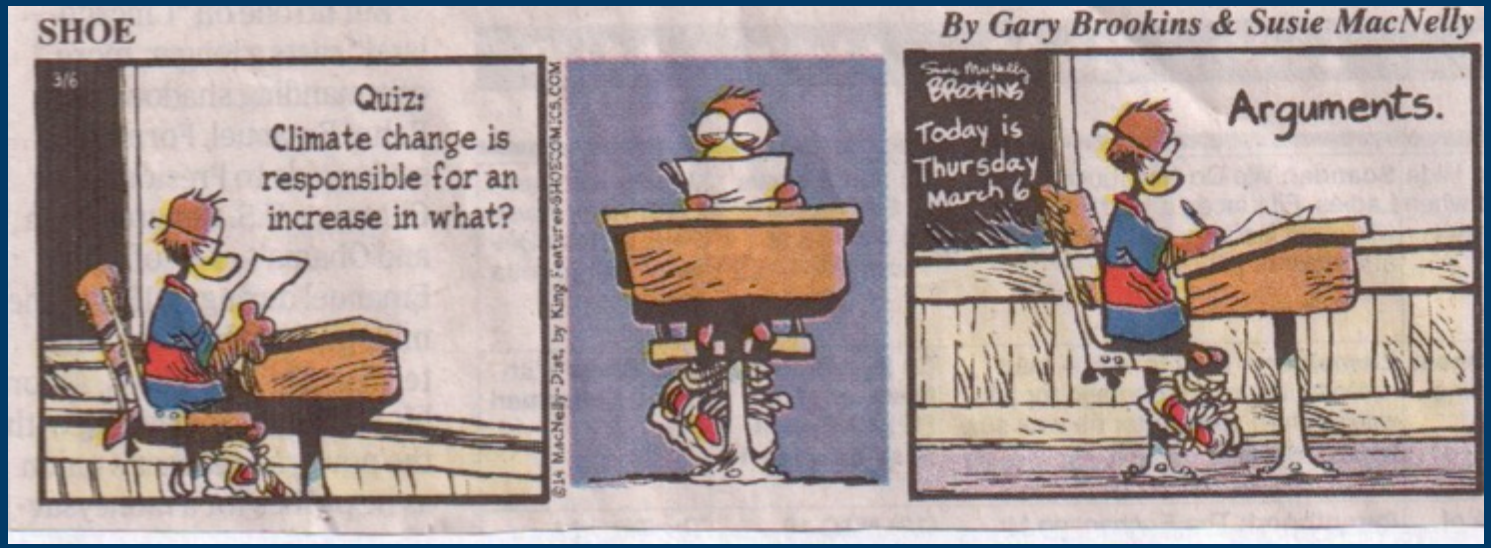
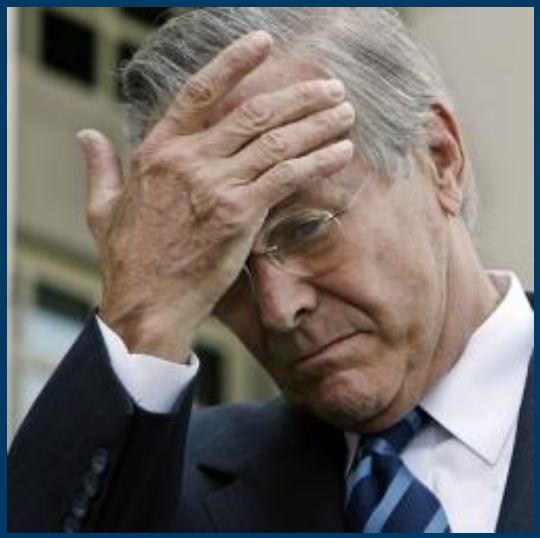
Impacts of Climate Change on Municipalities

Climate Adaptation Academy
May 3, 2014



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UNCERTAINTY



"As we know, there are known knowns.
There are things we know we know.
We also know there are known unknowns.
That is to say, we know there are some things we do not know.
But there are also unknown unknowns,
the ones we don't know we don't know

-Former Sec. of Defense Donald Rumsfeld

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What we know we know

Recent storms have raised an awareness of the need to adapt and become more resilient to storm related threats.



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March 2010



CT Post



CT Post



wtnh

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October 2011 Snowstorm



Photobucket

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Tropical Storm Irene



Westbrook

Stephen Dunn / Hartford Courant

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Two Storm Report

REPORT OF THE TWO STORM PANEL

PRESENTED TO:

GOVERNOR DANNEL P. MALLOY



Joe McGee (Co-Chair): Vice President, Business Council of Fairfield County
Major General James Skiff (Co-Chair): U.S. Air Force, Retired
Peter Carozza: President, Uniformed Professional Fire Fighters
Terry Edelstein: President, Connecticut Community Providers Association
Lee Hoffman: Attorney, Pullman & Comley, LLC

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Tropical Storm Sandy



Bay View Beach in Milford

John Woike, Hartford Courant

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Shoreline Preservation Task Force Report

OLR RESEARCH REPORT

January 14, 2013 2012-R-0513 (Revised)

REPORT OF THE SHORELINE PRESERVATION TASK FORCE

By: Kevin E. McCarthy, Principal Analyst

You asked that we prepare the report of the Shoreline Preservation Task Force. A legislative website has links to the presentations and videos of the meetings.

INTRODUCTION FROM THE CHAIR

Since the formation of the Shoreline Preservation Task Force in February 2012, we have collectively learned a great deal about the complexity of the issues relating to sea level rise, storm impacts, and

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Feb 2013 Snowstorm

Hobart Street in Meriden



Alan Chaniewski, FoxCT

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What do hurricanes have to do with climate change?

Once a hurricane has formed – what feeds it is warm, moist air and warm water temperatures.



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Disaster Declarations in CT since 1954

- Of the 30 Federal Disaster Declarations since 1954, 15 have occurred since 2004.
- Includes Emergency Declarations and Major Disaster Declarations.



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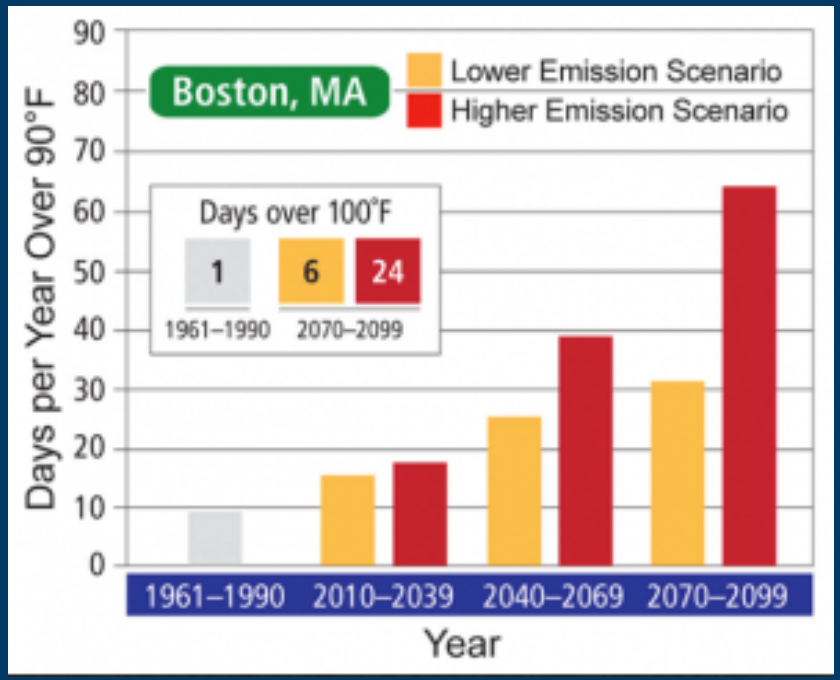
Science tells us the following things are happening

- Warmer Air and Land Temperatures
- More Frequent and Severe Droughts
- Sea Level Rise-Coastal Flooding and Storm Surge
- Coastal Land Loss-Erosion
- Warmer Oceans-Storms, environmental balance
- More Frequent and Serve Storms

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Temperature

- Avg temperatures in the Northeast have risen over 1.5 ºF since 1970 with winter temperatures rising over 4ºF between 1970 and 2000.



