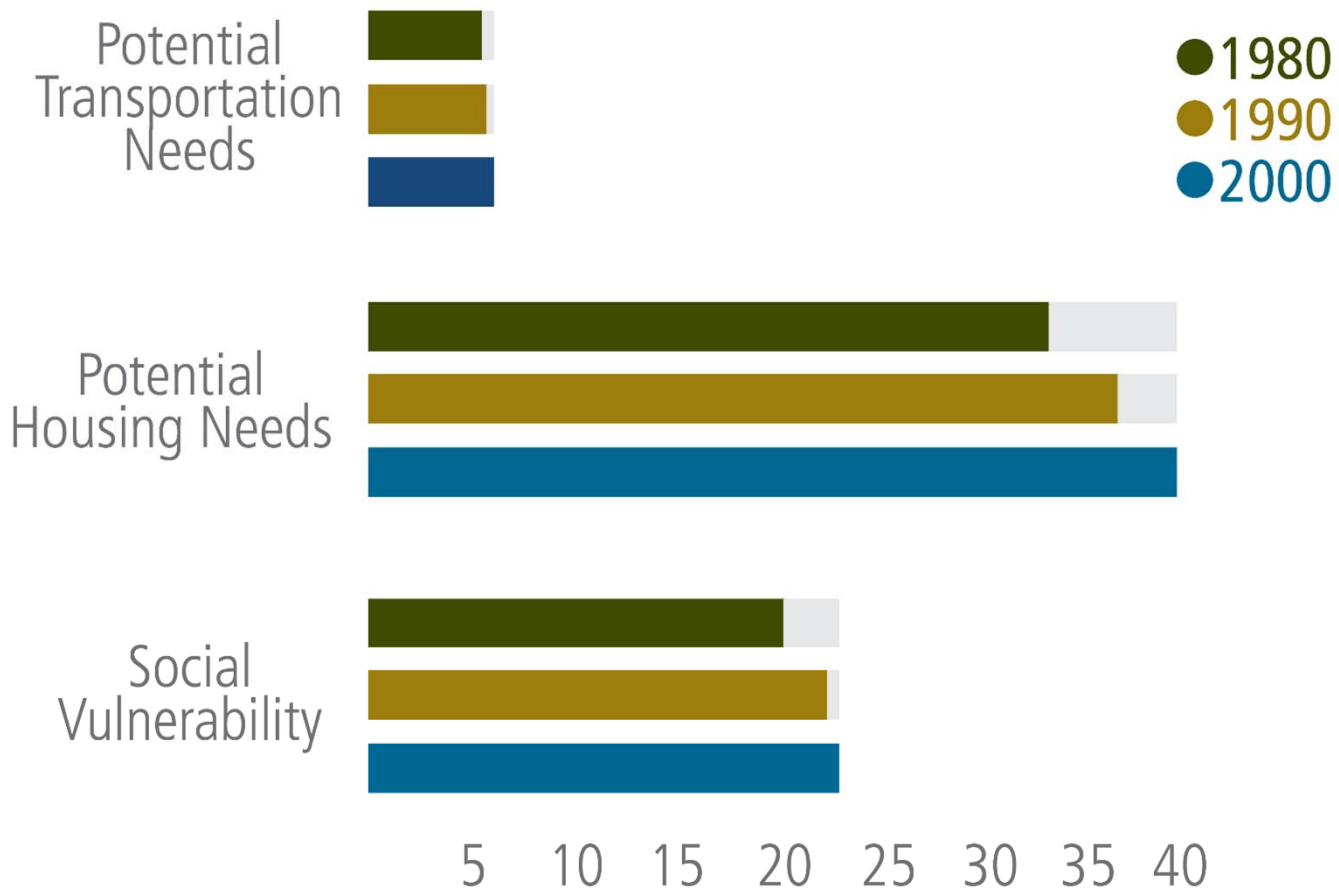


- Collected from the Census Bureau's American Community Survey
- Mapping tools, like the texasatlas.arch.tamu.edu

