About EESI...

**NON-PROFIT**
Founded in 1984 by a bipartisan Congressional caucus as an independent (i.e., not federally-funded) non-profit organization

**NON-PARTISAN**
Source of non-partisan information on environmental, energy, and climate policies

**DIRECT ASSISTANCE**
In addition to a full portfolio of federal policy work, EESI provides direct assistance to utilities to develop “on-bill financing” programs

**SUSTAINABLE SOCIETIES**
Focused on win-win solutions to make our energy, buildings, and transportation sectors sustainable, resilient, and more equitable
Policymaker Education

**Briefings and Webcasts**
Live, in-person and online public briefings, archived webcasts, and written summaries

**Climate Change Solutions**
Bi-weekly newsletter with everything policymakers and concerned citizens need to know, including a legislation and hearings tracker

**Fact Sheets and Issue Briefs**
Timely, objective coverage of environmental, clean energy, and climate change topics

**Social Media (@EESIOnline)**
Active engagement on Twitter, Facebook, LinkedIn, and YouTube
Upcoming Briefings & Series

Living with Climate Change
- Polar Vortex – April 13
- Sea Level Rise – May 18
- Wildfires – June 13
- Extreme Heat - TBA

Scaling Up Innovation to Drive Down Emissions
- Green Hydrogen – April 27
- Direct Air Capture – May 25
- Offshore Wind Energy - TBA
- Electric Vehicle Charging - TBA
Sea Level Rise in the US: Challenges and Policy Landscape

SUSAN RUFFO
Co-Facilitator, Coastal Flood Resilience Project
Senior Advisor, Ocean and Climate, UN Foundation
What is Sea Level Rise?
What is expected in the US?

Figure adapted from “Global and Regional Sea Level Rise Scenarios for the United States”, Sweet et al. NOAA Technical Report NOS 01. 2021
What does this mean for us?

On average, the U.S. will see as much sea level rise by 2050 as seen in the last century.

Sea level rise leads to increased coastal flooding even in the absence of rain or storms.

NOAA
What does sea level rise look like? A glimpse of the future?

Anthony Quintano/
https://www.flickr.com/photos/quintanomedia/8505192671/
HIGH TIDE FLOODING

Twice as frequently as in 2000
Up to 75 days per year by 2050
Impacts to homes, businesses, tourism, and livelihoods

In 1950 it would take a considerable amount of water caused by a large storm such as a hurricane to cause high tide flooding. High tide flooding was infrequent.

In 2010, with higher relative sea level, it no longer takes a strong storm or hurricane to cause flooding. Now, high tide flooding is frequent and can be caused merely by high tide.

How is local elevation important to high tide flooding?
The relationship between local elevation and the high tide line determines the rate of nuisance flooding. If they are close to the same in elevation, flooding is frequent. If they are not close, flooding is infrequent.
So what do we do?
So what do we do?

1. Cut emissions!
So what do we do?

1. Cut emissions!
2. Understand the problem and provide resources to explain it
So what do we do?

1. Cut emissions!
2. Understand the problem and provide resources to explain it
3. Engage stakeholders
So what do we do?

1. Cut emissions!
2. Understand the problem and provide resources to explain it
3. Engage stakeholders
4. Incorporate this knowledge and engagement into future policies, plans, development...
Policy Context

- This is not an environmental problem – it affects every aspect of society and economy

- All levels of government have to be part of the solution

- The Federal Government has several roles:
  o Getting its own house in order
  o Supporting other levels of government with incentives
  o Providing good information and data
A National Policy Agenda for Rising Seas

• Disclose Current and Future Risks of Coastal Flooding and Sea Level Rise
• Improve Disaster Preparedness
• Limit New Development in Places at Risk of Storms and Rising Seas
• Build Capacity to Sustain Coastal Communities, Homes, and Businesses
• Adapt Coastal Infrastructure (Transportation, Energy, Water, Defense)
• Promote Migration of Coastal Ecosystems to Higher Ground
• Build Commitment to Social Justice into Coastal Flood Management Plans and Programs
Executive Actions

- Adaptation plans for all agencies
- Improving climate science, information, and services
- Building resilience into all future investments and plans, including adapting new and existing programs for infrastructure and buy-outs
- Leveling the playing field for vulnerable communities to access resources, including through revising cost/benefit methodologies
- Promoting nature-base solutions to coastal flood risks
Legislative Action

- Provide funding for coastal resilience efforts, including planning and action at local levels as well as science and information development (e.g., grants for community plans or funding to invest in natural infrastructure.

