

US EPA ARCHIVE DOCUMENT



Climate Change Adaptation Efforts in Connecticut and Beyond

Jennifer Pagach

Connecticut Dept. of Environmental Protection
& Adjunct Professor, Science & Engineering



Tentative Agenda

- Climate Efforts in Connecticut
- Groton Project- Engaging all Layers of Government
- Challenges, Opportunities and Lessons Learned
- Resources and More to Come...

The Great Wave of Groton



Great Wave off of Kanagawa
by Katsushika Hokusai

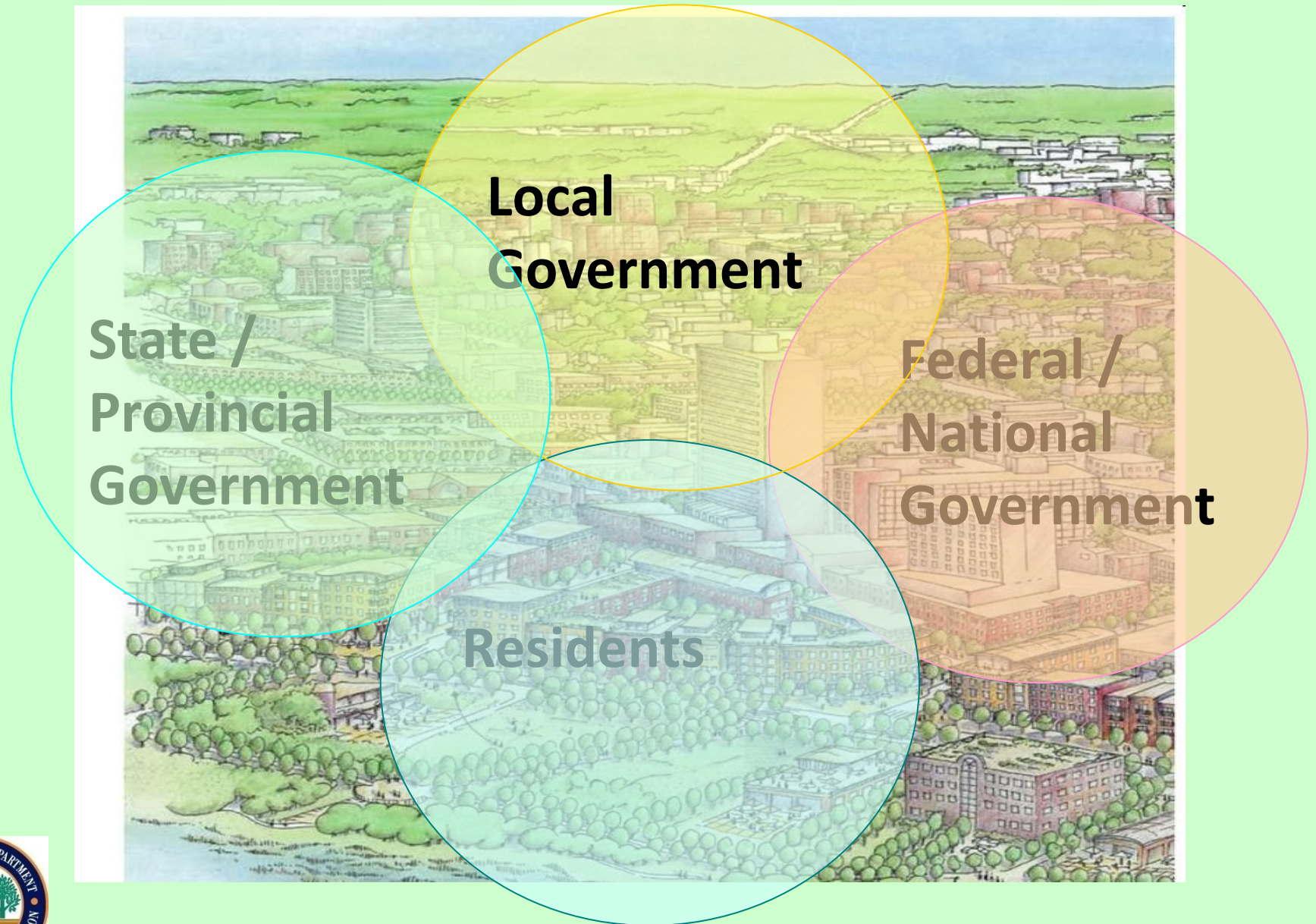
Thirty-six Views of Mount Fuji- woodblock print series

Note the waves take up majority of picture, but people in 3 boats at base of wave are hunkered down calmly rowing- what will we do in face of great force of nature?

Theory Behind Groton Project

- What are the roles of different levels of government and how do they interact?
- How does adaptation look on the ground, especially in a coastal community?
- What do local governments really need?
- What can state and federal gov't do to meet those needs?
- Can this much government coordination occur?

Spheres of Influence



At the State Level: CT Adaptation

Public Act No. 08-98 An Act Concerning Connecticut Global Warming Solutions

CT Climate Change Adaptation Subcommittee formed under the Governor's Steering Committee on Climate Change (GSC)

- Agriculture workgroup
- Natural Resources workgroup
- Infrastructure workgroup
- Public Health workgroup

Mitigation-Adaptation have historically been separate ---
ART and CT Climate Network and other projects are trying to merge-include all towns not just coastal



CT is
already
losing
lobster!

CLIMATE
CONNECTICUT
CHANGE

www.ctclimatechange.com

Why Groton?