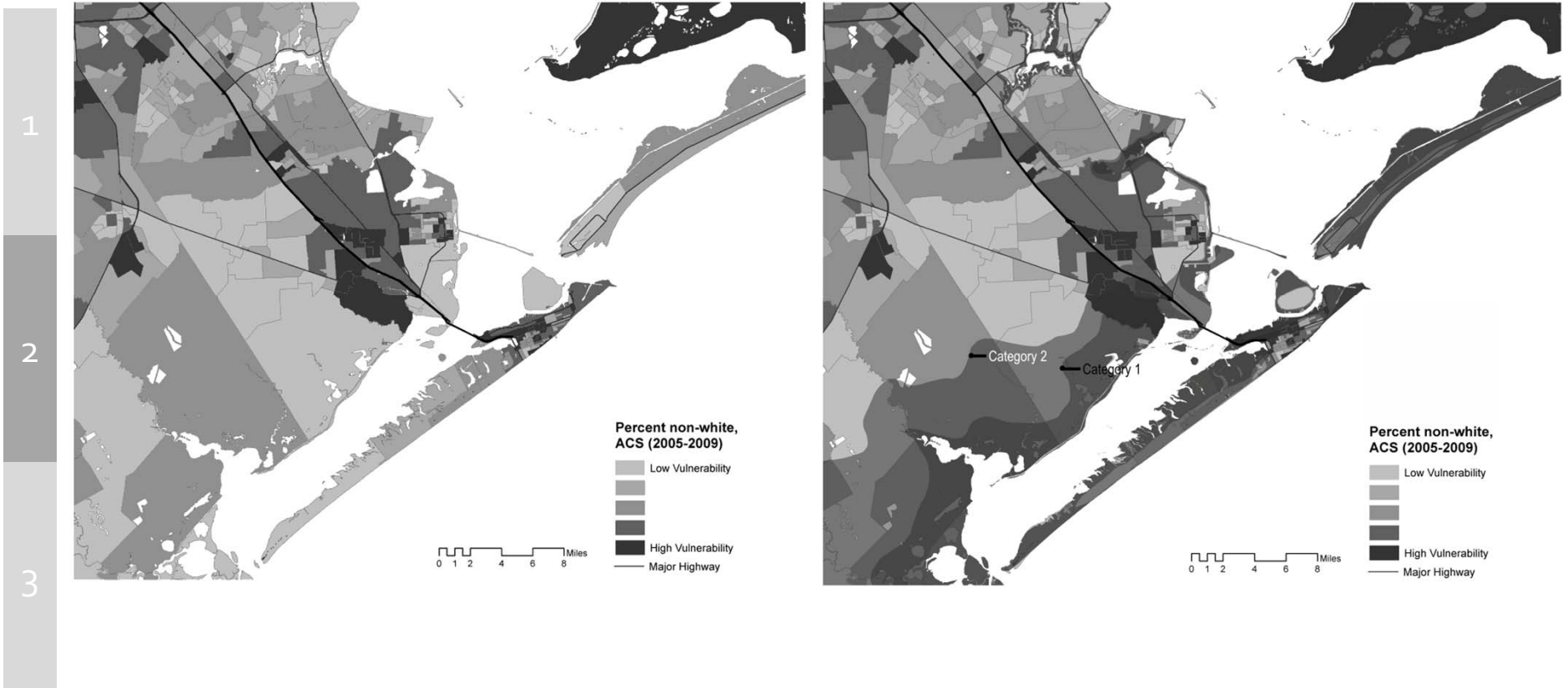


Mean percentage change from 1980-2000

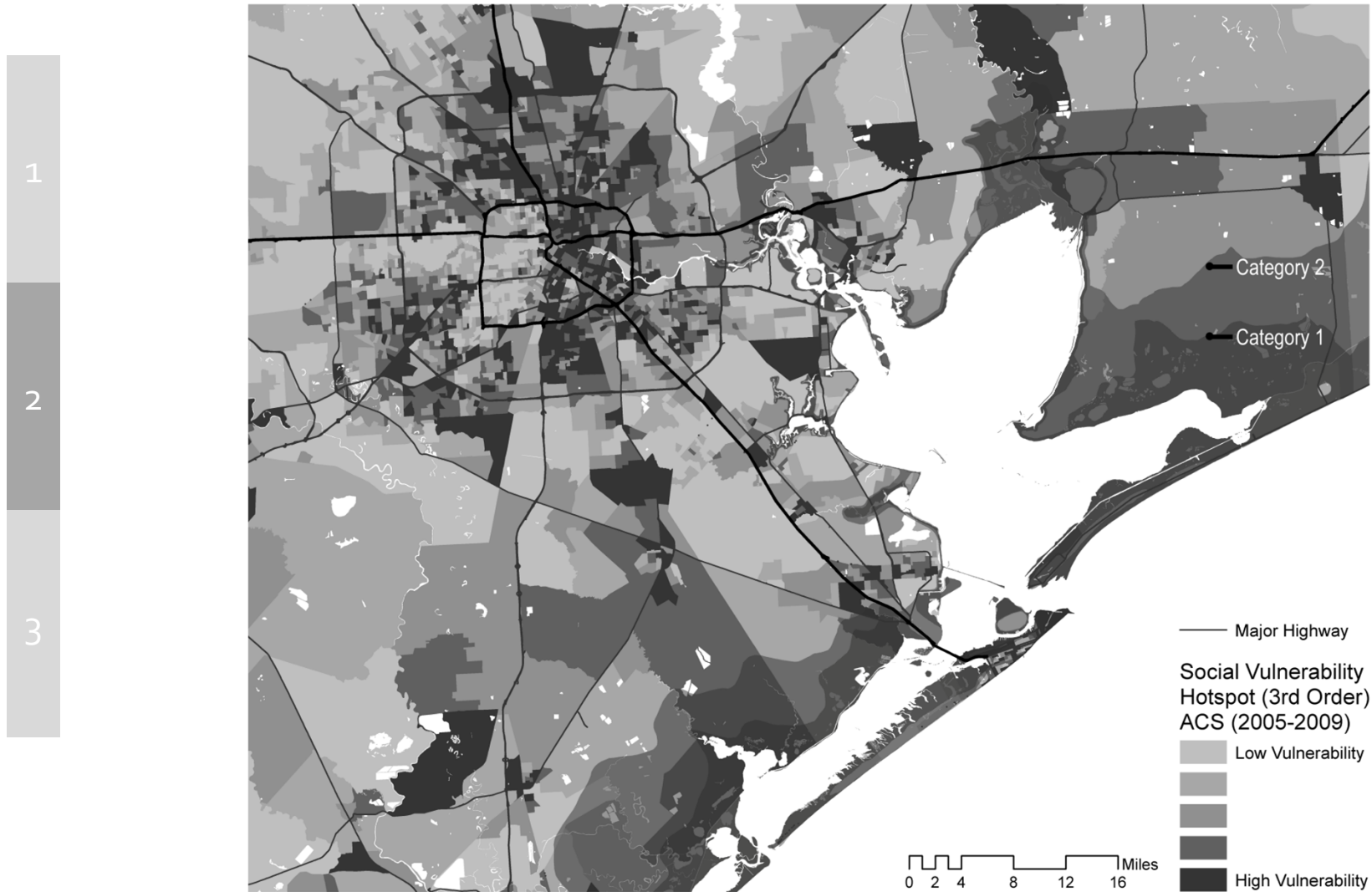
Peacock et al., 2011

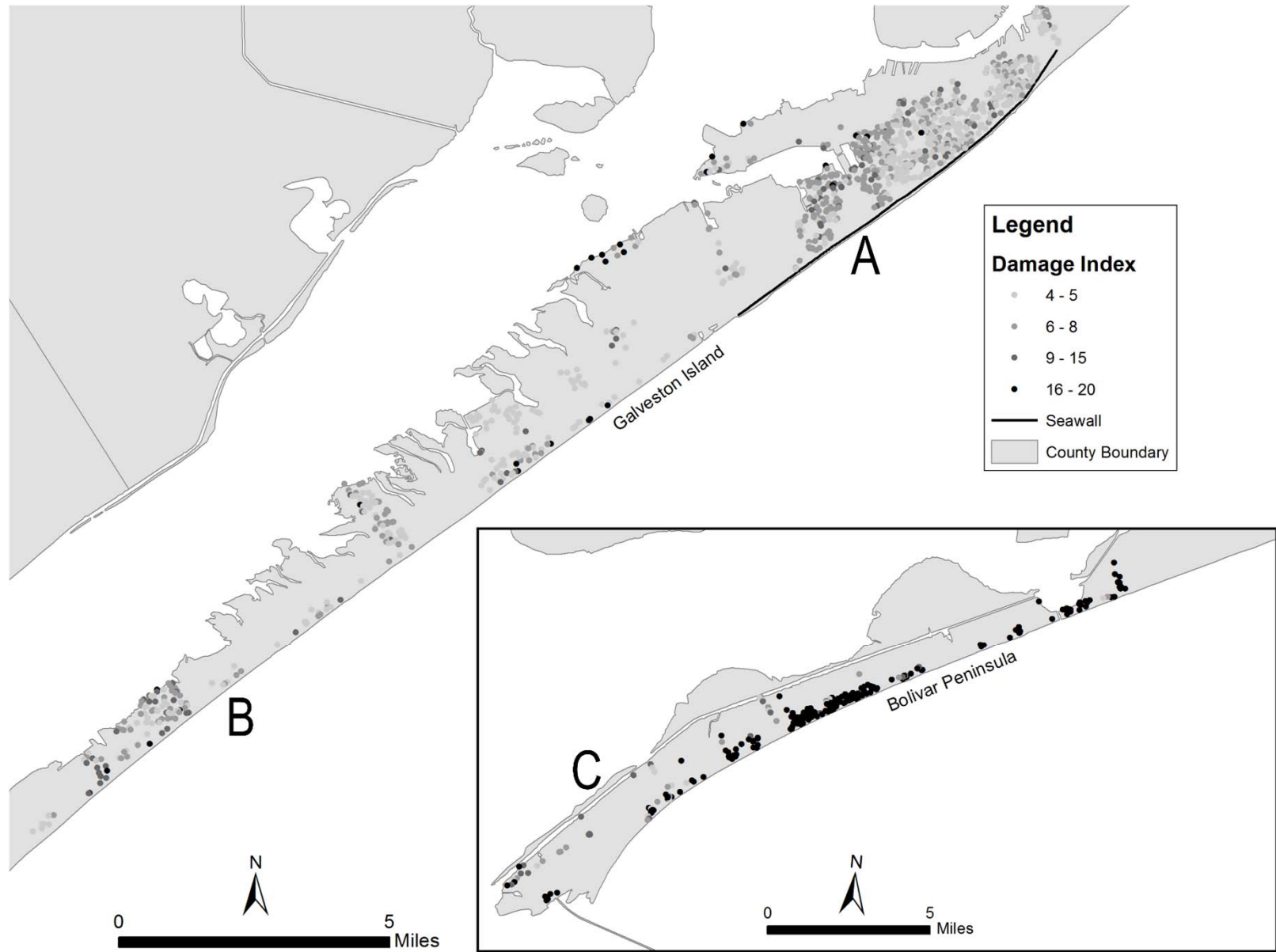


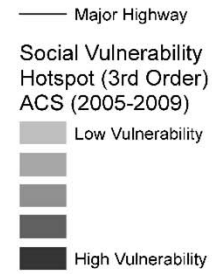
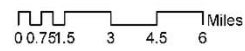
Assess Social Vulnerability



Assess Social Vulnerability

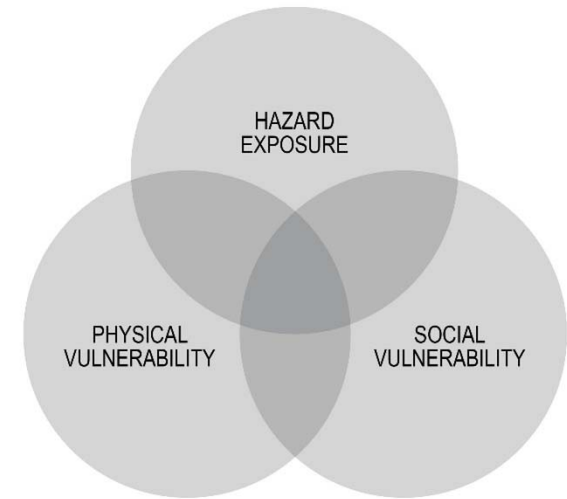






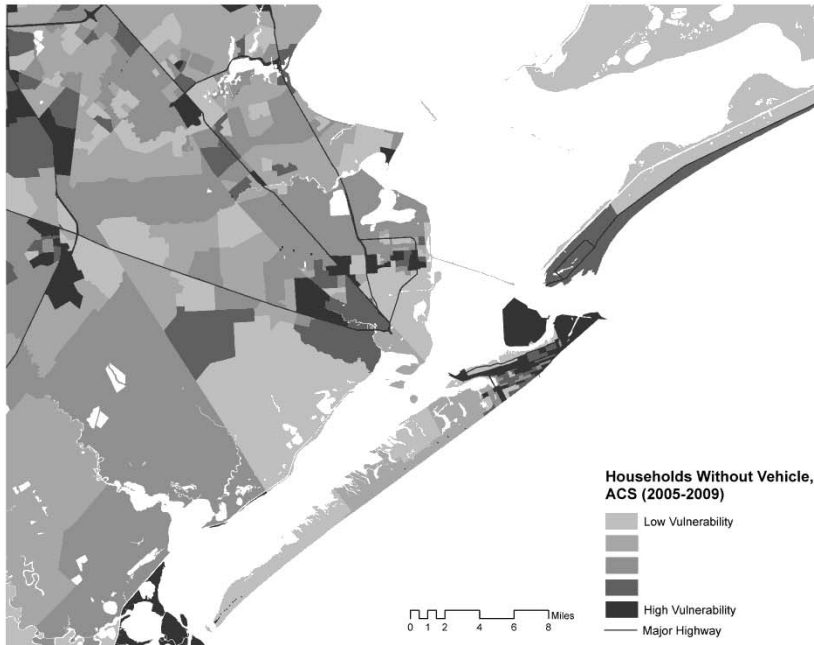
Hotspots of vulnerability

- The physical and social impacts of disasters are results of the exposure to hazards, the physical vulnerabilities, and the social vulnerabilities present in a community
- That vulnerability analysis should be based on assessments

