Planning for Disaster/Hazard Resilience: Mitigation Planning, Mitigation Policies, and Assessing Planning Integration

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Overview of my talk

* Discuss what I mean by disaster resilience and how I think of disasters
* Discuss what mitigation is all about
* Discuss various forms of mitigation policies and actions and their adoption by jurisdictions in Texas
* Briefly discuss mitigation plans along the Texas coast
* Discuss an approach to assess how well mitigation is integrated into a community's planning network.

What is disaster resilience?

Resilience is the ability of a

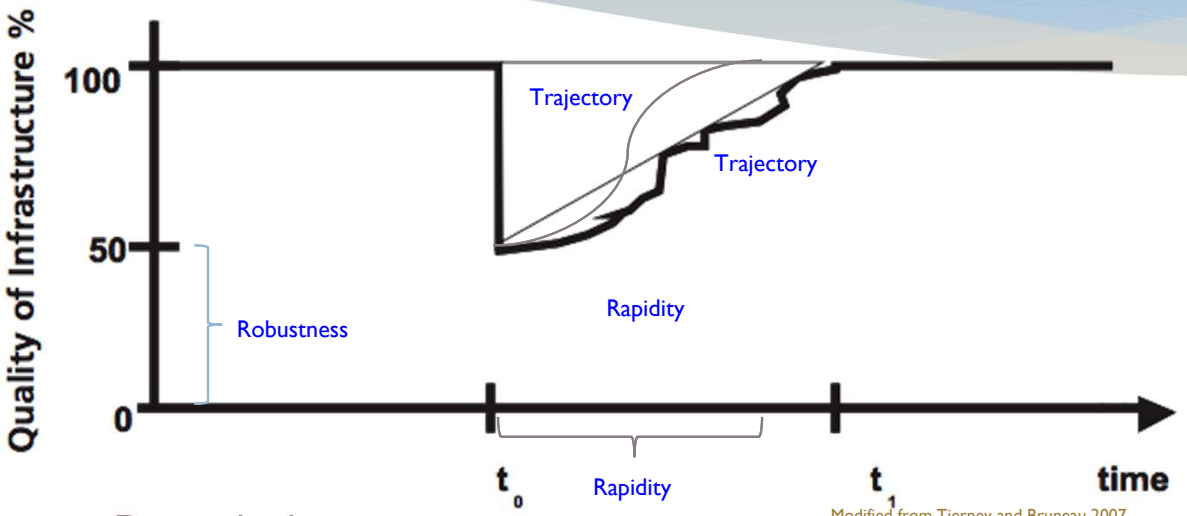
community  and the **bio-physical systems,** 

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).

More Formalized Dimensions of Resilience

FIGURE 1 The Resilience Triangle



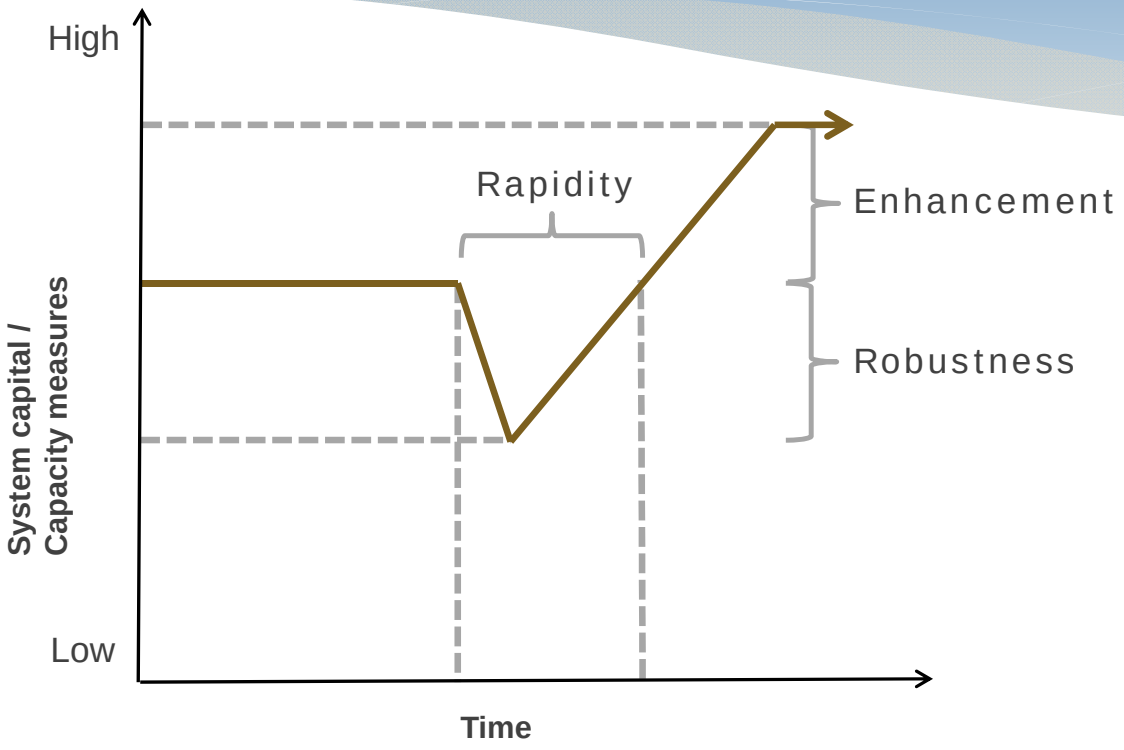
Modified from Tierney and Bruneau 2007

- Resistance or Diminished impact
  - ***Robustness***: the ability to resist disruption and failure and continue functioning effectively (Bruneau et al., 2003; Tierney and Bruneau 2007)
- Rapid, Restoration, or rebound
  - ***Rapidity***: the timely resolution of disaster-related challenges (Bruneau et al., 2003)

More Formalized Dimensions of Resilience

- The nature, quality or trajectory of recovery implies learning/adaptation such that we see…
  - Improvements in mitigation status
    - Enhancing robustness
    - Reducing future loss potential
    - Reducing future failure probabilities
  - Reduction of preexisting vulnerabilities
    - Reduced hazard exposure and risk
    - Reduced social vulnerabilities
  - Sustainable Disaster Recovery: improvements in the triple bottom line…
    - Enhanced economic sustainability
    - Enhanced ecological sustainability
    - Enhanced social sustainability

Three Dimensions of Resilience



Robustness captures the ability to withstand potential hazard impacts, which implies solid mitigation planning and implementation

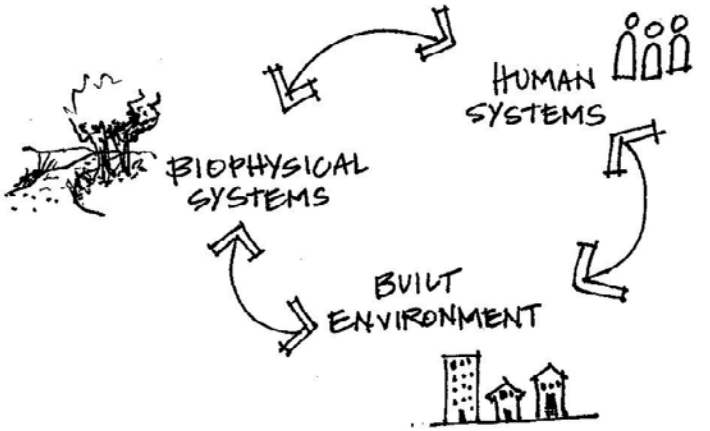
Rapidity captures how quickly restoration or recovery levels are achieved, which clearly points to the importance of recovery planning.

Enhancement captures the quality of recovery processes in terms of learning and adapting – in other words, mitigation must again be critical

Disasters are still treated as acute issues, but they are really symptomatic of chronic issues

* The scientific consensus is that natural disasters, are not simply "natural" events….
  * They are an outcome of an interaction between biophysical systems, human systems and their built environment.

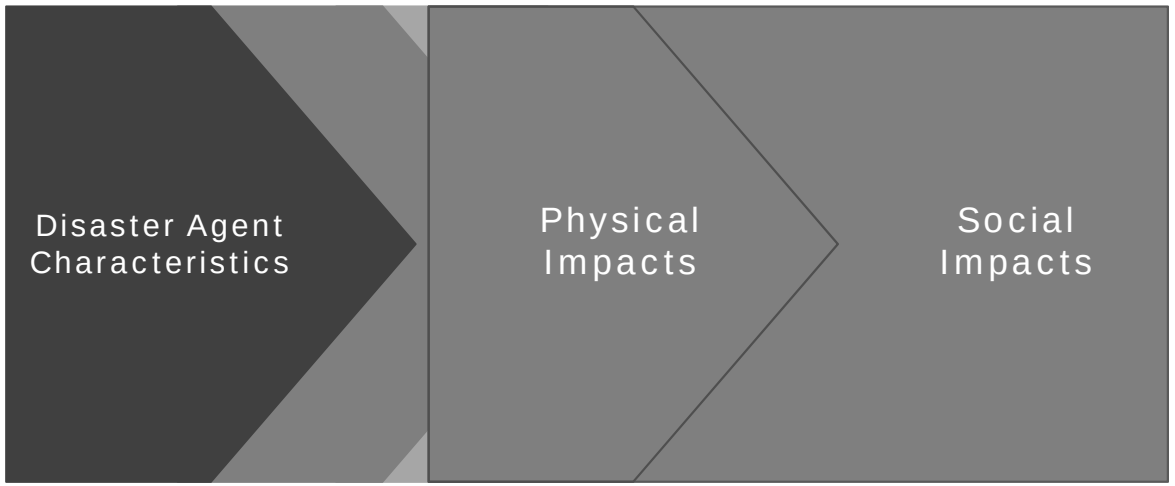
* Human action and inaction is in large measure driving these trends:
  * We continue to develop and expand into high hazard areas
    * Increasing hazard exposure and risk
  * Our buildings and infrastructure (the built environment) are often based on designs and methods that are inappropriate given hazard exposure and risks
  * As we develop these areas we often destroy or compromise natural resources such as wetlands that can mitigate against disaster losses



DISASTERS = (f) HUMAN ACTION ^ in

DISASTER IMPACT MODEL

The simple and more traditional view of disaster impacts



Characteristics of Hazard
- Speed of onset
- Perceptual cues
- Intensity
- Scope
- Duration
- Probability of occurrence

Casualties
- Deaths
- Injuries
- Illnesses

Property destruction
- Buildings
- Contents
- Vehicles
- Infrastructure
- Animals and crops

Environmental degradation & habitat loss

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.

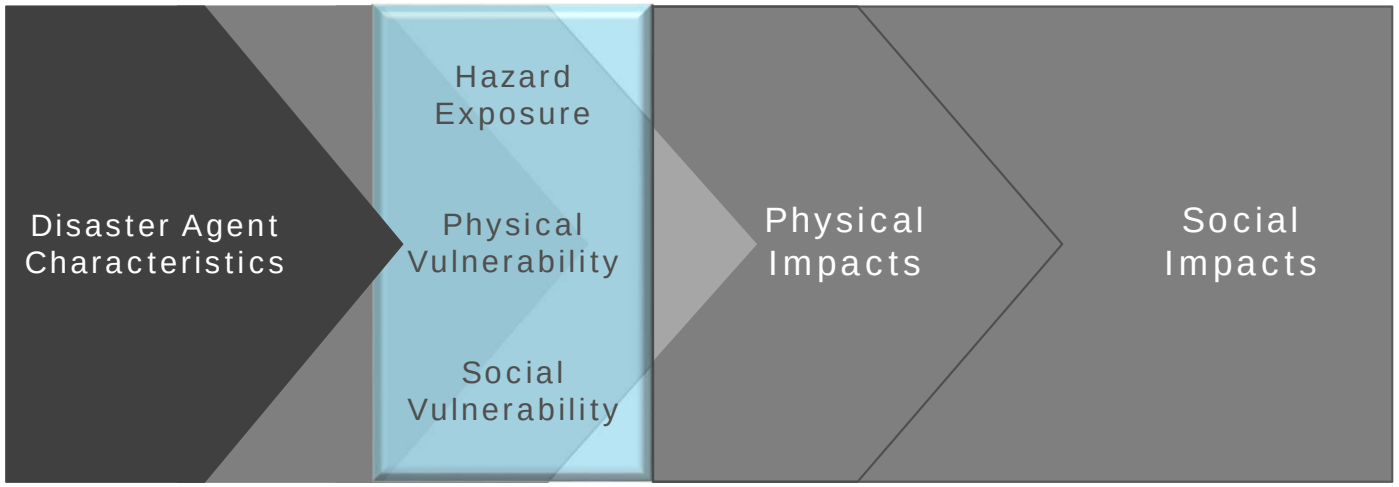
Resiliency Outcomes:
- Recovery (speed and quality)
- Adaptation

DISASTER IMPACT MODEL

Pre-event hazard management planning/actions

Hazard Mitigation | Preparedness & Response | Recovery

Community characteristics



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* Modified from Lindell, Prater, and Perry, 2007

Hazard Management Interventions

* Hazard Mitigation
  * Actions taken to reduce or eliminate long-term risk to people and property from natural hazards and their effects" (FEMA, 2009)
  * "pre-impact actions that provide passive protection at the time of disaster impact" (Lindell, Prater, Perry)
  * (Will come back to this in a moment)
* Emergency Preparedness Practices
  * Pre-impact actions that provide the human and material resources needed to support active responses at the time of hazard impact (Lindell and Perry 2000)
  * Emergency assessment actions (forecast), hazard operations (short term actions taken to protect), pop. protection (evacuation/warning), incident management actions.
* Recovery Preparedness practices
  * Pre disaster recovery planning for coordinated effective recovery actions.

DISASTER IMPACT MODEL

Pre-event hazard management planning/actions

Hazard Mitigation | Preparedness & Response | Recovery

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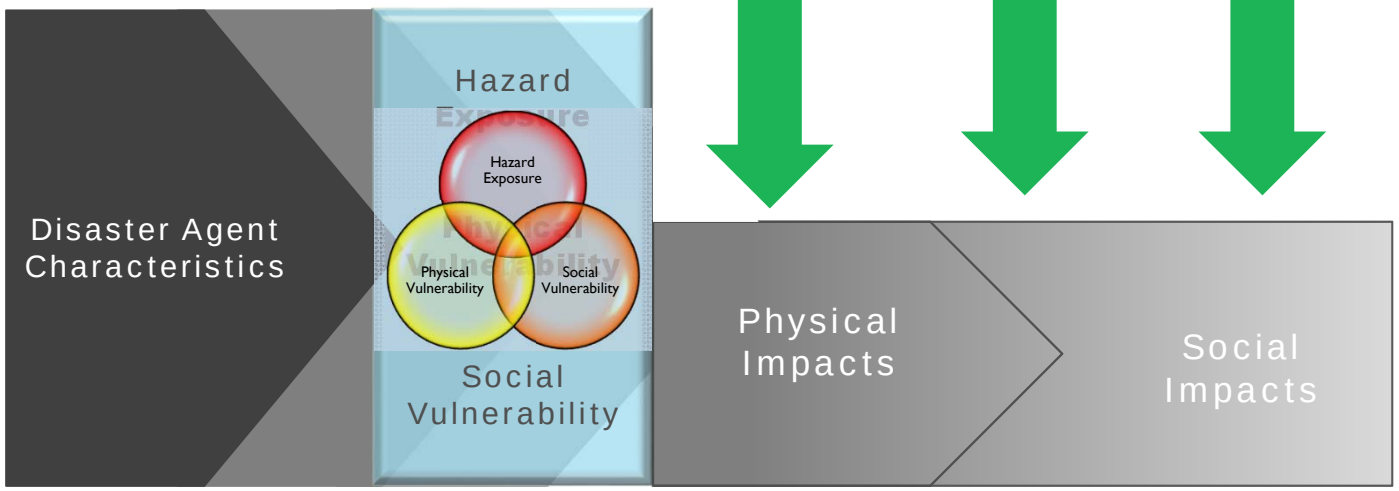

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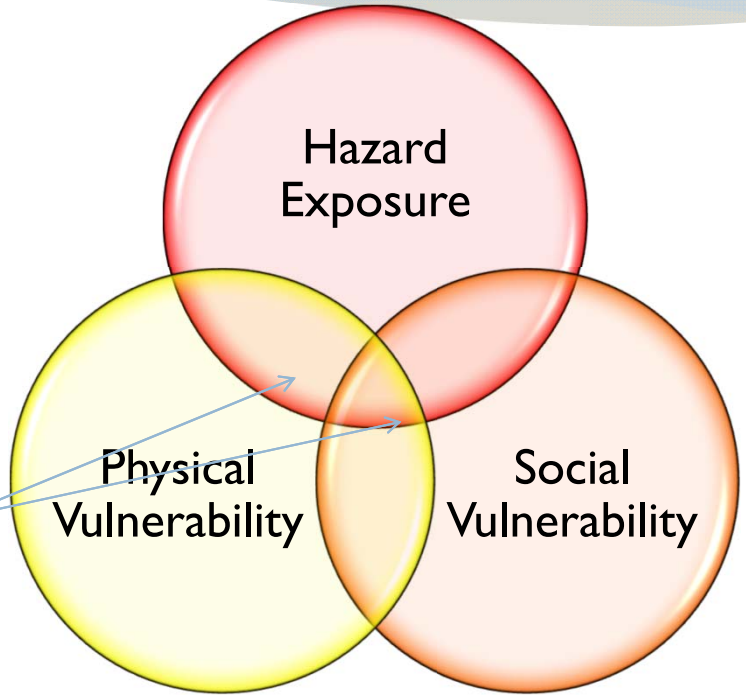
Community Characteristics

* The pre-existing community characteristics that shape and determine the specific impacts of hazard agents:
  * Hazard exposure
  * Physical vulnerability
  * Social Vulnerability
* These are to a large extent knowable and potentially predictable
  * Unfortunately they are often ignored or neglected
  * And yet, they must be the basis for resiliency planning when it comes to emergency management interventions: Mitigation, Response, and Recovery Planning
  * Indeed, they are the fact basis for all comprehensive community planning & resiliency planning
  * Plans should/must be based on an understanding and assessment of these pre-existing community characteristics.

Community Characteristics: The Fact Basis for good planning

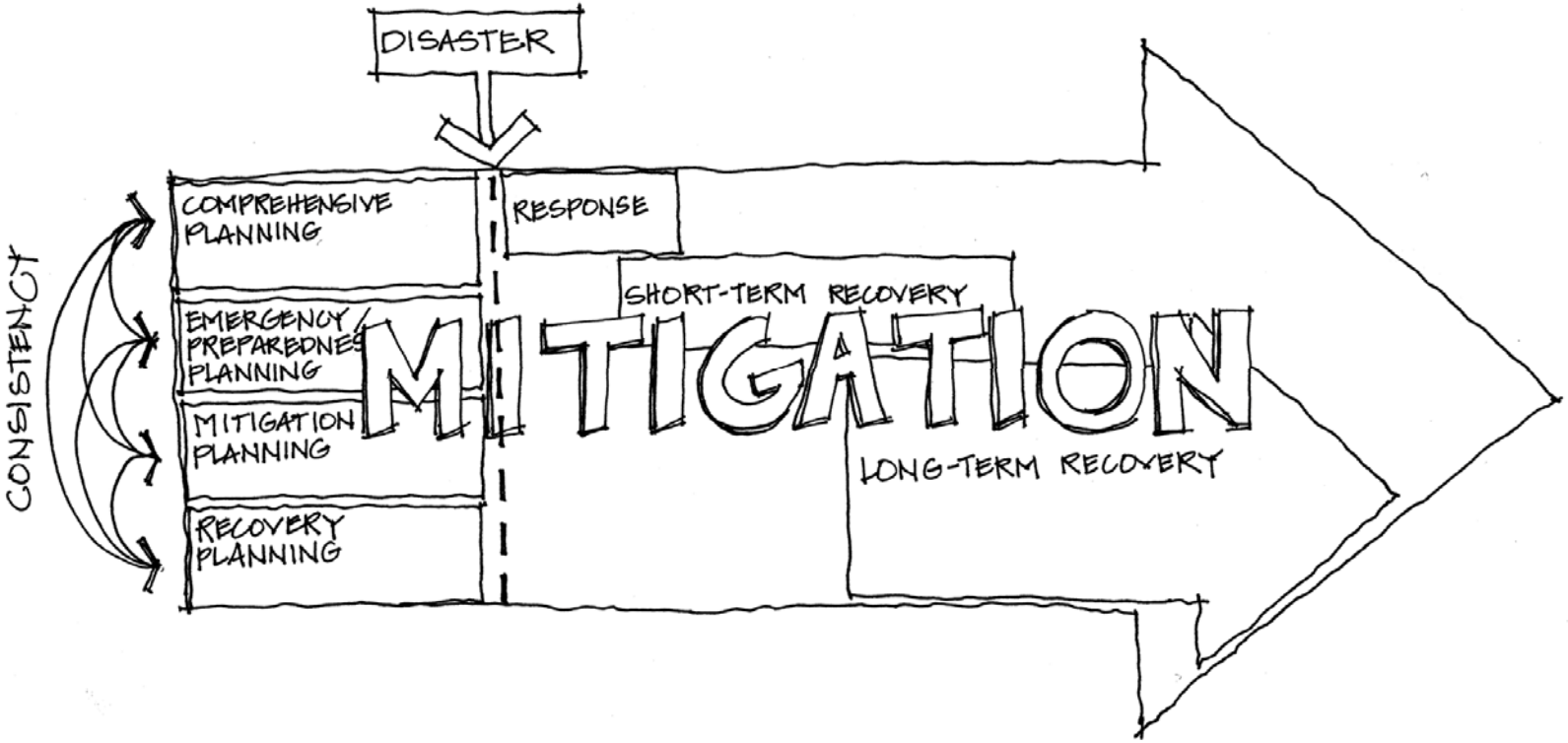
* Critical elements in guiding effective resiliency planning should be the convergence of these three:
  * Hazard exposure
  * Physical vulnerability
  * Social Vulnerability

The overlap represent hotspots that are prime targets for resiliency planning issues whether considering mitigation, recovery, or other planning activities.