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Record Heat and Weather Extremes

"Global warming from human activities has reared its head in a way that can only be a major warning for the future."

KEVIN TRENBERTH, CLIMATE ANALYSIS CHIEF OF THE NATIONAL CENTER FOR ATMOSPHERIC RESEARCH

July in U.S. was hottest in history

Last month's 77.6-degree average temperature topped record set during Dust Bowl by 0.2 degrees

By SETH BORENSTEIN
AP Science Writer

Washington — This probably comes as no surprise: Federal scientists say July was the hottest month ever recorded in the Lower 48 states, breaking a record set during the Dust Bowl of the 1930s.

And even less of a surprise: The U.S. this year keeps setting records for weather extremes, based on precise calculations that include drought, heavy rainfall, unusual temperatures, and storms.

The average temperature last month was 77.6 degrees. That breaks the old record from July 1936 by 0.2 degree, according to the National Oceanic and Atmospheric Administration. Records go back to 1895.

"It's a pretty significant increase over the last record," said climate scientist Jake Crouch of NOAA's National Climatic Data Center in Asheville, N.C. In the past, skeptics of global warming have pointed to the Dust Bowl to argue that recent heat isn't unprecedented. But Crouch said this shows that the current year "is out and beyond those Dust Bowl years. We're rivaling and beating them consistently from month to month."

Three of the nation's five hottest months on record have been recent Julys: This year, 2011 and 2006. Julys in 1936 and 1934 round out the top five.

Last month also was 3.3 degrees warmer than the 20th century average for July.

Thirty-two states had months that were among their 10 warmest Julys, but only one, Virginia, had the hottest July on record. Crouch said that's a bit unusual, but that it shows the breadth of the heat and associated drought.

For example in 2011, the heat seemed to be centered mostly in

SEE SCIENTISTS PAGE A7

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Agricultural Impacts --Food Security

Could Midwest drought cause global crisis?

Two of the 3 most costly disasters since 1980 have been droughts, and the fallout from ruined crops could go beyond the financial.

By The Fiscal Times 5 hours ago

Share 129

Share 129 Tweet 7 Like 53

By Suzanne McGee

THE FiscalTIMES

The news from the U.S. Department of Agriculture wasn't quite as it bad as it could have been. But the weekly report indicating that less than a quarter of this year's corn crop can be rated as being in "good" or "fair" condition, compared with 62% at this time last year, was enough to send prices of both corn and soybeans back toward record highs.

That's great news for investors. Agricultural commodities have handily beaten most other asset classes so far this year as a place where investors have been able not only to generate positive returns but to capture gains of 20% or more, depending on their ability to buy into the right contract at the right time and roll that contract over when it approaches expiry.

The cause underpinning the gains is, of course, the drought that has swept through most of the mainland United States. Even last week's storms didn't leave enough moisture behind them to help get the corn and soybeans through the critical next week or two of their growing season. Some regions didn't see much rain at all, including parts of major corn-growing states like Iowa. There's a bit of wiggle room left for soybeans, but for much of the corn crop, even if the rest of the summer is a rainy washout for vacationers, it will simply be too late for farmers and their





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Aporkalypse Now





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Mississippi River Too Low to Go-8/20/12



Not-so-deep river



ROGELIO V. SOLIS/AP PHOTO

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Poor air quality & heat related illnesses