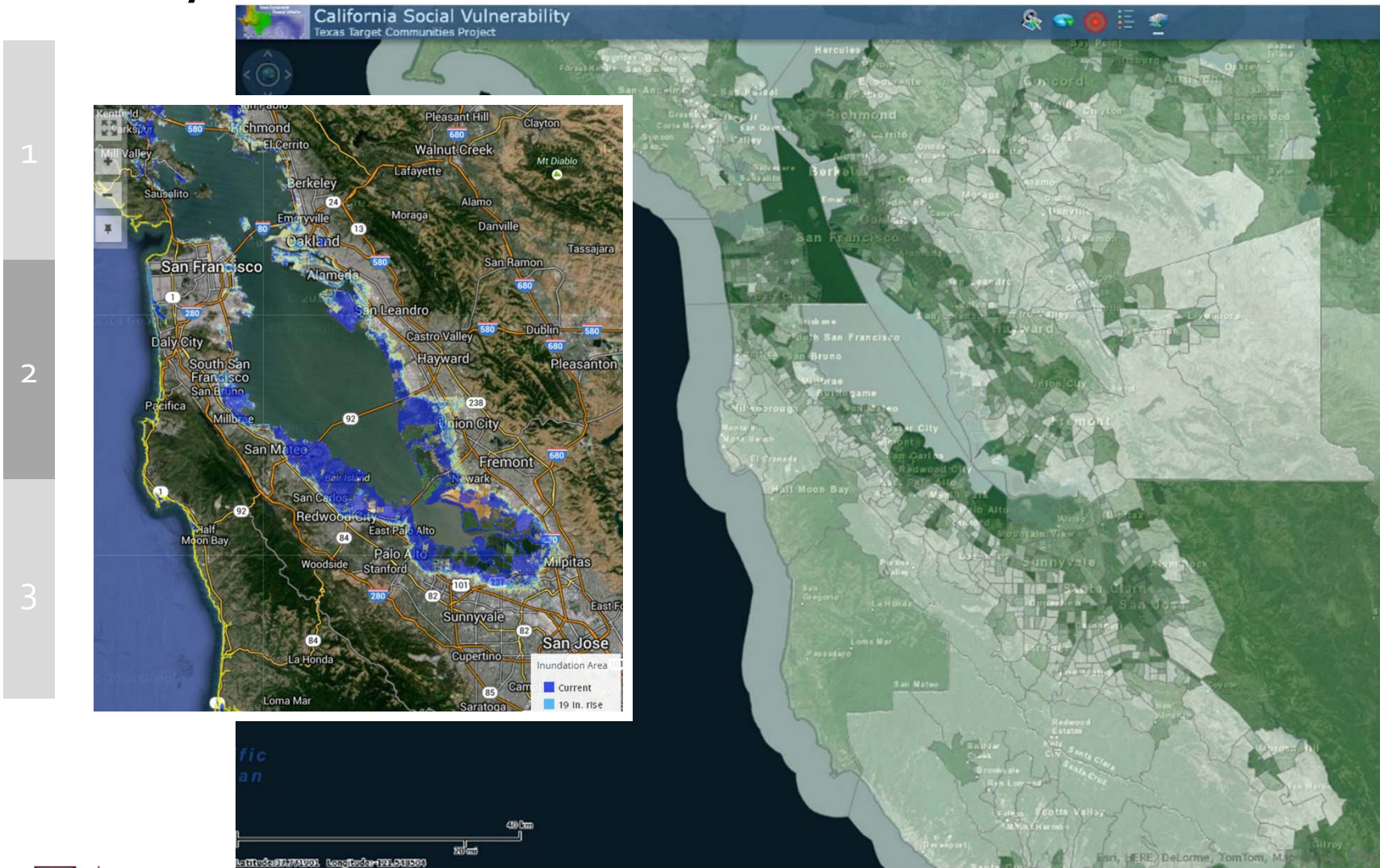


Overlay data

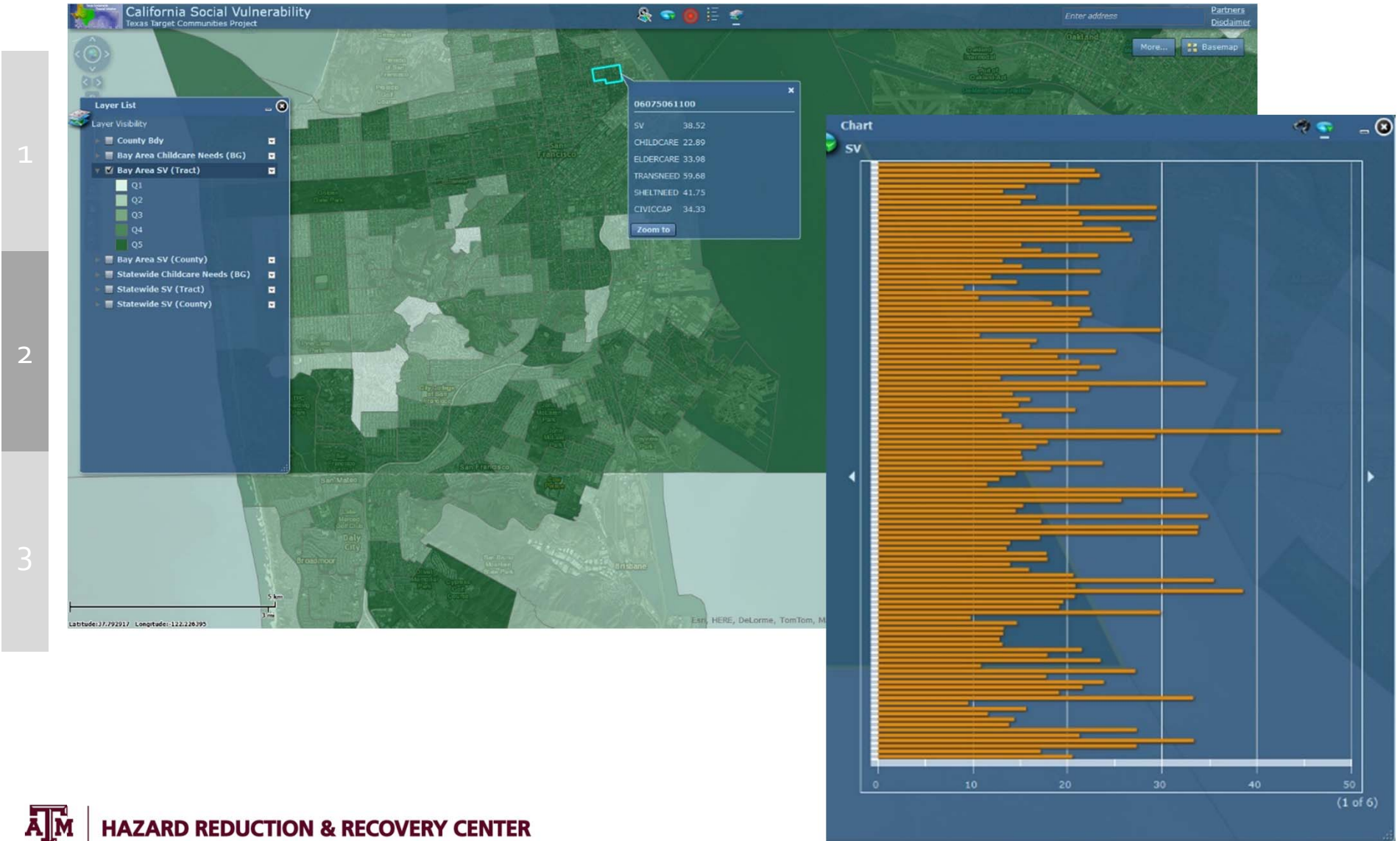
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2
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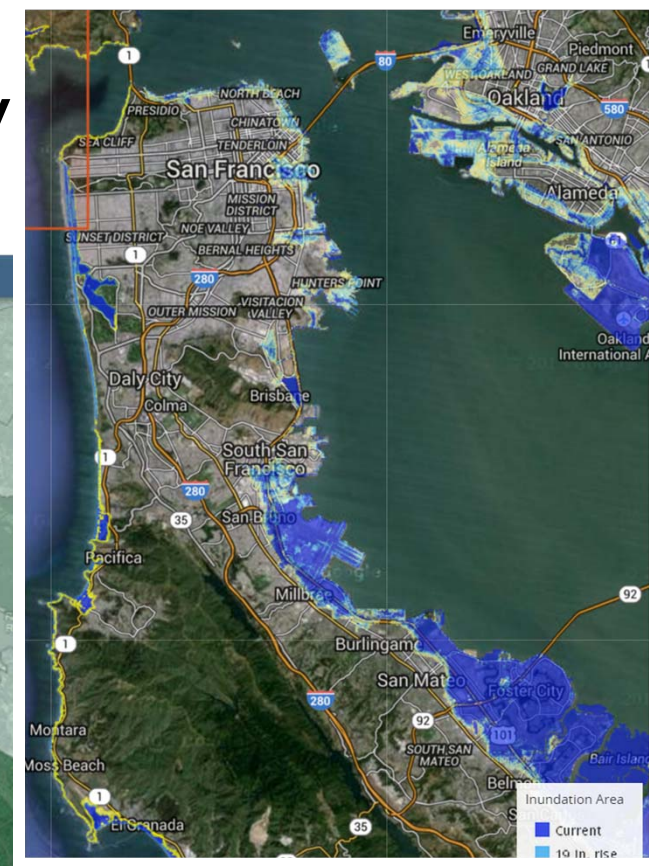
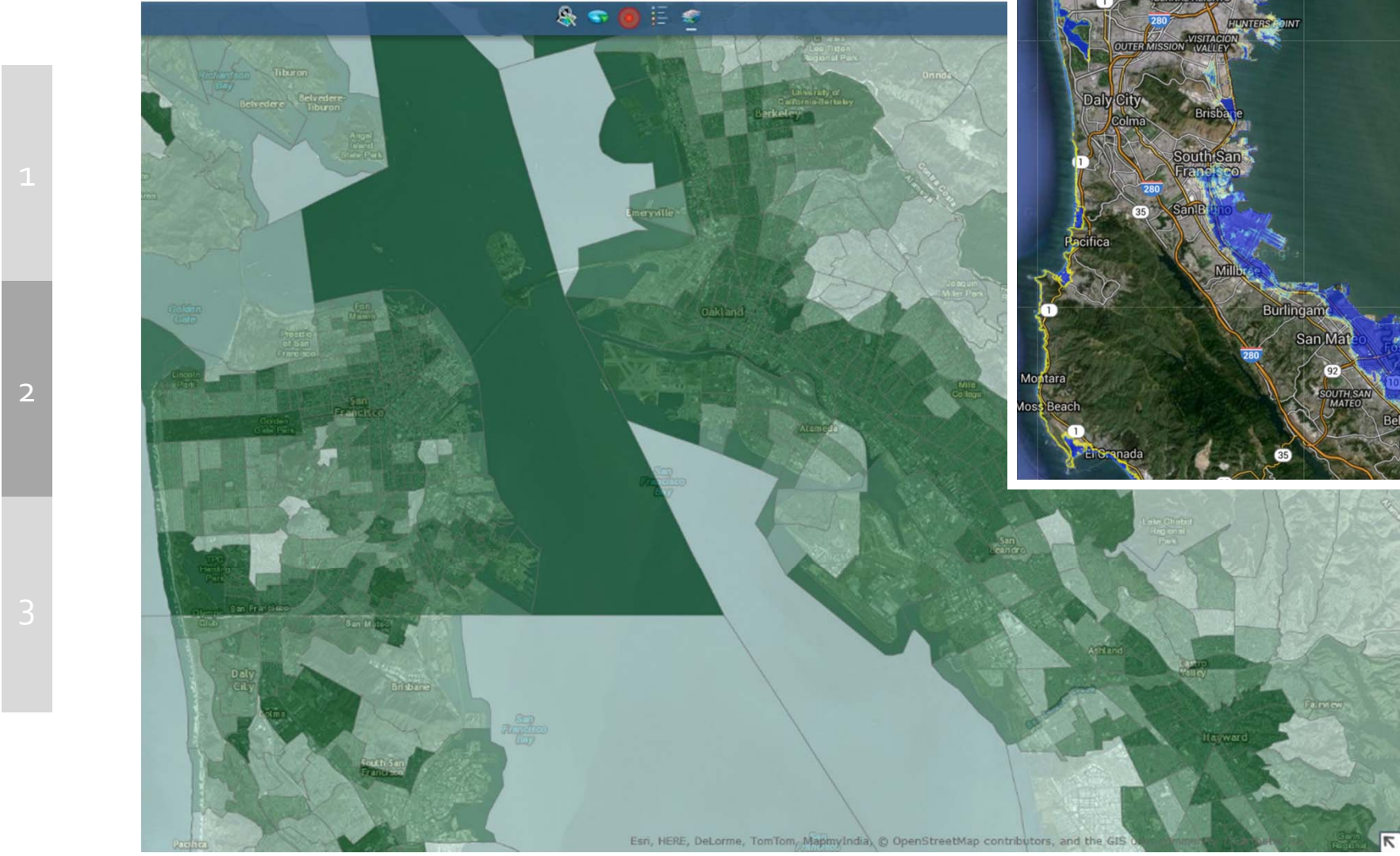
Assess Social Vulnerability Bay Area



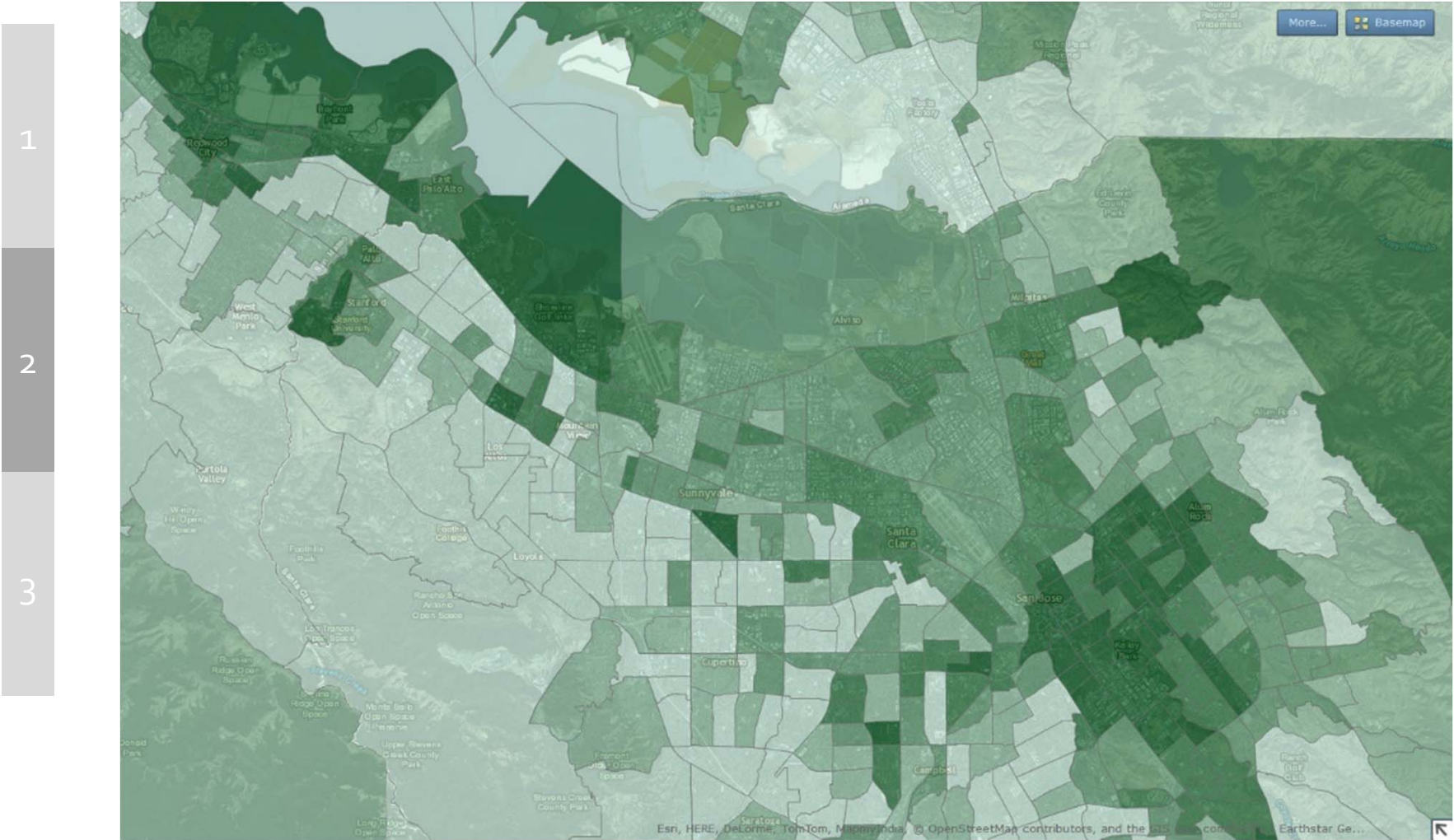
Assess Social Vulnerability San Francisco