Leadership and Innovation-
Source Protection work,
DWQMP, Climate Taskforce,
Great GIS, SLOSH and
CHAMP work occurring

Politically Complex- Groton is
more than your average
Connecticut town

SE Economic Hub- water
dependant, tourism, jobs,
military presence, amazing
history and bright future



At the Local Level: Groton, CT

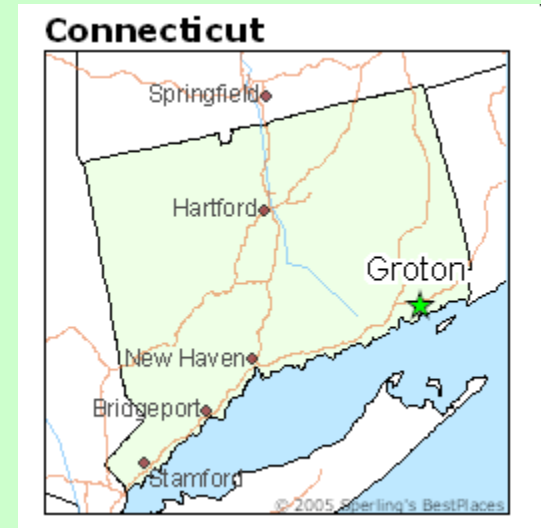
Unite together federal, state, and local stakeholders to discuss strategies for increasing coastal resilience

Three step process:

- Align on the science of climate change
- Identify vulnerabilities
- Start defining strategies that can be taken to increase resilience or seize opportunities

Focus on respective roles each agency can fill & provide recommendations on next steps for all levels of governance

- December 2010, presentation of implementation strategies at town council and final report

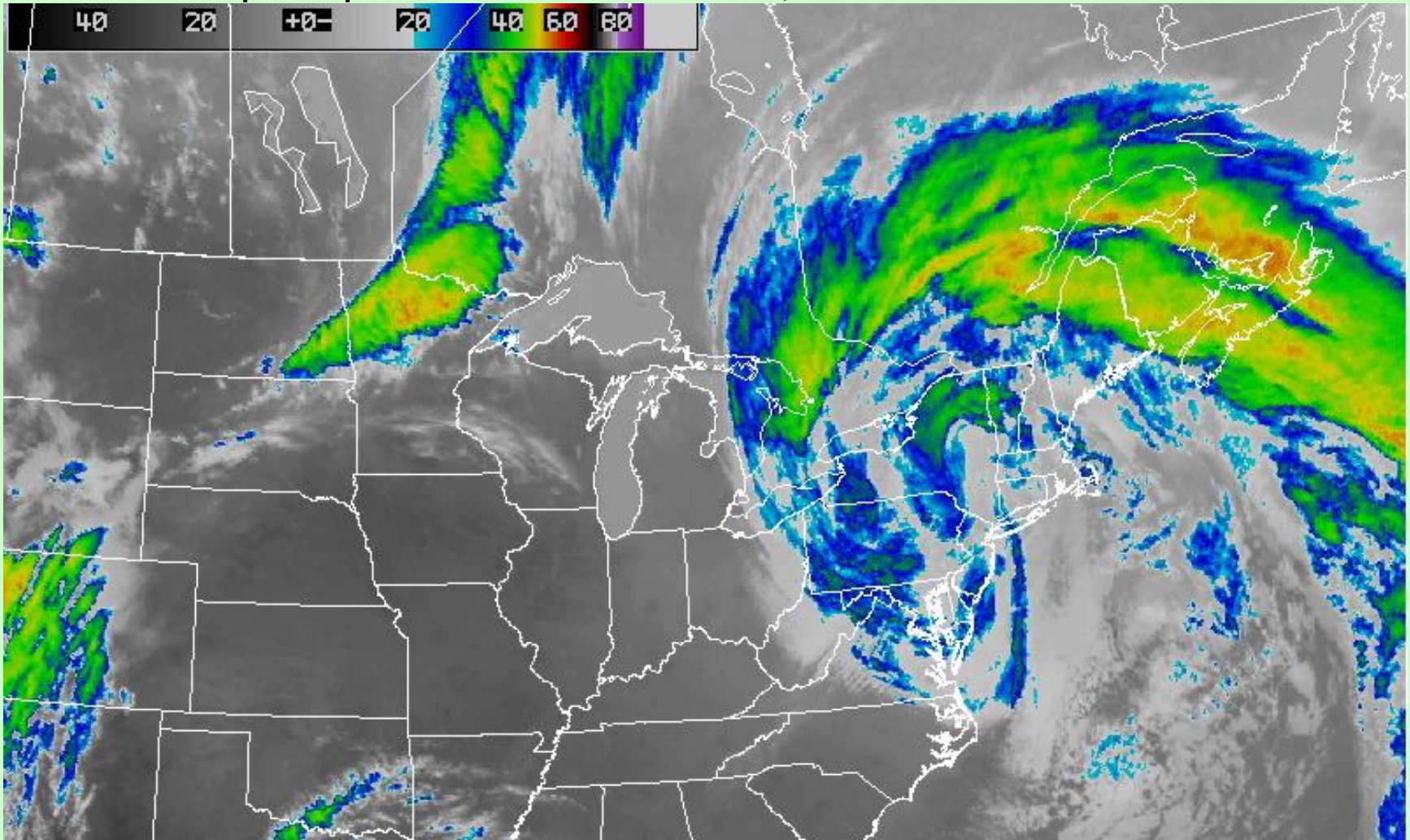


Groton Coastal Climate Change Adaptation Workshops

- Over 95 Federal, State & Local Government representatives, NGO's, Academics & Groton Taskforce
- 3 workshops, 1st focused on climate science, 2nd vulnerabilities, 3rd strategies & roles, plus conference call “homework”
- Coastal Hazards website (CHAMP) and inundation scenarios for coastal towns, UCONN Surge Modeling
- Featured Rhode Island laws requiring buffers and now recognizing SLR range
- Financial models of adaptation- Sam Merrill, New England Financial Institute & Paul Kirshen, Battelle

Plans Always Change

- We had workshop dates in mind but Mother Nature had other plans...
- Workshop 1: planned December 9, 2009- Nor'easter hits