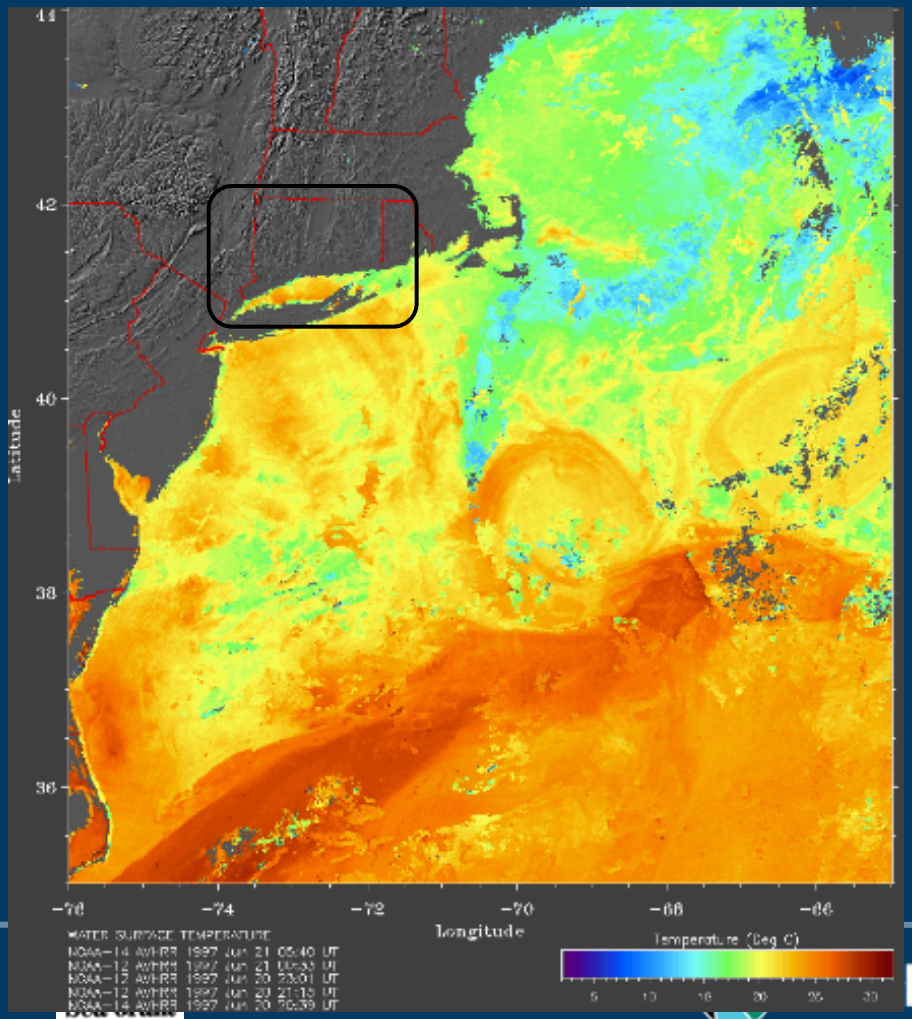




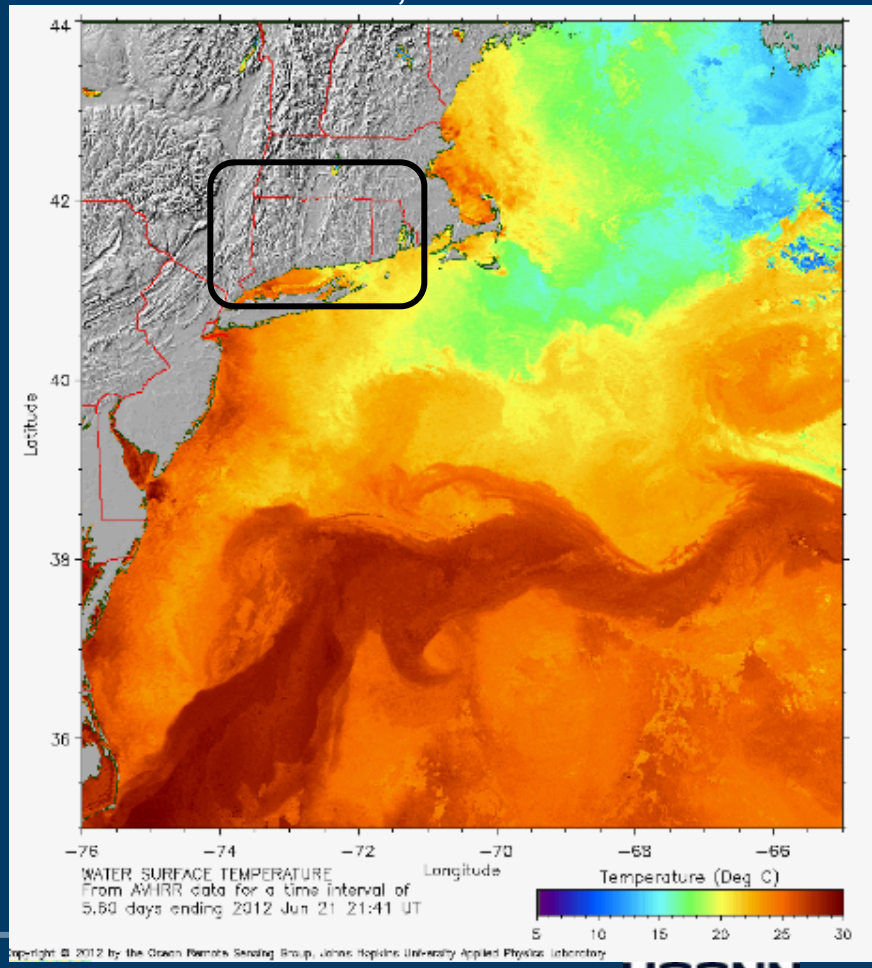
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Warmer Ocean Temperatures

June 21, 1997



June 21, 2012



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Record High Water Temp in LIS Shuts Down Millstone

*FRIDAY, AUGUST 17, 2012 VOL. 132 NO. 47 52 PAGES

Millstone looking to adjust to warm water

Nuclear plant to explore ways to avoid future shutdowns due to higher Sound temperatures

By JUDY BENSON
Day Staff Writer

Waterford — As the Unit 2 nuclear reactor at the Millstone Power Station begins its sixth day of a shutdown due to record high water temperatures in Long Island Sound, engineers at the plant are beginning to look at whether the plant could be operated safely with warmer water than the current license allows.

"It's a long-term project to analyze whether we could go above 75 degrees," said Ken Holt, spokesman for Millstone owner Dominion. "It may involve some changes in the equipment."

Unit 2 was shut down Sunday when the water temperature in the intake channel on Niantic Bay rose above 75 degrees, the maximum allowed by the plant's Nuclear Regulatory Commission license.

The water is used to cool the plant, and water over 75 degrees would not cool equipment sufficiently to keep it within the margin of safety set by the current license.

SEE CHANGES PAGE A3



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The Millstone Solution

Millstone 2 may now use warmer cooling water

By **Judy Benson**

Publication: theday.com

Published April 21. 2014 1:00PM Updated April 22. 2014 12:27AM

COMMENTS (8) SHARE PRINT

NRC hikes temperature limit after 2012 shutdown

Waterford — Unit 2 at the Millstone Power Station will now be able to use cooling water up to 80 degrees, averting a repeat of the shutdown that happened two years ago when the water at the plant's intake pipe in Long Island Sound exceeded its licensing limit of 75 degrees for the first time.

The Nuclear Regulatory Commission announced Monday that it has approved the increased temperature limit for Unit 2, the first time this has occurred at any of the 13 U.S. nuclear power plants located on marine waters, said NRC spokesman Neil Sheehan. License amendments for temperature increases have previously been allowed for plants located on rivers and lakes.

The 11-day shutdown in August 2012 was the first time a U.S. nuclear power plant had to shut down because of rising water temperatures. In response, the Nuclear Regulatory Commission ordered a review of climate change impacts on power plants nationwide.



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Habitat migration

Warmer Long Island Sound reeling in southern fish

Study says changes consistent with global warming

By JUDY BENSON
Day Staff Writer

In the classic 1948 film noir "Key Largo," gangster Johnny Rocco dines on what was then a unique subtropical cuisine: pompano and champagne.

But in the 64 years since actor Edward G. Robinson so famously licked his chops over the meal, pompano have ceased to be a species found only in southern waters. In fact, it's now conceivable that a southeastern Connecticut fisherman could serve such a meal from his own Long Island Sound catch.

"We're getting some strange fish we haven't seen before, and some that we used to get only occasionally we're seeing more often," said Jon Hillyer, owner of Hillyer's Tackle Shop in Waterford, Tuesday. "A lot of guys are catching them by mistake while they're fishing for bluefish or porgies, and some of them we can't even identify. And some of the things we used to see, like tomcod and smelt, we don't get any more."

The shifting diversity of fish species in Long Island Sound is the subject of a study published last month

SEE LOCAL FISHERMEN PAGE A5





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A Troubling Question

Will the Maine Lobster be replaced by the Maine Blue Crab?