The Old View: The Disaster Cycle

A Newer View…



Modified from Schwab et al., 1989; Lindell et al 2007;
Original sources: Rosenberge FEMA and Lisa Barton APA

Major Points to be addressed:

* Focus of my talk:
  * Quick review of policies and strategies that can be employed to enhance community mitigation – a critical elements for promoting resiliency
  * Adoption and implementation of "non-structural" mitigation policies and strategies along the Texas Coast
    * Adoption and the extent to which practices are being employed
    * Local jurisdictions (municipalities and counties)
  * Mitigation plans along the Texas Coast:
  * A tool that is under development to help assess the integration of community planning with respect to mitigation.
  * A little extra on Social Vulnerability mapping if we have time.

Gilbert White: "Floods are acts of God, but flood losses are largely acts of man."

Hazard Management Interventions

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* Forms of Mitigation:
  * Structural vs Non structural
    * Structural: Engineering solutions (dams, levees, etc)
    * Non-structural: policy related solutions, land-use planning
    * But these distinctions can be arbitrary and confusing.
      * Building Codes are a policy distinction, yet can refer to "structural" changes in the way our homes and buildings are constructed

Types of Mitigation Actions

- Hazard Source Control
  - Often associated with technological hazards, but relevant to natural Hazards
    - controlling fire, fire suppression, fuel controls
    - chemical (using non-toxic chemicals, preventing leaks, reducing quantities, etc.).
- Community Protection works
  - Usually refers to major public safety works: dams, levees, seawalls, river channelization, canals, landslide control, industrial hazard controls
- Land-Use Practices
  - Implemented through: risk communication, incentives, and sanctions
  - Acquisition of land/development rights, zoning, subdivision regulation, tax incentives, density bonuses, etc.

Types of Mitigation Actions

* Building Construction practices
  * Building codes and strengthening components
  * Structural protections from flood, wind, seismic, etc.
  * Retro-fitting programs
  * Special utility codes

* Natural Resource preservation and restoration
  * Preserving and restoring "natural" resources and the services they provide
    * Wetlands
    * re-vegetation and reforestation
    * dune protection
    * Protected areas

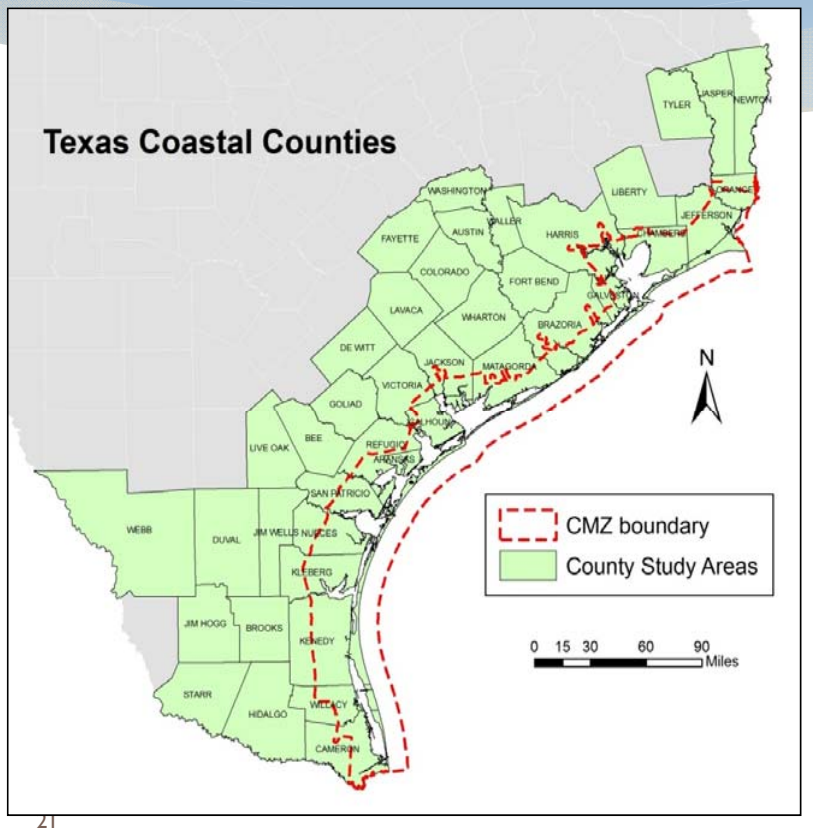
Types of Mitigation Actions

* Risk communication, education, and outreach
  * Targeting accurate risk and vulnerability assessment
  * Signage to educate the public on different hazard exposure
  * Hazard disclosure for property transfers etc.
  * Comprehensive education programs within schools
* Social infrastructure development
  * community and neighborhood based organizations, vulnerable population organizations (faith and non-faith based)
  * Promoting non-profits and other community based organizations that address chronic vulnerability issues (food banks, women's shelters, habitat, housing programs, etc.)
  * Partnerships and reciprocal agreements (intra and inter community)
  * Housing programs, maintenance, and equitable neighborhood infrastructure improvements and maintenance

Hazard Mitigation Policies and Strategies along the Texas Coast

* Target Area and Sample:
  * Targeted 267 coastal jurisdictions (41 counties and 226 municipalities).
  * Final sample was 124 jurisdictions (26 counties and 98 municipalities)
  * Internet based survey
  * Response rate of 46.4%

Population Size	Targeted Jurisdictions	Responding Jurisdictions	Response Rates
< 1,000	44	11	25.0%
1,000-4,999	94	35	37.2%
5,000 - 14,999	65	38	58.5%
15,000 - 49,999	40	23	57.5%
50,000 - 99,999	14	10	71.4%
100,000-299,999	7	4	57.1%
300,000 - 499,000	1	1	100.0%
> 1,000,000	2	2	100.0%
Total	267	124	46.4%



Specific Hazard Mitigation Policies and Strategies: 12 types 44 in all

1) Land use and Development Regulations (7)

Residential subdivision ordinance; Planned unit development, Special overlay districts; Agricultural or open space zoning; Performance zoning; Hazard setback ordinance; Storm water retention requirements

2) Shoreline Regulations (5)

Limitation of shoreline development to water-dependent uses; Restrictions on shoreline armoring; Restriction on dredging/filling; Dune protection; Coastal vegetation protection

3) Natural Resource Protection (3)

Wetland protection; Habitat protection/restoration; Protected areas

4) Building Standards and Codes (5)

Building code; Wind hazard resistance for new home; Flood hazard resistance for new home; Retrofit for existing building; Special utility codes

5) Information Dissemination/ Awareness Programs (5)

Public education for hazard mitigation; Citizen involvement in hazard mitigation planning; Seminar on hazard mitigation practices for developers and builders; Hazard disclosure; Hazard zone sign

6) Local Incentive Programs (3)

Transfer of development rights; Density bonuses; Clustered development

7) Federal Incentive Programs(2)

Participation in the National Flood Insurance Program (NFIP); Participation in the FEMA community rating system (CRS);

8) Property Acquisition Programs (3)

Fee simple purchases of undeveloped lands; Acquisition of developments and easements; Relocation of existing structures out of hazardous areas.

9) Financial Tools (3)

Lower tax rates; Special tax assessment; Impact fees or special assessments

10) Critical public/private facilities policies (3)

Requirements for locating public facilities and infrastructure; Requirements for locating critical private facilities and infrastructure; Using municipal service areas to limit development

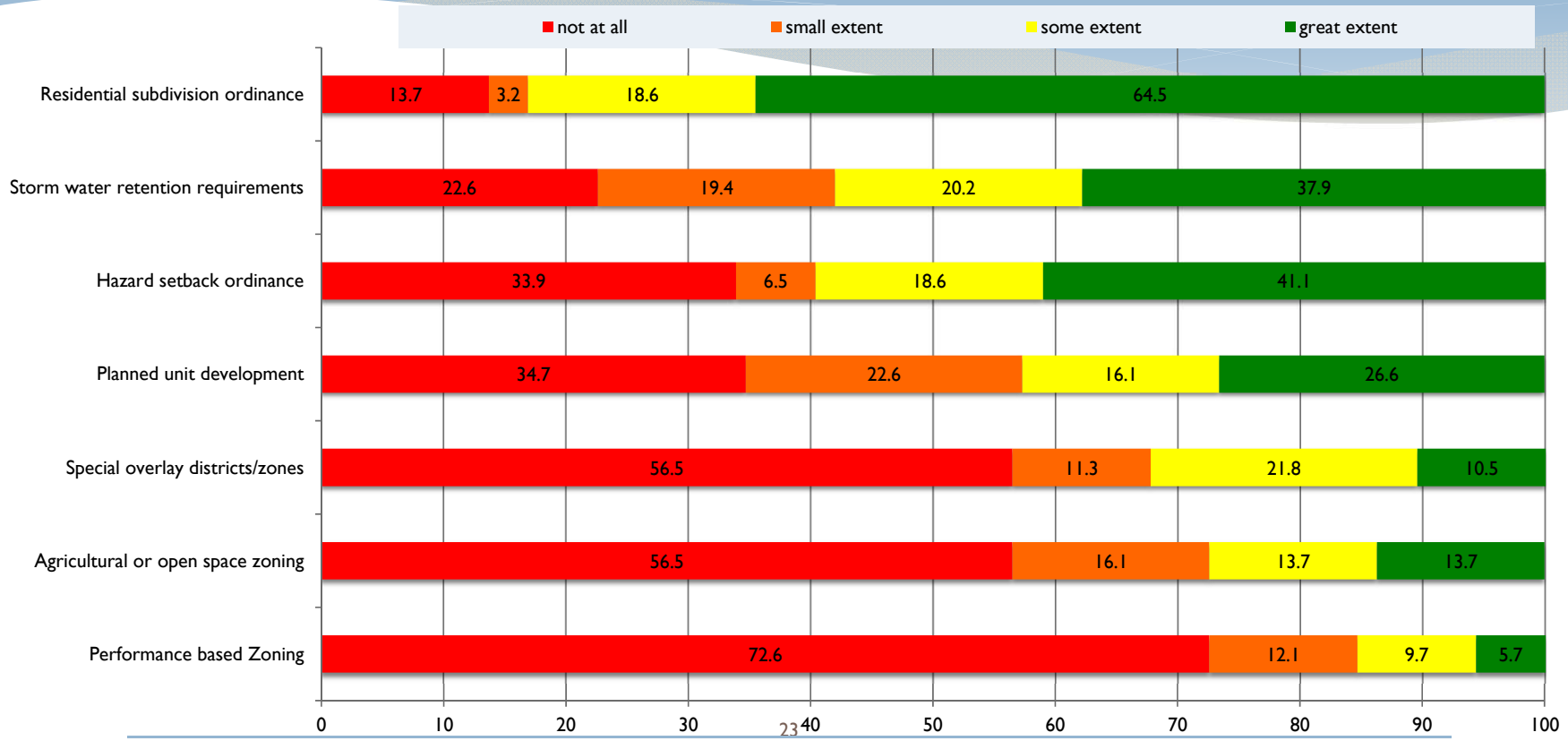
11) Public-private sector initiatives (2)

Land trusts; Public-private partnerships

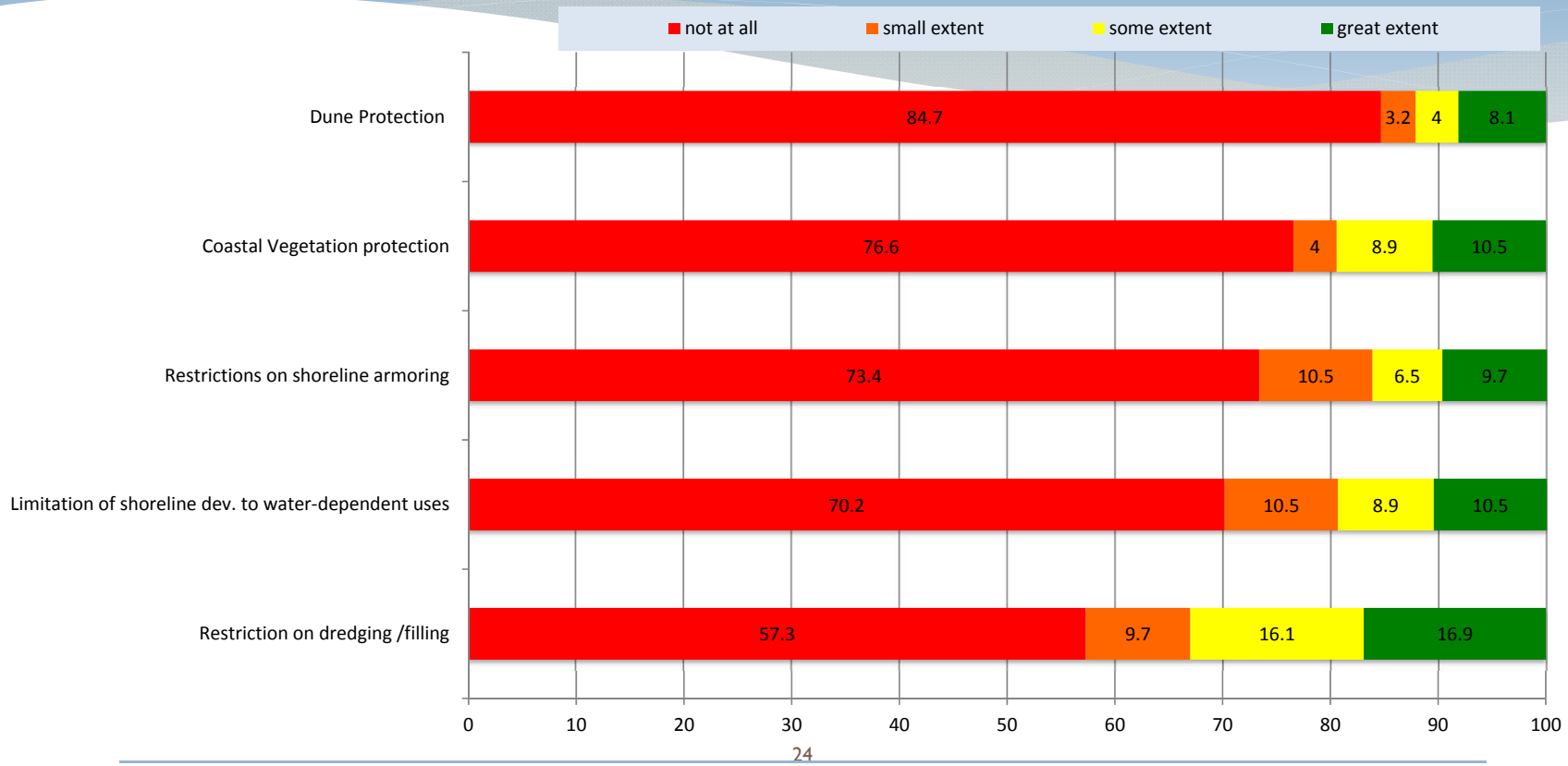
12) Utilizing Professionals: (3)

Hiring professionals to identify suitable building sites; Hiring professionals to develop special building techniques; Hiring professionals to conduct windstorm/roof inspection

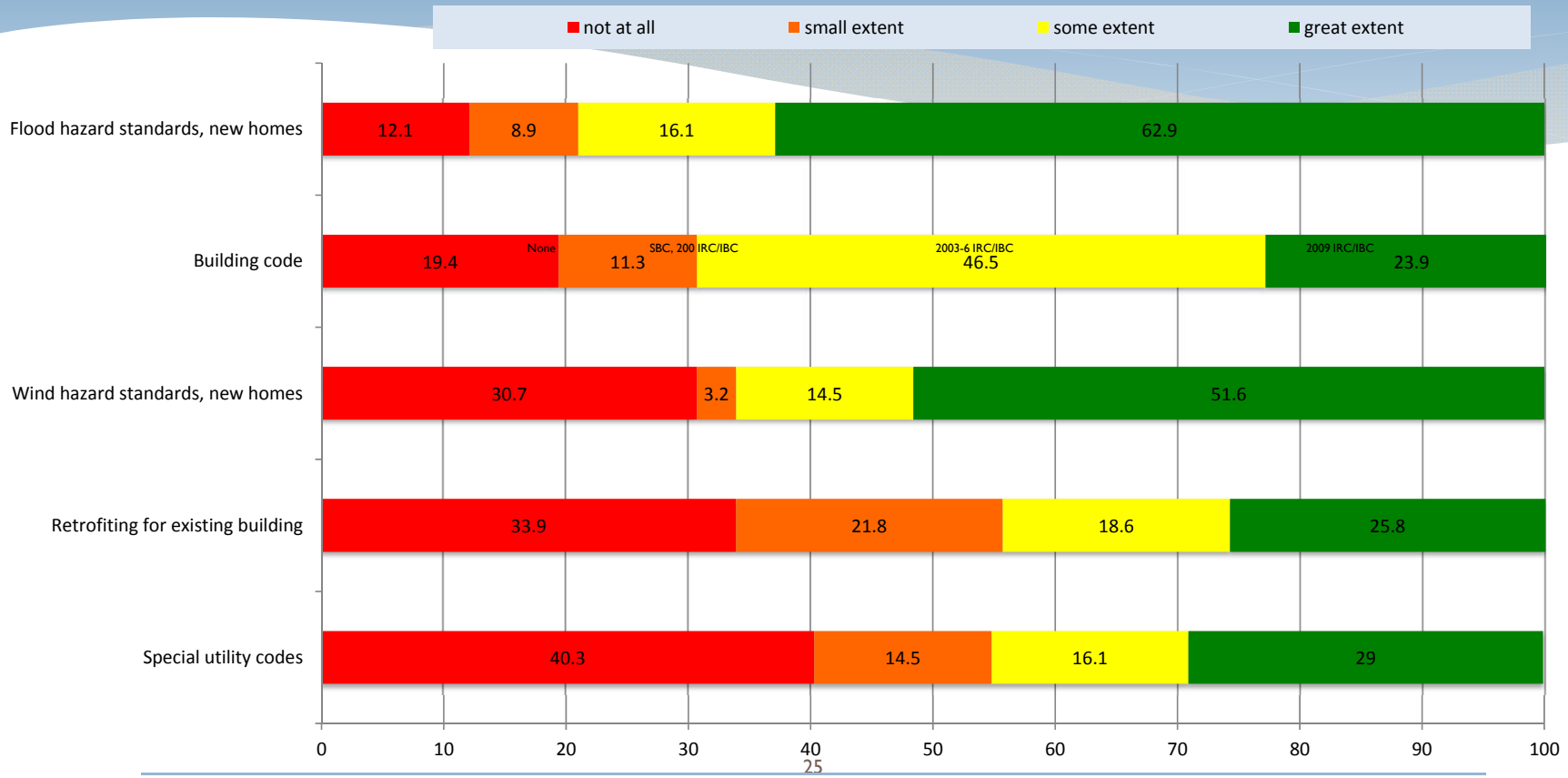
1. Development Regulation and Land Use Management



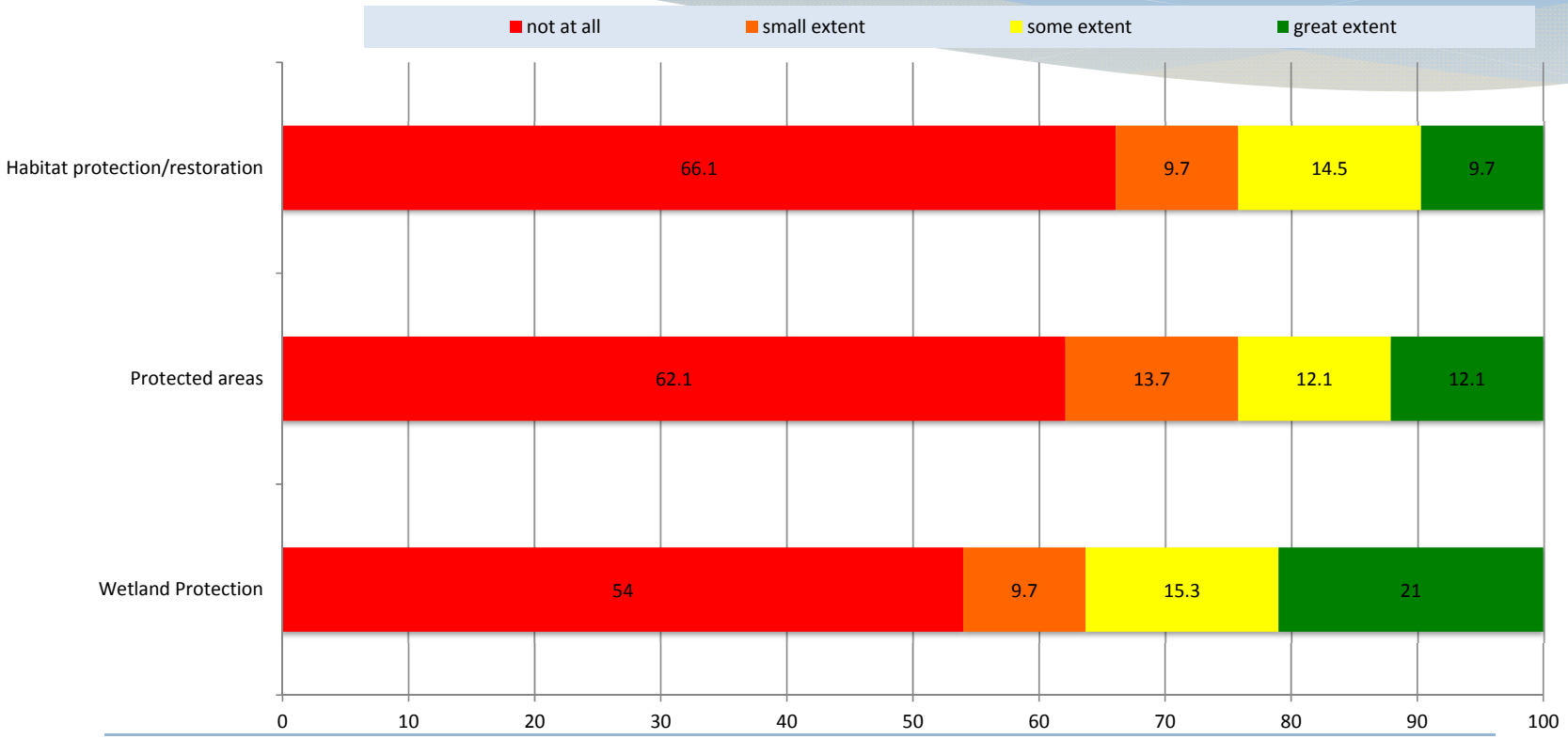
2. Limit Development and Shoreline Activities