- Ensure existing programs and legislation address sea level rise, e.g. WRDA, NFIP, etc.

- Champion and coordinate actions across committees and bills that promote coastal resilience

Credit:  Wikimedia commons image
Thank you and Resources

Resources:

- Interagency 2022 Sea Level Rise Technical Report
  (NOAA, NASA, EPA, USGS, DHS, FEMA, USACOE, DOD)
  https://oceanservice.noaa.gov/hazards/sealevelrise/sealevelrise-tech-report.html

- 2021 State of High Tide Flooding and Annual Outlook
  NOAA
  https://tidesandcurrents.noaa.gov/HighTideFlooding_AnnualOutlook.html

Coastal Flood Resilience Project website: https://www.cfrp.info/
Including:
• National Policy Agenda: Preparing for More Severe Coastal Storms and Rising Seas
• White papers on NFIP reform, relocation and migration, disclosure of coastal flood risk, legislative issues, etc.
• Links to Coastal Flood Resilience Resources from a variety of partners, including Surfrider Foundation, Union of Concerned Scientists, Anthropocene Alliance, Meridian Institute, NRDC and others

“A New Coast: Strategies for Responding to Devasting Storms and Rising Seas” by Jeffrey Peterson
https://islandpress.org/books/new-coast

Thank you! to
- Jeff Peterson, Co-Facilitator, Coastal Flood Resilience Project
- Coastal Flood Resilience Project collaborating organizations
- EESI
- All of you!
### Illustrative Legislative initiatives with provisions on sea level rise and coastal resilience

1. **H.R. 3764; the Ocean-Based Climate Solutions Act;** authorizing diverse programs to make coastal communities more resilient; and to provide for the conservation and restoration of ocean and coastal habitats, biodiversity, and marine mammal and fish populations

2. **H.R. 2570; the Climate Risk Disclosure Act of 2021;** requiring the Securities and Exchange Commission to require corporations to annually disclose information regarding climate change-related risks, including strategies and actions to mitigate these risks

3. **H.R. 3228; the National Coastal Resilience Data and Services Act;** directing the National Oceanic and Atmospheric Administration, to improve science, data, and services that enable sound decision making in response to coastal flood risk, including impacts of sea level rise, storm events, changing Great Lakes water levels, and land subsidence

4. **H.R. 2632; the Build for Future Disasters Act of 2021;** eliminating National Flood Insurance Program (NFIP) rate subsidies for newly constructed property

5. **H.R. 481; the Flood Resiliency and Taxpayers Savings Act of 2021;** enacting key provisions of the Federal Flood Risk Management Standard

6. **H.R. 2872; the SAFE Act;** requires the President to establish an interagency National Fish, Wildlife, and Plants Climate Adaptation Strategy Working Group and address the effects of extreme weather and climate change on fish, wildlife, and plants

7. **H.R. 744; the FEMA Climate Change Preparedness Act;** requires the FEMA to revise its 2018-2022 Strategic Plan to ensure that the plan explicitly mentions climate change and addresses the implications of climate change on national disaster risk

8. **H.R. 1963; the Climate Resilient Communities Act;** requiring the government Accountability Office to report to Congress on the use of model, consensus-based building codes, standards, and provisions that support resilience to climate risks and impact

9. **H.R. 4235; the Living Shorelines Act;** authorizing grants to certain entities for purposes of carrying out climate-resilient living shoreline projects that protect coastal communities

10. **H.R. 2534; the Climate Stewardship Act of 2021;** establishing a Coastal and Estuary Resilience Grant Program

11. **H.R. 5477; Federal Agency Climate PREP Act,** providing for expanded coordination among federal agencies in preparing for climate change
Legal Aspects of SEA LEVEL RISE

Robin Kundis Craig
Robert C. Packard Trustee Chair in Law
University of Southern California Gould School of Law
There Are A LOT of Legal Issues!