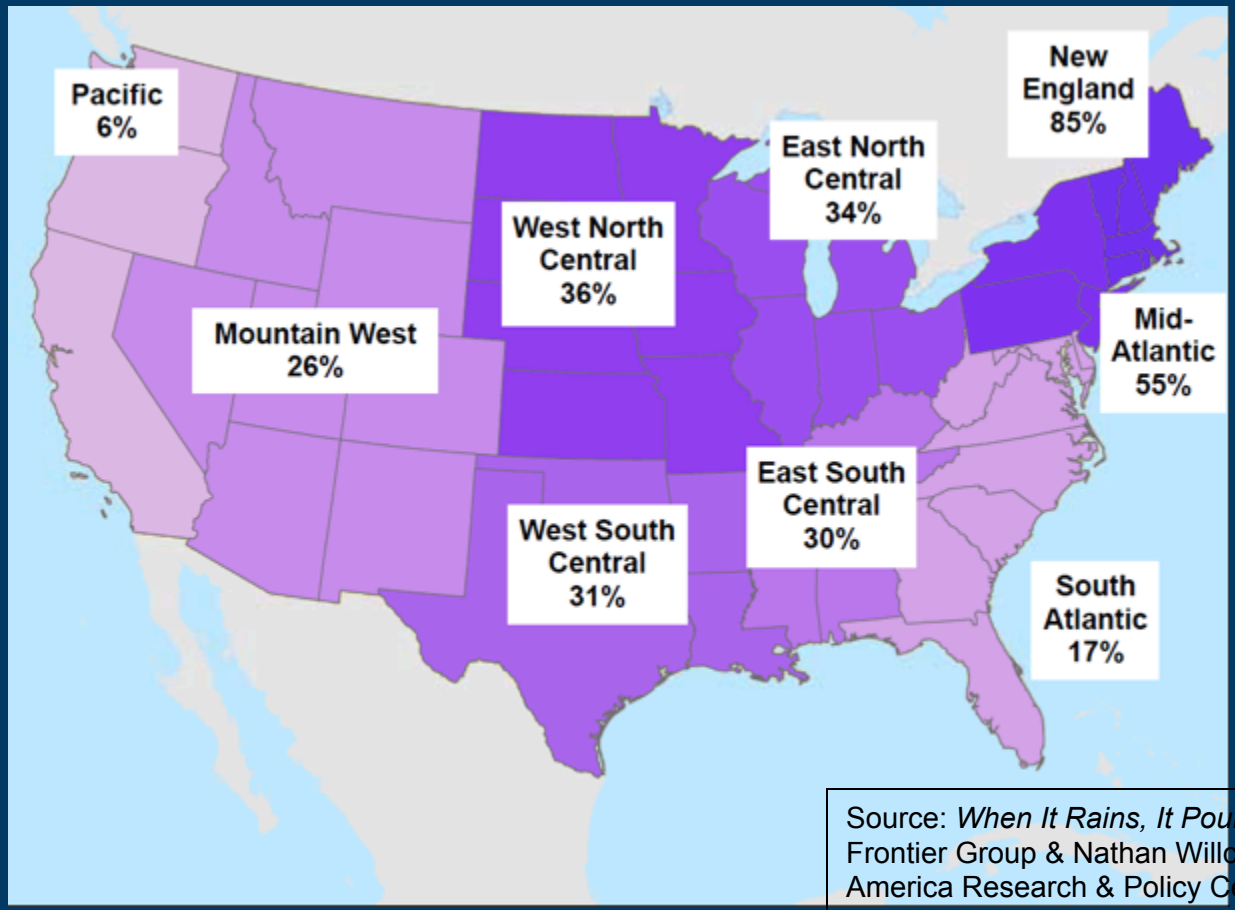


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Warming Water Impacts on Fish



In NE intense rainstorms and snowstorms now happening 85 percent more often than in 1948.



Source: *When It Rains, It Pours* by Travis Madsen, Frontier Group & Nathan Willcox, Environment America Research & Policy Center

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More Westbrook News



Researcher warns of problem gambling
A British researcher says the advent of online gambling is ...



Cancer survivors use boat to de-stress

Flood waters strand Westbrook residents

Updated: Thursday, 12 Jan 2012, 6:55 PM EST
Published : Thursday, 12 Jan 2012, 5:15 PM EST

Tina Detelj

Westbrook, Conn. (WTNH) - Folks without a boat were stranded when Westbrook's shore flooded with water.

"This has been the worst that It's been since Irene," said resident Nancy Bromley.

Bromley says her road, Sunrise, and others along Westbrook's Grove Beach flood a few times a year when conditions are right.

"You can see it come up. It happens with the full moon," said Scott Atwater. "A full moon something to do with the tide the full moon and then the heavy rain and then it just comes over. It floods over comes over in the marsh area."

"It was a little bit of water and then a half hour later it was a lot of water," Bromley said, while laughing.

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Mold Hazard From Flooding





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Centers for Disease Control and Prevention

CDC 24/7: Saving Lives. Protecting People.™



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Utility Issues



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Transportation Infrastructure-Rail, Highway, Port Operations, Ferries, Airports, Bridges, Canals, Parking Garages



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Not Just a Coastal Issue



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Ice and Snowstorms









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Rise in Groundwater Causing Septic System Failure







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Storms and Pollution



Norwalk
by Main Street Connect

Your Reporter
Nancy Guenther Chapman

News ▼ Lifestyle ▼ Sports Schools Events Gallery Wheels Real Estate

News

Storms Worsened Sound's Sewage Problems

by Greg Canuel (email) 01/23/12

Tweet 4 Like Send Like 0 Send Email

Watch your step: Heavy rainfall like that during Hurricane Irene can cause sewage overflows, even without power outages knocking out treatment plants.

Photo credit: *Greg Canuel (File)*

Sign up

- Millions of gallons of sewage flow into the Sound during storm events
- Flooded agricultural fields-crop loss
- During heavy rains, such as during Irene and the recent storms, there is too much water for the plants to handle. Excess water flows untreated into LIS.

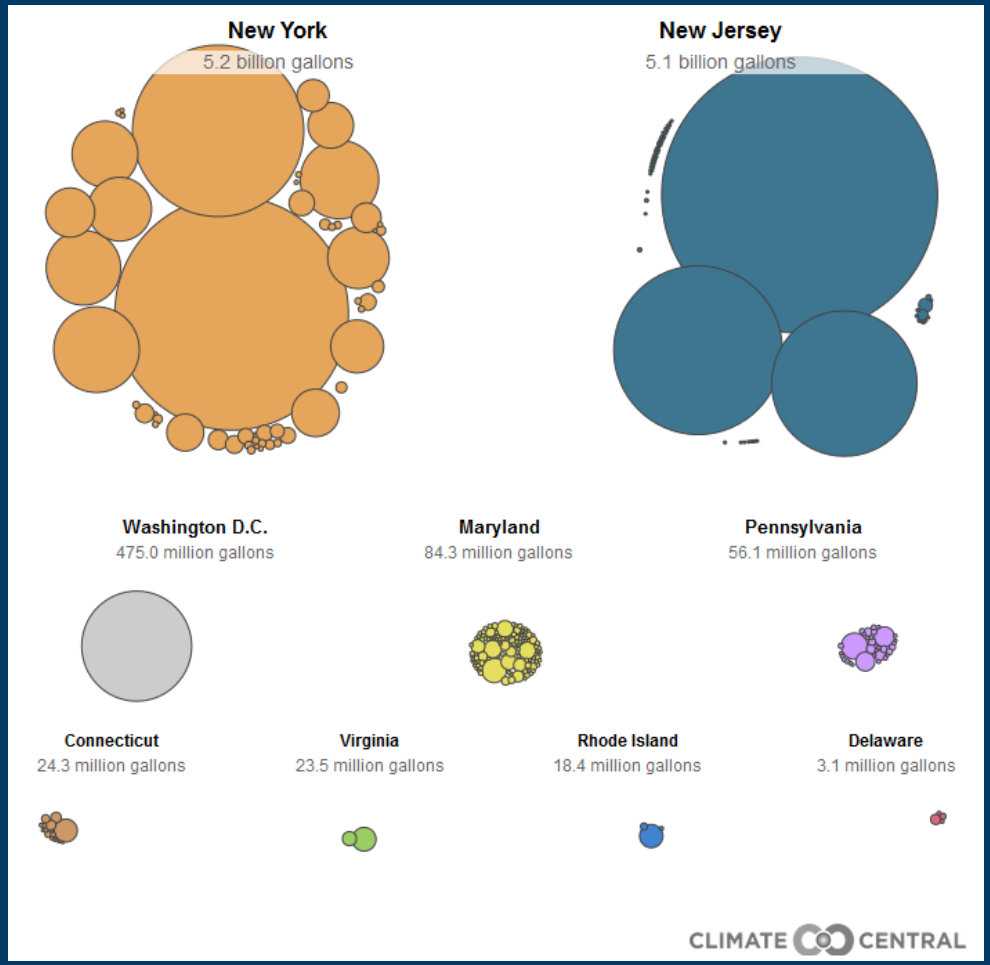
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11 Billion Gallons of Sandy Sewage Overflow