3. Building Standards

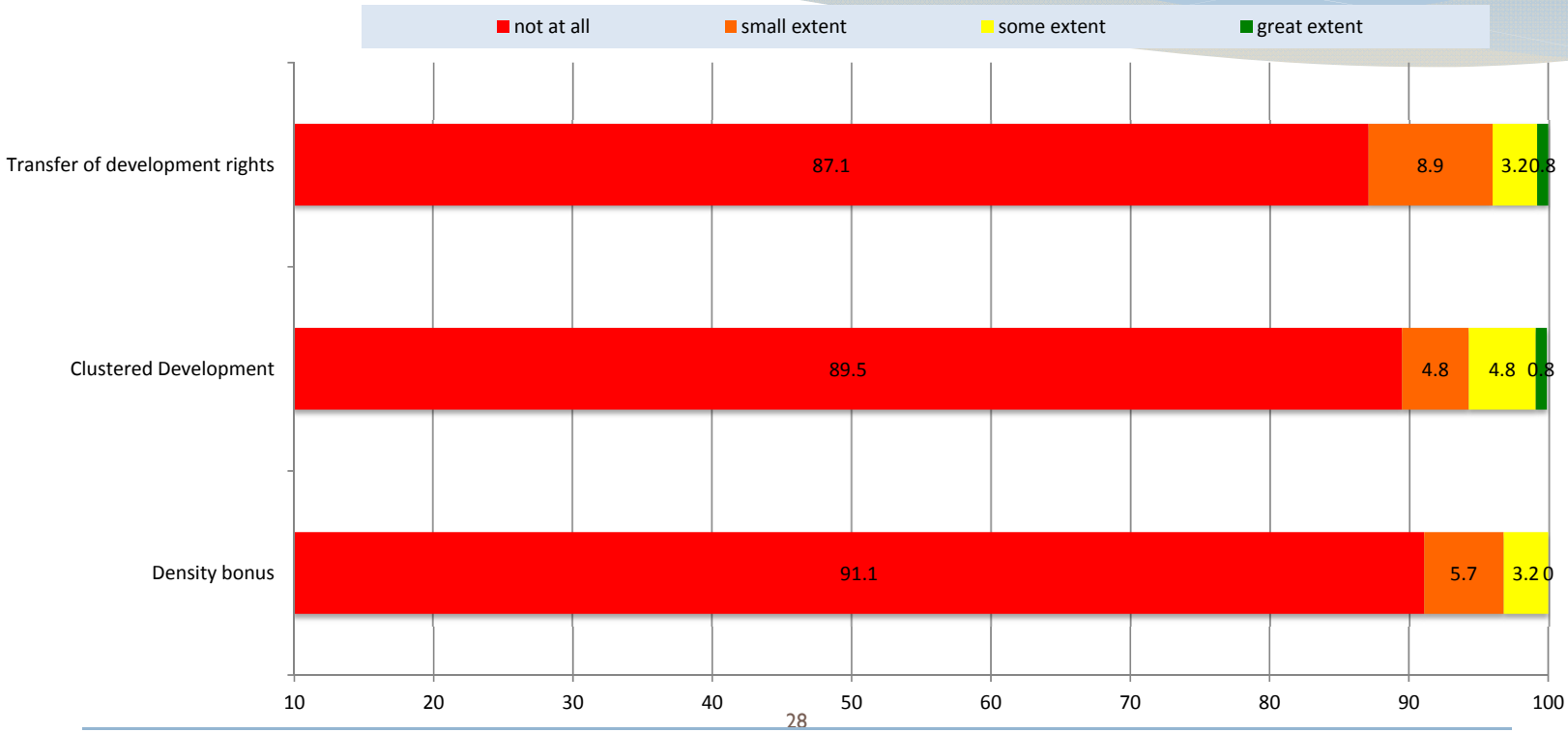


4. Natural Resource Protection

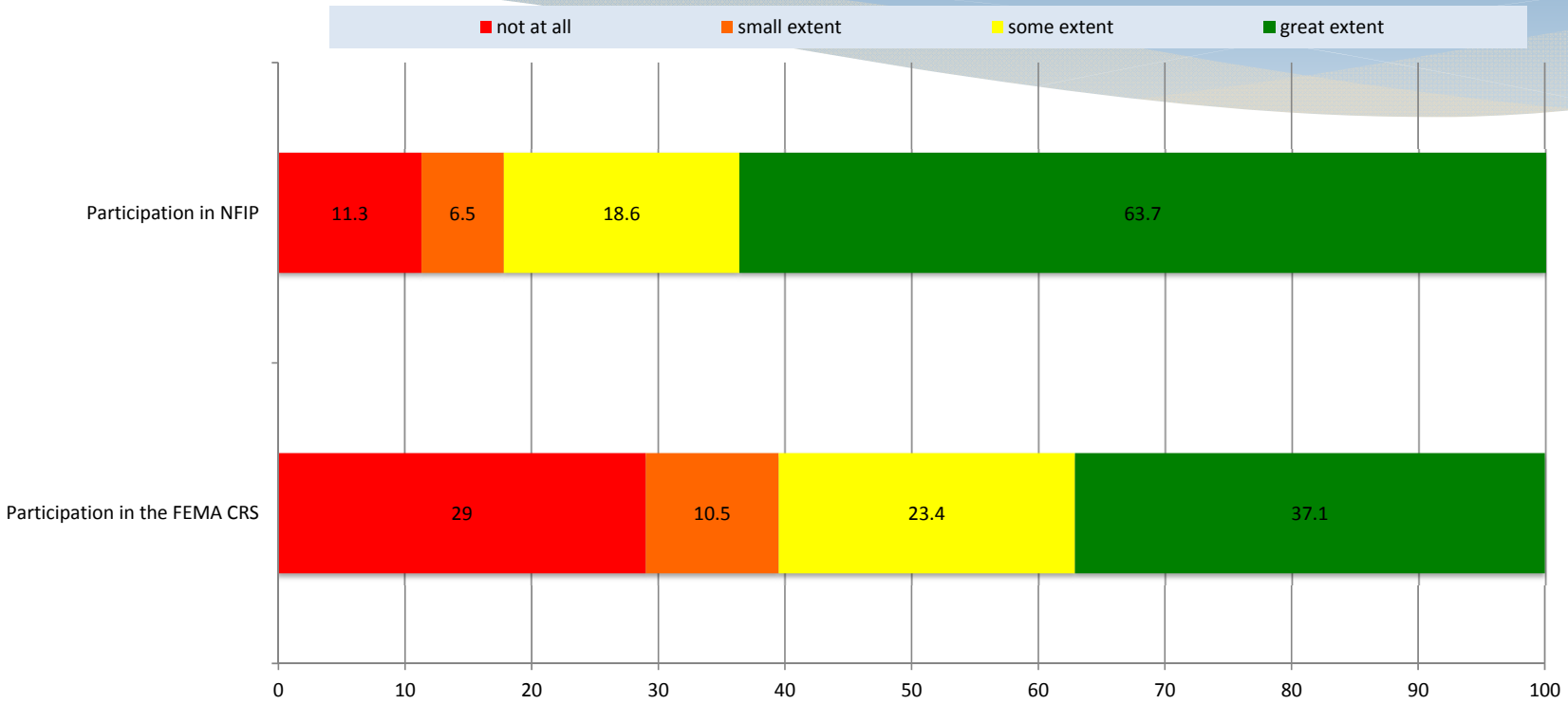


5. Public Information and Awareness

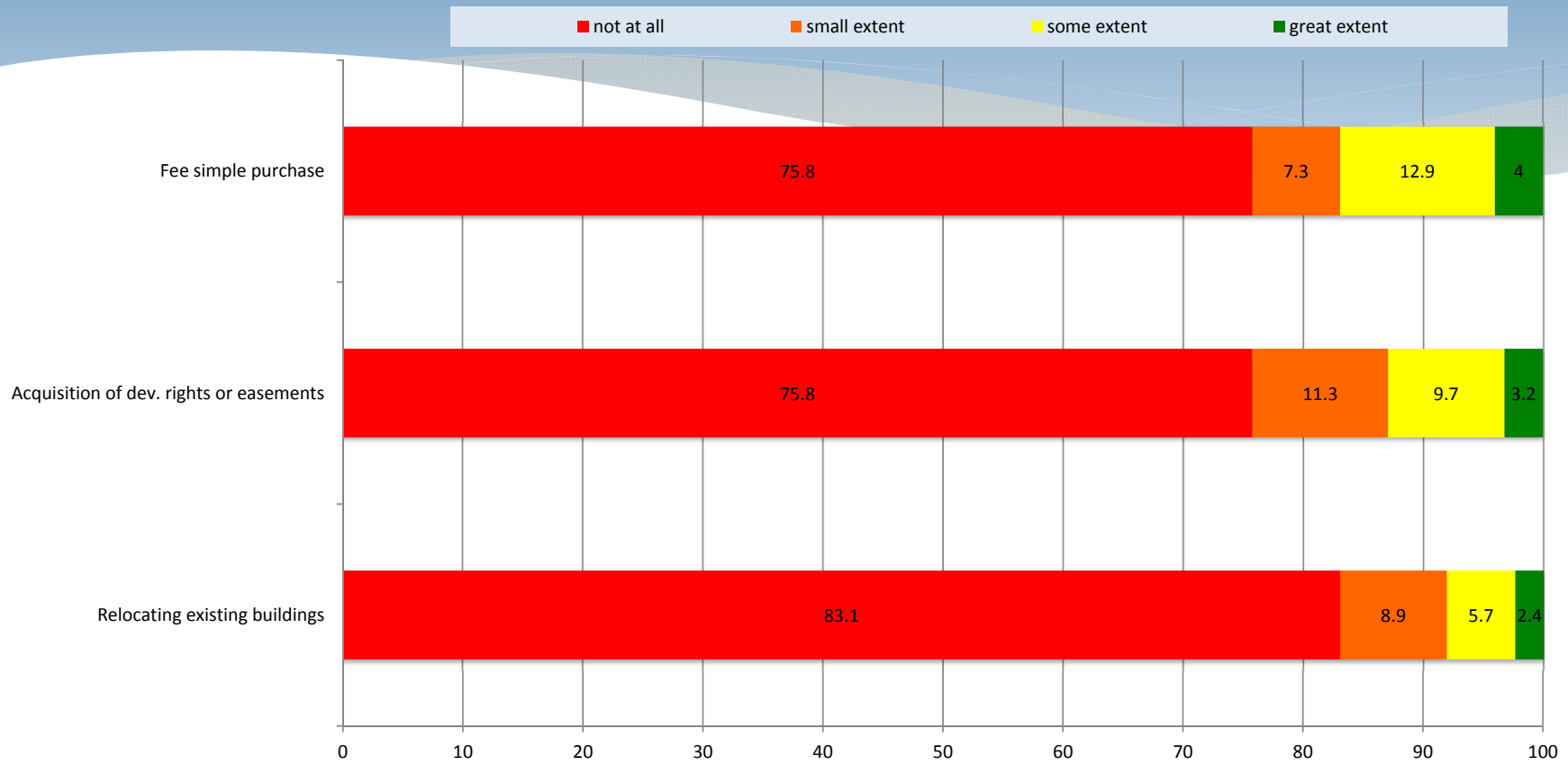
6. Local Incentives for Environmentally Sensitive/Hazardous Areas



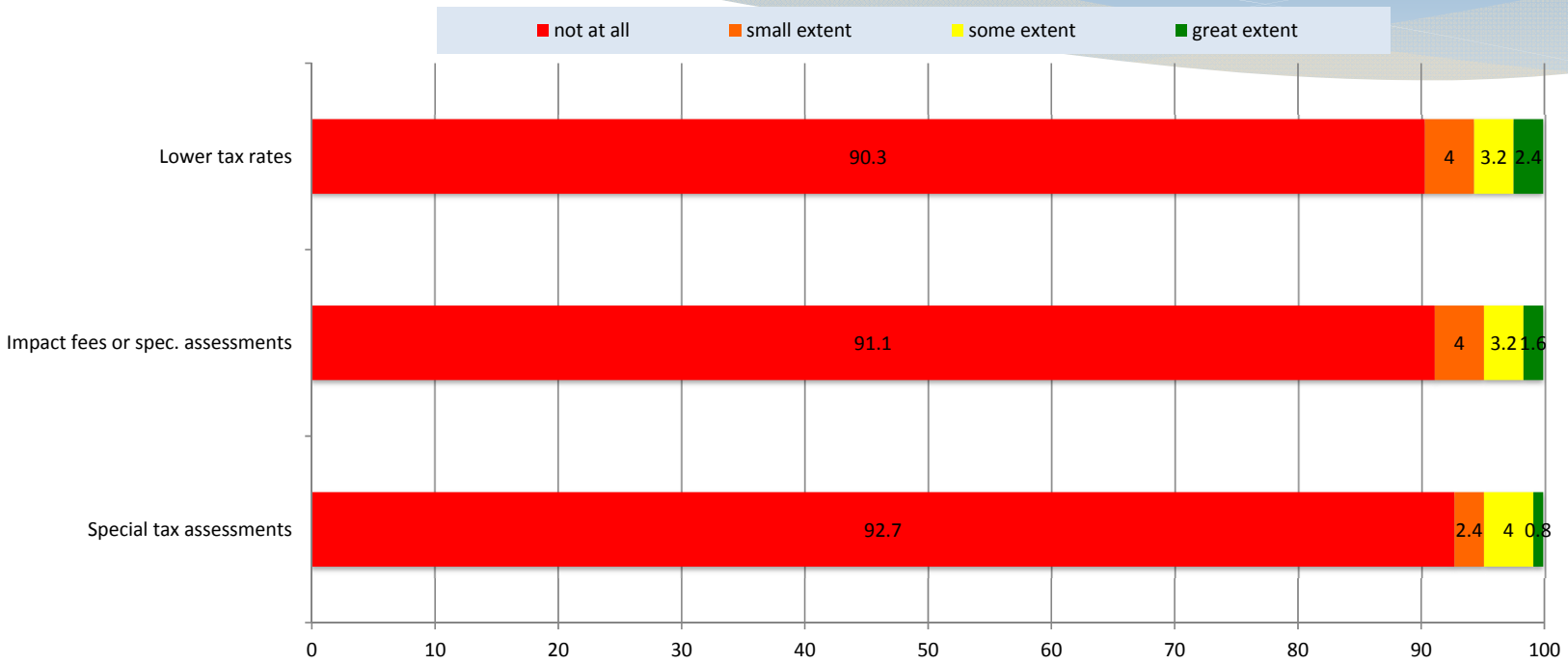
7. Federal Incentives and mitigation programs



