Methods, Tools, and Data for Coastal System Resilience Assessments

Overview (1 of 2)

- Types of Assessments: Top-Down (T), Bottom-Up (B)
- Examples of Tools (for additional discussion, see handout)
  - T: Baseline Resilience Indicators for Communities (BRIC)
  - T: SoVI® – Social Vulnerability Index
  - T: Regional Capacity Index (RCI)
  - B: Coastal Resilience Index (CRI)
  - B: Maryland's CoastSmart Communities Report Card
  - B: Communities Advancing Resilience Toolkit (CART)
  - More…*only a snapshot of the many tools available, with more being developed daily*

Overview (2 of 2)

- Data and Resources
  - Coastal Resilience Tool – The Nature Conservancy
  - Sea Level Rise Viewer – NOAA
  - Coastal Vulnerability Index – USGS
  - State of the Coast; NOAA Digital Coast - NOAA
- Discussion & Review

Assessments: Bottom-Up vs. Top-Down

Bottom-Up

- Community-Generated
- Utilize local knowledge, expert elicitation, anecdotal information
- Hazard-specific
- Intended for communities to identify vulnerabilities and build capacity
- Subjective - not transferrable

Top-Down

- Externally-Generated
- Utilize regional and national data
- Hazard-independent
- Intended to intercompare regions, address policy
- Objective, although data may be arbitrarily weighted in an index

Examples: Top-Down (T) and Bottom-Up (B)

Top-Down

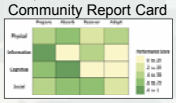
BRIC – Univ of South Carolina

ASCE's Infrastructure Report Card

Bottom-Up

Sea Grant's Coastal Resilience Index

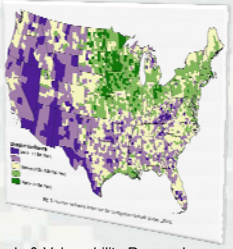
Maryland's CoastSmart Community Report Card



USACE's Resilience Matrix

T: Baseline Resilience Index for Communities (BRIC)

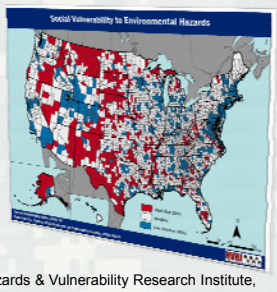
- Considers 6 categories using publically-available data: infrastructure, ecosystems, institutions; economic, social, and community capacity
- Hazard-independent
- Categories can be viewed independently or weighted and summed for an index; values will vary depending on spatial extent



Hazards & Vulnerability Research Institute, University of South Carolina
http://webra.cas.sc.edu/hvri

T: Social Vulnerability Index (SoVI®)

- Social vulnerability to environmental hazards
- County-level data
  - For policy makers and practitioners
  - Capacity for preparedness, response, and recovery from a disaster
- 29 socioeconomic variables; primarily US Census



Hazards & Vulnerability Research Institute, University of South Carolina
http://webra.cas.sc.edu/hvri/products/sovi.aspx

T:Resilience Capacity Index (RCI) for Metropolitan Areas

University at Buffalo Regional Institute, State University of New York
http://brr.berkeley.edu/rci/data/ranking

- Single index based on 12 publically-available factors for 360 metropolitan areas
- Deviation from national metropolitan average provides relative score
  - Low standard deviation = low RCI; High dev= high RCI
- Hazard-independent

B: Coastal Resilience Index (Sea Grant)

- Self-assessment for community leaders
  - Facilitated by Sea Grant
- 8 pages, 6 sections (critical facilities and infrastructure, transportation issues, community plans and agreements, mitigation measures, business plans and social systems)
- Considers past & future storms
- Based on number of 'yes' answers, can calculate a Resilience Index

Mississippi – Alabama Sea Grant Consortium; Sempier et al. (2010)
http://masgc.org/coastal-storms-program/resilience-index

B: Maryland's CoastSmart Community Report Card: http://www.dnr.maryland.gov/coastsmart