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Officials Take Note of Road Flooding Issue

Shore Publishing July 3, 2012



"We have to provide access to people for public safety. This is high priority.“ –Guilford Town Engineer James Portley

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More Frequent Street Flooding

Bank Street New London July 28, 2012



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Brooklyn-Battery Tunnel

Don’t really know what the long term costs are going to be



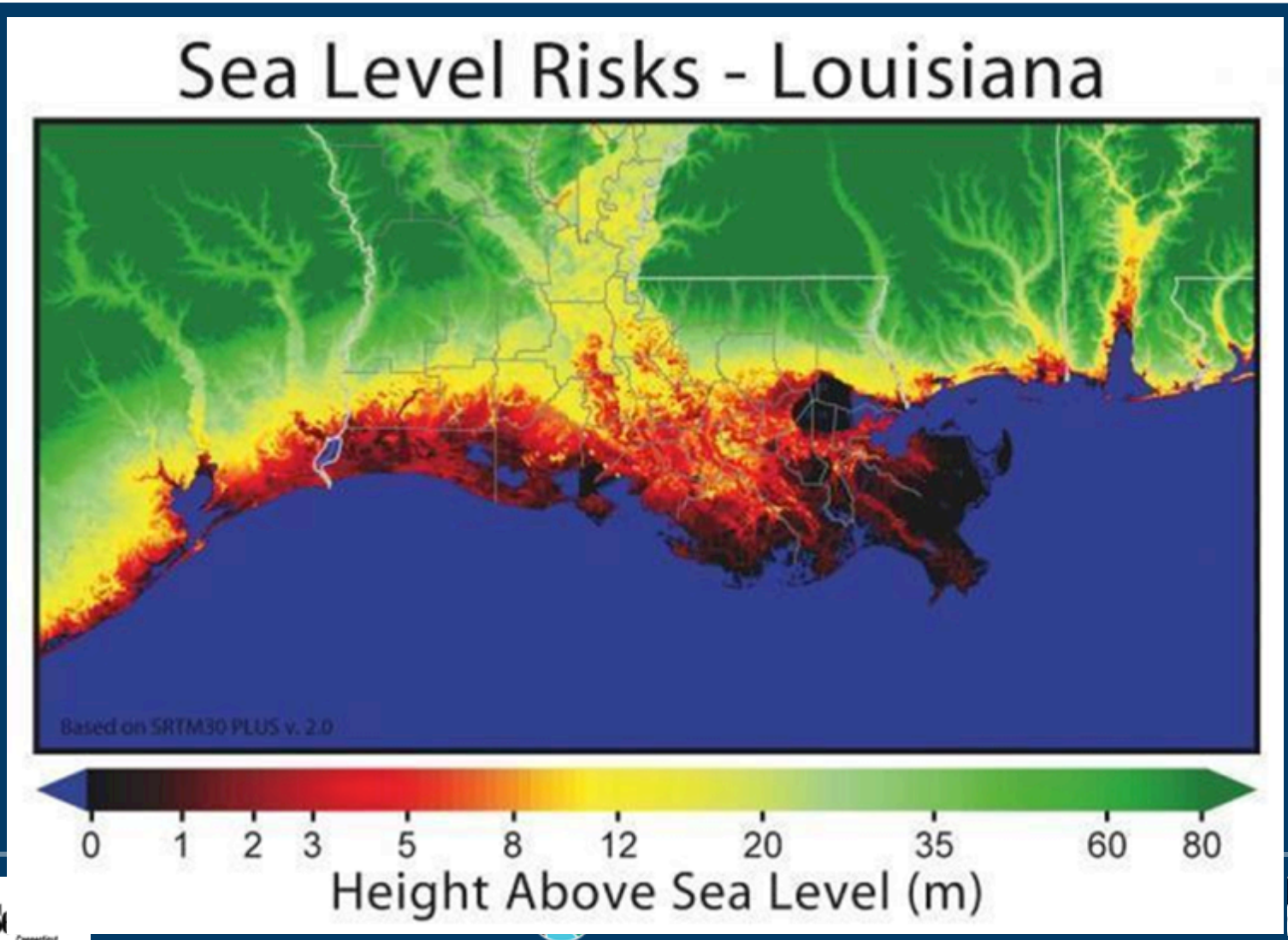
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Storm Surge Milford, CT During Tropical Storm Irene



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Louisiana's $50B Plan to Save the Coast



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Where will they go?



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Coastal Erosion







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Legal Issues

- Liability from erosion of property due to groins
- Loss of public trust land from seawalls
- Can a municipality abandon a road that suffers repeated damage?
- Can a municipality deny authorization to build or expand on a non-conforming lot which may have been conforming in the past?