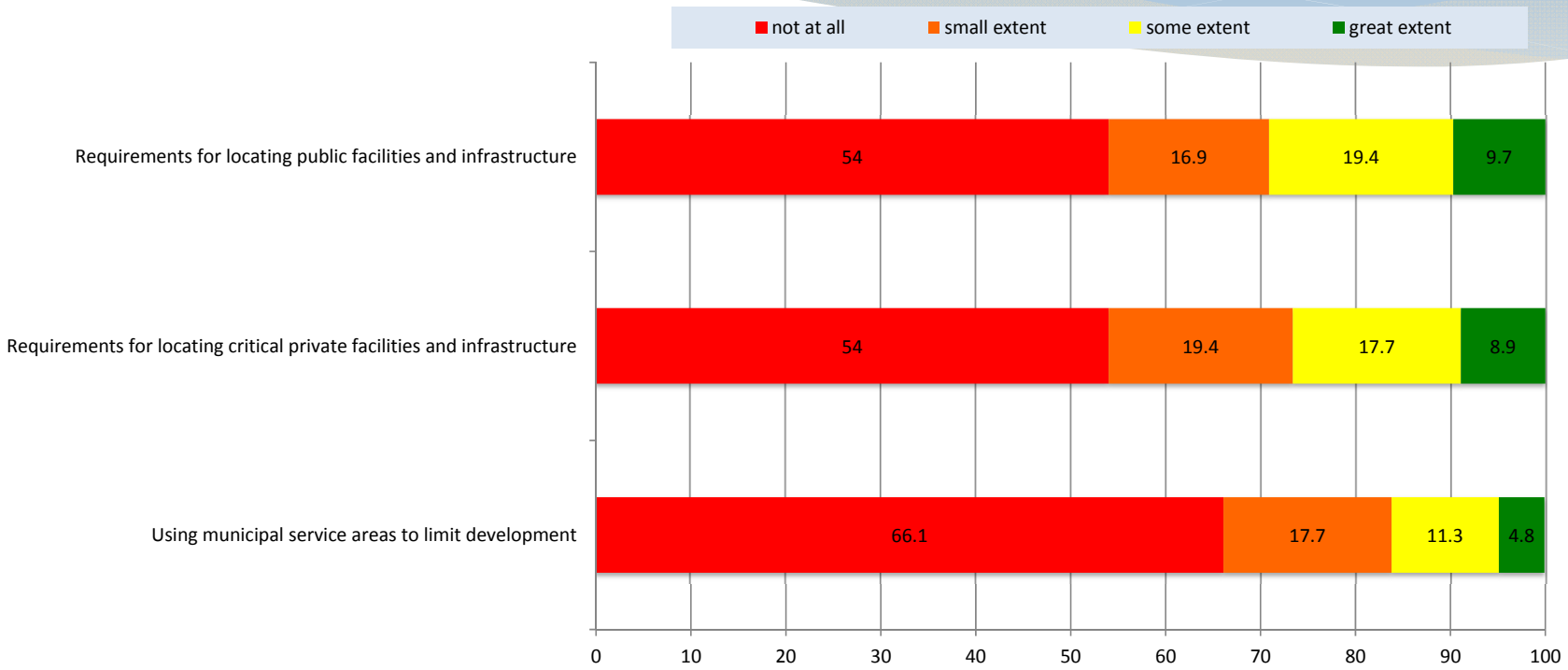
8. Property Acquisition Programs



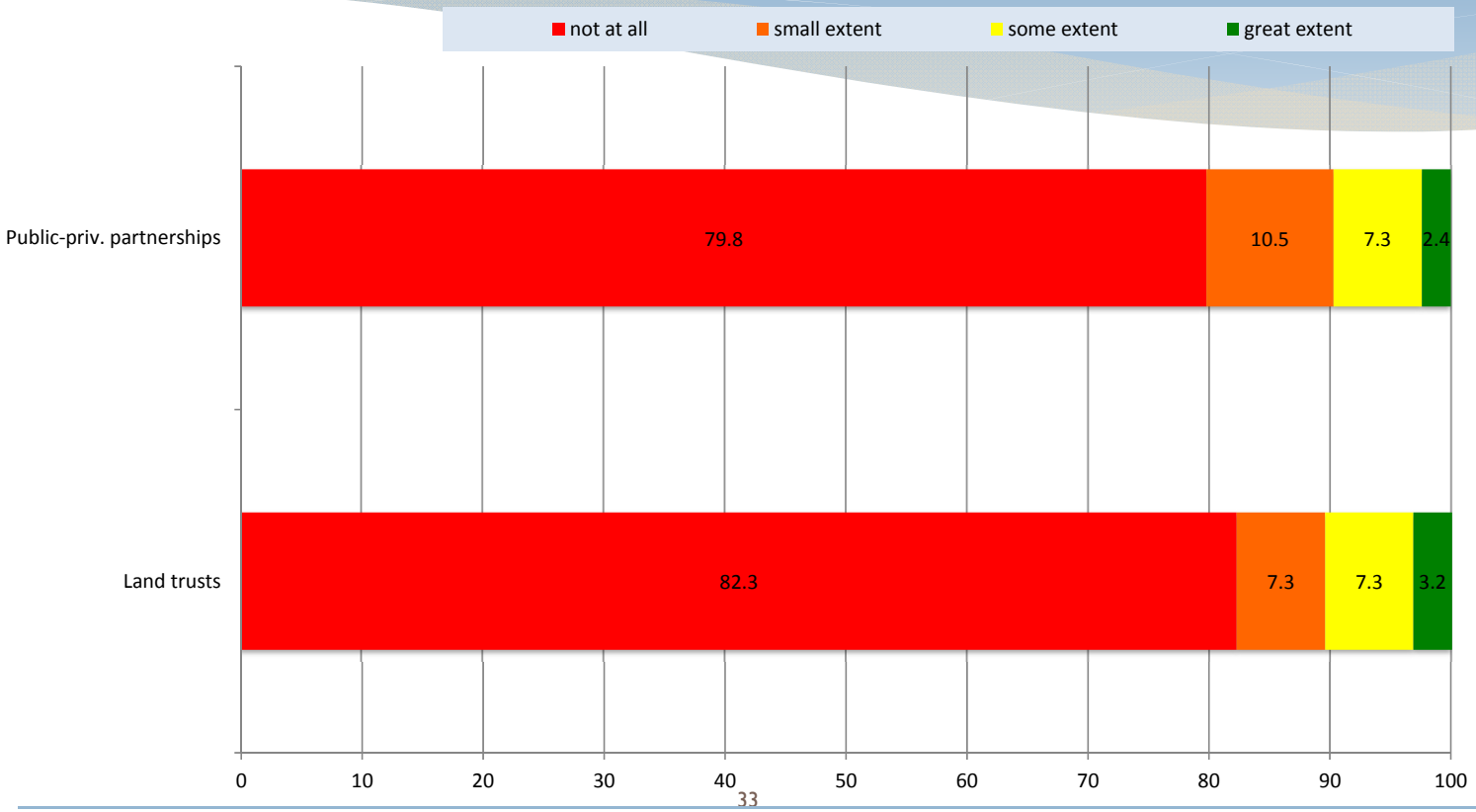
9. Financial Tools



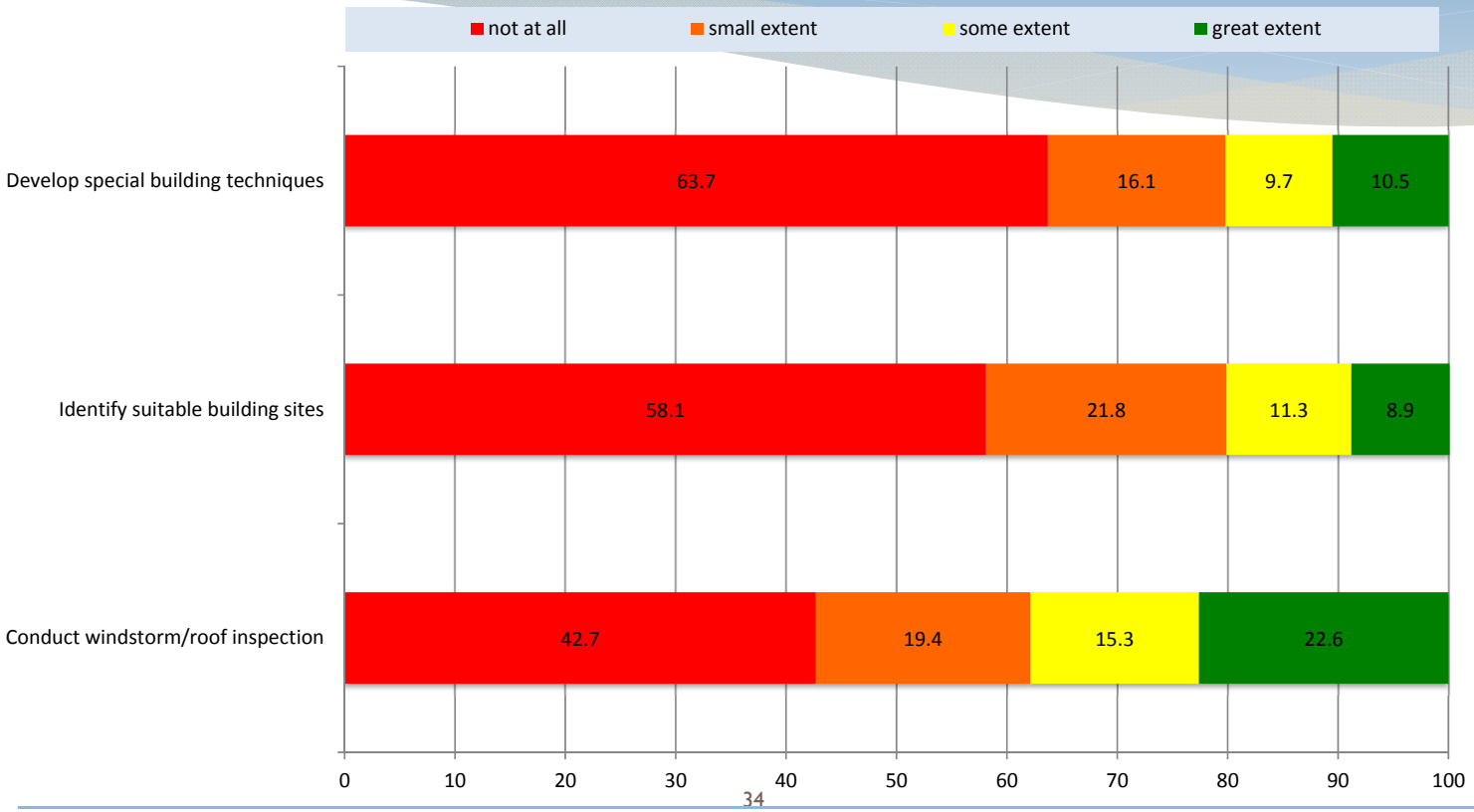
10. Critical Public & Private Facility Policies



11. Private-public Sector Initiatives

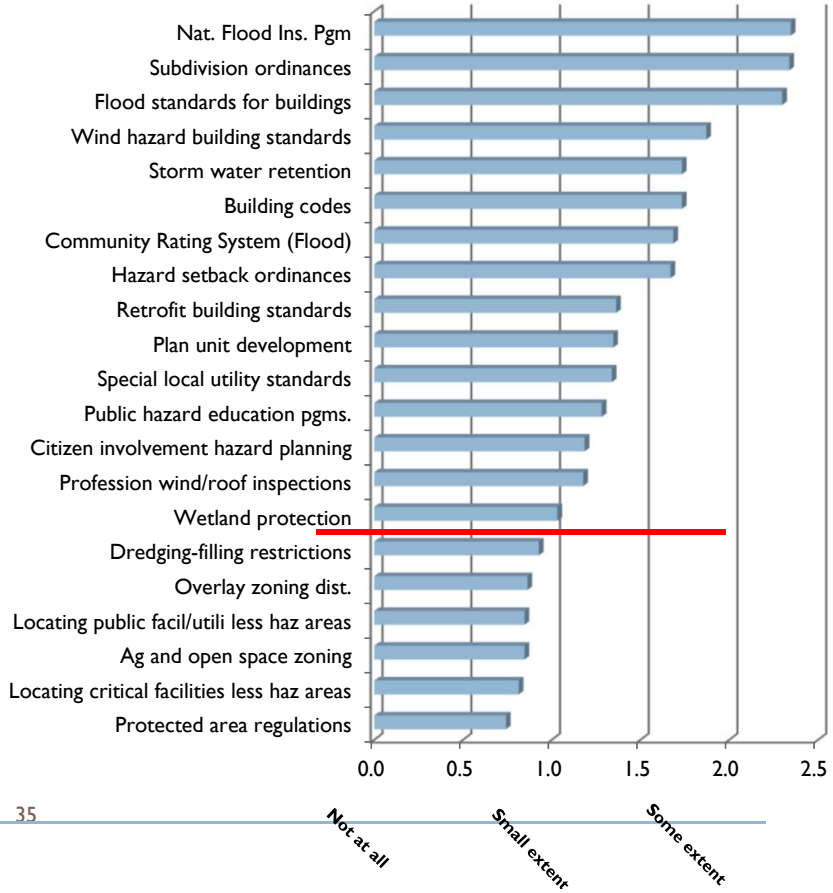


12. Hiring professional/technical assistance



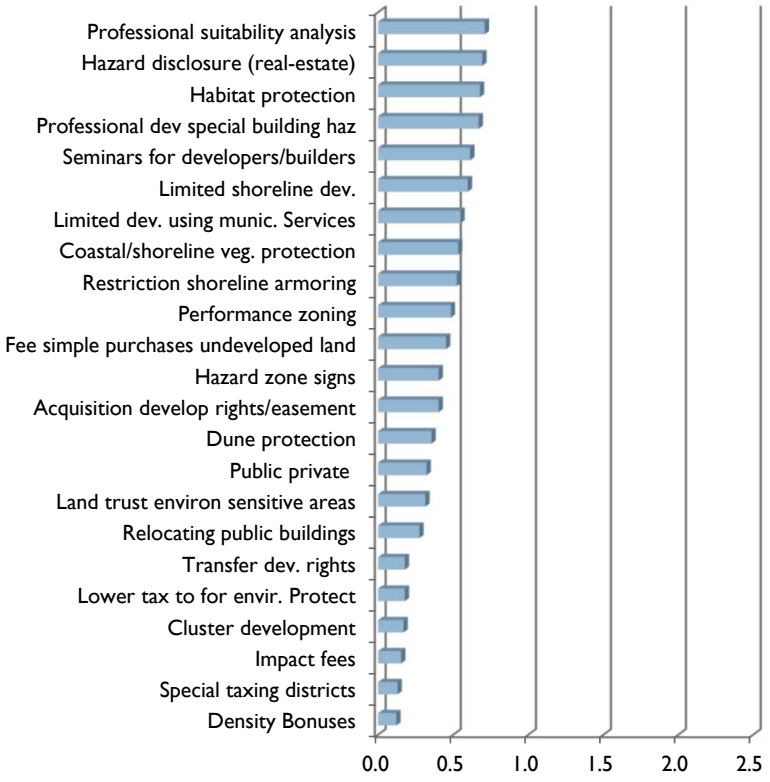
Top 21 Policies

- Top 3:
  - NFIP
  - Subdivision ordinances
  - Flood Standards
- Top 10:
  - 4 building codes
  - 2 federal programs
  - 4 land use/dev. policies
- Only 15 of 44 had average scores above one
  - limited portfolio and usage levels.
  - Wetland protection is the last that is rated "1" or above.

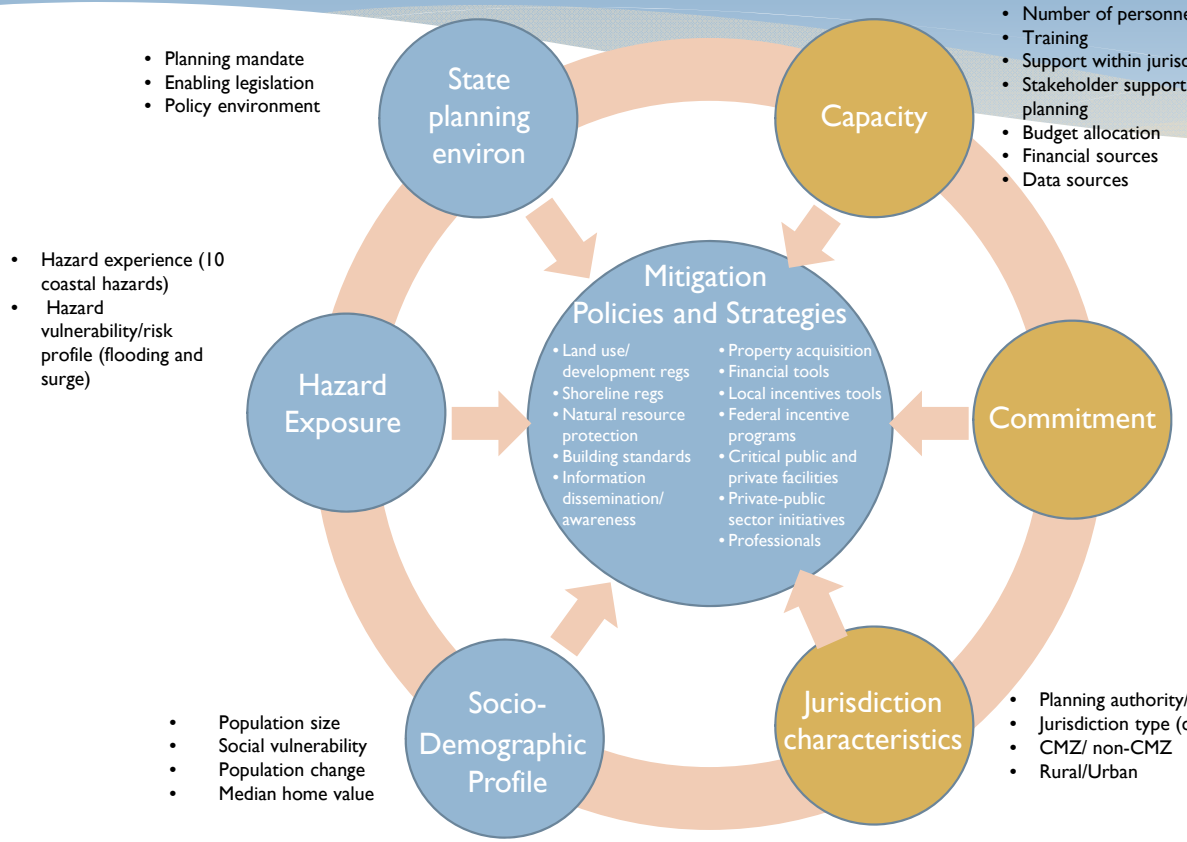


Bottom 23 Policies

- These are less widely adopted:
  - Politically out of favor
  - Limited capabilities by many jurisdictions
  - Also perhaps a function of geographic location



Factors Influencing Mitigation



- Planning mandate
- Enabling legislation
- Policy environment

- Number of personnel
- Training
- Support within jurisdiction
- Stakeholder support for general planning
- Budget allocation
- Financial sources
- Data sources

- Hazard experience (10 coastal hazards)
- Hazard vulnerability/risk profile (flooding and surge)

- Coordination & work with other jurisdiction/s
- Intra and Inter jurisdictional Agency Agreements
- Administrative Staff-time allocation
- Stakeholder/positional leader commitment

- Population size
- Social vulnerability
- Population change
- Median home value

- Planning authority/discretion
- Jurisdiction type (county and municipality)
- CMZ/ non-CMZ
- Rural/Urban

From Peacock, Van Zandt and Grover 2012

Jurisdictional Characteristics

- Planning Authority/Discretion
  - Home rule: considerable variation across states and major differences in Texas
    - Municipalities much more comprehensive in approaches
      - Development regulations and Land-use planning Land Development approaches; Building Codes, and Critical public/private
      - Also overall
- Comprehensive planning versus no planning
  - Jurisdictions with comprehensive/general plans displayed more comprehensive HM policies/strategies
- Hazard Mitigation Plans, do they make a difference?
  - Limited to no difference between jurisdictions with or without a LHMP

Capacity

* Capacity: essentially the ability of a community/jurisdiction to do what "it" needs or wants to do; undertake actions, develop and implement policies and strategies; ability to respond effectively to change, etc.
* Typical indicators: financial, human, physical and social capital/resources.
  * We employed:
    * budget,
    * personnel,
    * training,
    * intra governmental support,
    * community support for planning,
    * additional financial resources,
    * data and informational resources.

Capacity

* Findings:
  * Capacity has a positive effect on the overall extent to which HM policies and strategies are utilized
    * Particularly significant for: Building standards/codes; implementing federal incentives, and property acquisition programs (3 of 12) and overall.
    * Rough order of indicator importance.
      * data and informational resources,
      * additional financial resources
      * community support for planning
      * intra governmental/agency support
      * training
      * budget, personnel

Commitment

- Commitment: essentially concerned with "buy-in" to the goals of mitigation, endorsement, investment of resources, involvement, promoting actions toward mitigation goals
- Indicators are diverse: capturing the degree of dedication, engagement, or buy in by politicians as well as jurisdictional and extra-jurisdictional agencies and constituencies/stakeholders.
  - We employed:
    - inter-jurisdictional agreements,
    - intra-governmental involvement & buy-in,
    - MOUs among community organizations/associations,
    - involvement with state agencies
    - FTE allocation of agency personnel.

Commitment

* Findings:
  * Commitment: positive and extremely important impact on the overall extent to which HM policies and strategies are utilized
    * Findings suggests increasing (nonlinear) payoff for commitment
    * Particularly significant for: development regulations, resource protection, information dissemination, local incentives, financial tools, property acquisition, critical facility policies, pub-private initiatives, building professionals (9 of 12) individual program program areas and overall.
    * Rough order of indicator importance:
      * intra-governmental involvement
      * inter-jurisdictional agreements
      * FTE allocation of agency personnel
      * involvement with/by state agencies
      * MOUs among community organizations

Additional factors

* Findings:
  * Hazard Experience: Positive effect
    * Financial tools, critical/public private facility placement, public/private initiatives and overall
  * Hazard Exposure
    * flood plain area: Positive effect
      * Shoreline, natural resource protection, building standards, information dissemination/education, using professionals, and overall
    * Surge zone: positive effect
      * Local incentive programs

Implications for Promoting Resiliency through Mitigation

* Enhance Jurisdictional capacity
  * Data/information, additional financial resources/incentives, and community support for planning
* Enhance jurisdictional commitment
  * Intra-governmental involvement/political buy-in, inter-governmental agreements, dedication of agency time, involvement with state agencies
* Seek the programs that addresses triple bottom lines
  * Promote and enhance spending that addresses multiple efforts
    * Environmental restoration/preservation AND mitigation, social vulnerability
    * Housing quality/efficiency AND physical and social vulnerabilities
* Effectively employ windows of opportunity
  * Mitigation and Recovery planning…

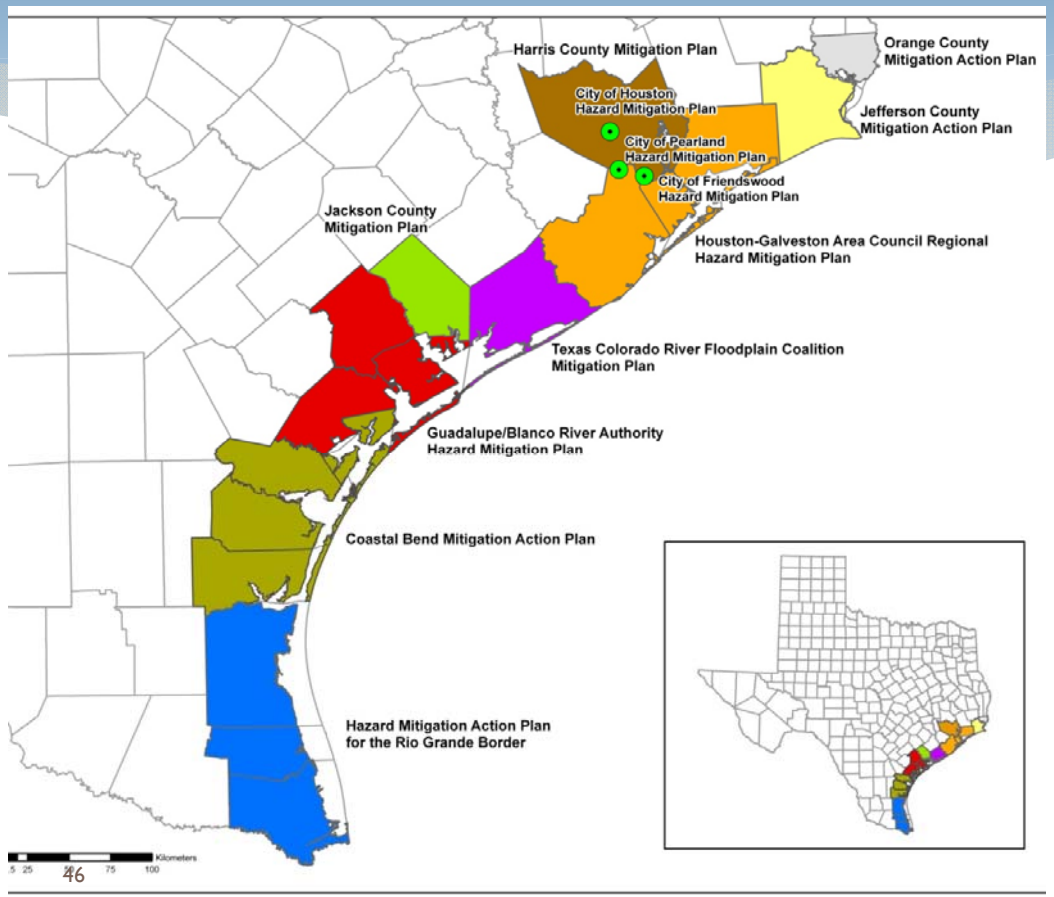
Implications for Promoting Resiliency through Mitigation

* Recognize variability in planning authority/discretion
  * Promoting and develop appropriate programs and strategies depending on authority
  * Consider and promote upgrading of authority/discretion when appropriate
* Promote comprehensive planning and the inclusion of mitigation and recovery elements
* Promote consistency among planning efforts
  * Mitigation Plans are important, but they are part (a very small part) of the process
  * All planning efforts: comprehensive, transportation, water conservation, special district, development, school, etc. should all have mitigation components, elements
  * There must be consistency.