Workshop 2: March 30, 2010

500 year storm event

Still held, some delays and RI folks stayed home, but CTDOT John DeCastro's new road photos captured the concerns

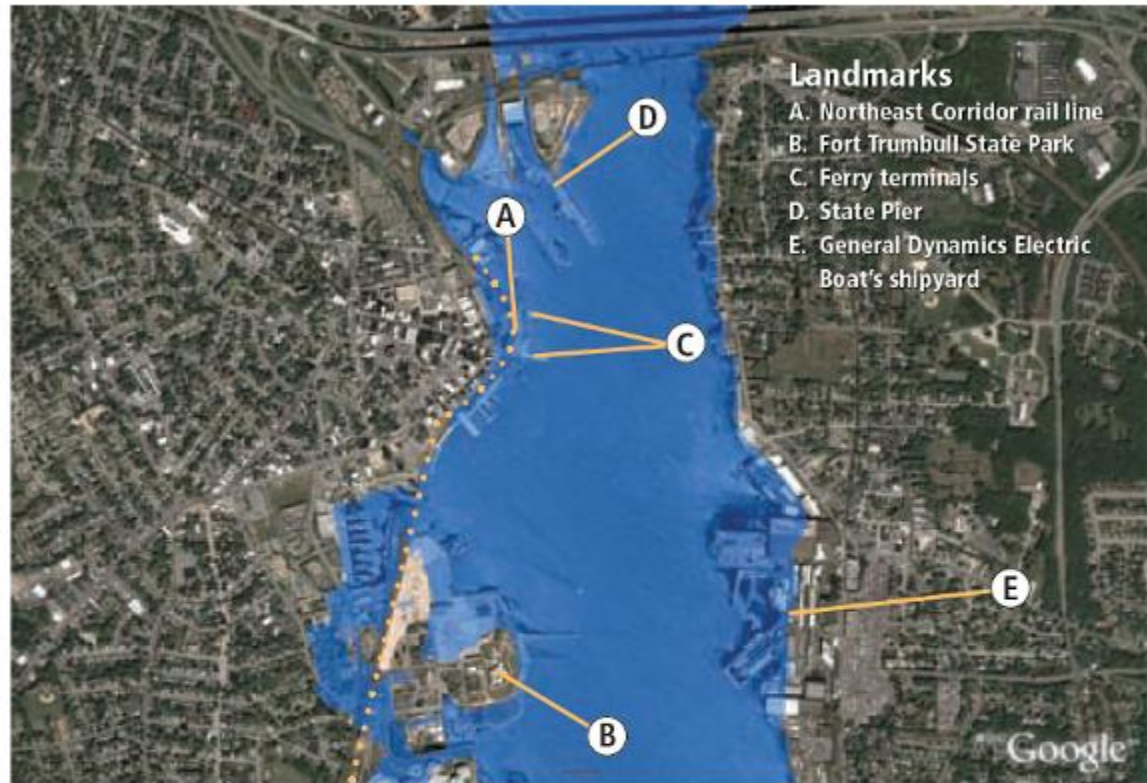


Not Yet.....



Identified Vulnerabilities

- More frequent river and coastal flooding
- Increased occurrence of sewer overflows
- Loss of coastal habitats and resources
- Increased coastal erosion;
- Reduced drinking water quality and supply from salt water intrusion
- Reduced access to key areas



New London/Groton Flooding

The light blue area in these maps depicts today's 100-year flood zone for New London and Groton (i.e., the area of these cities that is expected to be flooded once every 100 years). With additional sea-level rise by 2100 under the higher-emissions scenario, this approximate area is projected to flood once every 17 years, on average; under the lower-emissions scenario, once every 32 years. The 100-year flood at the end of the century (not mapped here) is projected to inundate a larger area of these cities, especially under the higher-emissions scenario.

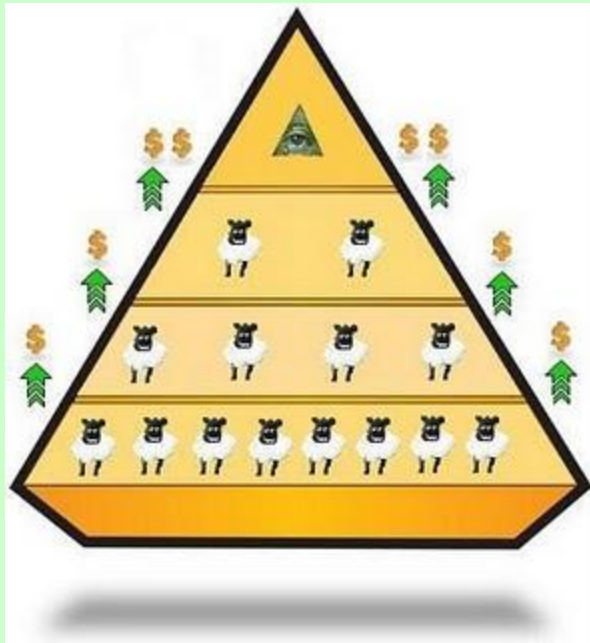
Challenges: Climate Change is the Great Aggravator

- ▶ Decisions are made locally in CT- towns have the power but they need our ear and support
- ▶ There are many things we don't control enough now, and those issues will be exacerbated
- ▶ The vulnerable areas in the future, are the problem areas now-already costing money
- ▶ Social & Economic issues-social limits of adaptation, charity hazard (gov't will bail me out), not my job
- ▶ Time scale/ risk issue- not in my political term, lifetime, immediate concern