Assess Social Vulnerability



Assess Social Vulnerability Palo Alto, San Jose

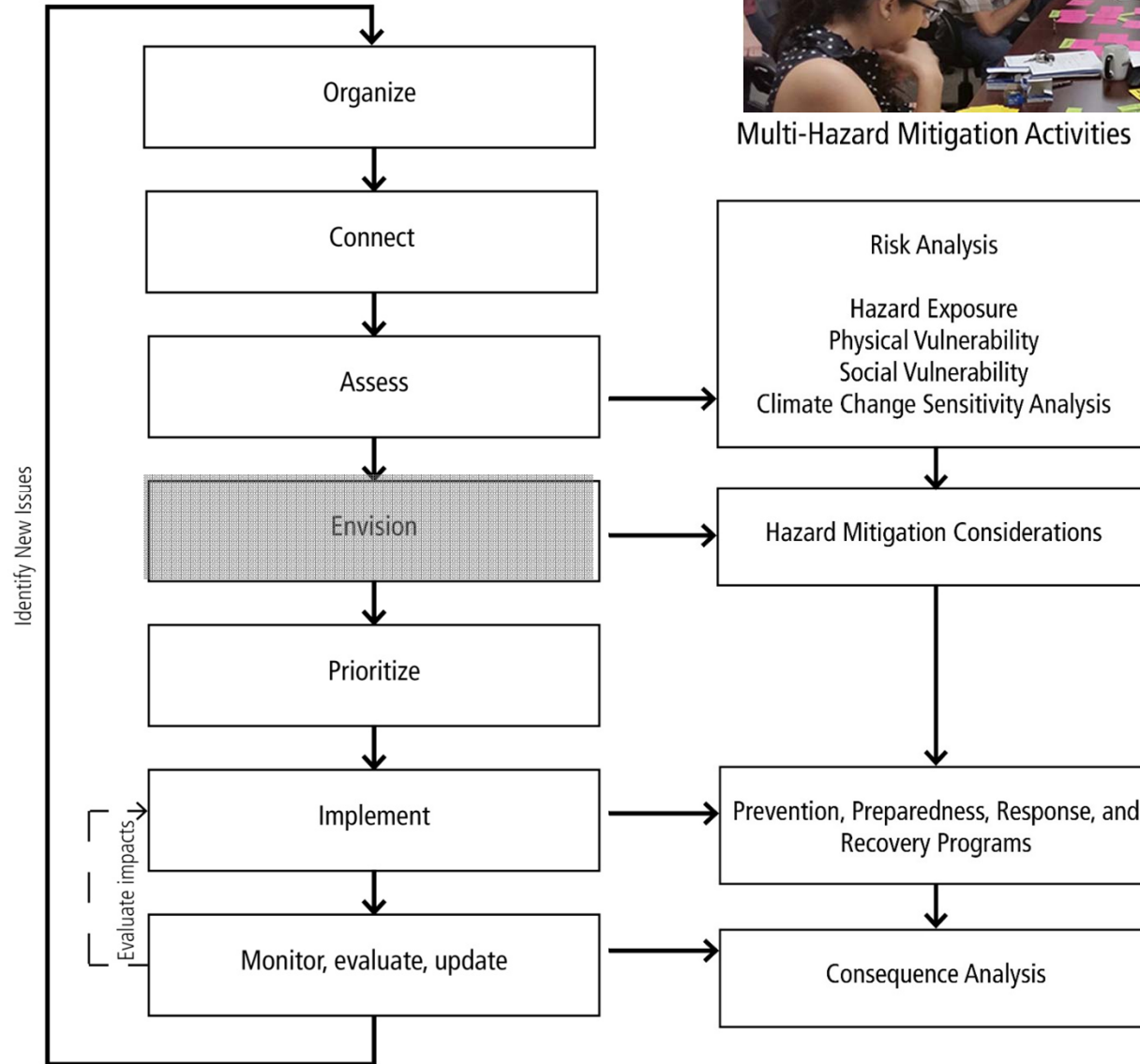


1

2

3

Inclusive Plan Making Process

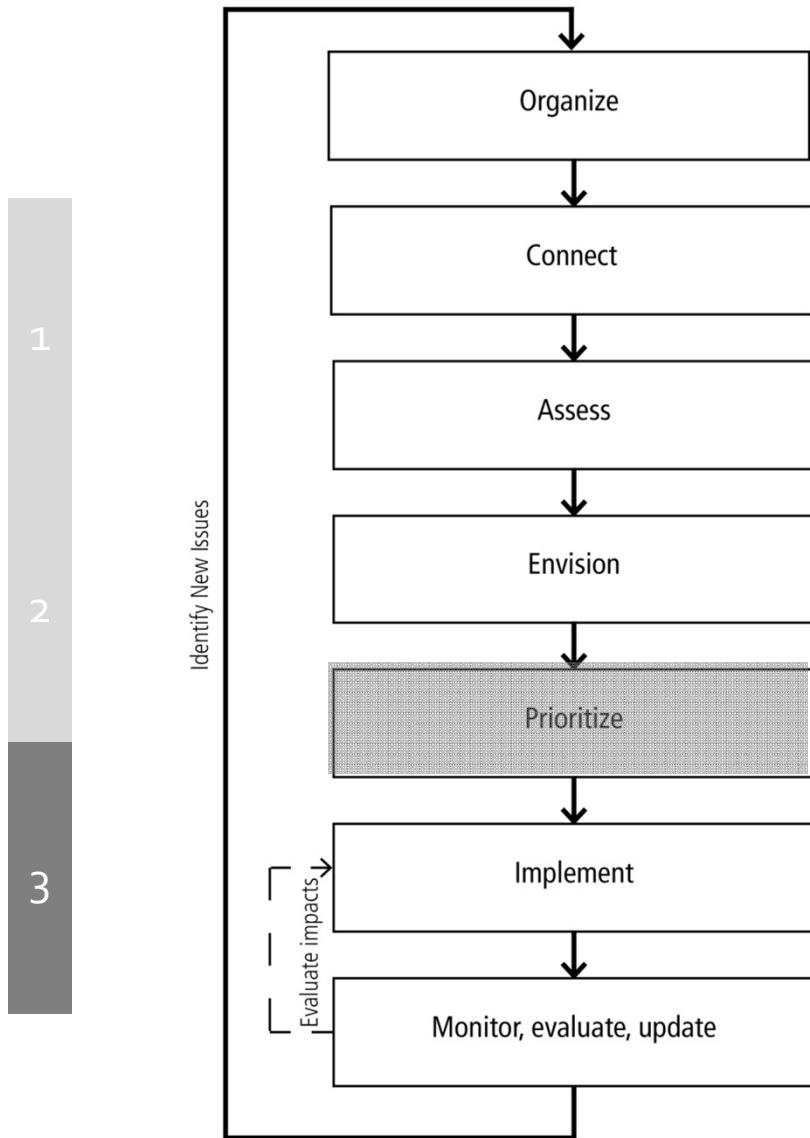


Multi-Hazard Mitigation Activities

- Interactively engage the public in setting goals to mitigate hazards and plan for recovery



Inclusive Plan Making Process



- Identify a range of promising policies and actions that align with other strategies
 - There are already available tools to incorporate resilient practices in your community



Hazard Mitigation Plans: Beyond the FEMA crosswalk

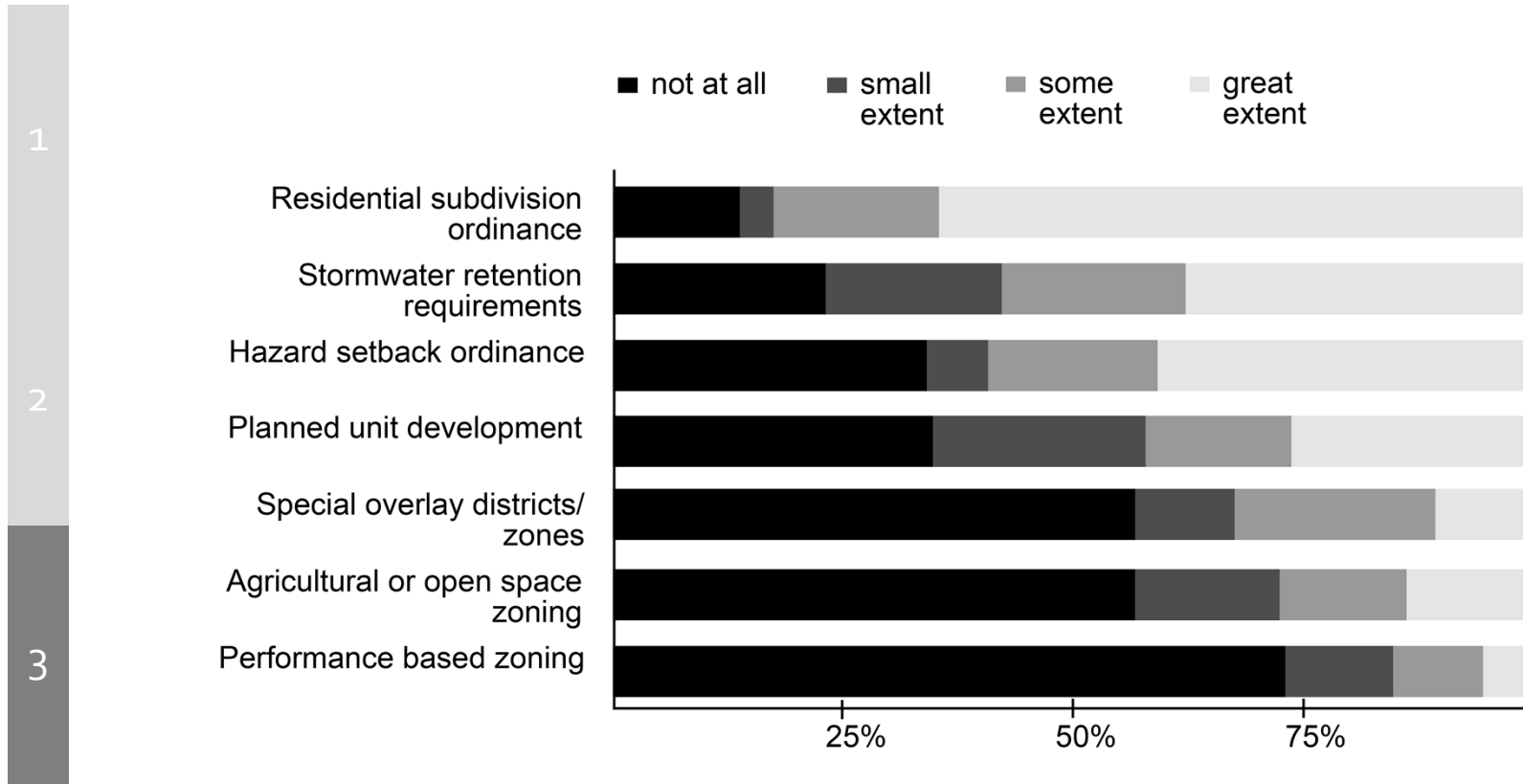
| Hazard Mitigation Plan Evaluation Protocols | |
|---|---|
| 1 | <p>1. Vision Statement: <i>Problem description, vision statement</i></p> <p>5. Inter-organization coordination and capabilities: <i>cooperation and organization identification, proposed participation techniques, information sharing on planned action, capacity development, conflict management</i></p> |
| 2 | <p>2. Planning Process: <i>general description, proposed participation techniques</i></p> <p>6. Specific Mitigation Policies and Actions: <i>general policy, regulatory tools for hazard zone, modeling technique and tools, floodplain regulations, incentives-based tool, structural tool, awareness/educational tool, social consideration/special needs, public facilities and infrastructure, recovery planning, emergency preparedness, natural resource protection</i></p> |
| 3 | <p>3. Fact Basis: <i>hazard identification, vulnerability assessment, risk analysis, emergency management</i></p> <p>7. Implementation: <i>implementation, evaluation, updating, and monitoring</i></p> |
| | <p>4. Mitigation Goals and Objectives: <i>economic impacts goals, physical and environmental impacts goals, and public interests goals</i></p> |