Local Hazard Mitigation Planning along the Texas Coast

* HMA 2000 began the process of requiring Local Hazard mitigation plans
* As of mid-2007, 14,000 approved plans
* But little empirical analysis of the quality of these plans

* 12 Hazard Mitigation Plans
  * 3 municipalities, 4 county, & 5 regional
  * Covering: 18 counties and 112 municipalities

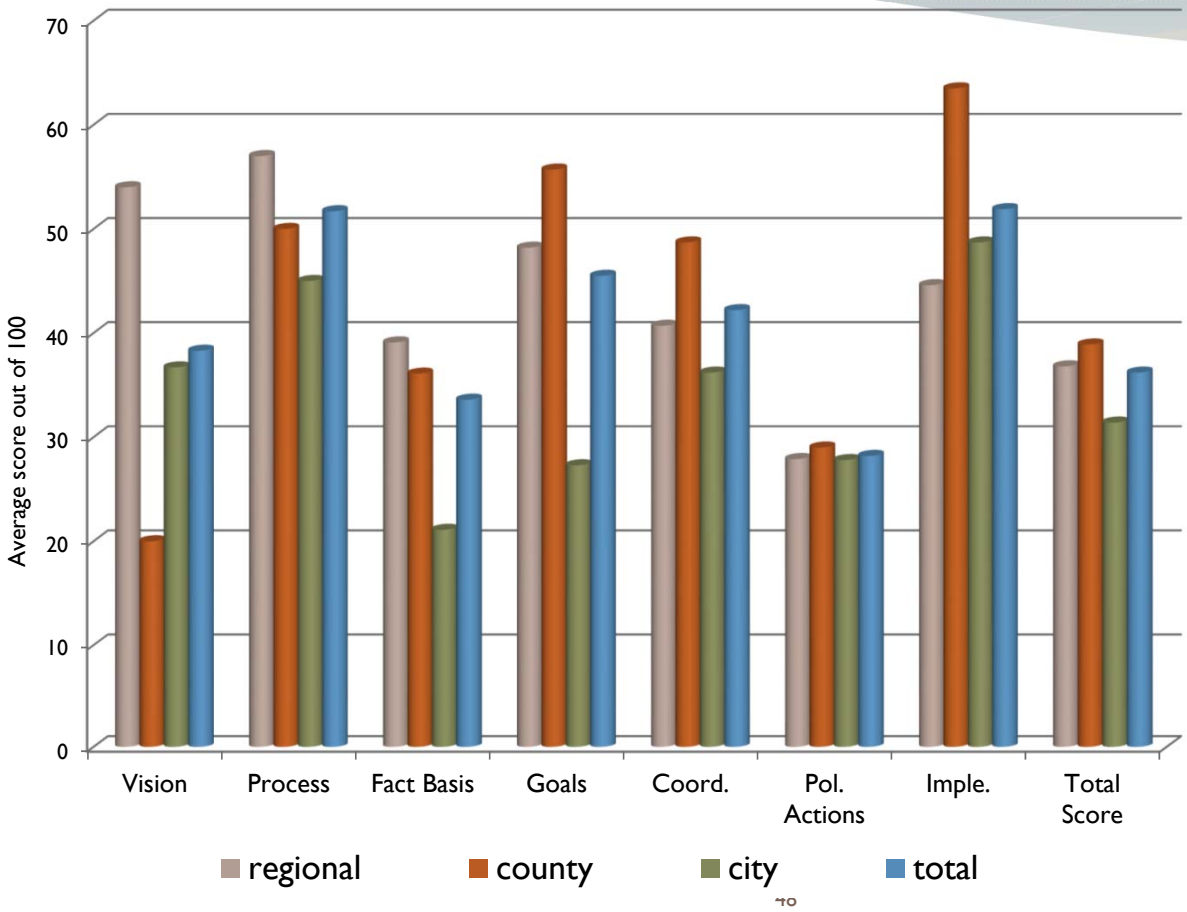


* For a more complete discussion of these findings and data collection see: Kang, Peacock and Hussein 2010 and Peacock et al. 2009.

Assessing Hazard Mitigation Plans:
Beyond the FEMA crosswalk

Hazard Mitigation Plan Evaluation Protocols	
1. Vision Statement: *Problem description, vision statement*	5. Inter-organization coordination and capabilities: *cooperation and organization identification, proposed participation techniques, information sharing on planned action, capacity development, conflict management*
2. Planning Process: *general description, proposed participation techniques*	6. Specific Mitigation Policies and Actions: *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*
3. Fact Basis: *hazard identification, vulnerability assessment, risk analysis, emergency management*	
4. Mitigation Goals and Objectives: *economic impacts goals, physical and environmental impacts goals, and public interests goals*	7. Implementation : *implementation, evaluation, updating, and monitoring*

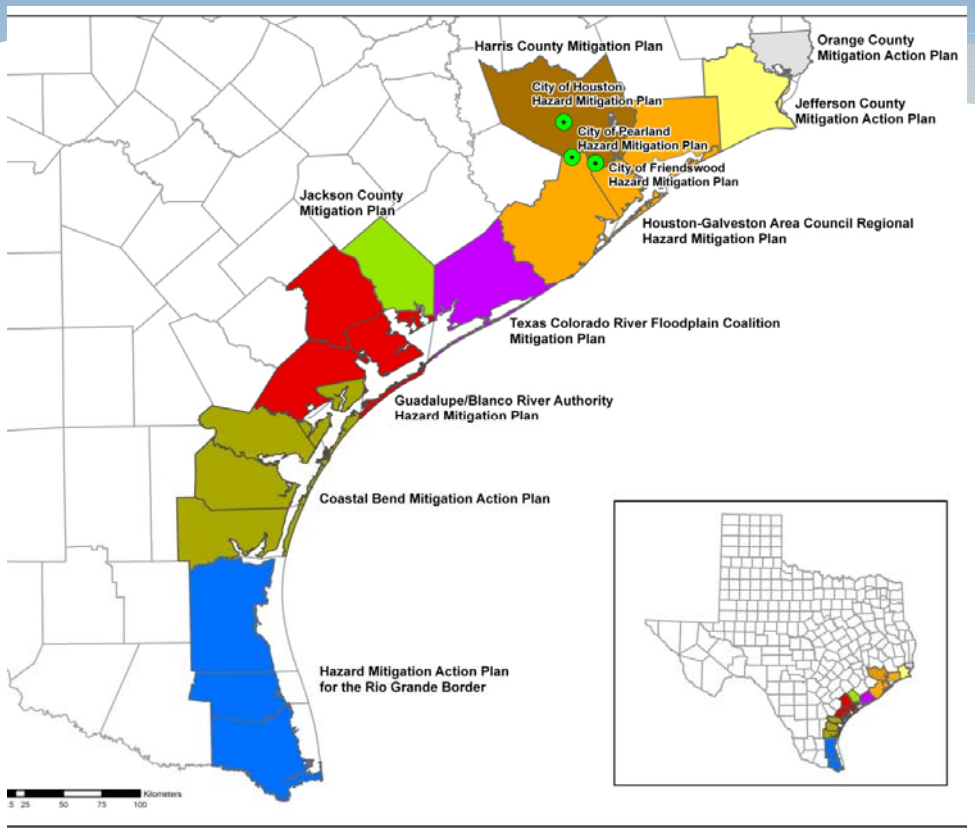
Plan Quality Scoring Results: Average Scores by Jurisdiction Type and Overall



General comments:

1) Total scores were relatively low – much room for improvement.
2) City HMP scores were significantly lower than other plan types
3) Fact basis for plans were very low (33.6%), particularly for cities/municipalities (21.1%)
4) Policies/actions were also scored quite low (28.2%), reflection limited policy considerations

Local Hazard Mitigation Planning: A Texas Example



* For a more complete discussion of these findings and data collection see: Kang, Peacock and Hussein 2010 and Peacock et al. 2009.

- In total the 12 plans proposed 836 mitigation actions:
  - Structural: 34.4%
  - Emergency management: 24.1%
  - Regulatory/planning: 25.8%
  - Education/Awareness: 14.4%
  - Natural resource protection/restoration: 1.4%
- There is a good deal of room for improvement
  - Particularly on fact basis and policies and actions which tended to be narrowly defined
  - Cities have the greatest need for improvement.
  - Disconnect between hazard mitigation plans and other plans.

Plan Integration *for Resilience* Scorecard:

How to spatially evaluate networks of plans to reduce hazard vulnerability

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Jaimie Hicks Masterson, AICP Research

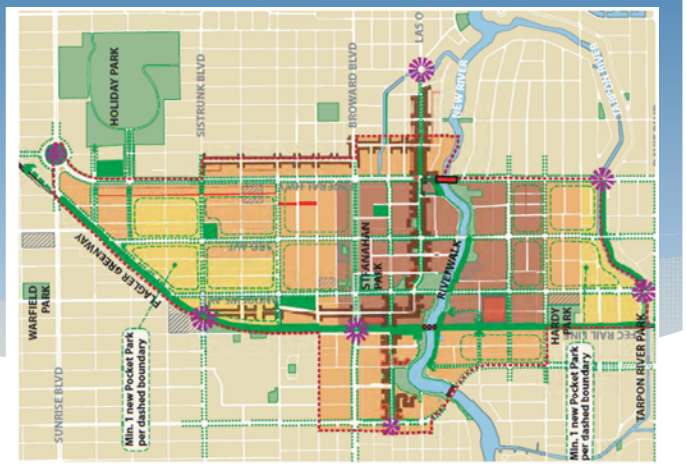
Team: P Berke, M. Malecha, S. Yu, J Lee, J Masterson

Texas A&M University
Institute for Sustainable Communities

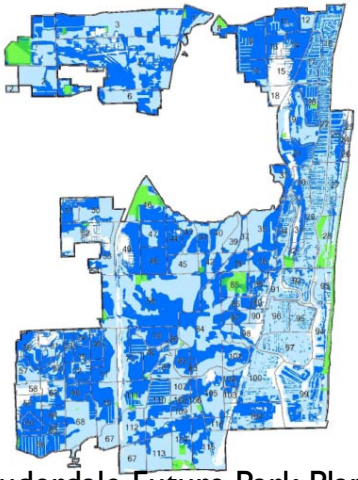
COASTAL RESILIENCE CENTER
A U.S. Department of Homeland Security Center of Excellence

Project Overview

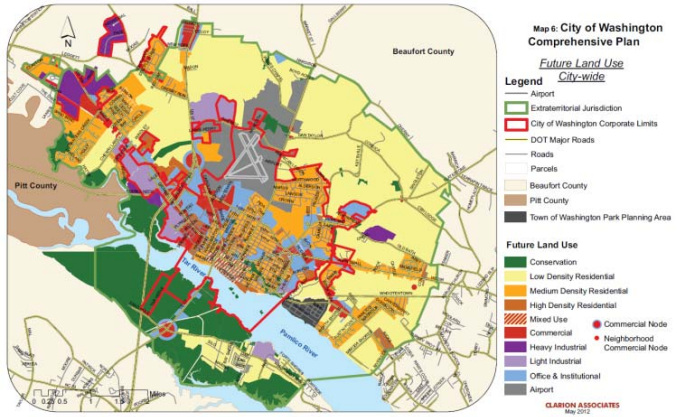
- Land use planning is key to mitigation
- Communities adopt networks of plans
- Integration of mitigation in local plans can significantly affect future vulnerability



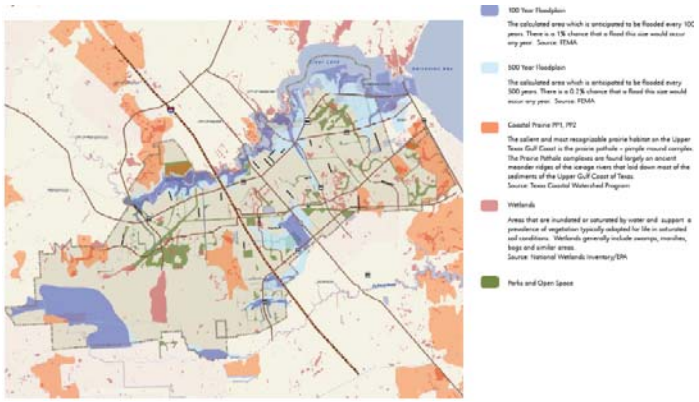
Ft. Lauderdale Downtown Area Framework Plan



Ft. Lauderdale Future Park Plan



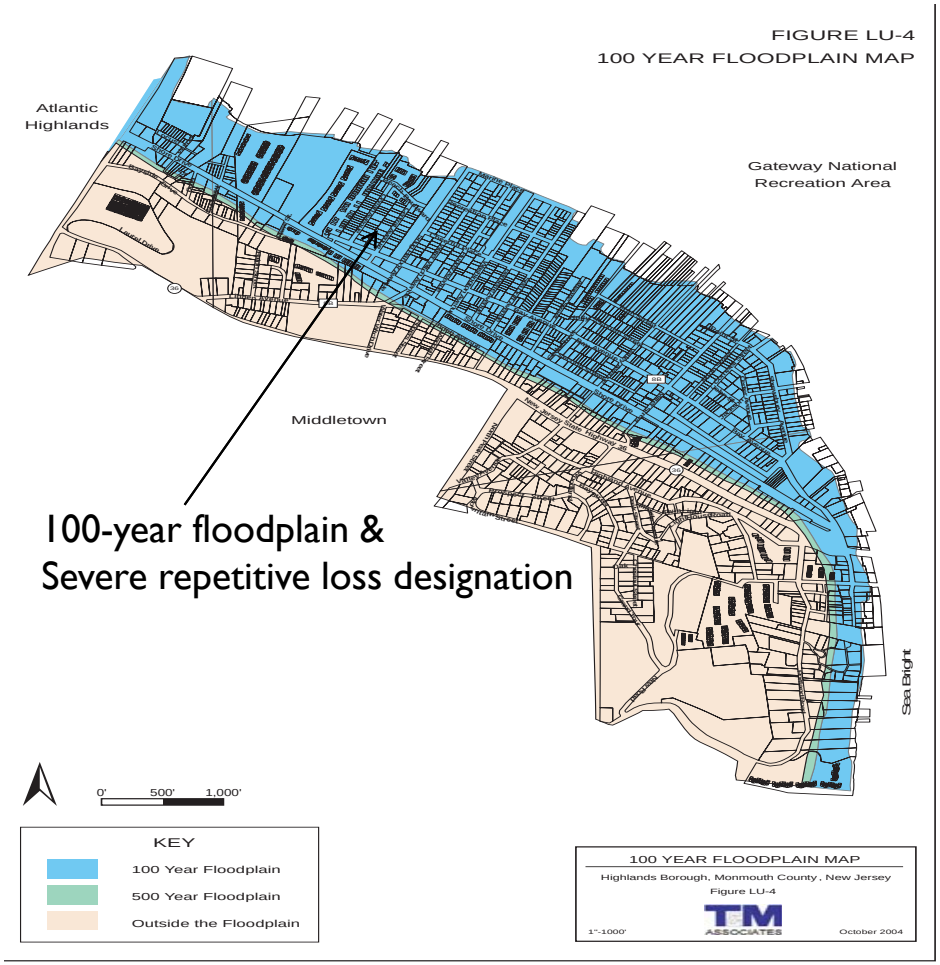
City of Washington Comprehensive Plan



League City Open Space and Sensitive Area Plan

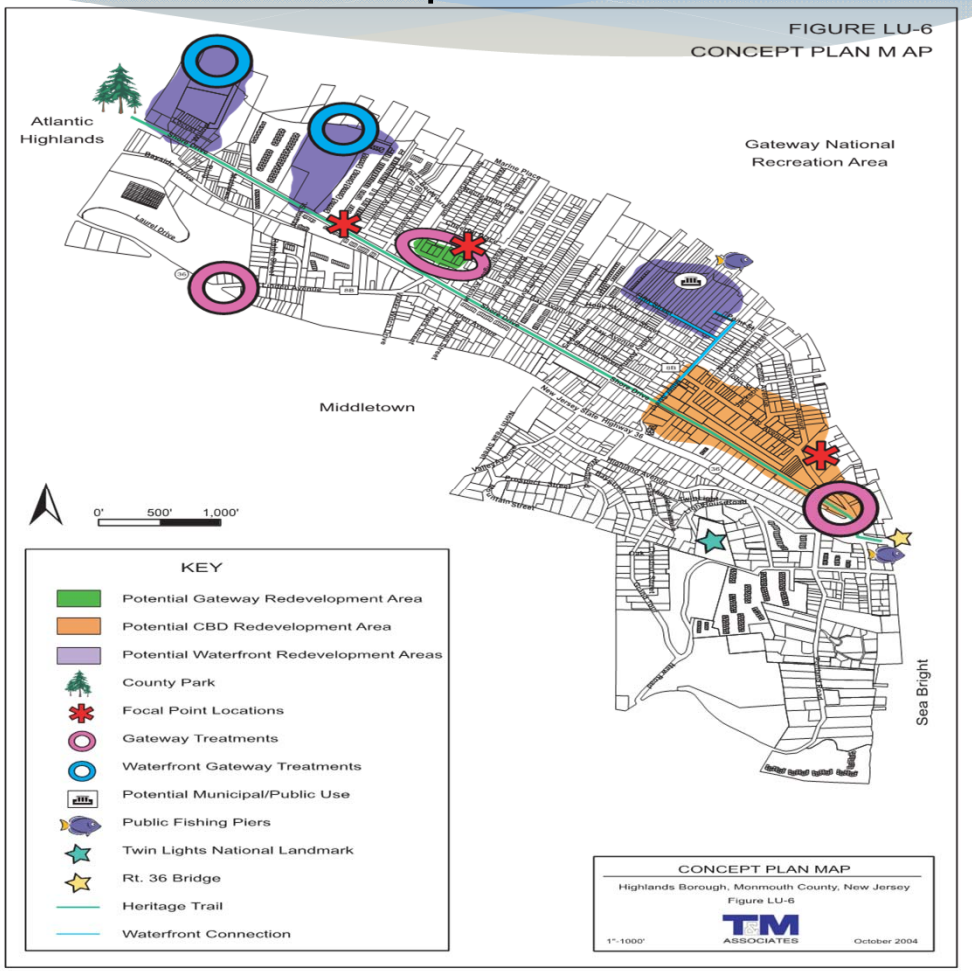
Highlands, NJ Before Hurricane Sandy: Opposing Intentions?

Hazard Mitigation Plan



100-year floodplain &
Severe repetitive loss designation

Comprehensive Plan



Project Objectives

We develop a resilience scorecard:

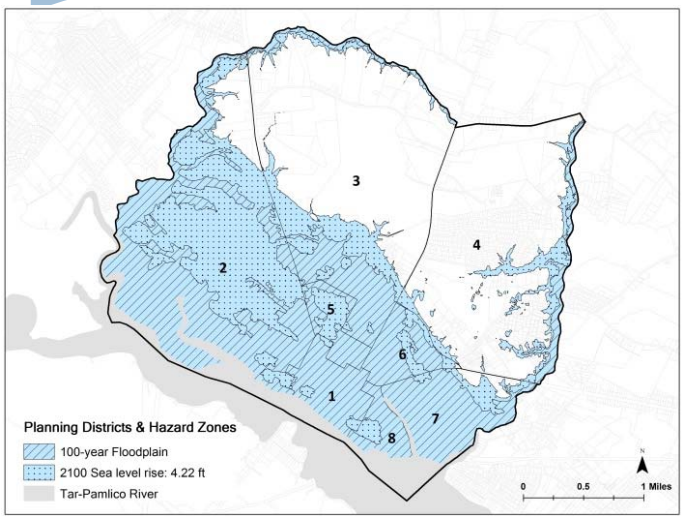
* To evaluate the coordination in local networks of plans
* To assess the degree to which the network of plans targets areas most vulnerable.

