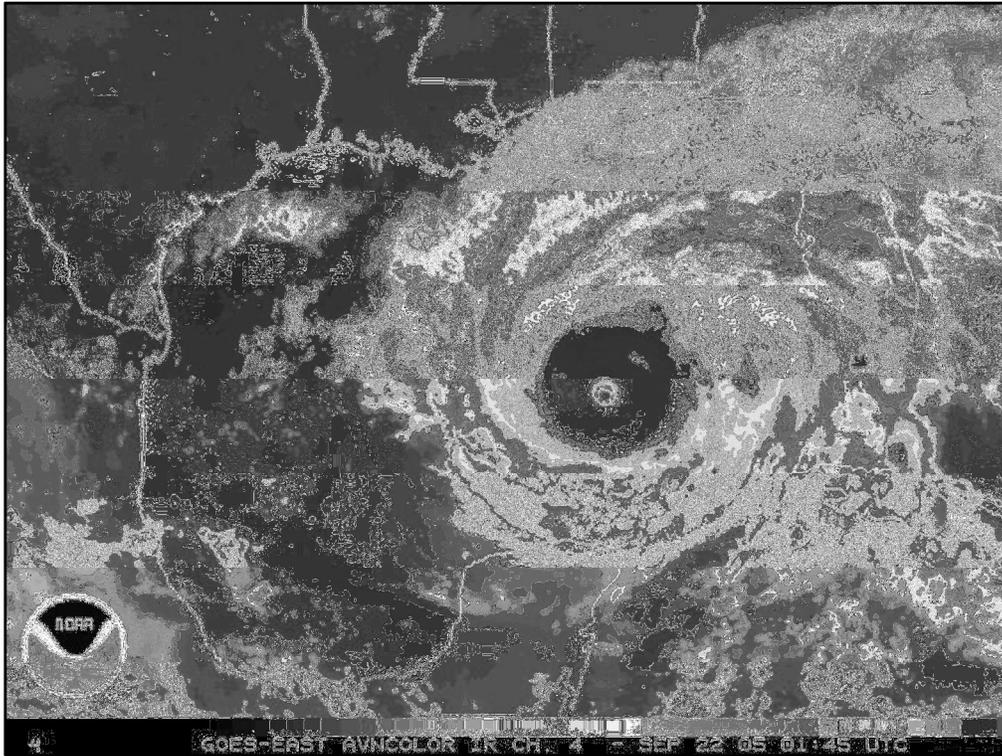
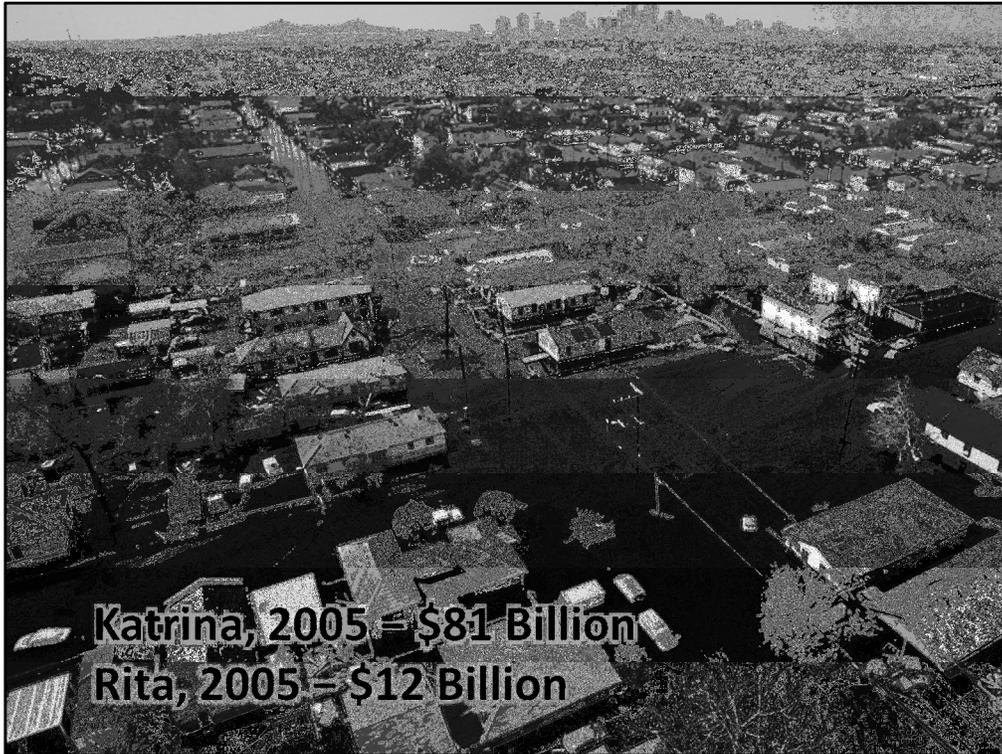