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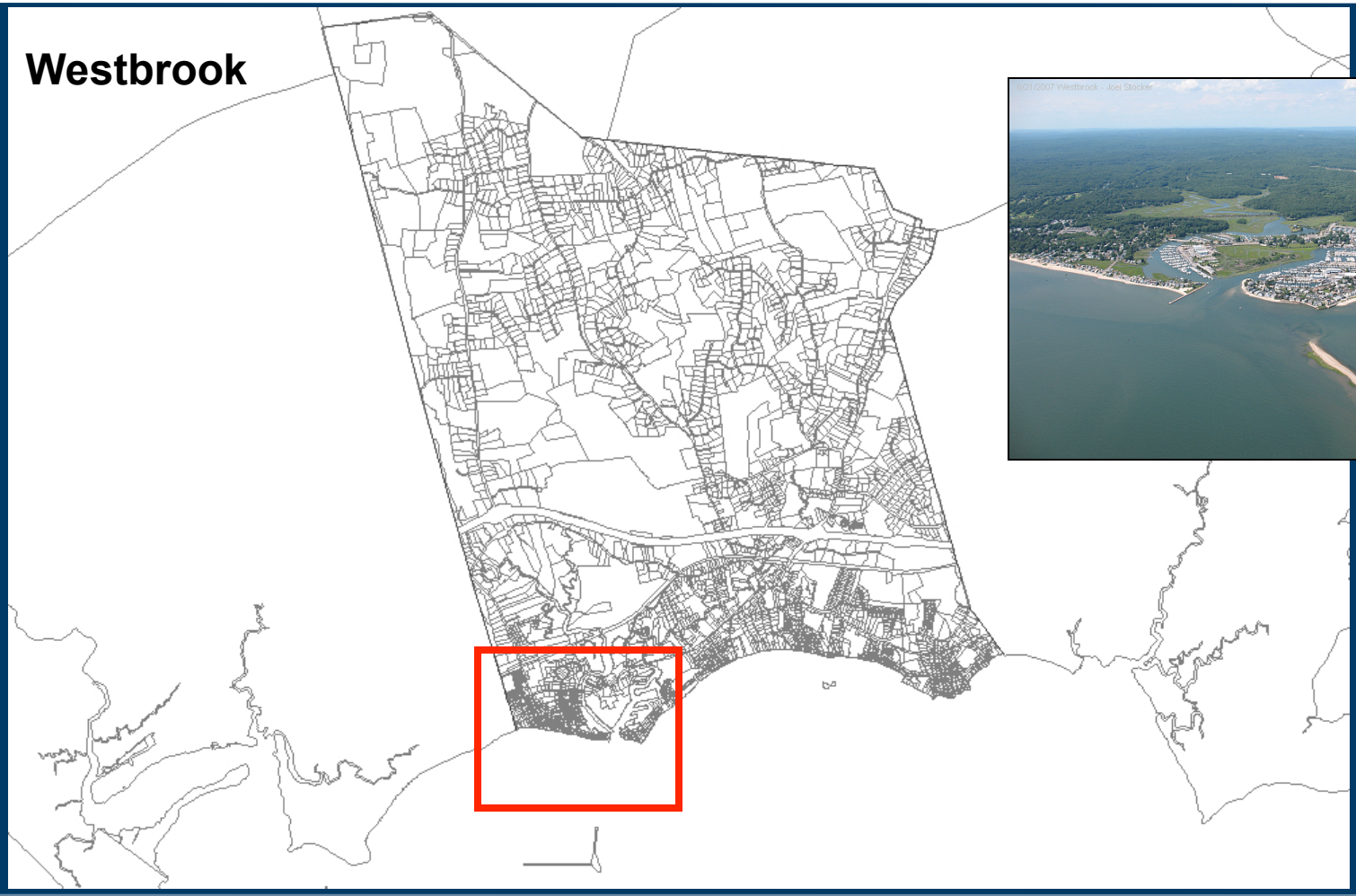
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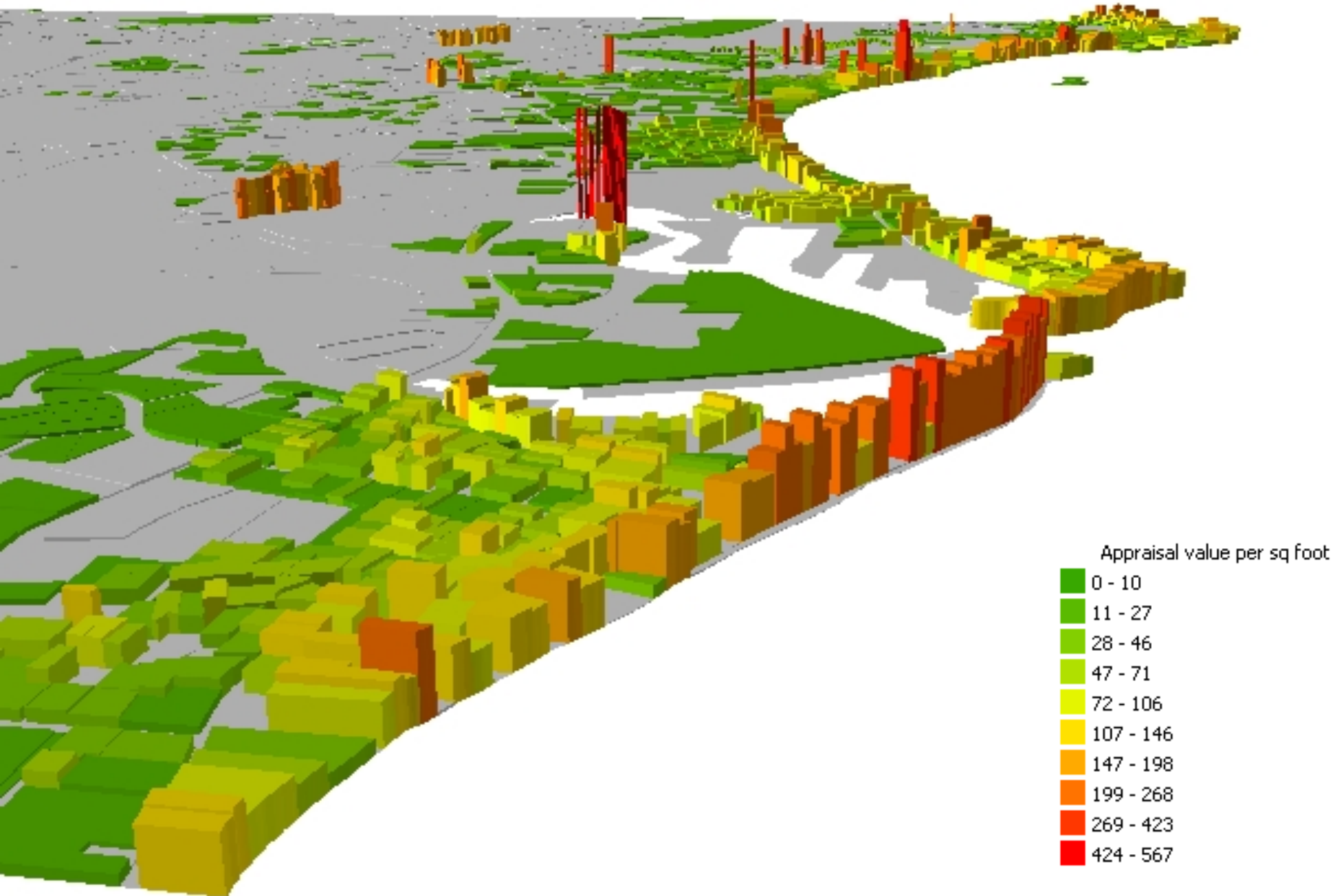
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Loss of Tax Base



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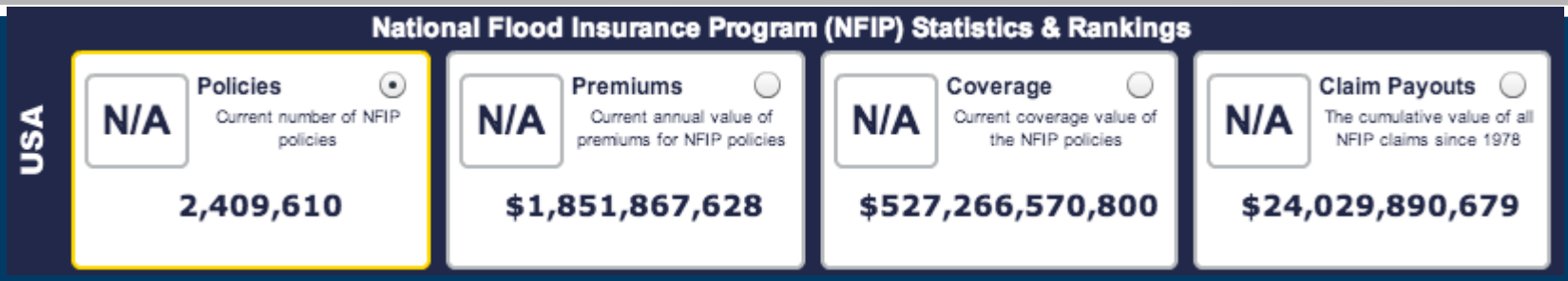