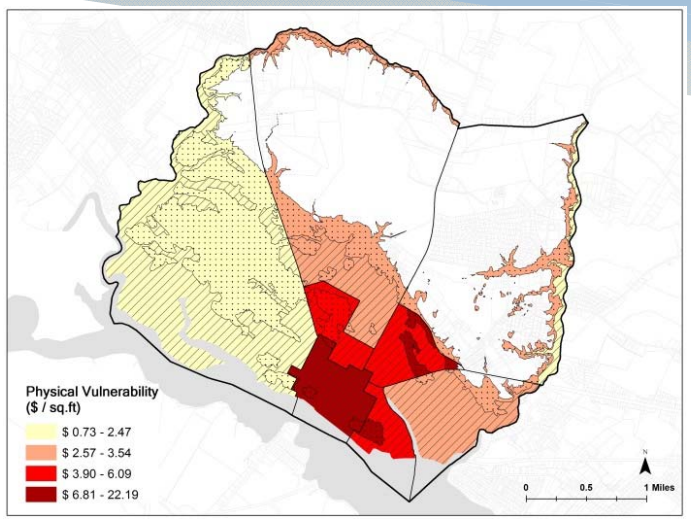
Source: Berke, P. et al. 2015. *Journal of the American Planning Association.* 81(4): 287-302

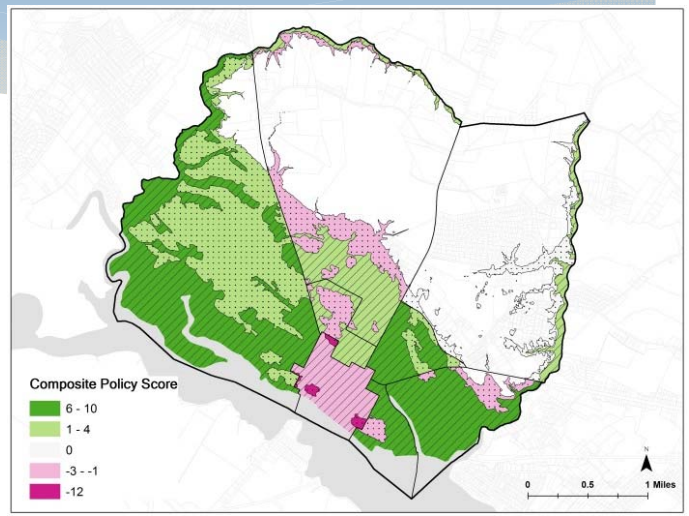
Important because:

* *Biggest problem is the inconsistency among the many plans that shape community development and change – we must deal with this NETWORK of plans…*
* *It is a collaborative approach for a community to understand vulnerability holistically*

Technical Approach: Developing and Testing a Resilience Scorecard







Phase 1

Delineate planning districts and hazard zones

Phase 2

Determine vulnerability

Phase 3

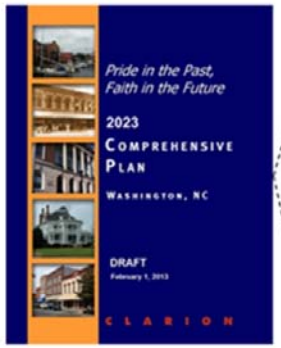
Score plans

Assembling your plans and analyzing them

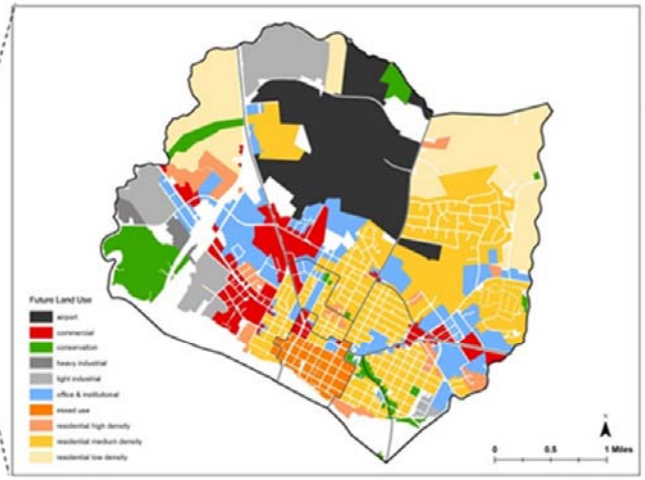
Plan Type	Purpose	Contribution (+/-) to Vulnerability
Comprehensive/General Plan	Main community planning document	Policies can guide future development into or away from hazard zones.
Hazard Mitigation Plan	Reduce long-term risk to human life and infrastructure	Advocates vulnerability reduction and resiliency building, often via general policies or specific "action items"
Disaster Recovery Plan	Address disaster recovery related needs to be activated during recovery	Advocates vulnerability reduction and resiliency building post-disaster. Coordinates agencies to assist people post-disaster.
Area Plans:	Address planning issues pertaining to a portion of the community	Targeted policies may increase or decrease vulnerability, depending on purpose and location. Area plans may also contribute to policy district delineation.
Downtown (Redevelopment)		
Small Area/Neighborhood/ District		
Waterfront		
Corridor Plan		
Functional or Sector-specific Plans:	Focus on individual or related functions or sectors in need of specialized planning	Individual plan policies (or objectives, action items, etc.) may increase or decrease vulnerability, and are often distinct from those found in comp or hazard mitigation plans. Applicability to individual policy district may be aided by additional function/sector maps.
Transportation (or Transit)		
Parks / Open Space		
Economic Development		
Environmental Management		
Climate Adaptation/Mitigation		
Housing (Consolidated/Strategic)		
Wildlife Management		
Wildfire Protection		

Generate lists of applicable policies

- Contain at least one mappable, place-specific term (political area, cultural area, geographic feature, individual building or facility)
- Potentially reduce or increase vulnerability to hazards; and
- Contain a recognizable policy tool, or a form of government intervention to achieve specific objectives and outcomes.



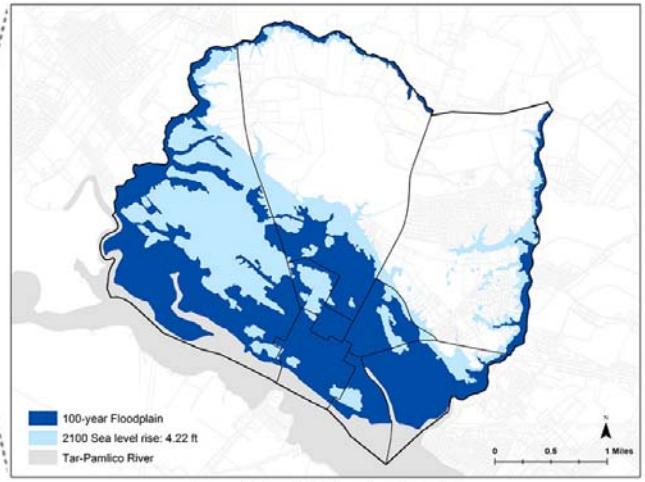
2023 Comprehensive Plan



Future Land Use

Policy 1 Increase and bolster the number of key destinations near the **downtown** and waterfront to provide multiple components and uses catering to different audiences.

Beaufort County Multi-Jurisdictional Hazard Mitigation Plan

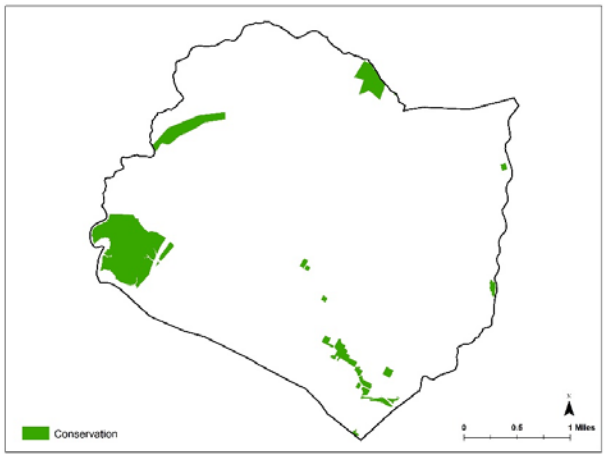


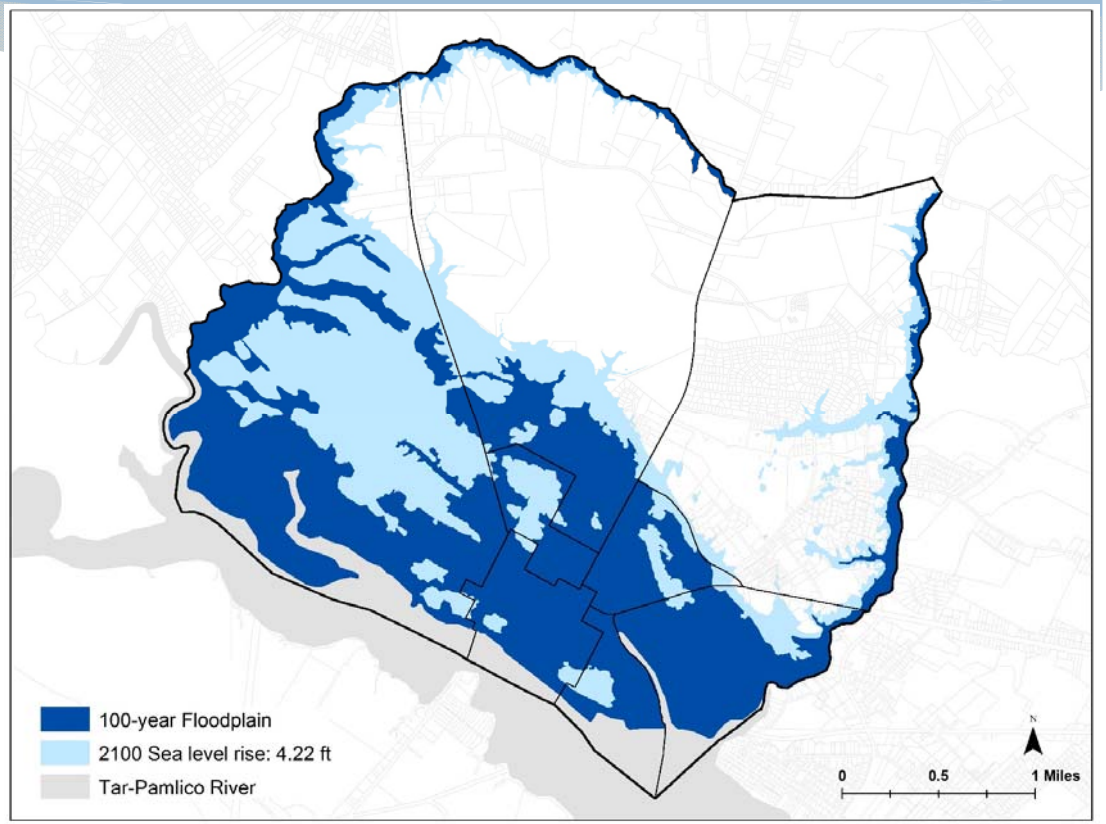
Hazard Zone& Planning District

Policy A Strengthen controls on development within **flood-prone and wetland areas** by improving existing ordinances, such as the erosion and sediment control ordinance, zoning ordinance, subdivision ordinance, flood plain regulations and other development regulations.

Mapping

- Delineate planning districts
- Delineate hazard zones
- Map your 'mappable policies'





Scoring Policies

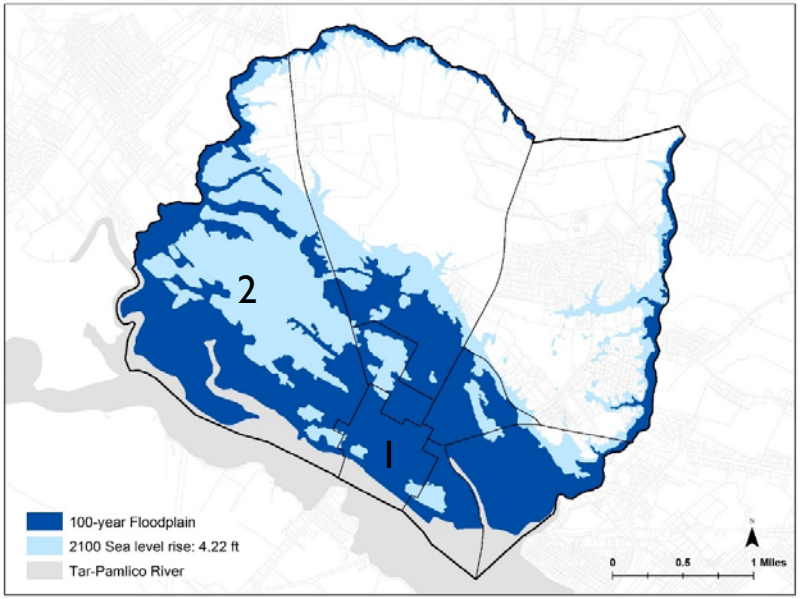
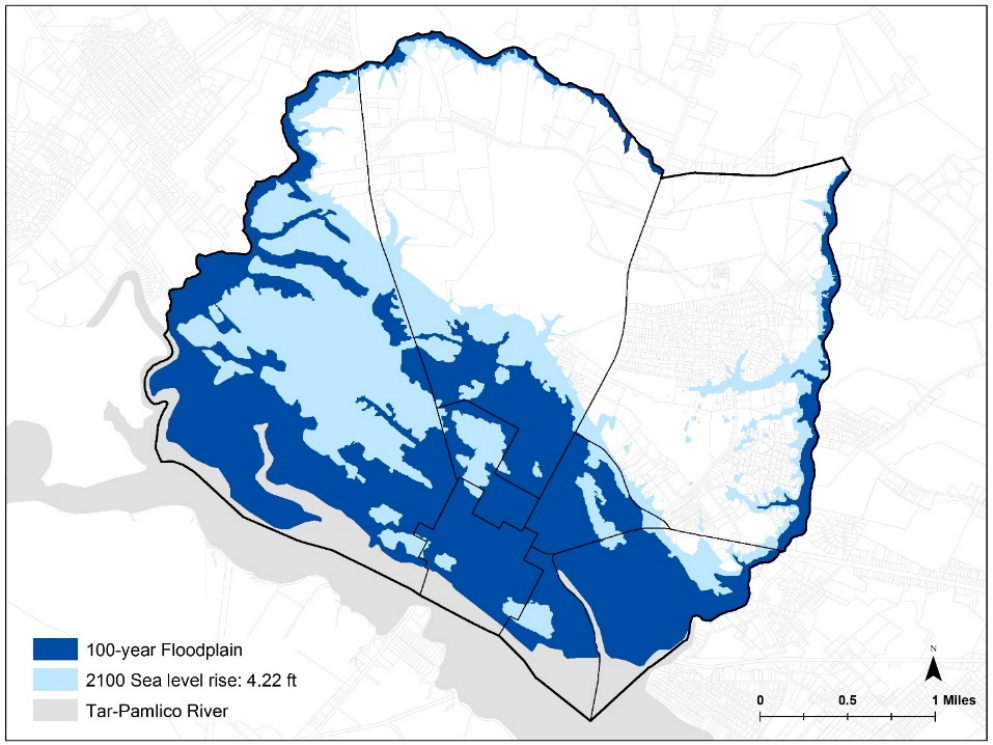


Table 3.1 Example of Portion of Scorecard for Washington, NC.

DEVELOPMENT REGULATIONS	Planning Districts	1	2
Permitted Land Use			
The City of Washington will give priority to the protection of the following shoreline assets… (p.185).	Current Hazard Zone	1	1
	Future Hazard Zone	1	1
The City should discourage development in areas designated for light-density residential use with the exception of low-density residential/agriculture land uses (see Map 21). Because of its current land use patterns, rezoning and amendments to the future land use map should carefully balance with a demonstrated need for such proposed development that will be the overall best management policy for Washington's future land development. (p.189)	Current Hazard Zone		1
	Future Hazard Zone		1
Industrial development which can comply with the use standards specified by 15A NCAC7H, the City of Washington zoning ordinance and state/federal regulations may be located within conservation classified areas. (p. 191)	Current Hazard Zone		-1
	Future Hazard Zone		-1

Scoring Policies



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	Future Hazard Zone		1
Industrial development which can comply with the use standards specified by 15A NCAC7H, the City of Washington zoning ordinance and state/federal regulations may be located within conservation classified areas. (p. 191)	Current Hazard Zone		-1
	Future Hazard Zone		-1
The City supports commercial development at the intersections of major roads (i.e., in a nodal fashion) and in the Central Business District consistent with the City's future land use map. (p.192)	Current Hazard Zone	-1	
	Future Hazard Zone	-1	

Figure 3.2 Scores by district, and hazard zone for Washington, NC for the comprehensive plan.

Development Regulations	Land Policy District:	01	02	03	04	05	06	07	08	TOTAL (ALL LPDs)
Permitted Land Use										
[GOAL] Public facilities and publicly owned lands will be used at their highest and best use, except for those public lands that are in environmentally sensitive locations, where conservation should be the objective. (p. 47)	Current hazard zone		1				1			2
	Future hazard zone		1				1			2
Subdivision Regulations										
Strengthen controls on development within flood-prone and wetland areas by improving existing ordinances, such as the erosion and sediment control ordinance, zoning ordinance, subdivision ordinance, flood plain regulations and other development regulations. (p. 46)	Current hazard zone	1	1			1	1	1	1	6
	Future hazard zone	1	1	1		1	1	1	1	7
Zoning Overlays										
Consider creation of a Conservation Overlay Zoning District to help protect sensitive areas. (p. 42)	Current hazard zone		1				1			2
	Future hazard zone		1				1			2
Increase and bolster the number of key destinations near the downtown and waterfront to provide multiple components and uses catering to different audiences. (p. 38)	Current hazard zone	-1	-1					-1	-1	-4
	Future hazard zone	-1	-1					-1	-1	-4
Seek out opportunities to enhance downtown as a center of arts and cultural resources. Promote efforts to enhance the visibility and use of the historic Turnage Theater. (p44)	Current hazard zone	-1								-1
	Future hazard zone	-1								-1
Policy Category Total	Current hazard zone	-1	2	0	0	1	3	0	0	5
	Future hazard zone	-1	2	1	0	1	3	0	0	6

Ultimately each plan is scored for all planning districts or areas related to increasing or decreasing hazard vulnerability and risk

	Core Land Use (CAMA)		2023 Comprehensive		Hazard Mitigation		Parks & Recreation		*All Four Plans (Combined)*	
District (total score for all policies in district)	100-year Floodplain	SLR	100-year Floodplain	SLR	100-year Floodplain	SLR	100-year Floodplain	SLR	*100-year Floodplain*	*SLR*
District 1 (Downtown)	-4	-7	-6	-6	6	0	0	0	-4	-13
District 2	-1	-4	-3	-3	5	0	0	0	1	-7
District 3	-3	-5	-1	-1	1	0	0	0	-3	-6
District 4	-3	-4	0	0	1	0	0	0	-2	-4
District 5	-1	-4	-1	-1	4	0	0	0	2	-5
District 6	0	-3	-1	-1	5	0	0	0	4	-4
District 7	-2	-5	-3	-3	6	0	0	0	1	-8
District 8	-3	-6	-2	-2	6	0	0	0	1	-8

Figure 3.3 Scores by district, plan, and hazard zone for Washington, NC

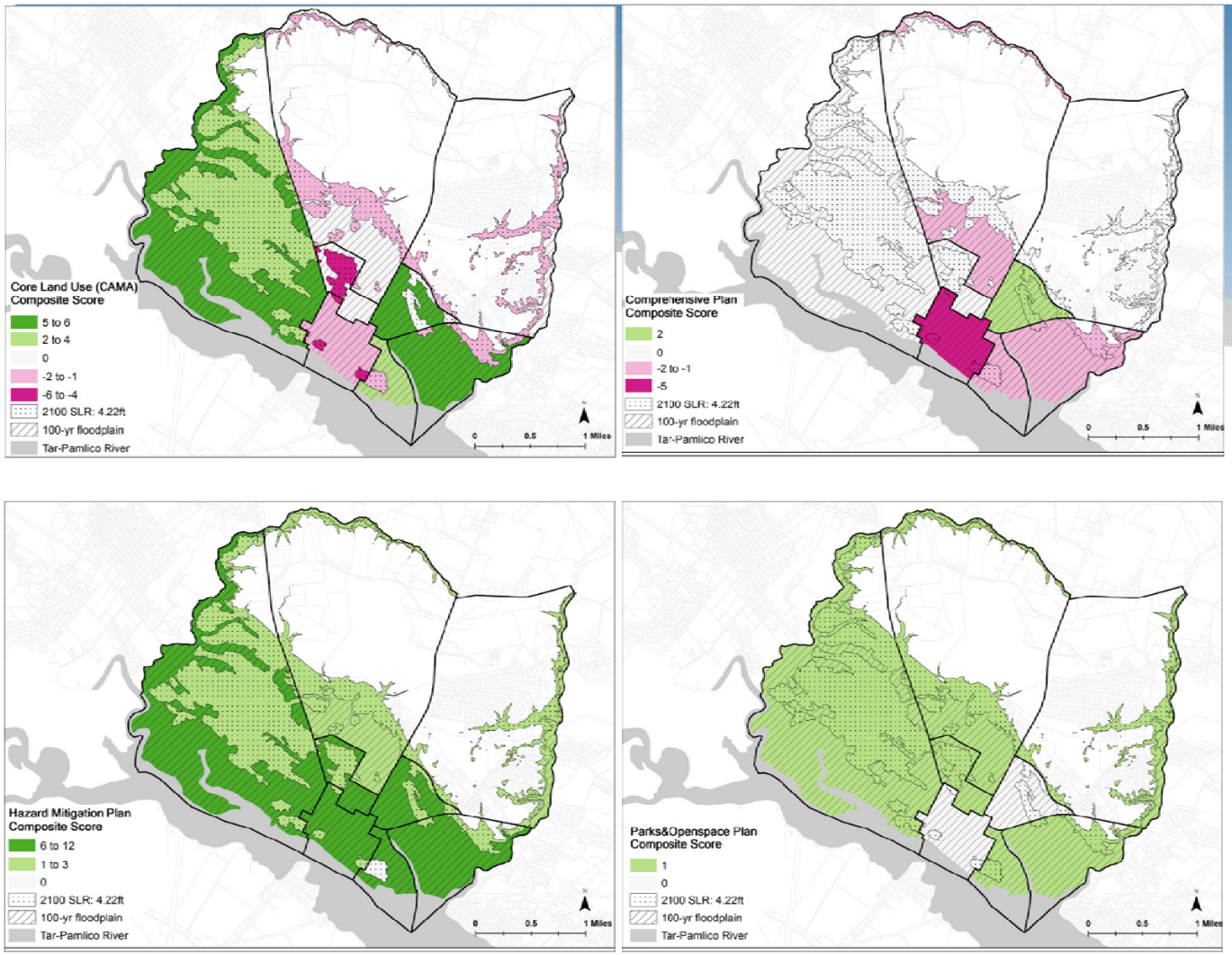


Figure 3.3 Comparing Scores of Different Planning Documents in Washington, NC.

By scoring and then mapping the results we can better understand where individual plans and policies are falling short for our communities.