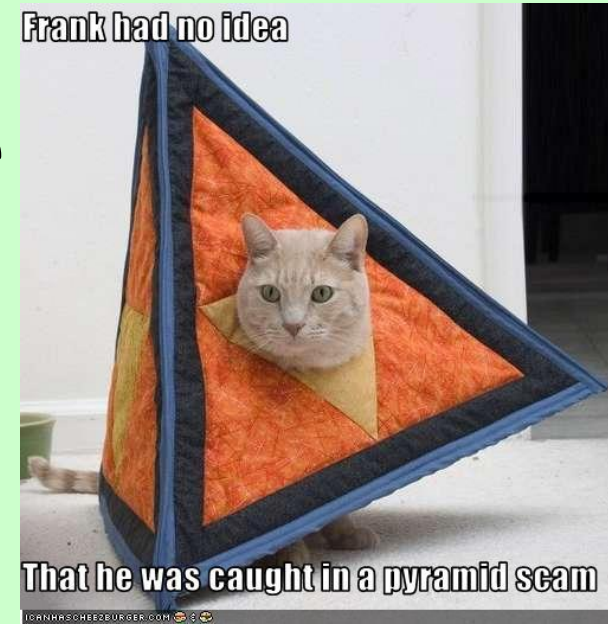
Lessons learned

- Better than expected- climate science was a breeze for these folks!
- Modeling- we already know what is vulnerable-what is an issue now
- Thought up and down flow of communication needed (fed,state,local) but horizontal needed too!
- State agency involvement and achievements- state park vulnerability assessment, Office of Long Island Sound climate change group, Dept. of Transportation involvement
- Federal and local discussions and support (EPA , NOAA, etc. are so helpful to us!)
- National and International model-coordinating gov't is a crucial approach



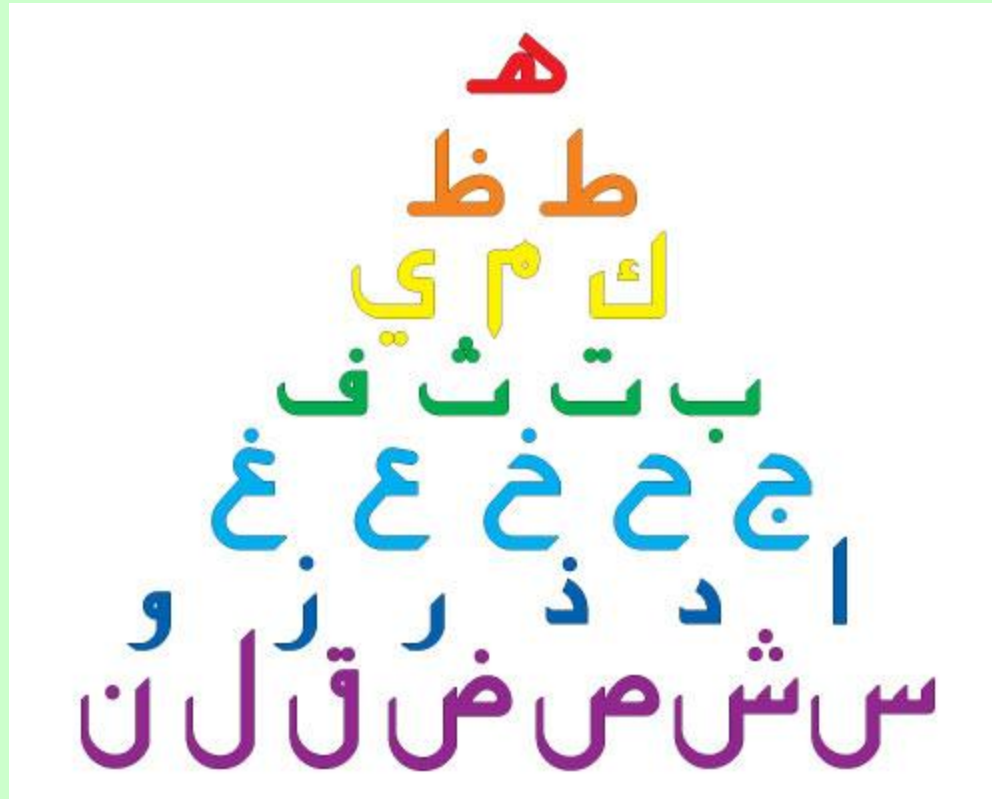


Pyramid Scheme



- Conference calls helped coordinate within layers- State level DOT, OPM, DOI, DPH, and just within 6 different DEP programs in 4 bureaus (LID/watershed mgmnt, OLISP planning, permitting, Inland water hazard mitigation, planning office for high level plan, wastewater mgmt, state parks etc.)
- How can feds or locals reach all those folks without a coordinated process?

Pyramid of Communication Before...