Hazard Mitigation Plans: Beyond the FEMA crosswalk

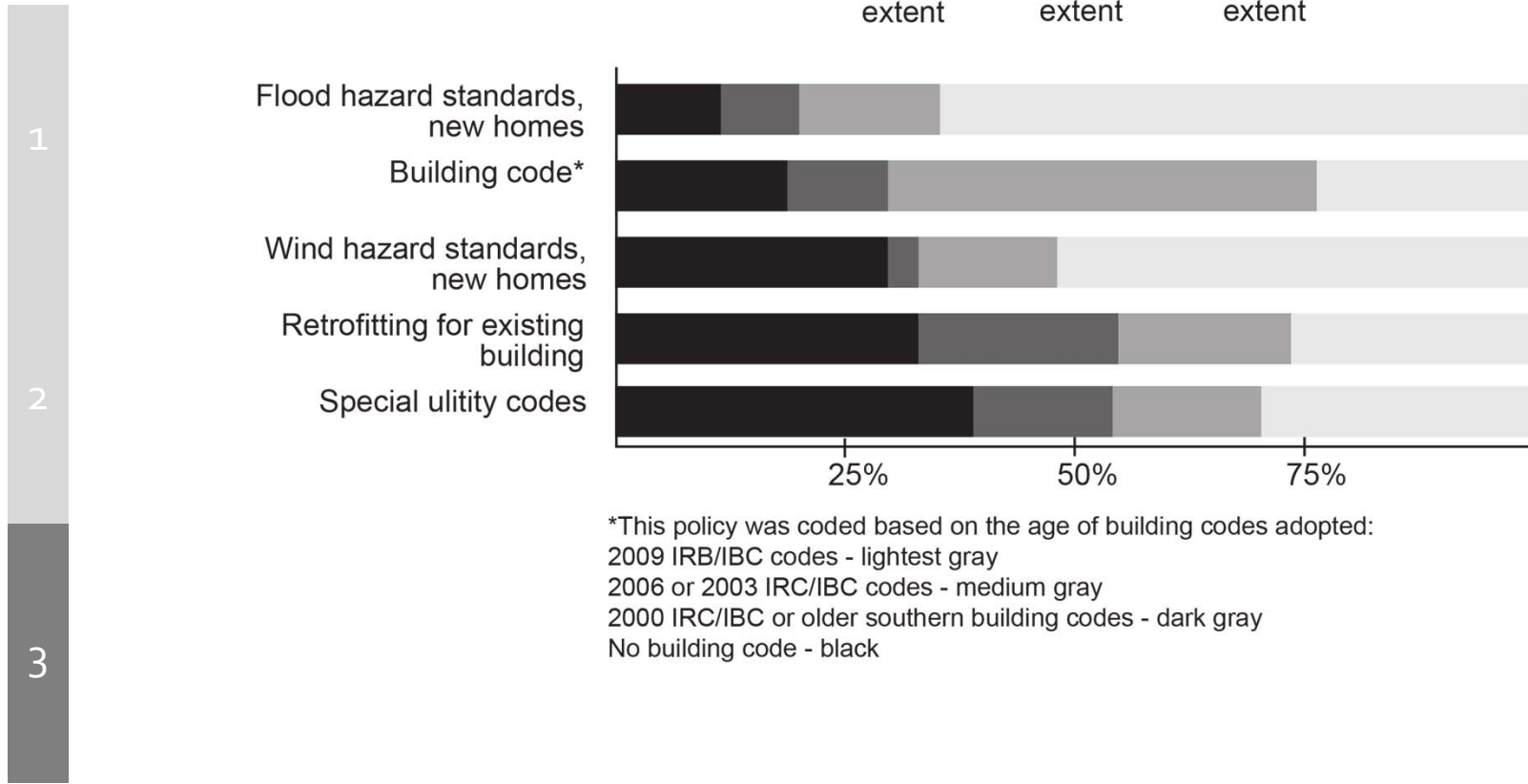
| | Plan Type | Vision | Process | Fact Basis | Goals & Object. | Inter-org. Coordination | Policies & Actions | Implementation | Total Score |
|---|-----------|----------------------------|----------------|-----------------------------|-----------------|-------------------------|--------------------|----------------|-----------------|
| 1 | Regional | 5.40 54.0% | 11.40 57.0% | 16.44 39.1% | 10.60 48.2% | 23.60 40.7% | 41.80 27.9% | 11.60 44.6% | 120.84 36.8% |
| 2 | County | 2.00 [#] 20.0% | 10.00 50.0% | 15.18 36.1% | 12.25 55.7% | 28.25 48.7% | 43.50 29.0% | 16.50 63.5% | 127.68 38.9% |
| 3 | City | 3.67 36.7% | 9.00 45.0% | 8.88 ^{##} 21.1% | 6.00 27.3% | 21.00 36.2% | 41.67 27.8% | 12.67 48.7% | 102.88 31.4% |
| | All Plans | 3.83 38.3% | 10.33 51.7% | 14.13 33.6% | 10.00 45.5% | 24.50 42.2% | 42.33 28.2% | 13.50 51.9% | 118.63 36.2% |

** = $P(F) \leq .05$; * = $P(F) \leq .01$; # = County average *vision* scores significantly lower than regional average scores; ## = average city *fact basis* significantly lower than county and regional average scores. & = statistically different than regional plans at the .10.

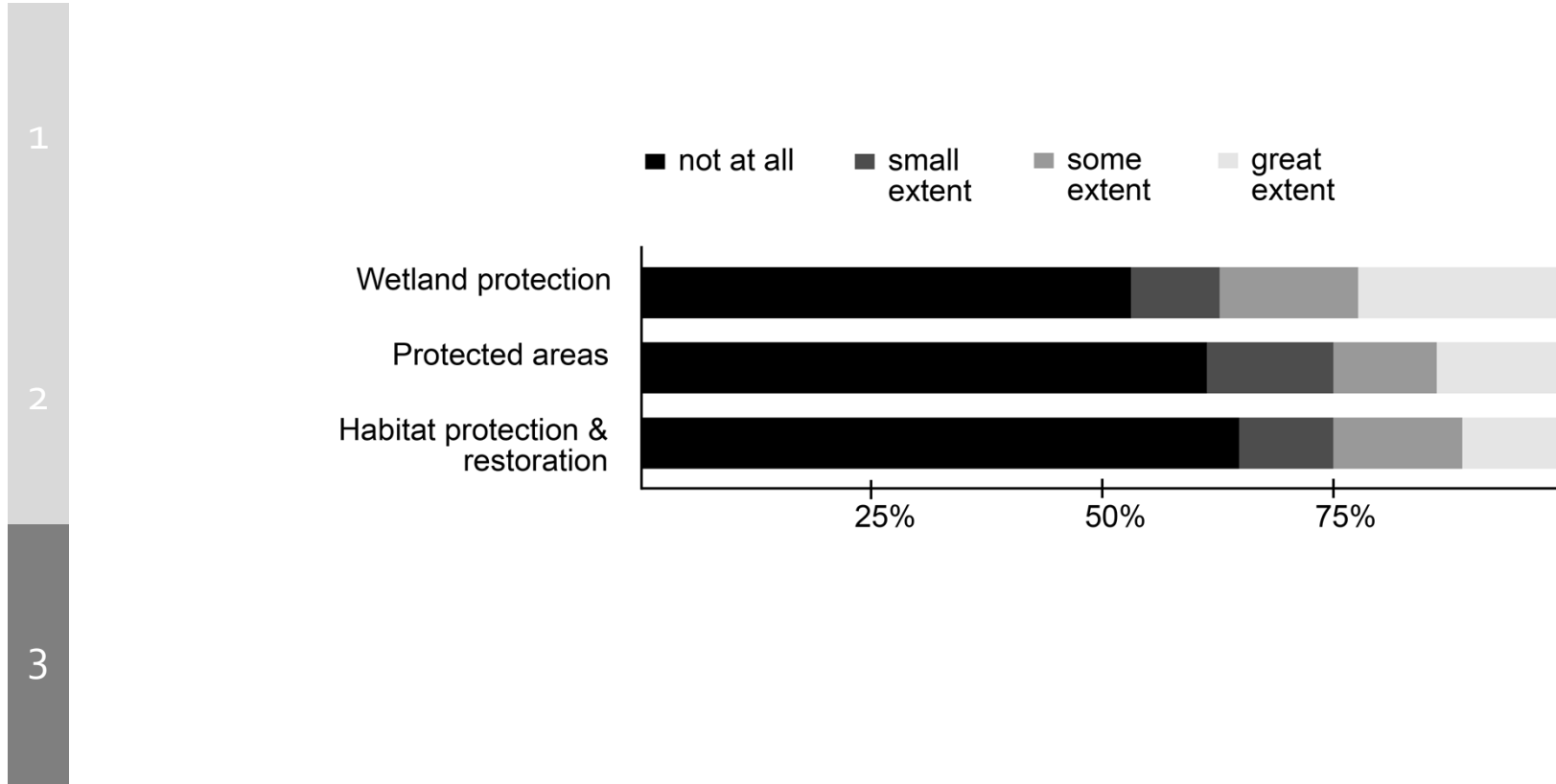
1. Development regulations and land use management