- Community self-assessment
  - Local officials in group setting
  - Hazards: coastal storms, flooding, storm surge, and sea level rise
  - Facilitated by CoastSmart planner
  - Not used for comparison/ranking of communities
  - Rating based on yes answers
- Facilitates awareness of
  - Strengths & weaknesses
  - Vulnerabilities & risks
  - Next steps to increase resilience

B: Communities Advancing Resilience Toolkit (CART)

- Community surveys, group meetings, strategy development & implementation
  - Connection and caring (support systems, equity, diversity)
  - Resources (natural, physical, financial, human, social)
  - Potential for transformation (data, assets, skills)
- Not intended to intercompare or rank communities

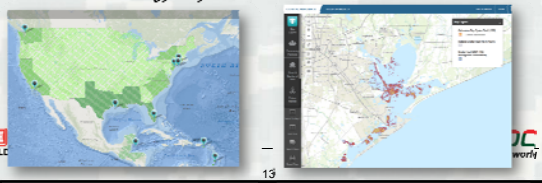
University of Missouri, Terrorism and Disaster Center, National Child Traumatic Stress Network http://www.oumedicine.com/psychiatry/research/terrorism-and-disaster-center/interventions/community-resilience-(cr)

Data and Resources

- Need information to help assess preparedness and ability to absorb impact, recover, and adapt

Coastal Resilience Tool – The Nature Conservancy http://coastalresilience.org/

- Online geoportal with natural resource, storm and related process data; selected locations (see map lower left)
  - Oyster restoration, habitat, species, bathymetry, salinity, management, social, economic, and built infrastructure information – a "must" to explore for your region!
  - Only a portion of the Tool's resources are discussed herein
  - We will use part of the Tool during the breakout
  - *Note: Terminology may differ from definitions herein*



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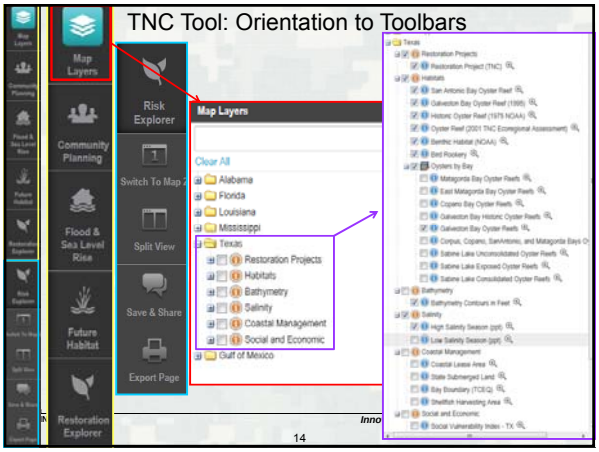
TNC Tool: Orientation to Toolbars



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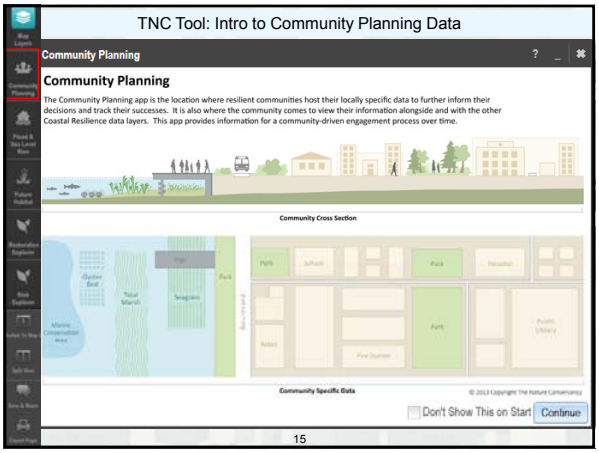
TNC Tool: Intro to Community Planning Data