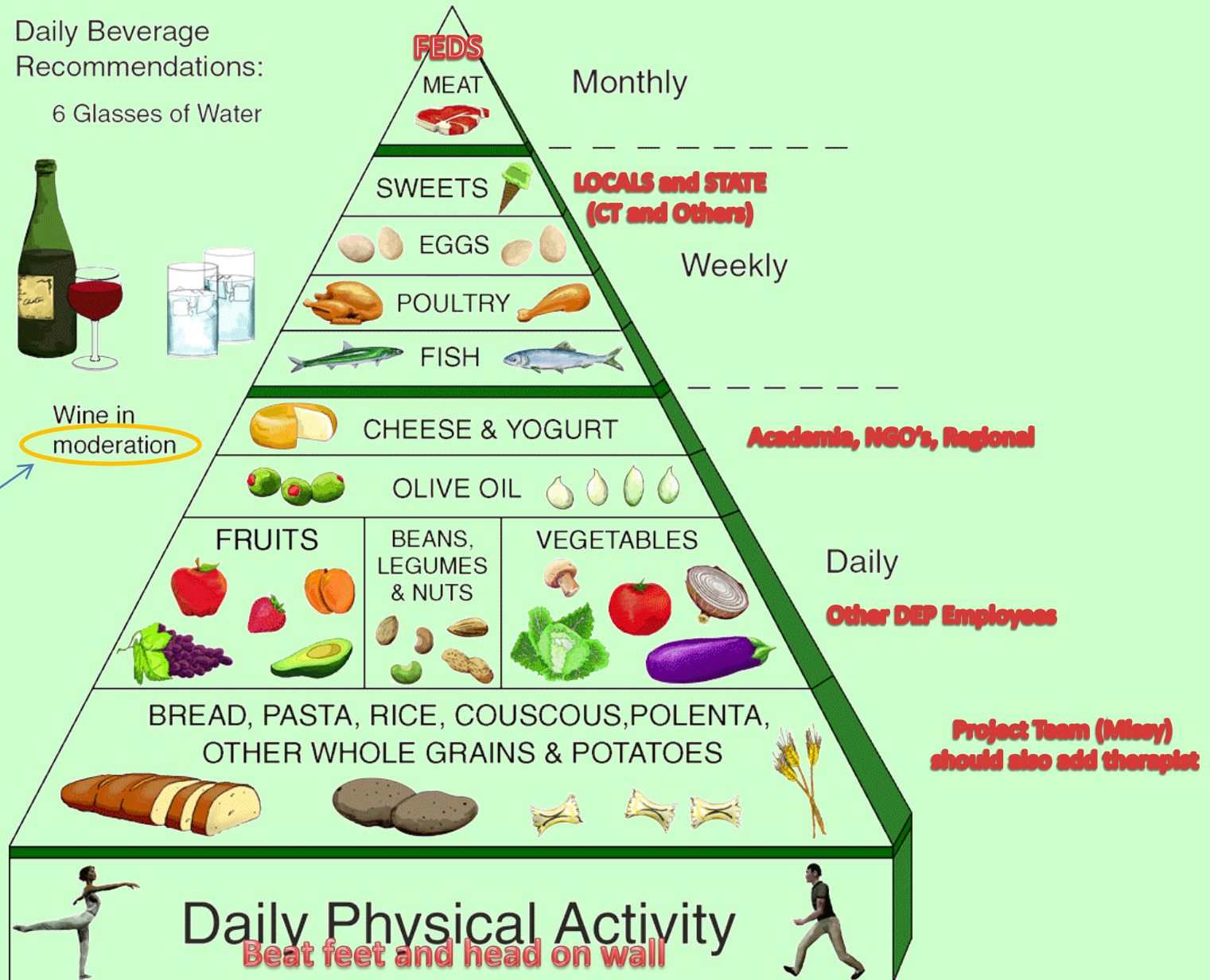
....During....

Daily Beverage
Recommendations:
6 Glasses of Water



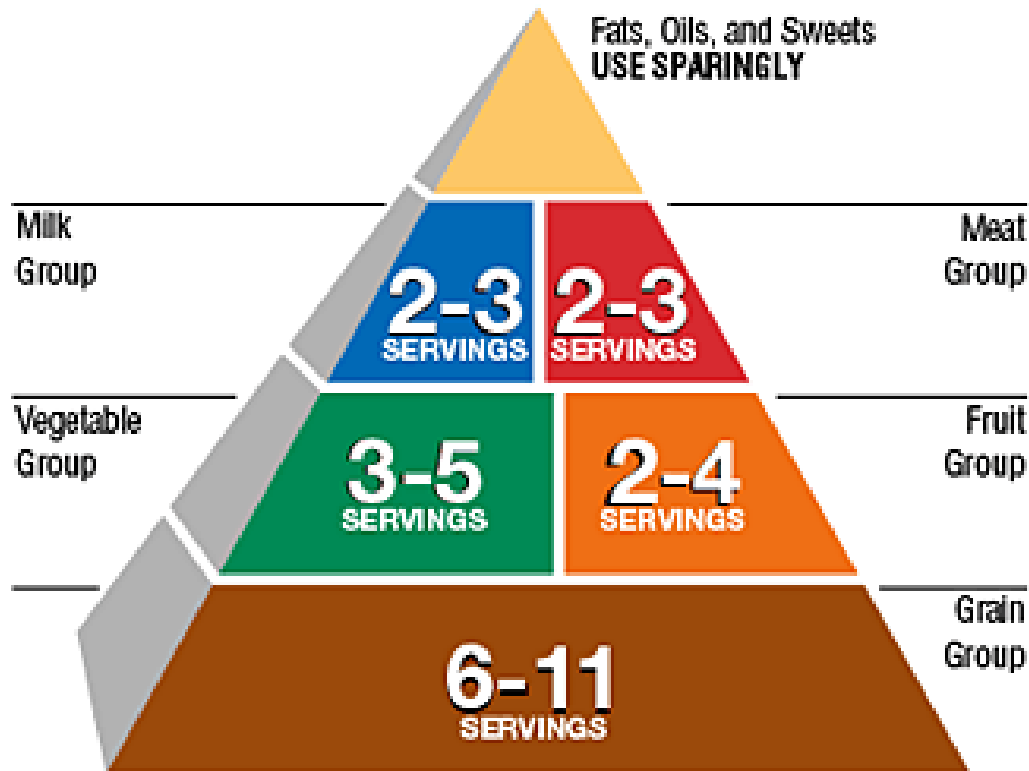
Wine in
moderation

Ha!



....and After!!!