01. PROPERTY USE
Can you build a sea wall? What happens when you have to retreat?

02. TAKINGS
If you CAN'T build that seawall or are ordered to retreat.

03. INSURANCE
Private insurance departures, bankrupt government alternatives.

04. WATER SUPPLIES
Salt water can intrude into both coastal aquifers and coastal rivers.

05. BUILDING CODES
How do you design for incoming saltwater and worsening storms?

06. PUBLIC HEALTH
Toxic hot spots and new diseases require public health law interventions.
01. **PROPERTY USE**

Probably the first thing you thought of.
The California Seawall Case

The California Court of Appeal upheld a Coastal Commission cease-and-desist order requiring demolition of a seawall and payment of a $1 million penalty by homeowners who performed major reconstruction on their coastal home without notifying the California Coastal Commission. 11 Lagunita, LLC v. California Coastal Commission, (4th Dist., Dec. 18, 2020). In March 2021, the California Supreme Court refused to review the case.
What makes the news and instills fear in local governments.
Borough of Harvey Cedars v. Karan (N.J. 2013)

Loss of View from Beach Renourishment = Storm Protection for Harvey & Phyllis Karan
03. INSURANCE ISSUES

Insuring an increasingly inundated and storm-ridden coast makes NO fiscal sense.
In recent years, properties in low-lying coastal states have experienced increasing damage from storms and severe flooding. Almost three million people—and their homes—reside within three feet of mean sea level. With rising seas projected to exceed this level by 2100, the risks are daunting for coastal communities.

Repetitive Loss is a Coastal Problem

Insurance claims on properties that are repeatedly damaged by flooding, or “repetitive losses,” are of particular concern to the National Flood Insurance Program (NFIP). NFIP has paid out almost $9 billion in claims to repetitive-loss properties, which amounts to about a quarter of all NFIP payments since 1978. Repetitive-loss properties, shown here, account for just 1.3 percent of all policies but are responsible for fully 25 percent of all NFIP claim payments since 1978. The darker colors show counties particularly prone to repetitive losses. Map based on data from FEMA as of May 2013.

Hurricanes Bankrupt the NFIP

So, maybe turn flood insurance into a government buyout program?

Rising tides, falling funds
The National Flood Insurance Program is officially under water. After record payouts for damages related to Hurricanes Katrina and Sandy, and accumulated smaller storms, the program is nearly $25 billion in debt.

In billions

<table>
<thead>
<tr>
<th>Year</th>
<th>Total payments made to policyholders</th>
<th>Total written premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2002</td>
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<td>2004</td>
<td>17.7B*</td>
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<tr>
<td>2006</td>
<td>7.8B</td>
<td>0</td>
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<tr>
<td>2008</td>
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<td>0</td>
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<tr>
<td>2010</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Year of Hurricanes Katrina, Rita, Wilma and Dennis

Source: FEMA
04. **WATER SUPPLY**

Probably NOT the first thing you thought of.
Inundated Drinking Water
A Pervasive Problem in the U.S.

Jasechko et al., 11 Nature Communications 3229 (2020), https://doi.org/10.1038/s41467-020-17038-2
One Approach

- Shallow Aquifer
- Principal Aquifer
- Deep Aquifer
- Peralta Hills Fault
- Newport-Inglewood Fault Zone
- Amber Colored Water: Natural discoloration from ancient buried plant and woody material
- Consolidated, non-water-bearing formations
- Aquitards: Low-permeability clay and silt deposits
- Aquifers: Water-bearing sand and gravel
05. BUILDING CODES

Good building codes can prevent a lot of damage and loss of life.
Legal Strategy: Enact Building Codes that Allow for Structural Survival

Anatomy of a High Wind & Hurricane Resistant Home

All aspects of a Deltec home are ingeniously designed to work as a system, making it the smartest home you can build for high wind areas.