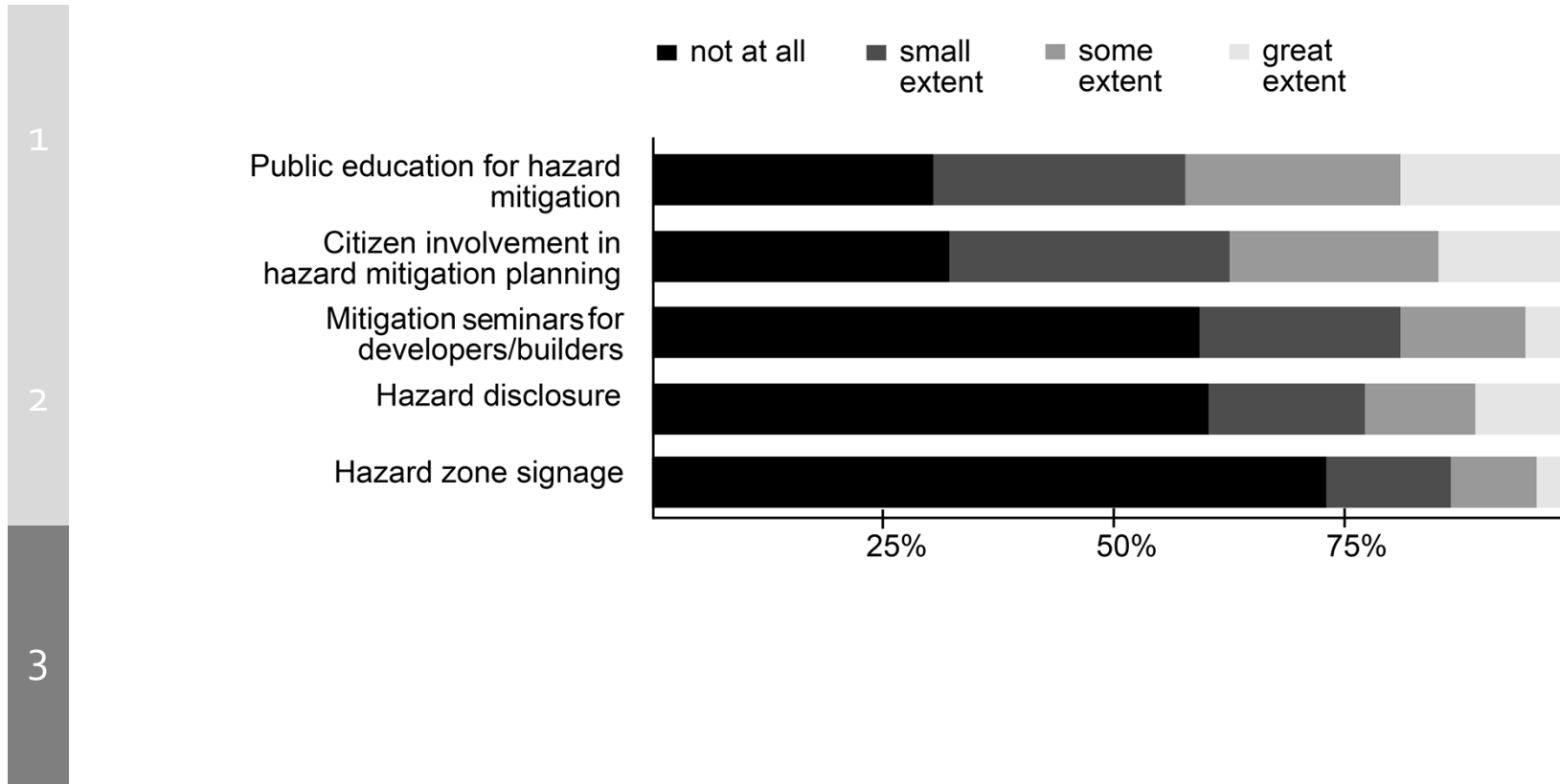
2. Building Standards



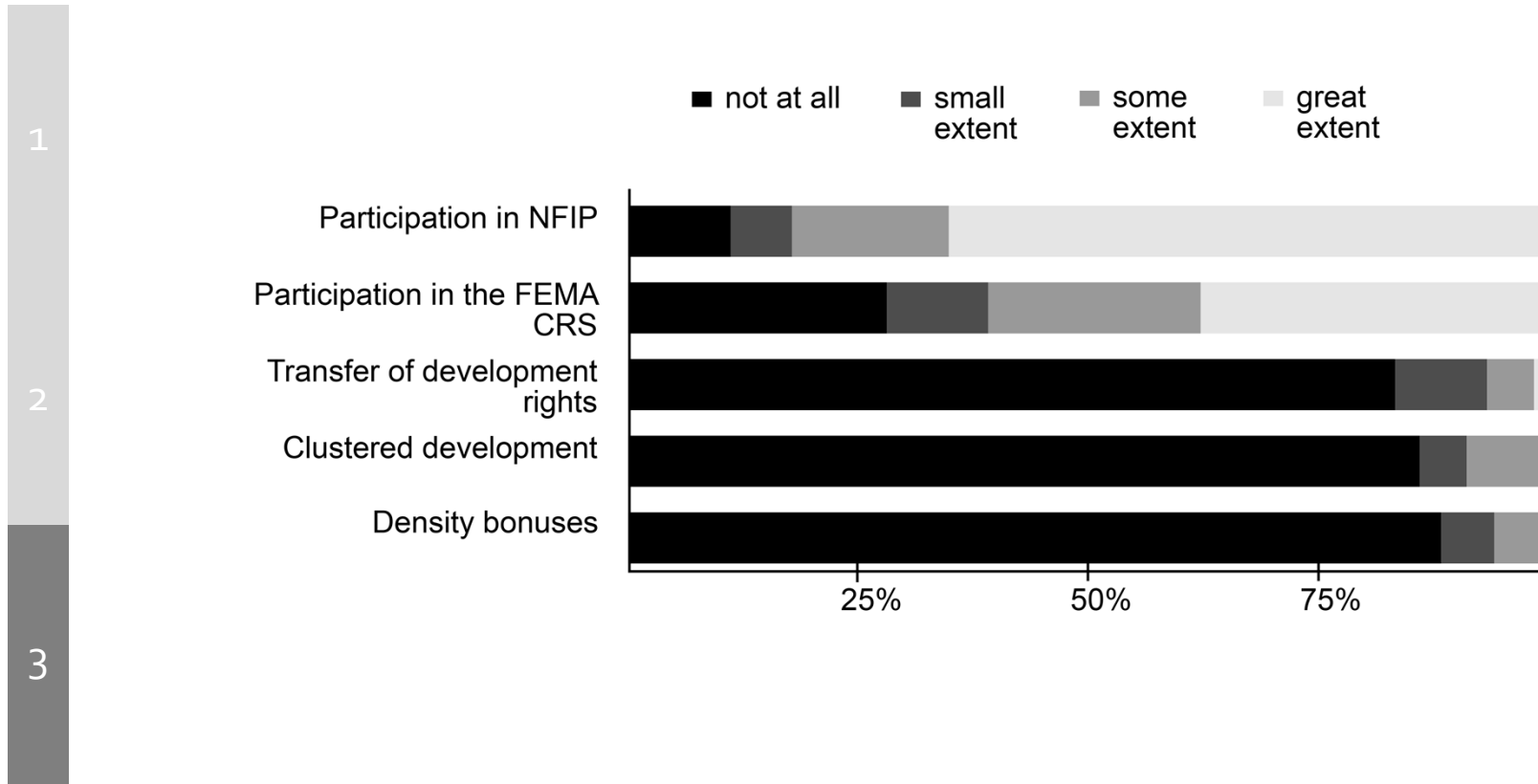
3. Natural Resource Protection



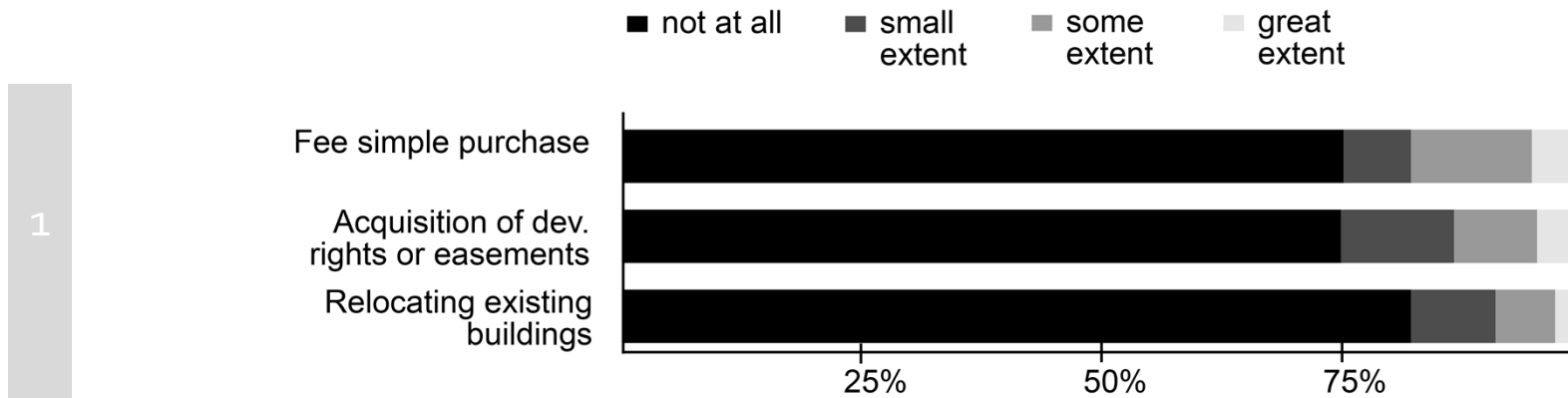
4. Public information and awareness



5. Incentive Tools

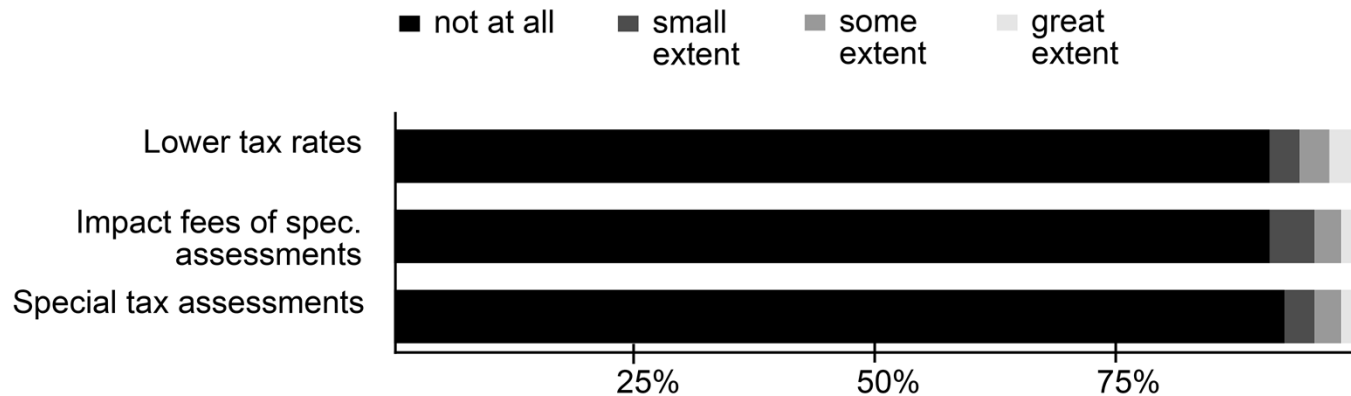


6. Property acquisition programs

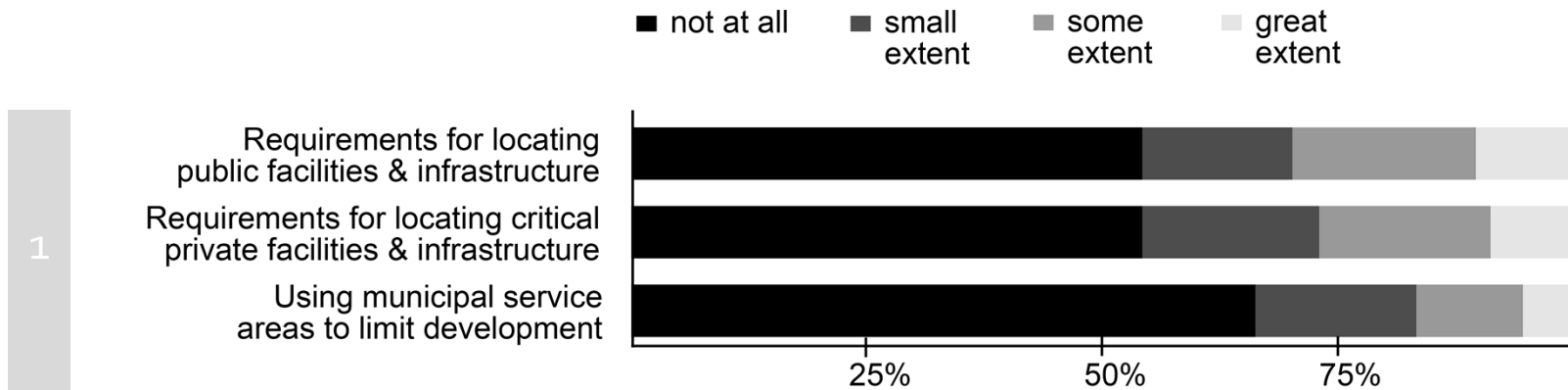


1
2
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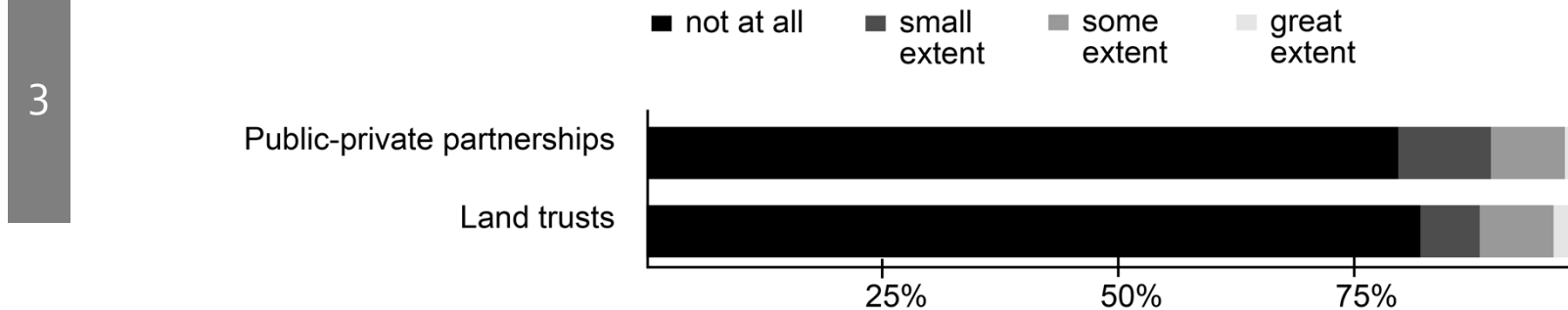
7. Financial tools