How To Make the Pyramid Work for You



- Top of the pyramid- big grant efforts
- Milk and meat-other folks who understand connections and may willing to work with us
- Fruits and nuts- Those who already work with us – *willingly!*
- Grains are those folks doing existing efforts we can seed adaptation into

Next Steps

- Continue to develop Town's capacity to do adaptation work
- Conduct Town-wide vulnerability assessment
- Integrate climate considerations into existing and future community plans
- Explore opportunities for flood proofing existing structures and discouraging building in vulnerable locations
- Continue refinement of outreach strategy
- Continue sharing Town's experience with other communities



Groton Project Inspired Actions

- DEP State Parks performed vulnerability assessment of all coastal properties
- Office of Long Island Sound Programs internal Climate Change Group- self inventory of policies and adaptation
- CT Climate Network and ART- Adaptation Resource Toolkit for Groton and beyond
- Featured Case Study Success in upcoming Governors Steering Committee report to Legislature
- Groton seeding adaptation into existing planning mechanisms- Plan of Conservation and Development, Streetscape project, active climate taskforce
- Highlighted at many regional, national and international conferences as model for adaptation process

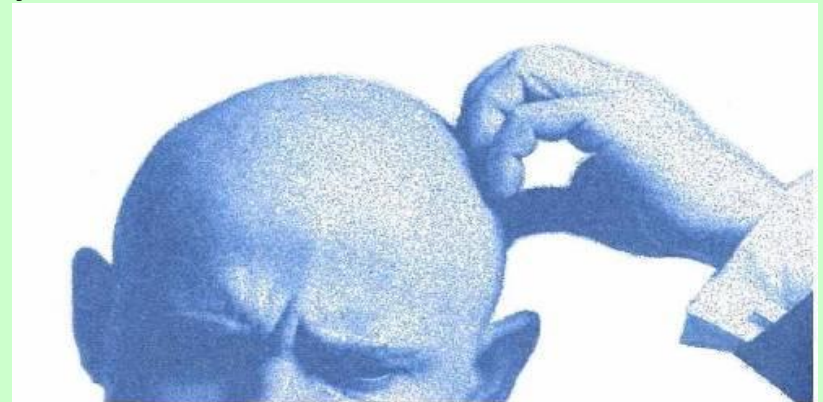


~~~~~The Wave of Interest~~~~~

- Resilient Cities 2010 in Bonn, Germany. Presented by Mike Murphy, Groton Planning Director to a crowd of about 50-70
- Massachusetts State Climate Protection Network in Boston, MA. Presented to ICLEI members and State representatives from Massachusetts on June 4 (as well as presenting on other ICLEI efforts)
- Tijuana Estuary Adaptation Workshop in San Diego, CA to regional entities, municipalities, and practitioners on the Groton process & other ICLEI efforts) on May 14th
- Highlighted on May 3rd at the Global Oceans Conference, Paris, France as part of a panel on innovative climate change adaptation work at the state and local level in the US
- Jen and Missy stults presented at Coastal Climate Adaptation Training in October in Rhode Island to state and federal staff
- Sam Merrell's modeling in ArcUser magazine

High-Level Lessons Learned

- Importance of political support
- Integrating into existing planning efforts – not new
- Stakeholder engagement and importance of coordination
- Focus on existing vulnerabilities
- Importance of incremental strategies
- Integration with existing priorities --- timing matters
- Don't underestimate people --- but don't devalue the challenge of finding effective ways to build resilience
- Manage expectations appropriately --- no silver bullet



What have we learned all together?

- We have an opportunity to rise to the challenge
- Changes in society, government, and our culture and processes can be slow
- We already know a lot of where we are vulnerable
- We have many partners and initiatives that can merge
- Adaptation is best done when integrated into existing efforts

CT Climate Network

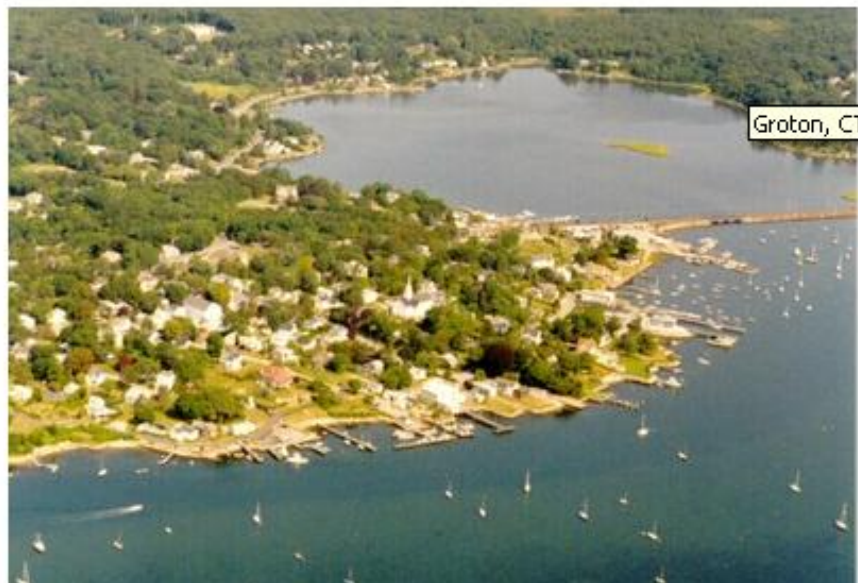
- Municipal outreach- what do towns need for climate change adaptation and mitigation?
- Many towns have climate taskforces, but do town planning/public works staff know?
- What are other communities doing that we can learn from?
- How can we all help?
- We are developing ART- Adaptation Resource Toolkit

For More information...

- Sound Outlook Climate Change Issue:
[http://ct.gov/dep/lib/dep/long_island_sound/soundout/sound_outlook_o
ctober_2010.pdf](http://ct.gov/dep/lib/dep/long_island_sound/soundout/sound_outlook_october_2010.pdf)
- www.CTclimatechange.com State website with multiple climate change resources, state report
- www.lclei.org Groton videos and presentations, multiple climate resources
- www.ct.gov/dep



Groton, Connecticut Coastal Climate Adaptation Workshop Presentations



Groton, CT

View or download these presentations and videos from the three-part 2010 **Groton Coastal Climate Adaptation Workshop**, which brought together local, state, and federal representations to discuss climate adaptation issues.

The 2010 **Groton** Coastal Climate Adaptation Workshop is a three-part

series designed to help engage representatives from federal, state, and municipal governments in climate adaptation efforts and to begin defining strategies for maximizing resilience to coastal impacts throughout Connecticut and the Northeast. Download these free presentations from the Workshop. If you attended the Workshop, please take a few moments to give us your feedback by downloading and filling out this [evaluation form](#).

Action Center

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Climate Adaptation Planning

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February 9, 2008 • Category: News

Welcome to the State of Connecticut's official climate change website, administered by the Governor's Steering Committee on Climate Change. Learn more about our work and our logo...

[FULL STORY](#)

Seeking Public Comment on Draft Greenhouse Gas Reduction Strategies