Appraisal value per sq foot
0 - 10
11 - 27
28 - 46
47 - 71
72 - 106
107 - 146
147 - 198
199 - 268
269 - 423
424 - 567

Flood Insurance

- May impact value of structures in flood prone areas
- Impact communities grand list
- Who should pay?
- Rollback of Biggert-Waters provides some relief

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Fun Facts From FEMA



$527 billion
Value of assets insured by the NFIP in the coastal floodplain in 2011.
Source: FEMA, 2012a

9
Of the top ten most destructive flood events on record have occurred since 1999.
Source: FEMA, 2012b

$24 billion
Total losses paid out by the NFIP within the coastal floodplain from 1978–2011.
Source: FEMA, 2012a

$16 billion
Total losses paid out by FEMA after Hurricane Katrina.
Source: FEMA, 2012b

The NFIP has become the second largest fiscal liability of the U.S. government, behind social security

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Municipal officials have to contend with:

- Strained municipal budgets
- Uncertainty
- Public/Political Decisions
- Taxpayers
- Lack of experience from which to learn
- Managing Expectations

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Response requires participation from a wide range of municipal officials

- Mayor or First Selectman-budgeting, decision-making
- Planning Departments—Land use, environmental, transportation
- Engineering and Public Works Dept.-roads, stormwater systems, etc.
- Public Utilities Dept.-water and sewer systems
- EM-access to fires and other emergencies
- Health-heat related illnesses, infectious diseases,
- Social Services-sheltering displaced persons
- Finance and Recreation **AND.....**

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THE PUBLIC



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Public Perception

New research center on climate change preparation to be at Avery Point

By **Judy Benson**

Publication: The Day

Published January 21. 2014 4:00AM Updated January 22. 2014 1:00PM

COMMENTS (28) SHARE

DEEP, UConn will work jointly

Groton - The state is using a $2.5
pollution lawsuit to create a new re
Connecticut's Avery Point campus
businesses and homeowners deter
their properties against what the s
frequent severe storms caused by

The Institute for Community Resili
be a partnership of UConn and the

Climate planning

Published January 22. 2014 4:00AM

COMMENTS (61) SHARE PRINT

The climate is changing, water levels will rise, and ocean storms will inflict more damage, all of which should be of great interest to Connecticut, a state with a littoral southern border. This is why it makes good sense that the state is creating an "Institute for Community Resiliency and Climate Adaptation."

The new agency will be located at the University of Connecticut's Avery Point campus in Groton, another good choice. The coastal campus specializes in the study of marine sciences, making it an appropriate location to pursue the new institute's mission of developing science-based policy proposals for dealing with rising seas.

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Generalrjp comments (15)

- "The hoax of global warming climate change continues. Radical left wingers want to believe the hoax so they can control another 1/6 of the economy with a climate tax. Climate change is the biggest man-made hoax in history"
- "The facts are irrevocable and simple. Liberals want to control another 1/6 of the economy and destroy freedom. Pushing this man-made hoax is their easiest path."

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Live Here (11)

"That sea levels are rising and our shoreline is very vulnerable is beyond dispute. We should be prepared for significant land loss and increased storm intensity. This is NOT a drill."

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“I’m more worried about flesh eating bacteria for the time being, this climate change stuff takes too long.”



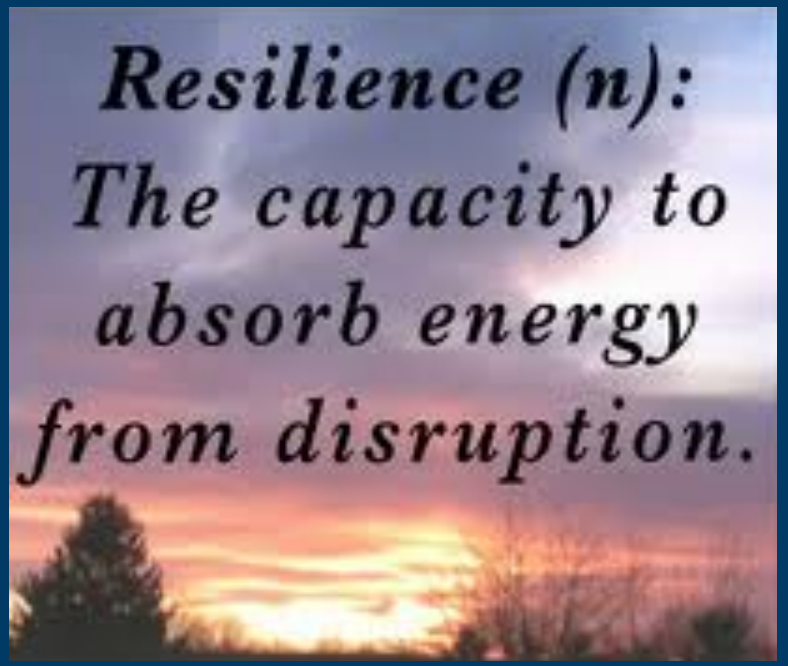
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Building resiliency costs money

What will it cost to upgrade a municipal storm water system or address failures of a large number of septic systems in an area?

How much resiliency can we afford?

Risk Management



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Response to Problem

- Do nothing and see what happens
- Develop a Plan of Action and do nothing
- Develop a Plan of Action and try to do it all at once
- Develop a measured response and implement over time

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Main Responses to Climate Change

- Protect resources/systems from change
- Adapt to predicted changes
- Abandon or retreat when necessary

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What is the goal of climate change adaptation?

- To improve local community resilience, or the ability to bounce back quickly from climate impacts (or not get knocked down in the first place).

- Current and projected climate change impacts require community preparation.



New Haven, CT following Sandy. AP Photo/US Coast Guard, Petty Officer 2nd Class Rob Simpson

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Approaches that makes sense:

- Look at CC in all areas related to public policy and expenditures
- Include CC issues in plans, implementation documents, all future municipal decisions
- Vulnerability Assessment– establish priorities for meeting challenges of CC
- Develop adaptation plans
- Build community support to implement adaptive responses
- Effectively use the government in responding to climate change

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ADAPTING URBAN WATER SYSTEMS TO CLIMATE CHANGE

A handbook for decision makers at the local level



EPA United States Environmental Protection Agency

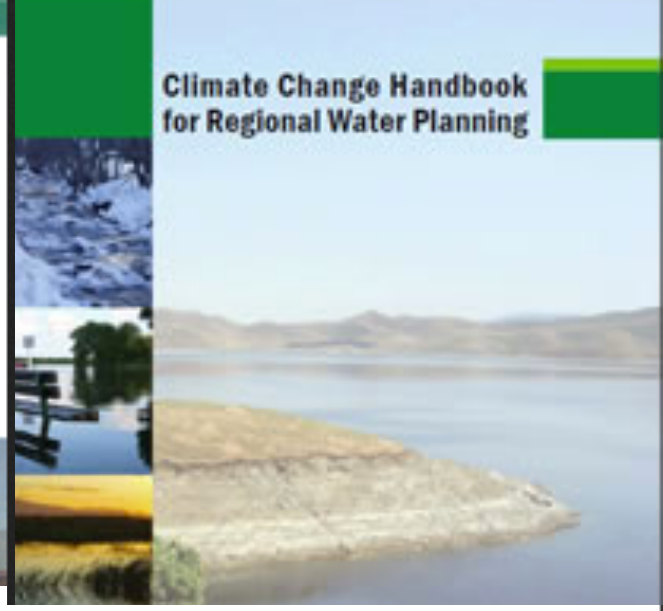
CLIMATE READY WATER UTILITIES @EPA

Adaptation Strategies Guide for Water Utilities





Climate Change Handbook for Regional Water Planning



PLANNING FOR CLIMATE CHANGE

Strategies for Mitigation and Adaptation for Spatial Planners

Edited by Simin Davoudi, Jenny Crawford and Abid Mehmood

ADAPTING TO CLIMATE CHANGE: A PLANNING GUIDE FOR STATE COASTAL MANAGERS



NOAA Office of Ocean and Coastal Resource Management

PREPARING FOR CLIMATE CHANGE

A Guidebook for Local, Regional, and State Governments



Written by

King County

ICLEI

Department of
ENERGY & ENVIRONMENTAL PROTECTION

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Energy

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Report an ENVIRONMENTAL Concern/Problem