By Combining scores hot-spots can be identified

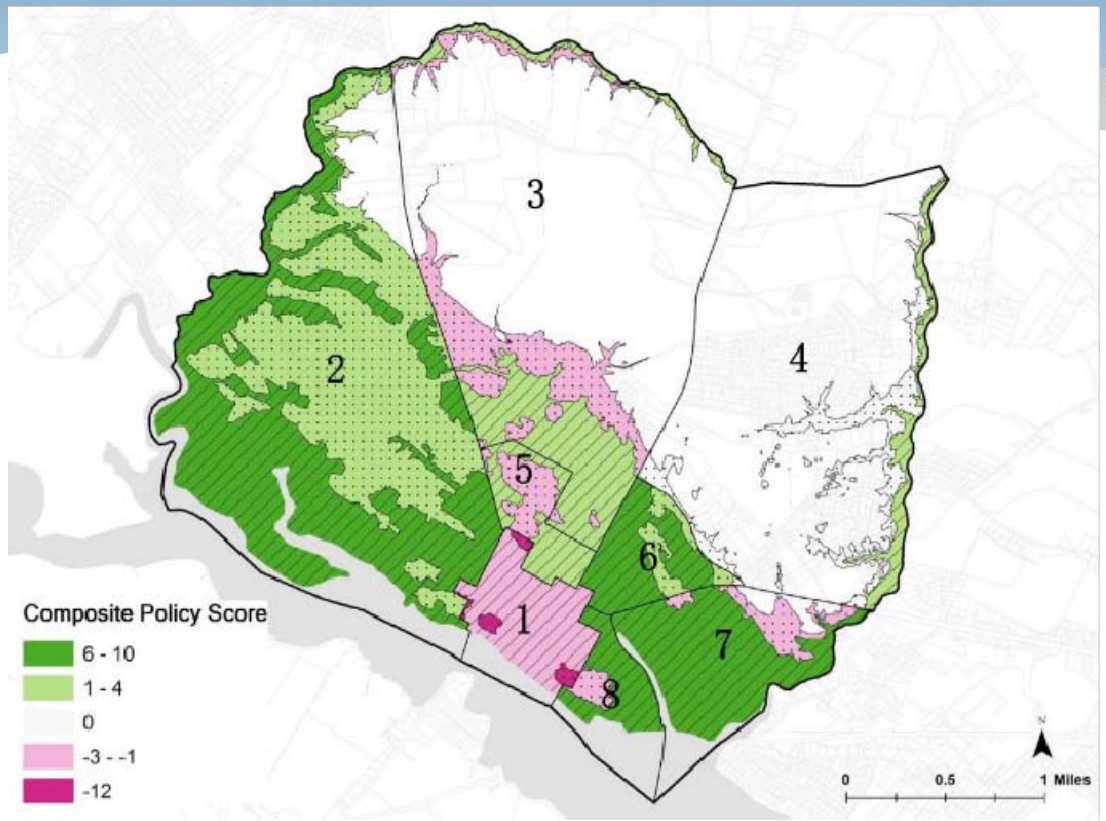
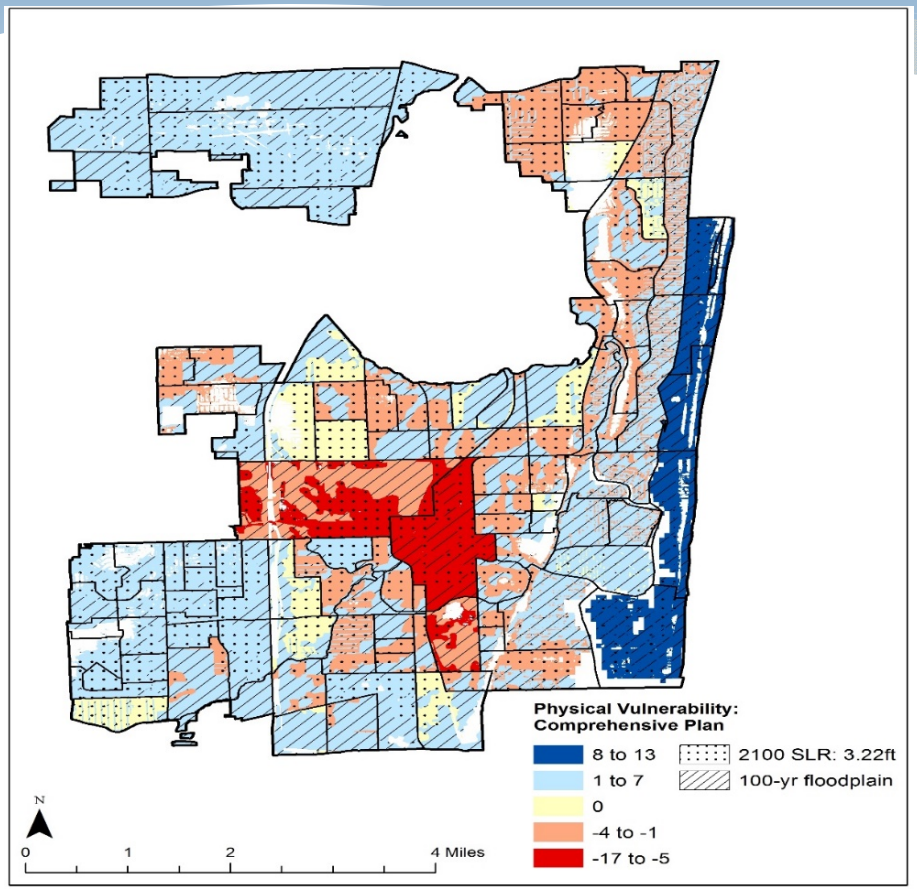


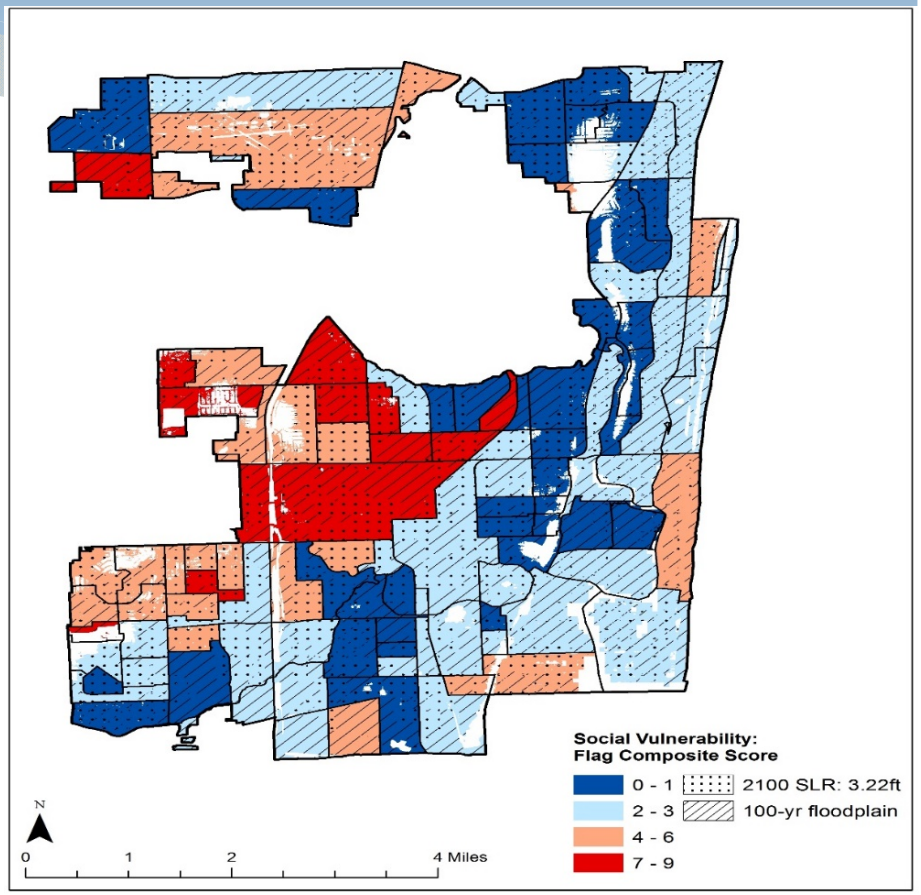
Figure 3.5 Composite score among all plans.

By combining assessments and creating composite scores and mapping these scores, we can better understand where our network of plans are inconsistent and potentially failing to make our communities more resilient.

Vulnerability

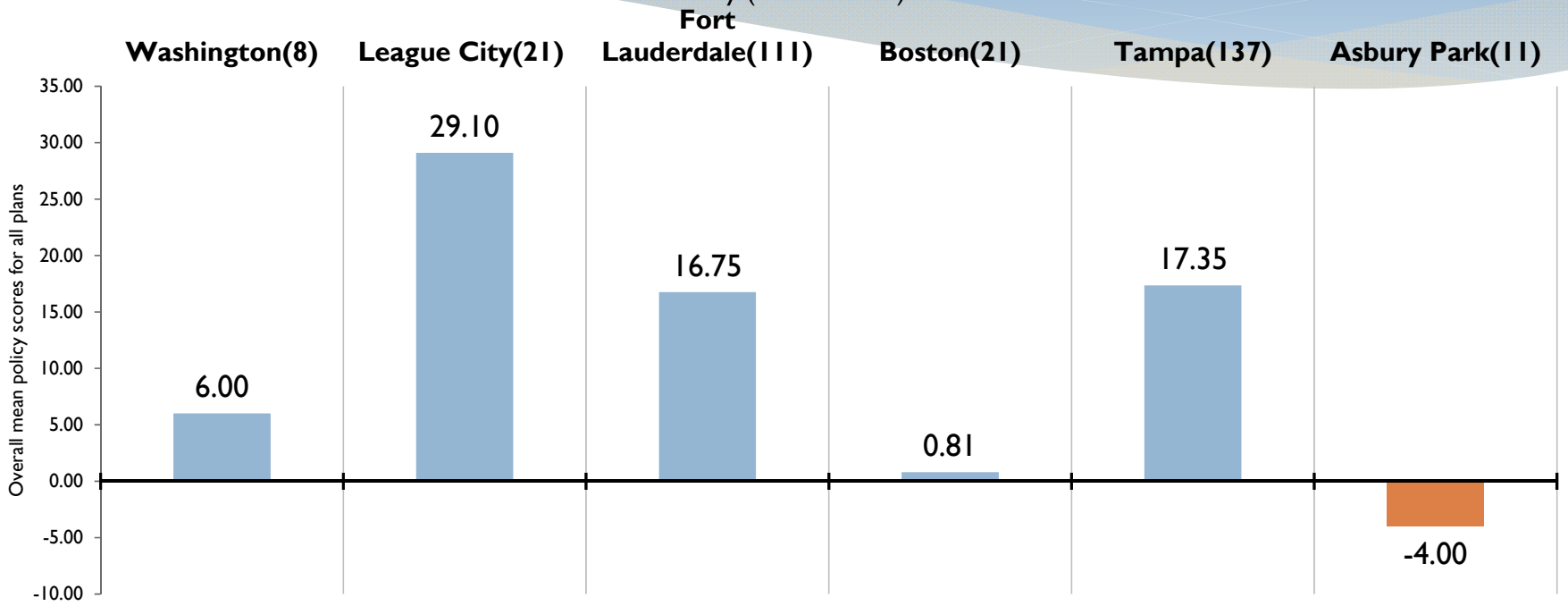
- Assess physical vulnerability
- Assess social vulnerability





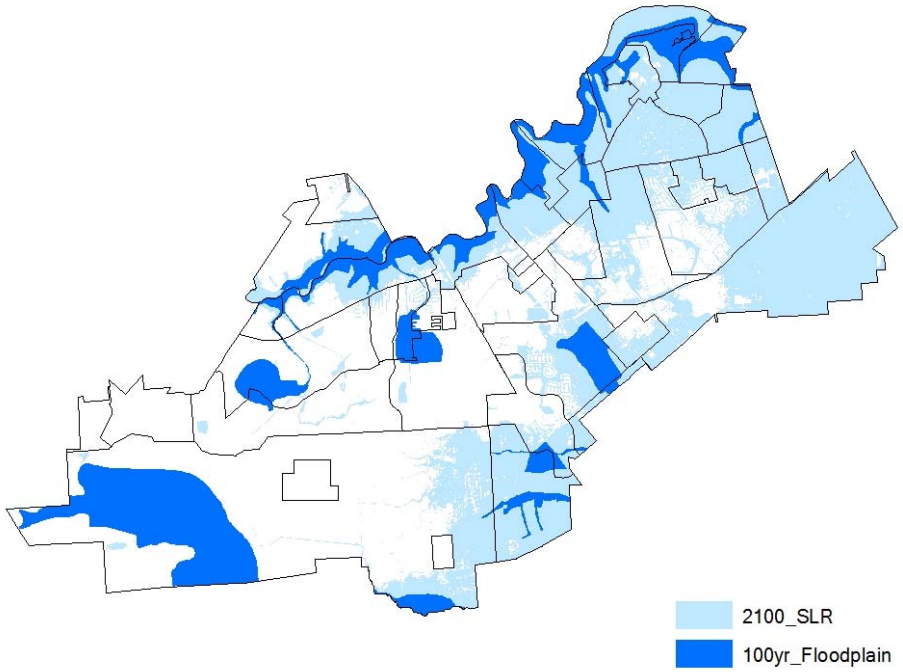
Stories & Case Studies

Total Policy Scores for Plans in Six Cities (100-year floodplain)



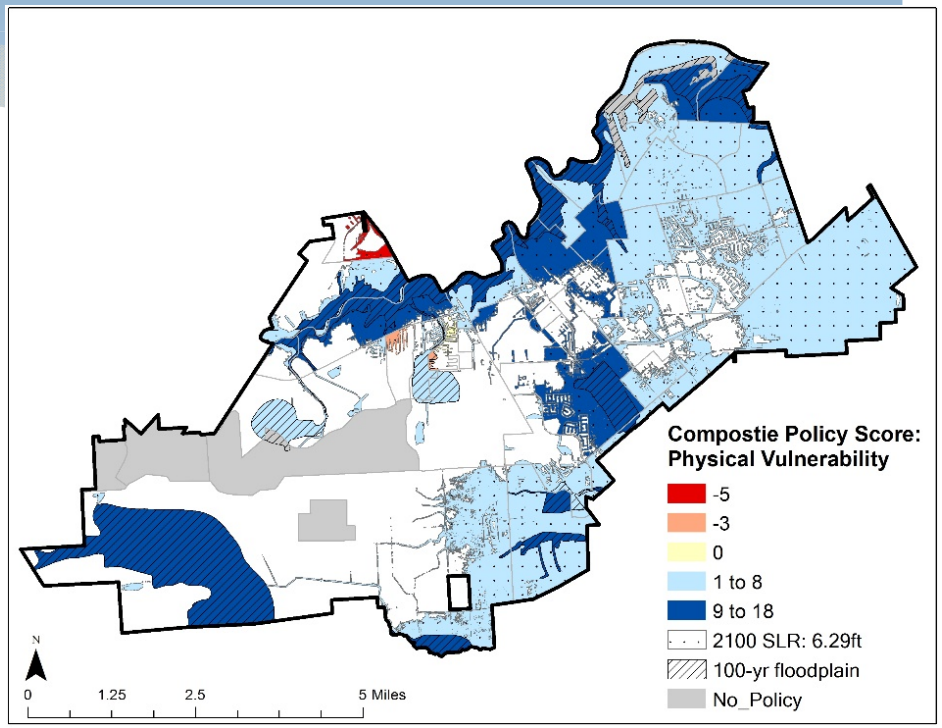
League City, TX

* Four major flood events since 2000
* Rapidly growing with a population increase from 83,500 in 2010 to a projected 228,000 in 2040
* 4,730 acres (15% of the city's total land area) is in the 100-year floodplain mostly due to the Clear Creek riparian area
  * 496 acres public park land and conservation areas
  * 4,234 acres privately owned
    * 57% is undeveloped

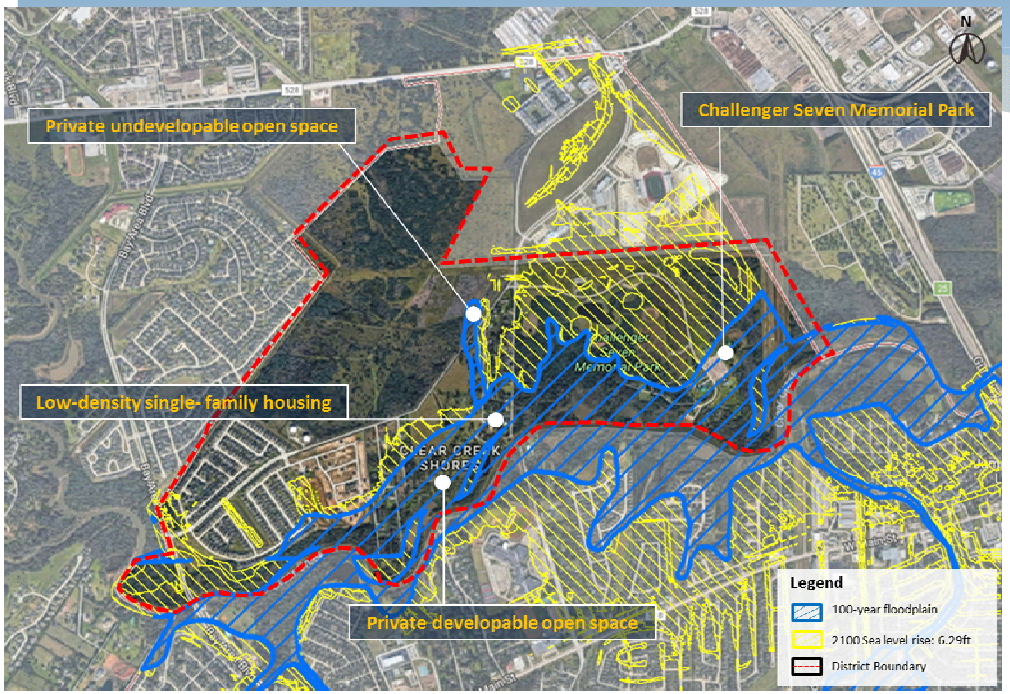


League City, TX

* All plans include similar hazard goals involving protection of people and structures through sound development and/or environmental practices that support flood mitigation
* The comprehensive plan, mitigation plan, and parks plan contain the city's future land use map to guide future new development and redevelopment



Innovative Policies in Low Vulnerability Areas



- Land use regulations that limit new development
  - Comp plan: Floodplain buffer regulations to preserve riparian areas
  - Subdivision Regs: cluster development and low density standards dedicating natural areas in floodplains
- Land acquisition in proposed conservation areas
  - Funds targeted toward repetitive loss areas, wetlands, etc. for parks and recreation use
- Public facility investments for storm water
  - Low impact design technologies (i.e. rain gardens, bio-swales, retention/detention)
  - Government buildings and special needs facilities prohibited in floodplains
- Development limits tied to evacuation times
  - Density limit standards

Recommendations for further alignment

* Guide new development toward un(der)developed upland areas;
* Stronger focus on high vulnerability areas
* Increase density allowances in upland areas and reduce them in the floodplain, possibly using TOD to help facilitate this 'density swap';
* Land acquisition of 'pockets' of most vulnerable areas of buffer zones surrounding them;
* Revegetate hazard and buffer zones to increase water retention, add retention/detention ponds (which also act as amenities)

The Guidebook

- Advisory Board
  - Chad Berginnis, CFM- Association of State Floodplain Managers
  - Darrin Punchard, AICP, CFM- Punchard Consulting
  - Matt Campbell- FEMA
  - Gavin Smith, PhD- US Department of Homeland Security's Coastal Resilience Center of Excellence, Director
  - Jennifer Ellison- City of Urbandale, Community Development Director
  - Allison Hardin, CFM- City of Myrtle Beach, Planner and Coastal Hazards Education Specialist
  - Michele Steinberg, National Fire Protection Association, Wildfire
  - Rich Roths- URS Corporation
  - Barry Hokanson, AICP- PLN Associates, President of the American Planning Association Hazard Mitigation and Disaster Recovery Division (APA-HMDR)
- Pilot Communities
  - Norfolk, VA
  - League City, TX
  - San Luis Obispo, CA
- Link for Draft Guidebook: http://ifsc.tamu.edu/getattachment/News/July-2017/Plan-Integration-for-Resilience-Scorecard-Guideboo/Scorecard-(1).pdf.aspx