The Draft Greenhouse Gas Reduction Strategies Table (PDF) summarizes many potential greenhouse gas reduction strategies for consideration in Connecticut. The table summarizes progress on meeting greenhouse gas (GHG) actions included in the 2005 CT Climate Change Action Plan and also includes additional federal, regional and state-level strategies that may help the state in its effort to meet its [...]



Invitation for Nominations, 2010 Climate Change Leadership Awards

The Governor's Steering Committee on Climate Change invites nominations for the 2010 CT Climate Change Leadership Awards Program. Nomination deadline is March 31, 2010.

[Initial Actions and Climate Action Map](#)

[Menu of Municipal Climate Actions and Resources](#)

[Household Climate Action Pledges by Town](#)

Calendar



Apr »

March 2010

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Upcoming Events

March 18, 2010:

Smart Growth Conference (2:00 pm)

April 5, 2010:

3rd Annual Global Environmental Sustainability Symposium A Green Economy for a Sustainable Future (all day)

April 8, 2010:

CT Environmental Literacy Plan Workshop, April 8 (9:00 am)



A NEWSLETTER OF THE CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION
EXPLORING LONG ISLAND SOUND – ISSUES AND OPPORTUNITIES

Planning for Climate Change in LIS

Substantial efforts have been made over the past two years toward adapting to climate change in Connecticut and Long Island Sound. Working together, representatives of all levels of government, as well as academic institutions, non-governmental organizations (NGOs) and other stakeholders, have undertaken collaborative efforts to identify climate change adaptation strategies that could and should be put forth for state and community implementation. In the following pages, we will explore some of the ongoing efforts described briefly below, and highlight continuing challenges for the years ahead.

In 2008 the Governor's Steering Committee on Climate Change created an Adaptation Subcommittee with work groups focusing on Public Health, Natural Resources, Infrastructure and Agriculture. DEP staff, including representatives of the Office of Long Island Sound Programs (OLISP), sit on these committees. The work groups have developed in-depth impact reports in these planning areas and are currently preparing recommendations to be provided to the state legislature. Additionally, OLISP started its own internal climate change group, which is examining Connecticut's coastal management policies and procedures with respect to climate change adaptation, and which will make formal recommendations to the state committees for inclusion in the report to the legislature.

OLISP staff have attended and spoken at many events, workshops and conferences on climate change adaptation, at which they have begun to inform communities about climate change issues and to identify effective adaptation strategies. OLISP has received grants in 2009 and 2010 from the Federal EPA's Climate Ready Estuaries Program (CRE) and the Long Island Sound Study (LISS) to fund the development of Sentinel Monitoring for Climate Change in Long Island Sound along with New York State and Federal partners. This effort has been selected as a pilot project in which lessons learned in LIS will be shared with New England and the New York Bight Region to help them develop a regional monitoring strategy for the coastal ecoregions and associated watersheds.

A major CRE-funded initiative applied at the local level was the Groton Coastal Climate Change Adaptation Project, a series of three workshops held in January, March

		
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Fall 2010

ArcUser

The Magazine for Esri Software Users



Renewable



Valuing Mitigation Strategies

A GIS-based approach for climate adaptation analysis

By Sam Merrill, Damon Yakovleff, David Holman, Joe Cooper, and Paul Kirshen

As more municipalities engage in climate change adaptation planning, better tools to quantify risks to vulnerable assets are needed to facilitate this process. The New England Environmental Finance Center (NE/EFC), with the support of Battelle Memorial Institute, has developed an approach that assesses the costs and benefits of adapting to sea level rise (SLR) scenarios. *[NE/EFC works throughout New England to advance the understanding and practice of smart growth, mitigating and adapting strategies for dealing with climate change, and developing alternative energy resources. NE/EFC strives to build local capacity to deal with these and related issues.]*

Many tools have been developed by the National Oceanic and Atmospheric Administration (NOAA), the Federal Emergency Management Agency (FEMA), The Nature Conservancy, and other organizations in response to challenges of climate change. These tools focus on the damage caused by SLR or increased storm surges and do not adequately anticipate the cost of damage caused by moving water or include opportunity costs incurred during floods and subsequent damages that render infrastructure unusable. Many existing GIS tools do not calculate or visualize the economic benefits of the adaptation options

canes (SLOSH) model; and other flood methods, as well as projected SLR scenarios over time, property values, and infrastructure costs, into a comprehensive GIS-based picture of potential economic damage. COAST displays the location-specific avoided costs associated with particular adaptive actions, along with the costs incurred by implementing those actions, to assist coastal municipalities in selecting appropriate strategies.