A. SHAPE
Aerodynamic circular building envelope works with nature, not against it
1. Wind can’t build up enough pressure on any side to cause a structural failure
2. Reinforced clear span roof is at optimum pitch (6/12) for wind deflection and reduced buildup
3. Circular structure transfers environmental loads most efficiently with a high degree of redundancy providing extra resilience and performance during critical events

B. ENGINEERING
Creating a building envelope to resist high wind and provide safety to its occupants
4. Radial truss system in roof and floors work like spokes on a wheel
5. Potential energy from sustained winds is dispersed throughout the structure instead of building up in a single area

C. MATERIAL EXCELLENCE
Merging superior materials with a superior design results in a stronger and more durable structure
6. Machine rated 2400 psi framing lumber used in trusses and walls is twice as strong as typical framing material
7. Five Ply SFI plywood sheathing used instead of OSB on exterior walls, roof and floors strengthens the home and prevents flying debris from penetrating the structural envelope of the home
8. Reinforced windows with impact glass prevent wind and water from entering the home

D. CONNECTIONS
Emphasis on maintaining continuous load paths and strong connections between the roof, exterior walls, floor system and foundation
9. Over-sized truss hangers keep roof system anchored to walls
10. Walls have multiple construction ties to the floor system for structural stability and to transfer shear forces
11. Continuous metal strapping from roof trusses to foundation helps maintain structural stability

E. SUSTAINABILITY
Utilizing products and construction techniques that enhance livability in the event of a prolonged power outage
12. Solar water heater provides uninterrupted hot water
13. Enhanced insulation maintains a more balanced temperature inside the home
14. High-wind rated reflective metal roofing helps reduce radiant heat gain in the home
15. Passive solar design helps heat and cool the building through appropriate shading and window placement
Engineers Are Getting Creative!

6 Flood Proof floating buildings to survive rising tides
New diseases, plus saltwater and toxic contamination is a bad mix!
August-September 2017: What Did Hurricane Harvey Encounter?

BLUE DOTS: Wastewater Treatment Facilities
YELLOW SQUARES: TRI Sites
ORANGE SQUARES: Petroleum Refineries
ORANGE DOTS: Petroleum Product Terminals
GREEN SQUARES: Natural Gas Processing Plants
GREEN DOTS: LNG Terminals

Map courtesy of the Union for Concerned Scientists
The nation's largest oil refinery, owned by Motiva and located in Port Arthur, Texas, was forced to shut down due to flooding from Hurricane Harvey.

Photograph courtesy of Alex Glostrum, Louisiana Bucket Brigade
Also, Sea Level Rise and Storm Surge Mean More Sewage Contamination of the Coast

Hurricane Michael Makes Landfall in Florida, October 2018
Photograph courtesy of CNN
And Inundated Coasts Tend to Increase Mosquito Habitat
Dengue in Florida

Dengue Cases in Florida, 2013
Graphic courtesy of Health News Florida
Legal Strategy #1: Clean Up Existing Problems

Superfund, RCRA, and Brownfields Sites
(FY2013)

Map courtesy of the U.S. EPA.
Legal Strategy #2: Toxic-Aware Land Use Planning Along the Coast
THANK YOU!
Sea level rise, coastal marsh, & climate resilience

EESI briefing
May 18, 2022
Lydia Olander, Duke University

Acknowledgements: Katie Warnell, Duke University and Carolyn Curran, formerly NOAA

Pine Island marshes. Photo: Robbie Fearn/Audubon
Coastal marshes create significant value for our communities.

- Recreation & tourism
- Blue carbon
- Coastal protection
- Fisheries
...marshes that can’t keep up or move up will likely drown as they are inundated by SLR
Our study area: coastal marsh and transition zone
Mid-Atlantic U.S. marshes are vulnerable to SLR, but have significant potential for inland migration.

Community impacts

- Reduced coastal protection
- Salt water intrusion and loss of productive lands

Ecological impacts

- Less pleasant views
- Loss of stored carbon
- Loss of habitats and species
Strategies to enhance resilience under SLR-driven coastal changes

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<td></td>
<td>Salt-tolerant crop planting</td>
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Policies/programs to enable these NB strategies

**Simplify permitting**
USCAE, NOAA; Funding by NFWF, REPI, etc...

**Rolling easements**, USDA/NRCS programs, forest service programs, profit driven, federal buyouts

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Maintain existing coastal marshes

Prevent or slow inland SWI & marsh migration

Direct inland marsh migration

Limit negative impacts of SWI & marsh migration
Protection/restoration of habitat