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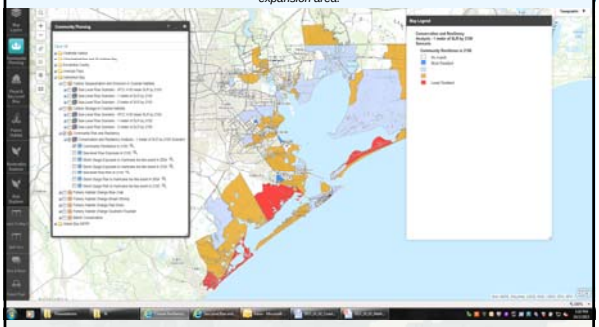
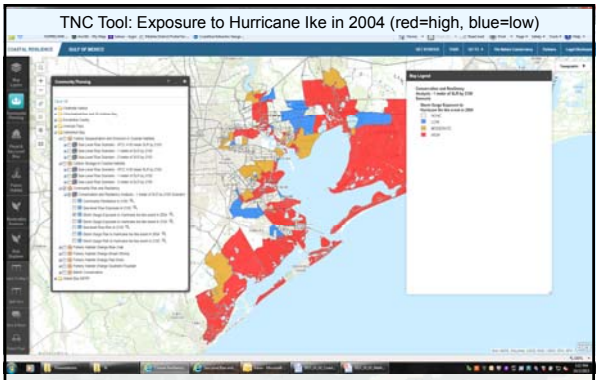
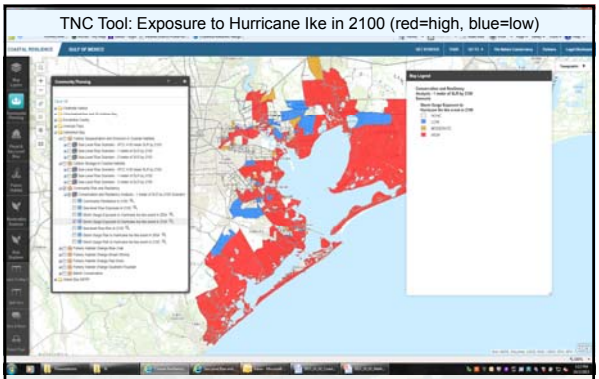
TNC Tool: Community Resilience in 2100 (red least, blue most resilient). *Greater resiliency for those areas with: lower vulnerable populations, less exposure to storm surge, and viable marsh expansion area.*



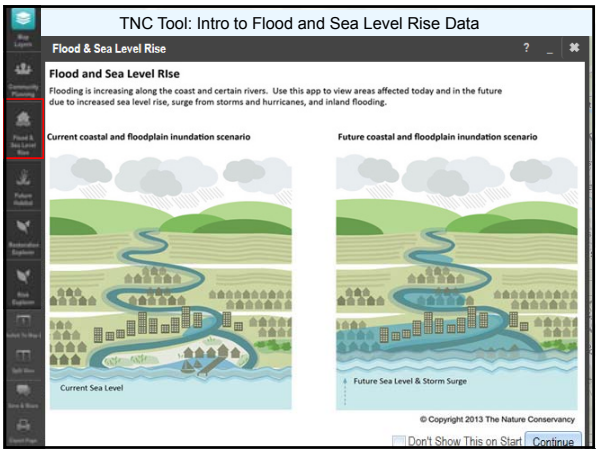
TNC Tool: Exposure to Hurricane Ike in 2004 (red=high, blue=low)



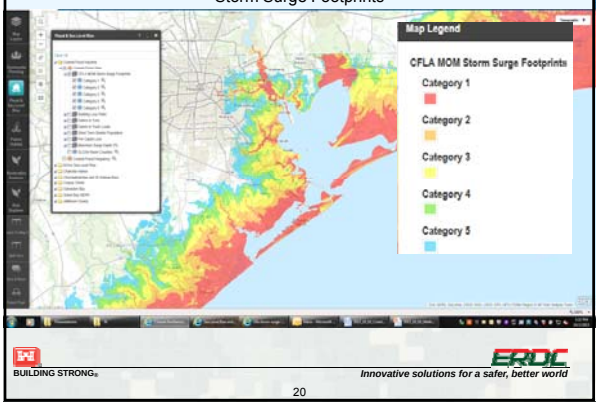
TNC Tool: Exposure to Hurricane Ike in 2100 (red=high, blue=low)