COAST is not limited to use by coastal cities for quantifying real property loss and other economic vulnerabilities. It has applications for inland areas that include analyzing and displaying the economic impacts of any potential hazard event that can be mapped (e.g., extreme rainfall, fire) as well as the social and environmental impacts of those events. COAST bundles processes in Excel and the ArcGIS ArcGlobe application in the ArcGIS 3D Analyst extension. (COAST requires an ArcGIS Desktop license.) It has been designed to eventually become a stand-alone ArcGIS Desktop extension.

Emergence of Adaptation Interest

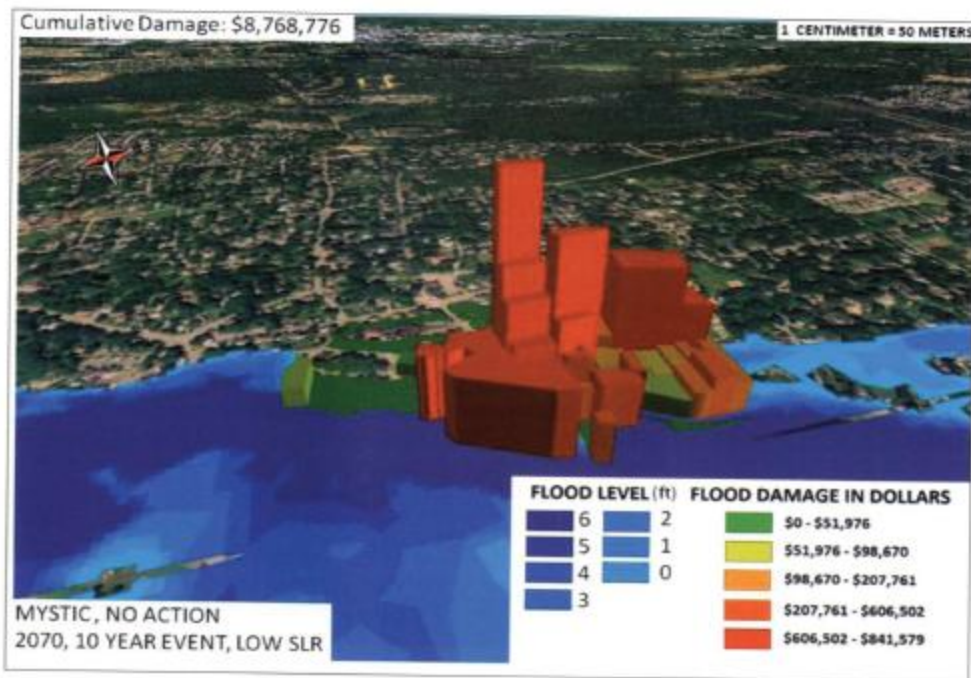
The principal response to the problems of SLR and increased storm frequency associated with global climate change has been to reduce green-

household emissions. The IPCC estimates SLR to have averaged 1.8 millimeters (mm) per year (± 0.5 mm yr⁻¹) between 1961 and 2003, accelerating to 3.1 mm (± 0.7 mm yr⁻¹) per year since 1993 (S.5.5.2.1, "Changes in Sea Level" in the *IPCC Fourth Assessment Report: Climate Change 2007*; note also that rate changes from 1961 to 1993 were derived using tide gauge data, whereas 1993–2003 rate changes were derived using TOPEX/Poseidon satellite altimetry). Studies show that expected increases in sea levels will magnify impacts of storm surge flooding. (For a literature review, see *Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions*. Union of Concerned Scientists, 2007). Municipalities must now adapt to this changing situation using the best information and modeling available.

The Visualization Approach

Using 3D capabilities of the ArcGlobe application, economic floodplains can be modeled that show real property and building contents loss, lost infrastructure value, lost economic output, displaced persons, and affected natural resources. The 3D map in Figure 1 models the economic floodplain for downtown Mystic, a portion of Groton, Connecticut. It shows predicted losses related to SLR of 1 m caused by

Figure 1: A no-adaptation action scenario modeled for downtown Mystic in Groton, Connecticut. Expected losses in real property and building contents damage from a simulated 10-year flood event projected for 2070 with 1 m of SLR are shown as extruded polygons.



age to real property and building contents. The adaptive actions modeled for this location include installing a hurricane barrier, elevating a road, and building dikes. Each action could provide some protection to the vulnerable areas.

Visually, each action is represented in these maps using the same perspective and showing polygon extrusion for each adaptation action being considered. This is an effective way of showing up-front and maintenance costs of hard-structure approaches versus expected damages from particular inundation events. Soft-structure approaches can also be modeled, such as floodproofing and rezoning over time.

More important, this approach also allows modeling of ranges of SLR heights and storm surge frequency and intensity. Combined outputs of multiple future scenarios provide an opportunity for stakeholders to select future conditions that match their expectations and visualize the predicted damages using both ac-

well as identifying robust adaptation strategies that may function acceptably and save money under any climate scenario.

Early applications suggest that parcel-based, graphic display of local vulnerabilities illustrating the likely benefits of taking adaptive actions is a powerful new way to engage local communities in proactive planning in protecting vulnerable economic assets. Work to date has been supported primarily by the U.S. Environmental Protection Agency, in collaboration with ICLEI—Local Governments for Sustainability USA; the Connecticut Department of Environmental Protection; officials in Old Orchard Beach, Maine; and other organizations. Further applications to broaden the suite of expected damage profiles are in development with the U.S. EPA; NOAA; and several cities, including Portland, Maine.

For more information, contact Sam Merrill, Ph.D.

About the Authors

Sam Merrill, Ph.D., has been with the Muskie School of Public Service for nine years. Previously, he worked for the Minnesota Department of Natural Resources. His graduate work was in the area of GPS radiotelemetry on large carnivores.

Damon Yakovlev is a graduate student studying community planning and development at the University of Southern Maine's Muskie School of Public Service.

David Holman is an MBA candidate at the University of Southern Maine's School of Business.

Joe Cooper is a utility engineer technician; a supervisor for the City of Saco, Maine; and a freelance GIS analyst.

Dr. Paul Kirshen joined Battelle as research leader in June 2009 after 13 years at Tufts University as cofounder and director of the Tufts University Water Systems Science

In Closing

- We have many resources
- We have each other, if we listen and coordinate
- We can leverage our efforts
- We can continuously adapt our adaptation
- Species variability- Homo Habilis, climate change and evolution- evolved to adapt

Questions?



Jennifer Pagach (860) 424-3295

Jennifer.Pagach@ct.gov