Transition from agriculture to habitat

Transition from homes to habitat

Constructed protection w natural features

FWS
NOAA/NERR
EPA NEP
USACE ER

USDA

FEMA
HUD CDBG

USACE
DOD
DOT

Executive Order to Strengthen America’s Forests, Boost Wildfire Resilience, and Combat Global Deforestation

Section 4. **Enlisting Nature in the Fight Against Climate Change**

- America the Beautiful initiative
- **Compendium of Federal Nature-Based Solutions for Coastal Communities, States, Tribes, and Territories**
- **Report on Nature-Based Solutions**
- **Guidance on Valuing Nature**
- First U.S. National Nature Assessment
Thank you

Lydia.oolander@duke.edu

Pine Island marshes. Photo: Robbie Fearn/Audubon
Create incentives for state & local govs to stop building in floodplains

Create governance for community relocation

Coordinate multiple agencies involved in buyouts

Invest in local & state capacity building

Reform buyout policy – faster & better compensation & track data to evaluate

Support affordable housing
COASTAL ADAPTATION STRATEGIES

Resist

Accommodate

Retreat

Avoid

e.g., Doberman et al. 2019; Burby and Nelson, 1991; Deyle et al., 2007; Titus, 1998
managed retreat* is:
purposeful, planned, (government) supported movement of people or assets that reduces hazard exposure
Managed retreat:
1. Reduces disaster costs (reduces government expenses)
2. Protects families
3. Creates space for healthy coasts
People helped

64,101 NEW repetitive loss properties (2009-2018)

People still at risk

Source: GAO analysis of Federal Emergency Management Agency (FEMA) data. | GAO-20-508
Note: FEMA provided these data as of June each year.
Brutal Choice in Houston: Sell Home at a Loss or Face New Floods

By Audra D. S. Burch

March 30, 2018
Resist  
- seawalls
- levee
- retention ponds
- breakwaters
- beach nourishment
- dune building
- living shorelines
- wetlands
- ...

Accom  
- autonomous retreat
- migration
- community relocations
- buyouts
- life estates
- leasebacks
- smart / targeted growth
- eminent domain
- nudges (setbacks, rolling easements)
- ...

Retreat  

Avoid  

1960s & 70s
- Ad hoc funding
- 1979 Soldiers Grove

1980s & 90s
- 1989 FEMA buyout program
- 1990s Midwest town relocations

The Stafford Act
- Robert T. Stafford
- Disaster Relief and Emergency Assistance Act, as Amended

Winslow NE 2019, Photo by State of Nebraska

Pattonsburg MO – St. Joseph Press Photo

Valmeyer IL

1980s & 90s
- 1989 FEMA buyout program
- 1990s Midwest town relocations
Need: Government coordination for community relocation (Suggest HUD Office for Coordination)

Consider: Changes to Fair Housing Act to support whole-community relocations
2000s
More, smaller buyouts

Buyouts Funded by:
- HUD
- FEMA
- USACE
- USDA
- State Funds
- Local Funds

Grand Forks ND Buyouts

FEMA-FUNDED PROPERTY ACQUISITIONS

Number of bought-out properties, 1989-2017
- 1-10
- 11-100
- 101-2213

Mach et al., Science Advances, 2019
1. Provide more funding

2. Provide funding faster – specifically, funding not tied to disasters (creating perverse incentives)

3. Build local & state capacity – and reduce paperwork burdens

4. Coordinate multiple agencies (HUD, FEMA, USDA, USACE)

5. Collect data on demographics

6. Collect data on where people move after to enable program evaluation

7. Increase the Increased Cost of Compliance & allow to be used for buyouts

8. Allow greater flexibility – e.g., support life estates & other types of acquisition

9. Offer “replacement cost” rather than “fair market value” (also more funding for people with limited mobility)

10. Encourage more affordable housing (outside floodplain) to enable relocation
Create incentives for state & local govs to stop building in floodplains

Create governance for community relocation

 Coordinate multiple agencies involved in buyouts

 Invest in local capacity building

 Reform buyout policy – faster & better compensation & track data to evaluate

 Support affordable housing

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@sidersadapts
www.sidersadapts.com
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Please take 2 minutes to let us know at:
www.eesi.org/survey

Materials will be available at:
www.eesi.org/051822climatechange

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Wednesday, May 18, 2022