TNC Tool: Intro to Flood and Sea Level Rise Data



TNC Tool: Coastal Flood Loss Atlas (CFLA) Maximum of Maximums (MOMs) Storm Surge Footprints



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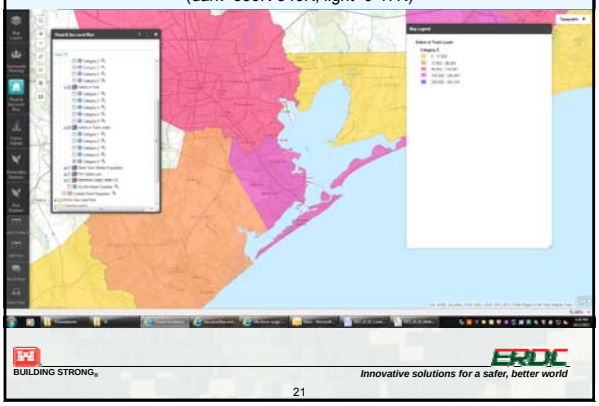
TNC Tool: Debris in Number of Truck Loads for Category 5 Hurricane (dark=330K-540K; light=0-17K)



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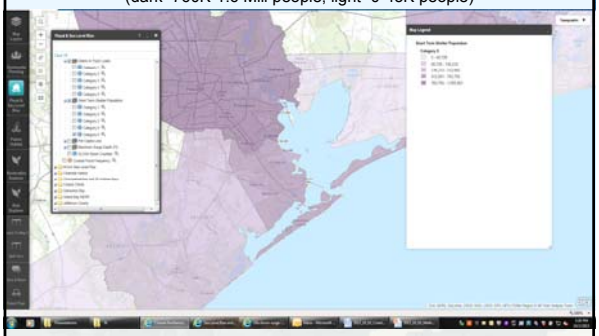
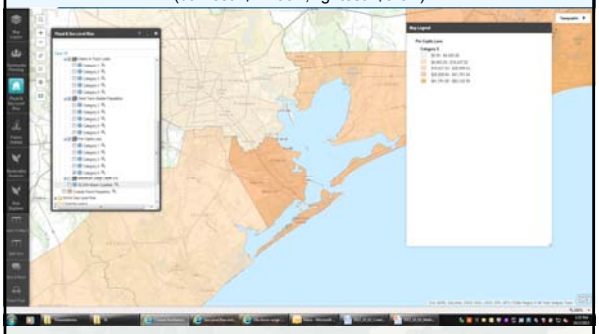
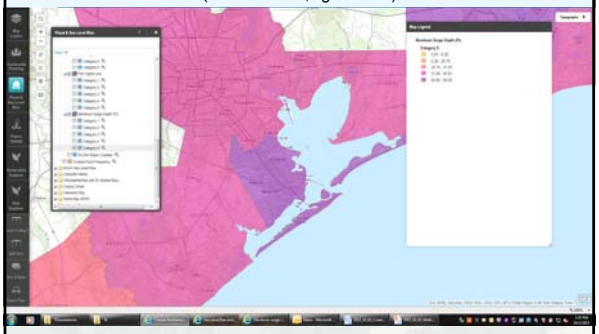
TNC Tool: Short-Term Shelter Population for Category 5 Hurricane
(dark=760K-1.6 Mill people; light=0-45K people)



TNC Tool: Per Capita Loss for Category 5 Hurricane
(darkest=$41-60K; lightest=$0-5K)



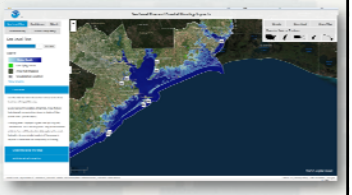
TNC Tool: Maximum Storm Surge Depth for Category 5 Hurricane
(dark=40-54 ft; light=0-6 ft)