What's Next for the Scorecard

Outreach

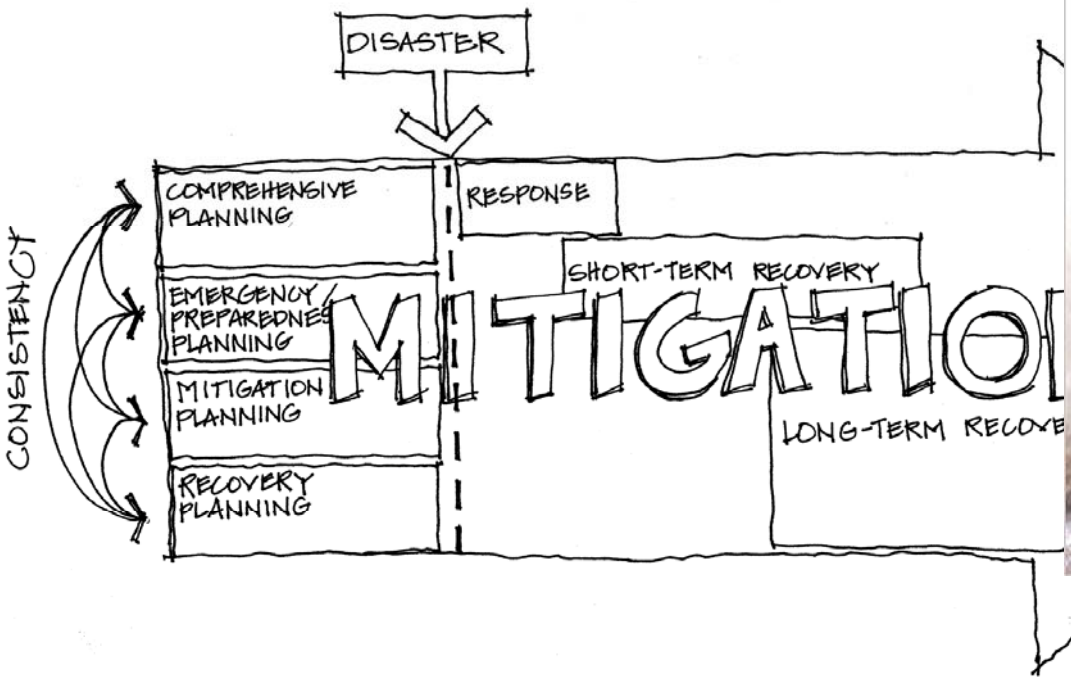
* APA include scorecard in best practice standards
  * Incorporating into PAS 578
* ASFPM network
* National Hurricane Conference 2017
* American Planning Association Conference 2017
* Folding into National Institute for Science and Technology (NIST)
* FEMA require scorecard for mitigation planning and climate change

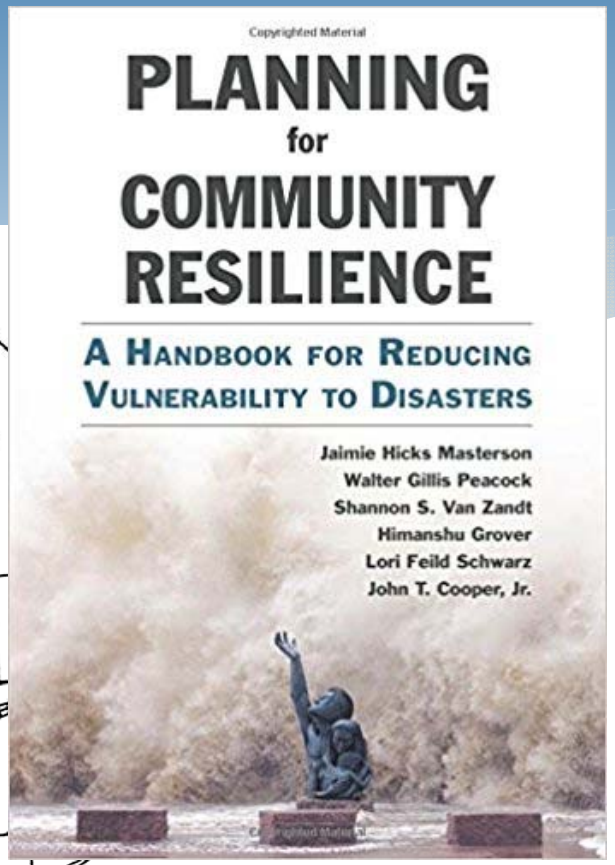
Current Applications

* Rotterdam, Netherlands
* Norfolk, VA; League City, TX; San Luis Obispo, CA
* Rockefeller Foundation 100 Resilient Cities

Interactive website

* mitigationguide.org
* planningforhazards.com

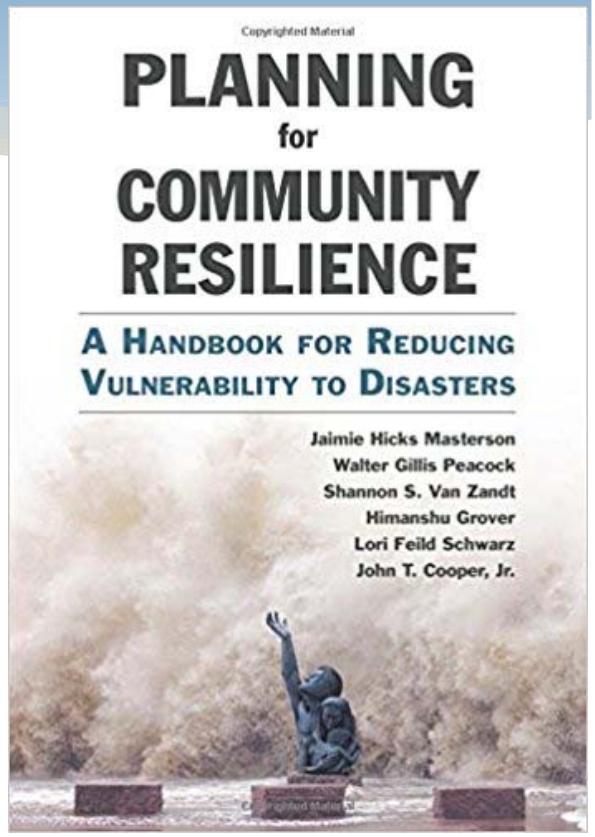




Modified from Schwab, 1998; Lindell, Prater, and Perry, 2007

Web Sources at Texas A&M University

- Hazard Reduction and Recovery Center: http://hrrc.arch.tamu.edu/
  - Texas Atlas: http://texasatlas.arch.tamu.edu/fv/texas_atlas/
  - Texas Coastal Atlas: http://texasatlas.arch.tamu.edu/fv/coastal_atlas/
  - South Texas Hurricane Study Atlas: http://texasatlas.arch.tamu.edu/fv/rgv_hes/
  - Hazard Mitigation Planning: beyond the basics: http://mitigationguide.org/
- Institute for Sustainable Communities: http://ifsc.tamu.edu/
- Texas Target Communities: https://ttc.arch.tamu.edu/
- Department of Landscape Architecture and Urban Planning: http://laup.arch.tamu.edu/



Readings:

Beatley, T., Brower, D. J., & Schwab, A. K. (2002). *An introduction to coastal zone management* (2nd ed.). Washington, D.C.: Island Press.

Berke, P. R. (1998). Reducing natural hazard risks through state growth management. *Journal of the American Planning Association, 64*(1), 76-87.

Berke, P. R., Backhurst, M., Laurian, L., Crawford, J., & Dixon, J. (2006). What makes plan implementation successful? An evaluation of local plans and implementation practices in New Zealand. Environment and Planning B: Planning and Design 33(4): 581-600.

* Berke, P., & French, S. (1994). The influence of state planning mandates on local plan quality. *Journal of Planning Education and Research, 13*(4), 237.
* Berke, P. R., & Roenigk, D. J. (1996). Enhancing plan quality: Evaluating the role of state planning mandates for natural hazard. *Journal of Environmental Planning & Management, 39*(1), 79.
* Berke, P., Crawford, J., Dixon, J., &Erickson, N. (1999). Do cooperative environmental planning mandates produce good plans? Empirical results from the New Zealand experience. *Environment and planning B, 26*, 643-664.
* Berke, P. R., Backhurst, M., Laurian, L., Crawford, J., and Dixon, J. (2006). What makes plan implementation successful? An evaluation of local plans and implementation practices in New Zealand. *Environment and Planning B: Planning and Design* 33 (4): 581-600.
* Berke, P. R., & Campanella, T. J. (2006). Planning for post disaster resiliency. *The Annals of the American Academy of Political and Social Science, 604*(1), 192.
* Blaikie, P. Cannon, T. Davis, I. and Wisner, B. 1994. *At Risk: Natural Hazards, People's Vulnerability and Disasters.* London: Routledge.
* Blake, E. S., &Gibney, E. J. (2011). *The deadliest, costliest, and most intense United States tropical cyclones from 1851 to 2006 (and other frequently requested hurricane facts)*. Miami, FL: NOAA/National Weather Service, National Centers for Environmental Prediction, National Hurricane Center.
* Bluestein, F. S. 2006. Do North Carolina local governments need home rule? *North Carolina Law Review* 84: 1983–2029.
* Boruff, B. J., Emrich, C., & Cutter, S. L. (2009). Erosion hazard vulnerability of us coastal counties. *Journal of Coastal Research, 21*(5), 932-842.
* Brody, S. D., & Highfield, W. E. (2005). Does planning work? : Testing the implementation of local environmental planning in Florida. *Journal of the American Planning Association, 71*(2), 159-175.
* Brody. S.D., W. E. Highfield, and JE Kang. 2011. Rising Waters: The Causes and Consequences of Flooding in the United States. New York: Cambridge University Press.
* Brody, S., Zahran, S., Highfield, W., Grover, H., &Vedlitz, A. (2008). Identifying the impact of the built environment on flood damage in Texas. *Disasters, 32*(1), 1-18.
* Brody, S.D., Z. Sahran, SP Bernhardt, and JE Kang (2009) Evaluating local Food mitigation strategies in Teas and Florida. Build Environment 35(4), 492-515.
* Brody, S. D., Kang, J. E., & Bernhardt, S. (2010). Identifying factors influencing flood mitigation at the local level in Texas and Florida: the role of organizational capacity. *Natural hazards, 52*(1), 167-184.
* Burby, R. J. (1998). *Cooperating with nature: Confronting natural hazards with land-use planning for sustainable communities*. Washington D.C.: National Academies Press.
* Burby, R. J. (2001). Flood insurance and floodplain management: the US experience. *Global Environmental Change Part B: Environmental Hazards, 3*(3-4), 111-122.
* Burby, R.J. (2003). Making Plans That Matter: Citizen Involvement and Government Action. *Journal of the American Planning Association, 69*(1), 33-50.
* Burby, R. J., & Dalton, L. C. (1994). Plans can matter! The role of land use plans and state planning mandates in limiting the development of hazardous areas. *Public administration review, 54*(3), 229-238.
* Burby, R., & May, P. (1997). *Making governments plan: State experiments in managing land use*: Johns Hopkins University Press.
* Burby, R., & May, P. (1998). Intergovernmental Environmental Planning: Addressing the Commitment Conundrum. *Journal of Environmental Planning and Management, 41*(1), 95-110.
* Burby, R., & May, P. (1999). Making building codes and effective tool for earthquake hazard mitigation. *Environmental hazards* 1:27-37.
* Burby, R., Berke, P., Dalton, L., DeGrove, J., French, S., Kaiser, E., and Roenigk, D. (1993). Is State-Mandated Planning Effective? *Land Use Law and Zoning Digest, 45*(10), 3-9.
* Crossett, K., Culliton, T., Wiley, P., &Goodspeed, T. (2004). Population trends along the coastal United States. 1980-2008. Coastal trends report series. NOAA, National Ocean Service. *Management and Budget Office, Special Projects*. Retrieved March 28, 2011 from http://oceanservice.noaa.gov/programs/mb/pdfs/coastal_pop_trends_complete.pdf
* Couper, M. P., Traugott, M. W., & Lamias, M. J. (2001). Web survey design and administration. *Public opinion quarterly, 65*(2), 230.
* Crossett, K. M., Culliton, T. J., Wiley, P. C., &Goodspeed, T. R. (2004). Population trend along the coastal United States: 1980-2008. Retrieved April 15, 2011, from www.oceanservice.noaa.gov.
* Cutter, S. L., B. J. Boruff, and W.L. Shirley. 2003. Social Vulnerability to Environmental Hazards. Social Science Quarterly 84: 242-261.
* Dalton, L. C., &Burby, R. J. (1994). Mandates, plans, and planners. *Journal of the American Planning Association,* 60(4), 444.
* Daniels, T., & Daniels, K. (2003). *The environmental planning handbook: for sustainable communities and regions*. Chicago, Ill: American Planning Association.
* Deyle, R. E., Chapin, T. S., & Baker, E. J. (2008). The Proof of the Planning Is in the Platting: An Evaluation of Florida's Hurricane Exposure Mitigation Planning Mandate. *Journal of the American Planning Association, 74*(3), 349-370.
* Deyle, R. E., French, S. P., Olshansky, R. B., & Paterson, R. G. (1998). Hazard assessment: The factual basis for planning and mitigation. Pages 119-166 in R. J. Burby, *Cooperating with nature: confronting natural hazards with land-use planning for sustainable communities.* Washington, D.C.: National Academies Press.
* Dillman, D. A., Smyth, J.D. and Christian, L.M. (2008). *Internet, Mail, and Mixed-Mode Survey*. New York: John Wiley & Sons, Inc.
* FEMA (2011). Fact sheet: Mitigation Value to Society. Retrieved August 18, 2011, from http://www.fema.gov/pdf/media/factsheets/2011/mit_value.pdf
* Fieock, R.C, A. F. Tavares, and M. Lubell. 2008. Policy Instruments Choices for Growth Management and Land Use Regulation. *Policy Studies Journal* 36(3): 461-80.
* Ge, Y., Peacock, W. G., & Lindell, M. K. (2011). Florida households' expected responses to hurricane hazard mitigation incentives. *Risk analysis,* 31(10), 1676.
* Godschalk, D., Beatley, T., & Berke, P. (1998). *Natural hazard mitigation: Recasting disaster policy and planning*. Washington, D.C.: Island Press.
* Godschalk, D. R., Beatley, T., Berke, P. R., Brower, D., & Kaiser, E. J. (1999). *Natural hazard mitigation: Recasting disaster policy and planning*. Washington, D.C.: Island Press.
* Godschalk, D. R., Brower, D. J., & Beatley, T. (1989). *Catastrophic coastal storms: Hazard mitigation and development management*. Durham, NC: Duke University Press
* Godschalk, D. R., Norton, R., Richardson, C., & Salvesen, D. (2000). Avoiding coastal hazard areas: Best state mitigation practices. *Environmental Geosciences, 7*(1), 13-22.
* Heinz, H. (1999). *The hidden costs of coastal hazards: Implications for risk assessment and mitigation*: Island Press.
* Henstra, D., & McBean, G. (2004). The role of government in services for natural disaster mitigation. *Institute for Catastrophic Loss Reduction Research Paper Series.*
* Husein, Rahmawati. 2012. *Examining Local Jurisdictions' capacity and commitment for hazard mitigation policies and strategies along the Texas Coast.* Dissertation. Texas A&M University.

Readings continued

Hyndman, D., & Hyndman, D. (2006). *Natural hazards and disasters*: Cengage Learning.

Klee, G. (1999). *The coastal environment: Toward integrated coastal and marine sanctuary management*: Prentice-Hall, Inc.

Krane, D., Rigos, N. & Hill, B., Jr. (2001) *Home Rule in America: A Fifty-state Handbook*, Washington, D.C.: CQ Press.

* Lindell, M. K., & Perry, R. W. (2000). Household adjustment to earthquake hazard. *Environment and Behavior, 32*(4), 461.
* Lindell, M., Prater, C., & Perry, R. (2006). Fundamentals of emergency management. *Emmitsburg MD: Federal Emergency Management Agency Emergency Management Institute.[Available at training. fema. gov/EMIWeb/edu/fem. asp]*.
* May, P. (1993). Mandate design and implementation: Enhancing implementation efforts and shaping regulatory styles. *Journal of Policy Analysis and Management, 12*(4), 634-663.
* May, P. J., &Deyle, R. E. (1998).Governing land use in hazardous areas with a patchwork system. *Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities*, 57-84.
* Norton, R. K. (2005a). More and Better Local Planning. *Journal of the American Planning Association, 71*(1), 55-71.
* Norton, R. K. (2005b). Local Commitment to State-Mandated Planning in Coastal North Carolina. *Journal of Planning Education and Research, 25*(2), 149-171.
* Olshansky, R. B., &Kartez, J. D. (1998). Managing land use to build resilience. *Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities*, 167-202.
* Peacock, W. G. (2003). Hurricane mitigation status and factors influencing mitigation status among Florida's single-family homeowners. *Natural Hazards Review, 4*, 149.
* Peacock, W. G., Kang, J. E., Husein, R., Burns, G. R., Prater, C., Brody, S., & Kennedy, T. (2009). *An Assessment of Coastal Zone Hazard Mitigation Plans in Texas*. College Station: Hazard Reduction and Recovery Center, Texas A&M University. http://archone.tamu.edu/hrrc/Publications/researchreports/Downloads/09-01R_An_assessment_of_CZ_Haz_Mit_Plans_January_11,_2009.pdf
* Peacock, Walter Gillis, Samuel D. Brody, Himanshu Grover, Douglas Wunneburger, Samuel Brody, Shannon Van Zandt, Rahmawati Husein*, Hee Ju Kim*, Forster Ndubisi, and June Martin. 2011. *Status and Trends of Coastal Vulnerability to Natural Hazards Project Annual Report for Phase 4*. Report submitted to the Texas General Land Office and the National Oceanic and Atmospheric Administration under GLO Contract No. 10-059-000-3758 and to the Coastal Coordination Council pursuant to National Oceanic and Atmospheric Administration Award No. NA09NOS4190165. College Station, Texas: Hazard Reduction and Recovery Center.
* Peacock, Walter Gillis and Rahmawati Husein. 2011. The Adoption and Implementation of Hazard Mitigation Policies and Strategies by Coastal Jurisdictions in Texas: The Planning Survey Results. Report submitted to the Texas General Land Office and the National Oceanic and Atmospheric Administration under GLO Contract No. 10-059-000-3758 and to the Coastal Coordination Council pursuant to National Oceanic and Atmospheric Administration Award No. NA09NOS4190165. College Station, Texas: Hazard Reduction and Recovery Center.
* Richardson, J.J. 2011. Dillon's Rule is From Mars, Home Rule is From Venus: Local Government Autonomy and the Rules of Statutory Construction. *Publius,* 41(4)662-685.
* Richardson, J.J., M. Z. Gough, and R. Puentes. 2003. *Is Home Rule the Answer? Clarifying the Influence of Dillion Rule on Growth Management.* Washington D.C. The Bookings Institution.
* Rovins, J. E. (2009). *Effective Hazard Mitigation: Are Local Mitigation Strategies Getting the Job Done?* FEMA. Retrieved from http://training.fema.gov
* Saenz, R. and WG Peacock. 2006. Rural People, Rural Places: The Hidden Costs of Hurricane Katrina. *Rural Realities* 1(2):1-11.
* Salvino, R. F. 2007. *Home rule, Selectivity and Overlapping Jurisdictions: Effects on State and Local Government Size*. Andrew Young School of Policy Studies, Georgia State University. Dissertation. http://digitalarchive.gsu.edu/econ_diss/46
* Salvino, R. 2007. Home Rule Effects on State and Local Government Size. Andrew Young School of Policy Studies, Georgia State University, Working Paper no. 701.
* Schwab, J. (2010). Hazard mitigation: Integrating best practices into planning. *Planning Advisory Service Report, 560*.
* Schwab, A., Eschelbach, K., & Brower, D. (2007). *Hazard mitigation and preparedness*. Danvers, MA: Wiley.
* Sigma (2011). The ten most costly world insurance losses, 1970-2010. Retrieved on April 25, 2011 from http://www.swissre.com/sigma.
* Sills, S. J., & Song, C. (2002). Innovations in survey research. *Social science computer review, 20*(1), 22-30.
* Slotterback, C. S. (2008). Evaluating the implementation of environmental review mitigation in local planning and development processes. *Environmental Impact Assessment Review, 28*(8), 546-561.
* Tang, Z. (2008). Evaluating local coastal zone land use planning capacities in California. *Ocean and Coastal Management, 51*(7), 544-555.
* Tang, Z. (2009). How are California local jurisdictions incorporating a strategic environmental assessment in local comprehensive land use plans? *Local Environment, 14*(4), 313-328.
* Tang, Z., Lindell, M. K., Prater, C. S., & Brody, S. D. (2008). Measuring Tsunami planning capacity on US Pacific coast. *Natural Hazards Review, 9*, 91.
* Tang, Z., Lindell, M. K., Prater, C., Wei, T., & Hussey, C. M. (2011). Examining Local Coastal Zone Management Capacity in US Pacific Coastal Counties. *Coastal Management, 39*(2), 105-132.
* Turnbull, G. K. and G. Geon. 2006. Local Government Internal Structure, External Constraints, and the Median Voter. *Public Choice,* 129:487-506.
* White, G. F., R. W. Kates, and I. Burton. 2001. Knowing better and losing even more: The Use of Knowledge in Hazards Management. *Environmental Hazards* 3:81-92.
* Williams, A., &Micallef, A. (2009). *Beach Management: Principles and Practice*. Sterling, VA: Earthscan.
* Wilson, J. P. (2009). Policy Actions of Texas Gulf Coast Cities to Mitigate Hurricane Damage: Perspectives of City Officials. *Applied Research Projects*, 312. http://ecommons.txstate.edu/arp/312
* Wolman, H., R. McManmon, M. Bell, and D. Brunori. 2010. Comparing local government autonomy across states. In The property tax and local autonomy, ed. Michael E. Bell, David Brunori, and Joan Youngman. 69–114. Cambridge, Massachusetts: Lincoln Institute of Land Policy.
* Wood, C. 2011. Exploring the Determinants of the Empowered U.S. Municipality. *State and Local Government Review*, 43(2):123-139.
* Wood, C. 2010. Understanding the Consequences of Municipal Discretion. *The American Review of Public Administration*, 41(4):411-427.
* Zimmerman, J.F. 1981. *Measuring local discretionary Authority.* Washington D.C.: U.S. Advisory Commission on Intergovernmental Relations.
* Zimmerman J. F. 1995. *State-local relations: A partnership approach* (2nd ed.). New York: Praeger.