Calendar of Events

Laws and Regulations

Maps and GIS Data

Adaptation Toolkit

The Connecticut Adaptation Resource Toolkit (CART) was developed by the Connecticut Department of Energy and Environmental Protection and ICLEI-Local Governments for Sustainability USA (ICLEI USA) with funding from the US Environmental Protection Agency's (US EPA) Climate Ready Estuaries through the Long Island Sound Study, a national estuary program.

CART was developed to help local government staff, committee members and active participants in Connecticut have instant access to climate change adaptation resources thereby enabling them to easily and meaningfully benefit their communities. Too often individuals or communities want to minimize future risks and costs, but they do not know where to start or how to continue. CART is a one stop shopping website for ideas and methods on local climate change adaptation planning and action.

The need for CART was identified through a prior EPA-funded CT DEEP and ICLEI collaborative project that involved working with Groton, CT, on a model adaptation planning process. The project focused on identifying the needs and policy types for each level of government as well as on helping the town conduct a preliminary vulnerability assessment. The administration in Groton, CT, has formally included adaptation criteria in the review and funding of capital improvements and has recently commenced development of a GIS /Microsoft Access database as the basis for its infrastructure vulnerability assessment efforts.

Nearly every municipal department has a role to play in climate change adaptation planning. In CART, resources have been separated by professional discipline. For each professional area there are resources that help you:

- Understand your profession's role in the adaptation planning process;
- Learn how climate change impacts your area of focus; and
- Discover actions that can improve your community's resilience to climate change.

Sea Grant Connecticut | CLEAR | UCONN College of Agriculture and Natural Resources

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Why Act Now?

Risk Management Responsibility

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Risk Management

	Irene	Cat 3
Trees	1-2%	70-80%
Power Outage	800,000+	CT?
Outage Length	9-12 days	Month
Damage	$700MM-$1B*	$54.2B
	* Included Frankenstorm	

From the Two Storm Report

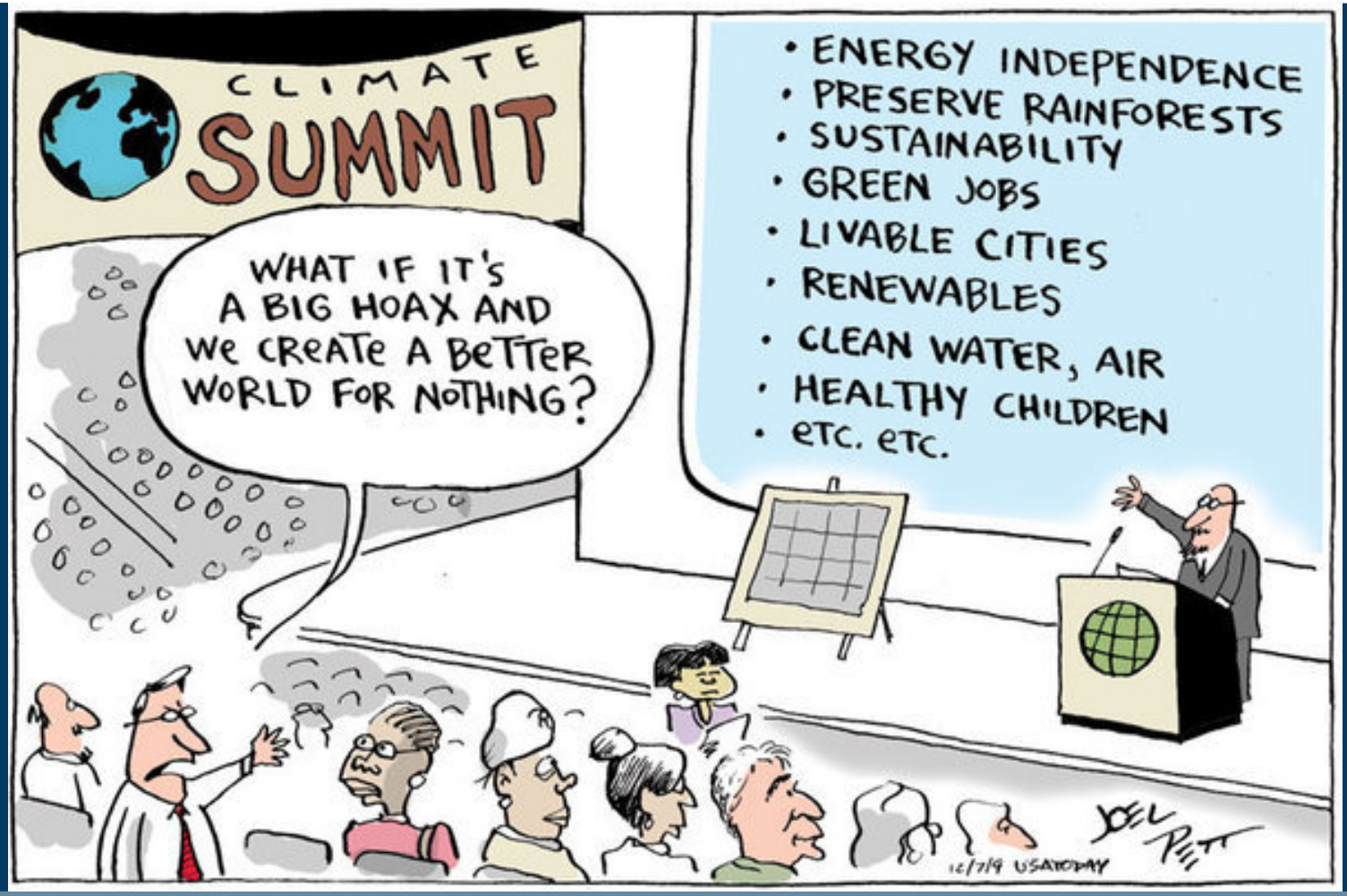
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Risk Management

- Connecticut engineering drainage standards currently use rainfall data based on National Weather Service from the 1960's.
- Impact of climate change and SLR (rise 1.5 ft by mid century) on storm surge raises serious concerns about need to protect critical infrastructure on coast (Irene surge w/ a foot of flooding Norwalk WWT plant)
- Cost of Sandy---$60 Billion
- Thousands of houses destroyed

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Responsibility



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