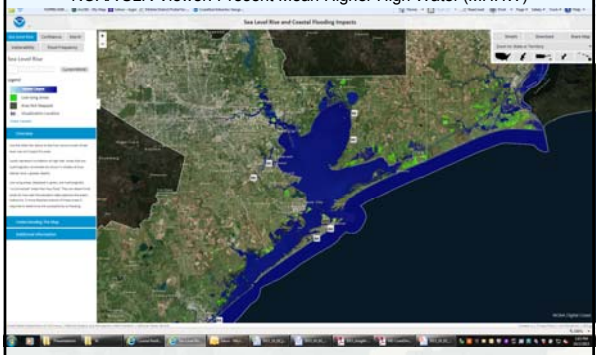
Sea Level Rise Viewer – NOAA

http://coast.noaa.gov/slr/

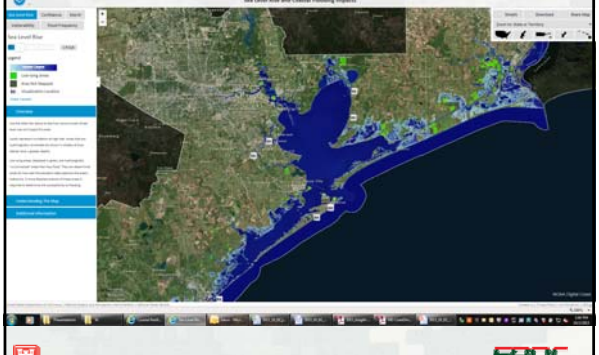
- Online geoportal with slider bar to visualize change in total water level, from present MHHW to +6-ft, not accounting for erosion, subsidence, and future construction
- Also provided:
  - Confidence ranges for SLR estimates, marsh locations, vulnerability ratings, and flooding frequency
- Some of these data are in the TNC tool



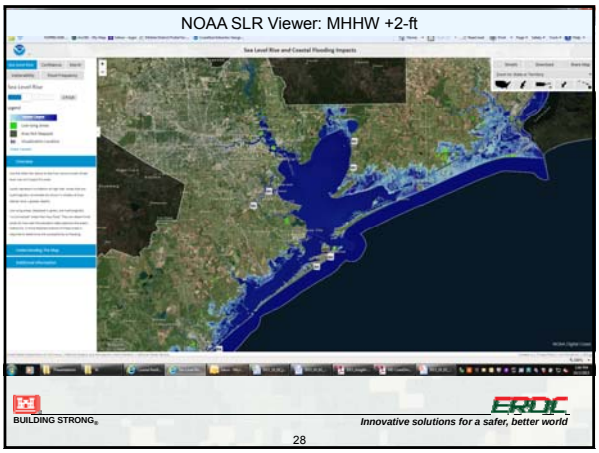
NOAA SLR Viewer: Present Mean Higher High Water (MHHW)