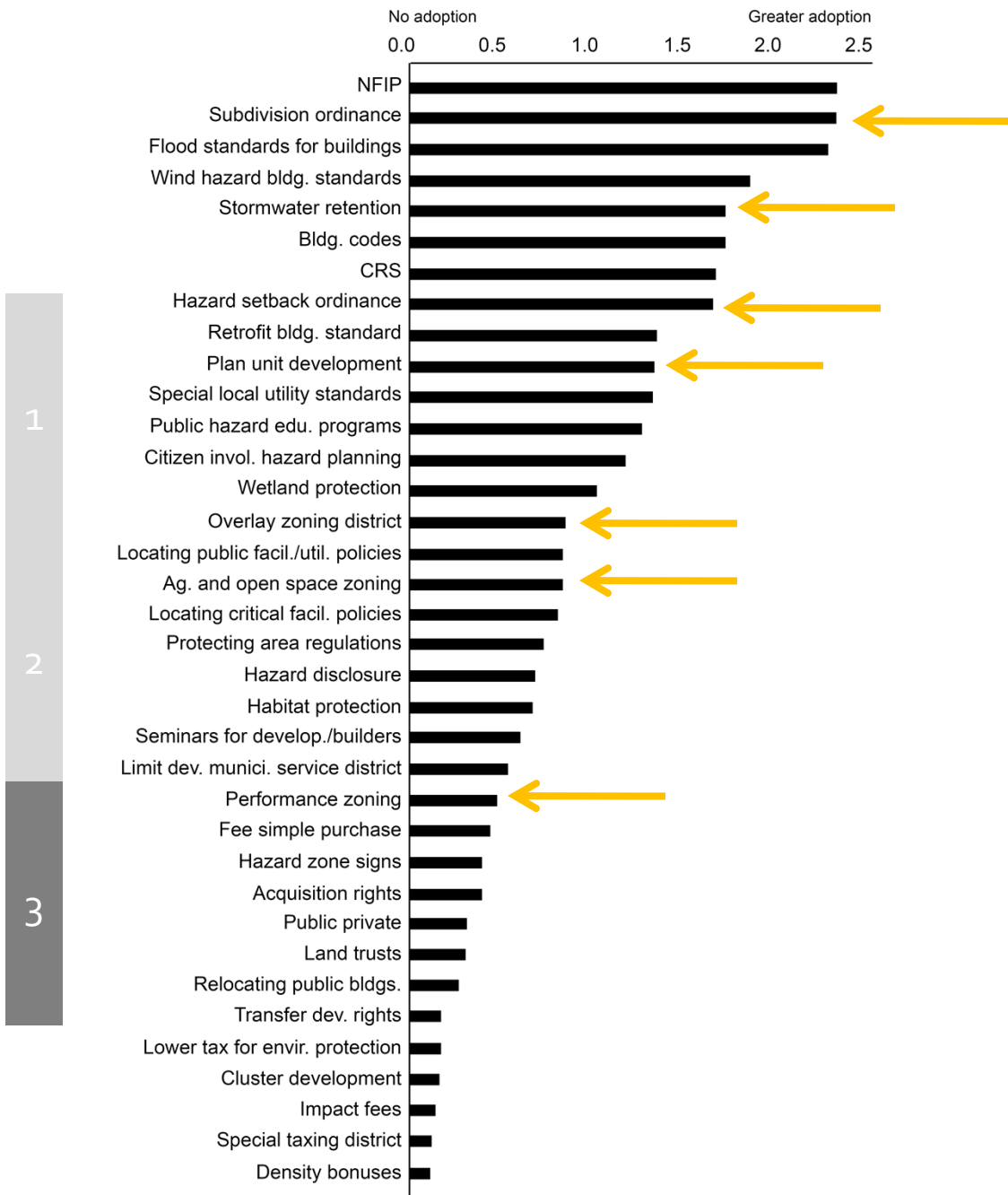


8. Critical public and private facilities policies

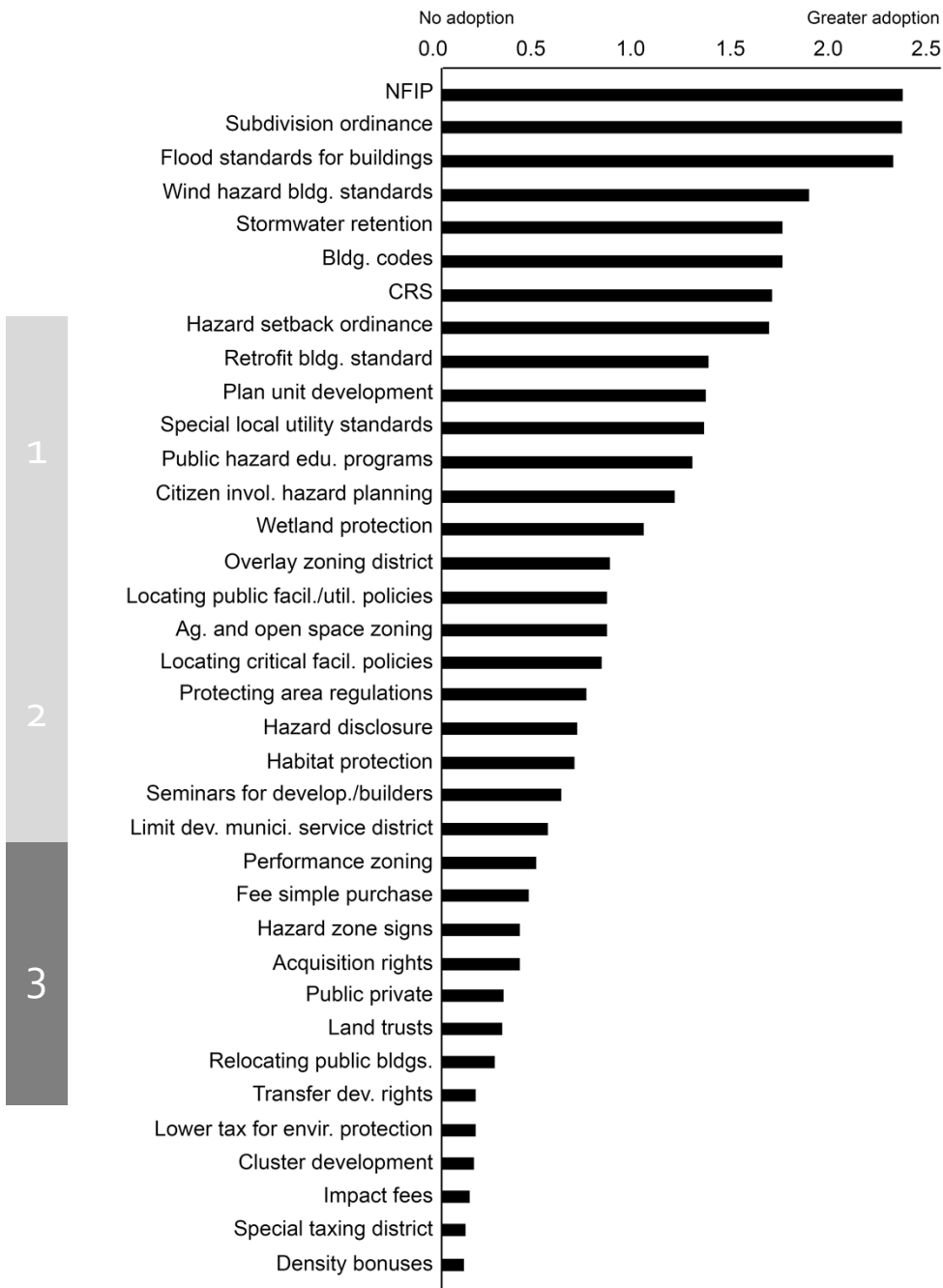


9. Private-public sector initiatives



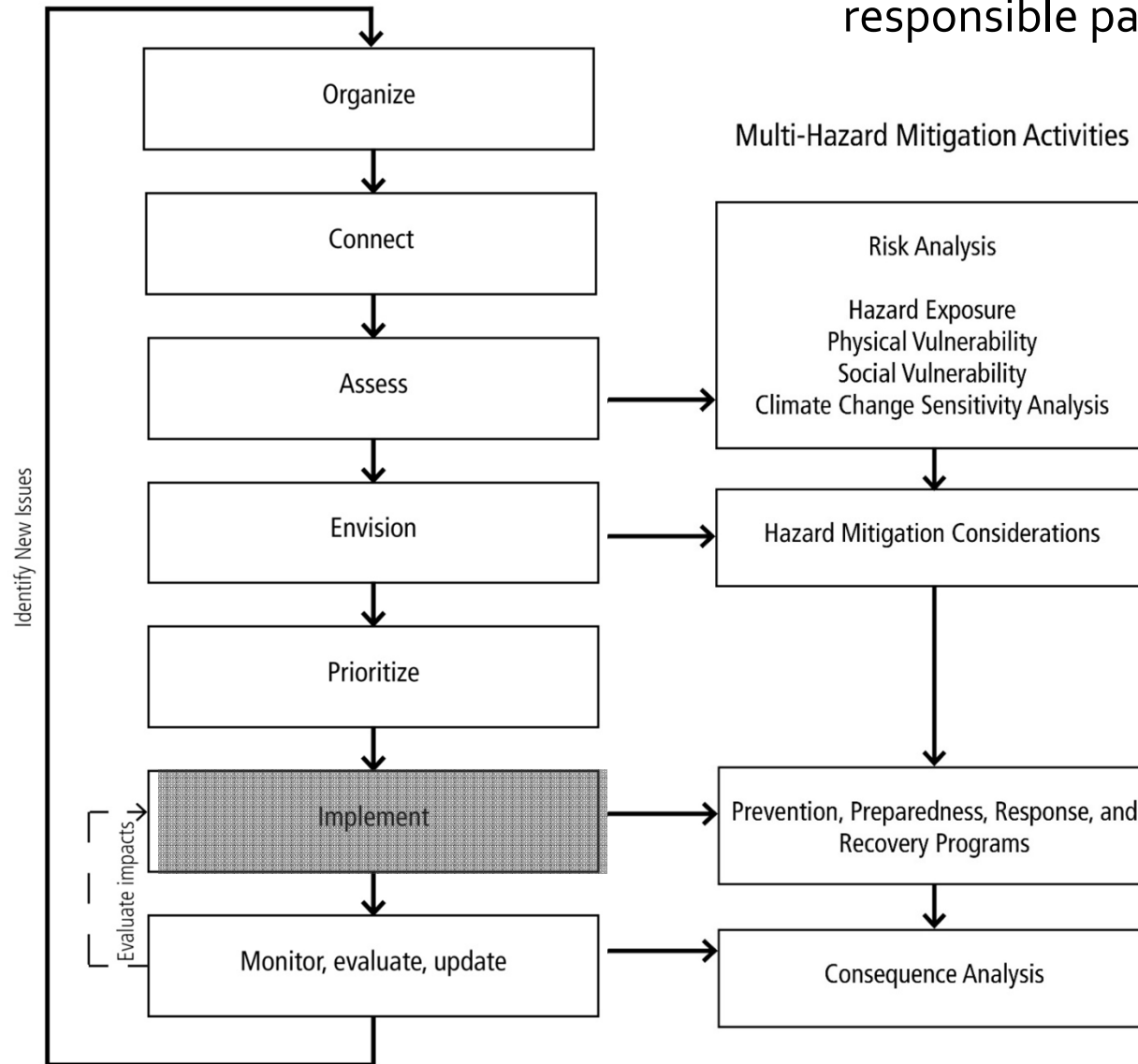


1. Development regulation and land use management



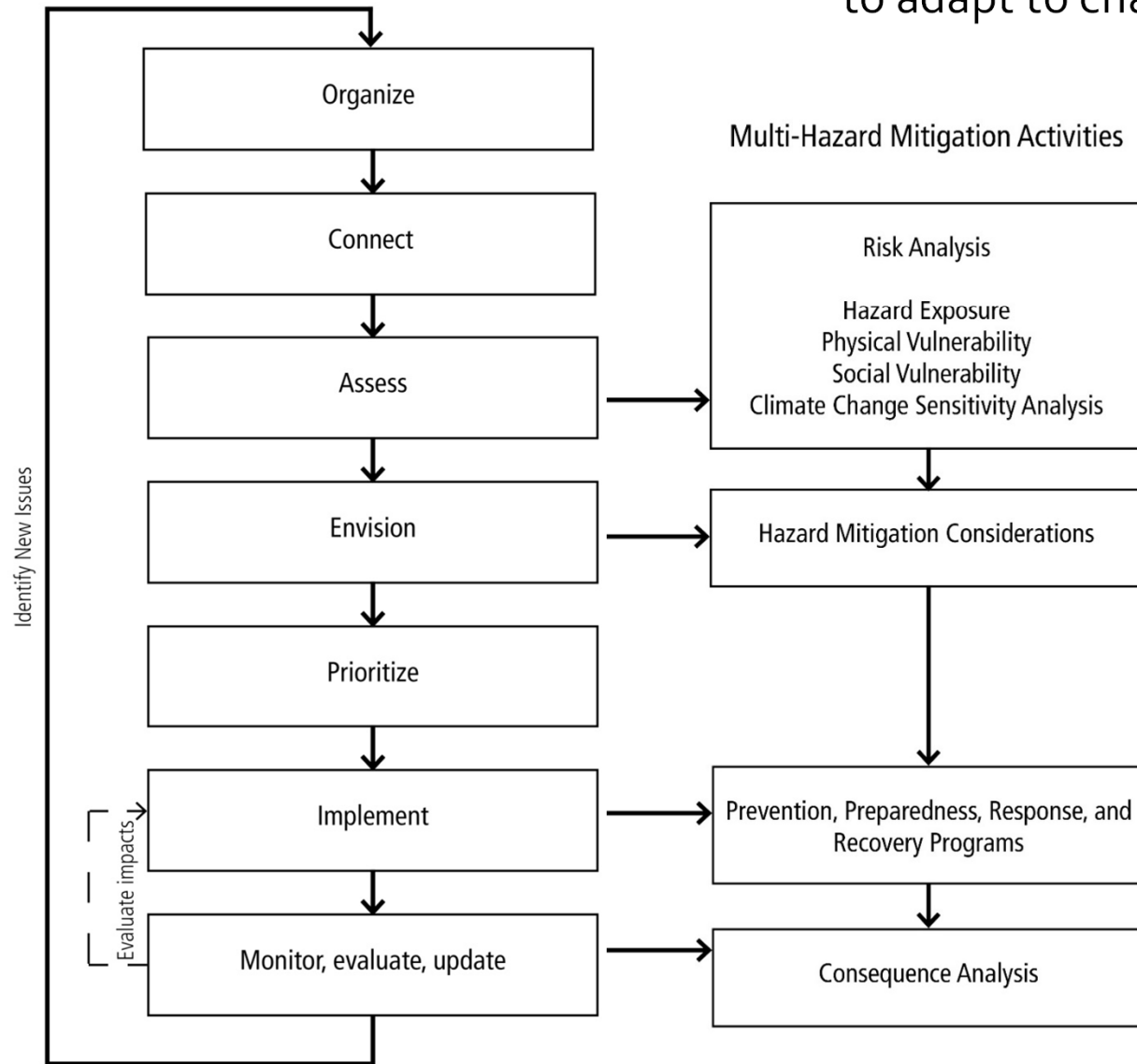
Inclusive Plan Making Process

- Identify manageable tasks and responsible parties



Inclusive Plan Making Process

- Create feedback loops as a way to adapt to changing conditions



Come away with:

1

City and regional planning must be a part of disaster planning

2

Inclusive planning—involving the whole community must take place

3

There are already available tools to incorporate resilient practices in your community







- Urban planning
- Hazards
- Landscape architecture
- Education & training
- Community engagement

MASTERSON



- Urban planning
- Hazards
- Climate change
- Environment
- Sustainability
- Mitigation

GROVER



- Urban planning
- Hazards
- Sociology
- Mitigation
- Recovery
- Hurricanes & flooding

PEACOCK



- Urban planning
- Practicing planner
- Historic preservation
- Architecture

SCHWARZ



- Urban planning
- Hazards
- Housing
- Recovery
- Social Vulnerability

VAN ZANDT



- Urban planning
- Hazards
- Inclusive planning
- Emergency Management
- Recovery
- Community engagement
- Philanthropy

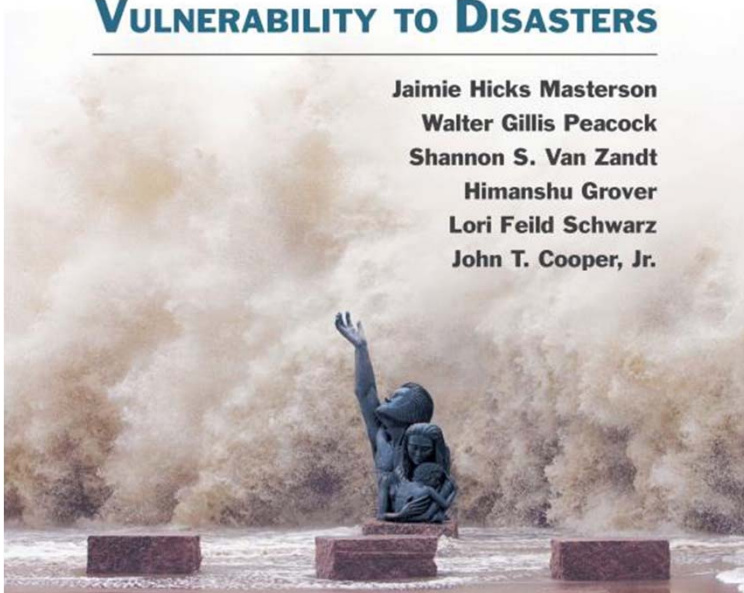
COOPER



PLANNING for **COMMUNITY RESILIENCE**

**A HANDBOOK FOR REDUCING
VULNERABILITY TO DISASTERS**

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Walter Gillis Peacock
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[http://islandpress.org/planning-
community-resilience](http://islandpress.org/planning-community-resilience)



Indicators for measuring capital

- **Physical capital**

- *Construction*: The construction component was measured using five indicators: building construction establishments, heavy and civil engineering construction establishments, highway, street, and bridge construction establishments, utility systems establishments and architecture and engineering establishments.
- *Environment*: The environment component was measured using two indicators: environmental consulting establishments and environmental and conservation establishments.
- *Land and building regulations*: This component was measured using three indicators: land subdivision establishments, legal services establishments, and building inspection establishments.
- *Land use planning*: The land use planning component was measured using landscape architecture and planning establishments.
- *Property insurance*: This component was measured using property and casualty insurance establishments
- *Research*: The research component was measured using scientific research and development establishments.
- *College*: The college component was measured using colleges, universities, and professional schools.
- *Housing*: The housing component was measured using two indicators: occupied housing units and vacant housing units.
- *Critical facilities*: This component was measured using eight indicators: hospitals, hospital beds, ambulances, fires stations, schools, licensed child care facilities, nursing homes, and hotels and motels.
- *Transportation*: The transportation component was measured using three indicators: occupied housing units with a vehicle available, special need transportation services, and school and employee buses.
- *Communication*: The communication component was measured using five indicators: occupied housing units with telephone services, newspaper publishers, radio stations, television stations, and internet providers.
- *Emergency shelter and relief services*: This component was measured using three indicators: temporary shelters, community housing, and community food services' facilities.



Indicators for measuring capital

- **Human capital**

- *Education attainment*: The education component was measured using percentage of population with more than high school education.
- *Health*: The health component was measured using two indicators: physicians and health care support workers.
- *Labor force in construction*: This sub-component was measured using four indicators: building construction workers, heavy and civil engineering construction workers, architecture and engineering workers, and highway, street, and bridge construction workers
- *Labor force in environmental related employment*: The environment sub-component was measured using two indicators: environmental consulting workers and environmental and conservation workers.
- *Labor force in land and building regulations*: This sub-component was measured using three indicators: land subdivision workers, population employed in legal services, and building inspectors.
- *Labor force in land-use planning*: The planning sub-component was measured using landscape architects and planners.
- *Labor force in property insurance*: This sub-component was measured using property and casualty insurance workers.
- *Labor force protected by mitigation policies*: The mitigation sub-component was measured using five indicators: FEMA community rating system (CRS) score, comprehensive plans, zoning regulations, FEMA approved mitigation plans, and building codes.
- *Labor force in citizen protection*: The citizen protection sub-component was measured using the population employed as fire fighters, prevention, and law enforcement workers.
- *Labor force in research*: The research sub-component was measured using the population employed in scientific research and development services.
- *Labor force in high education*: The professional sub-component was measured using population employed in colleges, universities, and professional school.
- *Labor force with language competency*: The language sub-component was measured using the population that speaks English language very well.
- *Labor force in Transportation*: The transportation sub-component was measured using the population employed in special need transportation services.
- *Labor force in Community and social services*: This sub-component was measured using community and social workers.



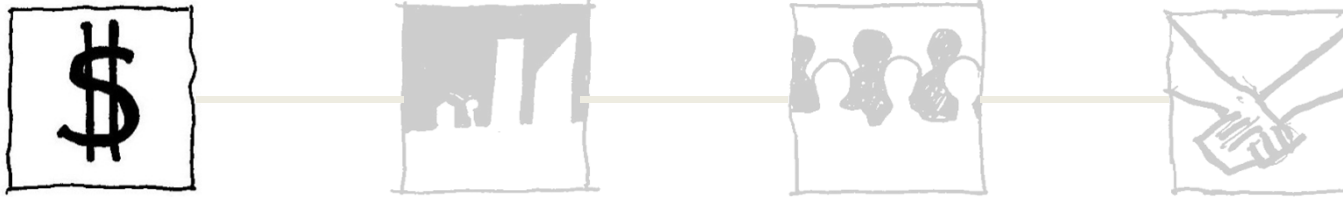
Indicators for measuring capital

- **Social capital**
 - *Participation in voluntary organizations (Volunteerism)*: This component was measured using registered nonprofit organizations.
 - *Involvement in social groups (Association densities)*: The involvement in social groups was measured using recreational centers (bowling centers, and fitness centers), golf clubs, and sport organizations.
 - *Civic and political participation*: This social capital component was measured using three indicators: registered voters, civic and political organizations, and U.S. Census response rates for the decennial (2000) population and housing survey.
 - *Religious participation*: Religious participation was measured using religious organizations.
 - *Community attachment*: The community attachment component was measured using owner-occupied housing units.
 - *Connection to working places*: This element was measured using two indicators: professional and business associations.
- **Economic capital**
 - *Income*: Income was measured using two indicators: per-capita income and median household income. Both per capita income and household median income were both utilized because together they indicated relative income and the degree to which the diverge suggests inequality as income distribution become more skewed.
 - *Employment*: The employment component was measured using the percentage of people who are employed.
 - *Property value*: This component was measured using the median value of owner-occupied housing units.
 - *Business*: The business component was measured using business establishments.
 - *Health insurance*: The health insurance component was measured using the percentage of people with health insurance.



What is resilience?

Economic



1

2

What are your community's financial resources?

- Per capita income
- Household income
- % employed
- Value of owner-occupied houses
- Number of businesses
- % of health insured

3

What is resilience?

Physical

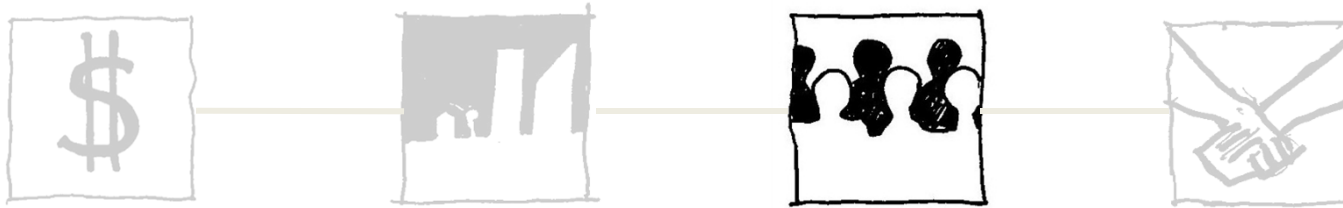


How does your community's built environment help support itself?

- Amount of residential housing
- Amount of commercial and industrial buildings
- Amount of roads, dams, levees, and bridges
- Amount of electricity, water, and telephone used
- Number of critical facilities

What is resilience?

Human



1

2

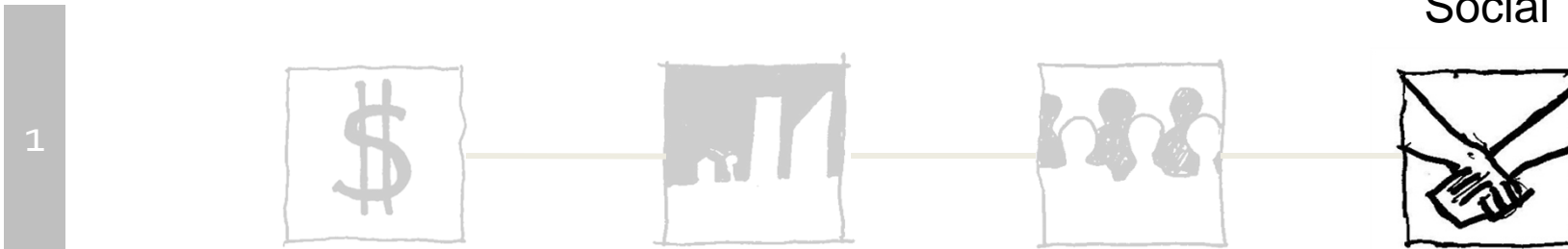
How many and what type of workers are in your community?

- Construction
- Environmental consulting
- Land and building Regulations
- Land-use planning
- Property Insurance
- Mitigation Policy
- Citizen Protection
- Research
- Education
- Transportation
- Community and social services

3



What is resilience?



How well connected are the citizens in your community?

- Recreational facilities
- Non-profit organizations
- Religious organizations
- Business associations
- Registered voters