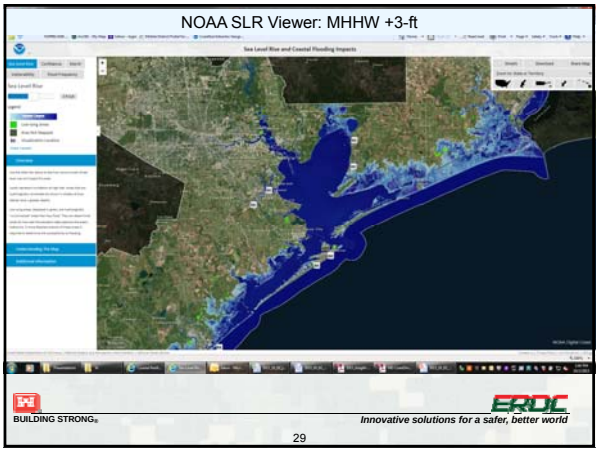
NOAA SLR Viewer: MHHW +1-ft



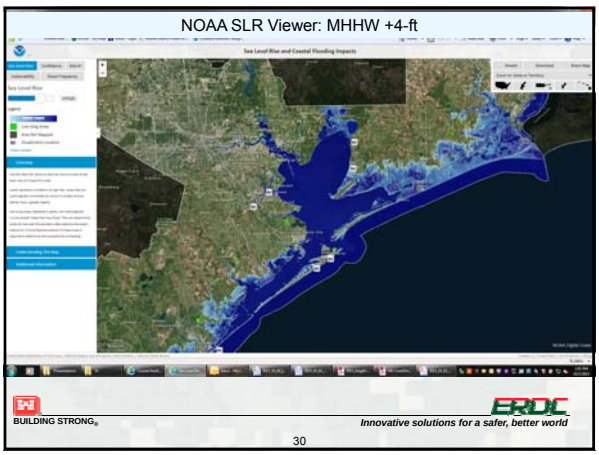
NOAA SLR Viewer: MHHW +2-ft



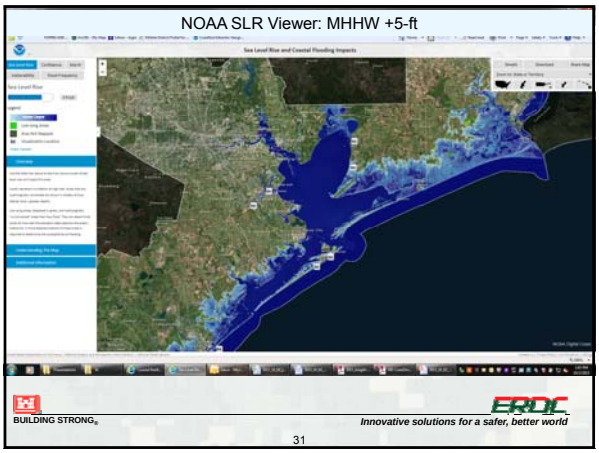
NOAA SLR Viewer: MHHW +3-ft



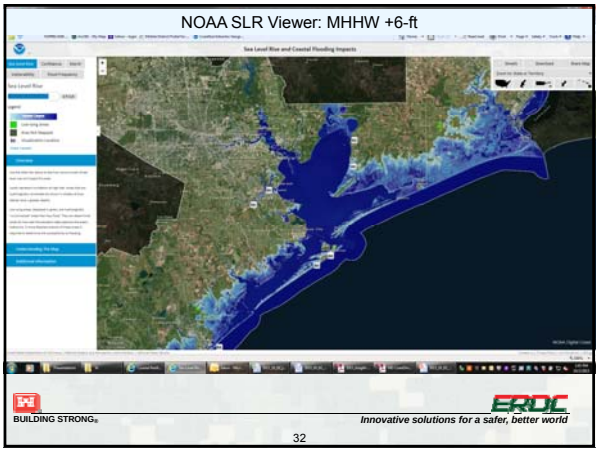
NOAA SLR Viewer: MHHW +4-ft



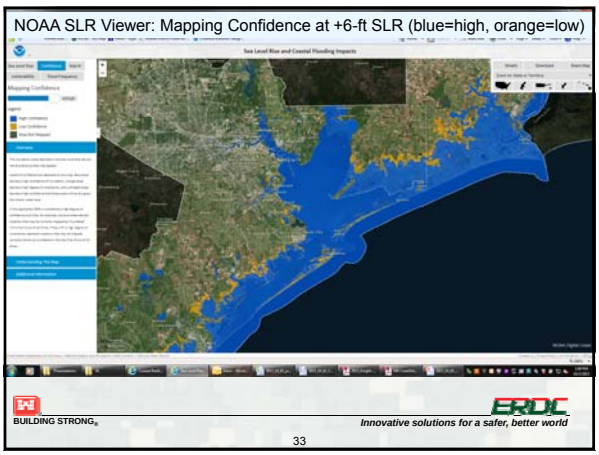
NOAA SLR Viewer: MHHW +5-ft



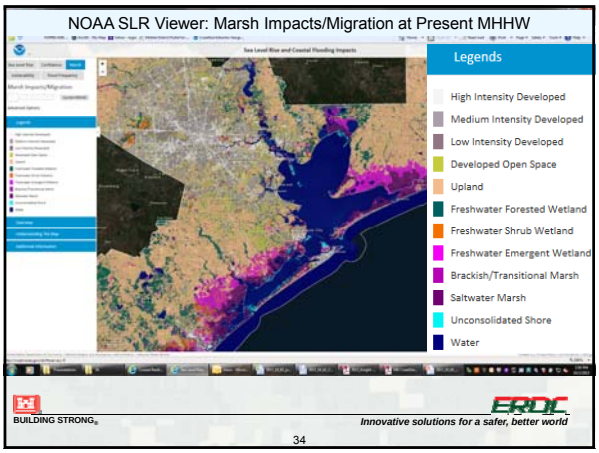
NOAA SLR Viewer: MHHW +6-ft



NOAA SLR Viewer: Mapping Confidence at +6-ft SLR (blue=high, orange=low)



NOAA SLR Viewer: Marsh Impacts/Migration at Present MHHW



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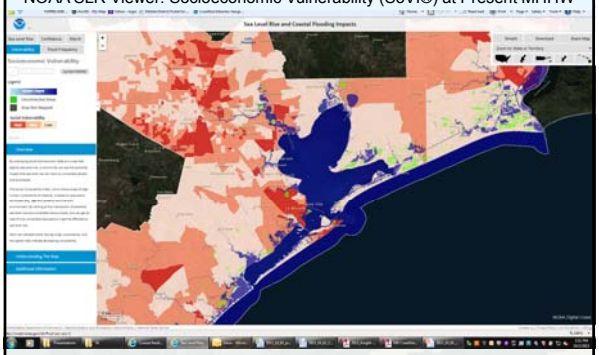
NOAA SLR Viewer: Socioeconomic Vulnerability (SoVI®) at Present MHHW



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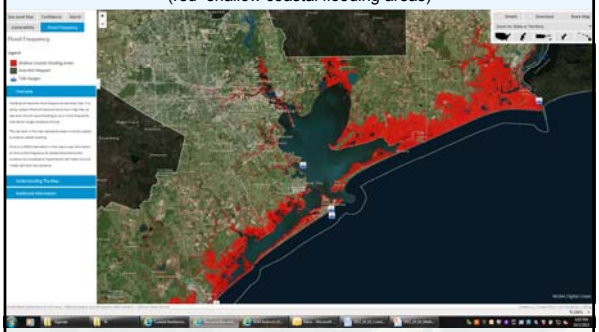
NOAA SLR Viewer: Flood Frequency at Present MHHW
(red=shallow coastal flooding areas)



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Coastal Vulnerability Index (CVI) – USGS

http://woodshole.er.usgs.gov/project-pages/cvi/images/largenat.jpg

- Risk that physical changes will occur as sea level rises
- Criteria: tidal range, wave height, coastal slope, shoreline change, geomorphology, and historical rate of relative sea level rise
- Calculated as the root-mean-square of the ranked variables

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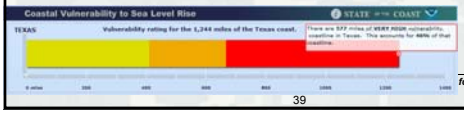
State of the Coast - NOAA

http://stateofthecoast.noaa.gov/vulnerability/welcome.html

- Uses CVI data:
  - Erosion rate, geomorphology, historic sea level rise, regional coastal slope, wave height, and tidal range
- Summary for entire US
- Selecting a state will provide individual state rankings; hovering over toolbar (below) provides statistics for that state



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Closing Remarks; Discussion

- Many assessment tools and a lot of data are available
  - More are being developed regularly
  - Worthwhile to explore new tools and data when starting new study
- Many of the Top-Down tools are not hazard-specific, but results are comparable between regions
  - Be aware that aggregation of data sets may mask vulnerabilities
  - Typically utilize data that are not easily changed (e.g., median income, % older/vulnerable population, number of roadways, etc.)
- Most of the Bottom-Up tools are qualitative and not transferrable
  - Beneficial for coming to common understanding, identifying vulnerabilities and developing actionable decisions
- Advancements are needed in tool development
- Data documenting recovery and the potential for adaptation are lacking