# State and Local Efforts to Cope with Climate Change

Vicki Arroyo  
Georgetown Climate Center  
Rutgers May 2013

GEORGETOWN  
CLIMATE CENTER



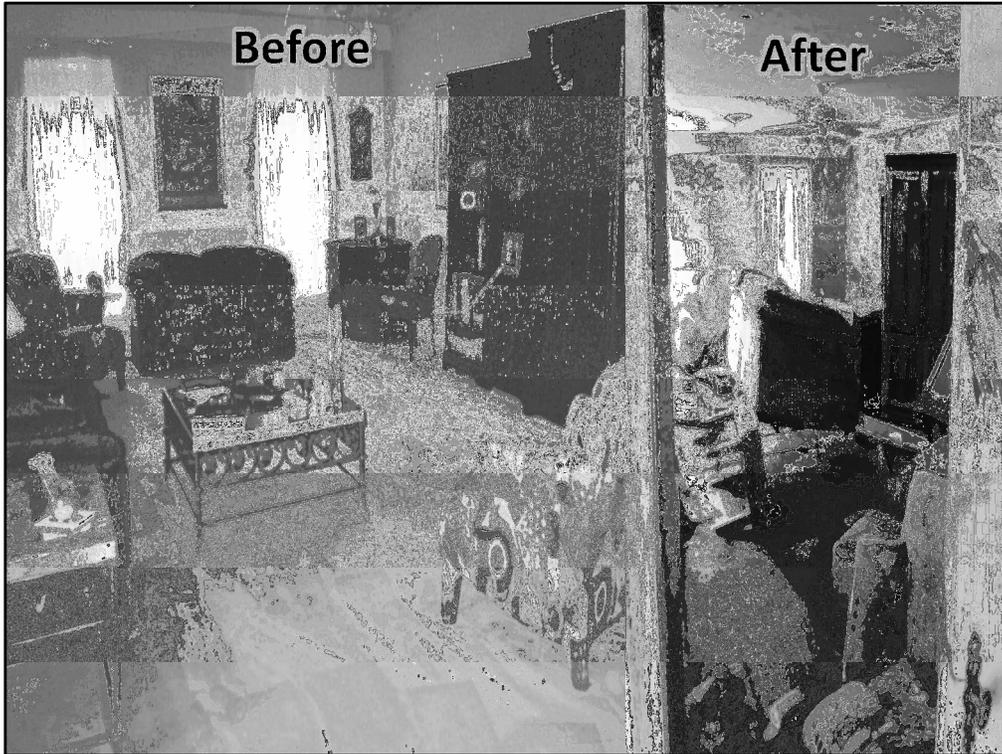


I am going to take you through a bit of photographic tour of our last decade of billion dollar disasters.

In 2005, as we all remember, Hurricane's Katrina and Rita, a couple weeks later, hit the Gulf coast – and combined caused almost \$100B dollars in damages.

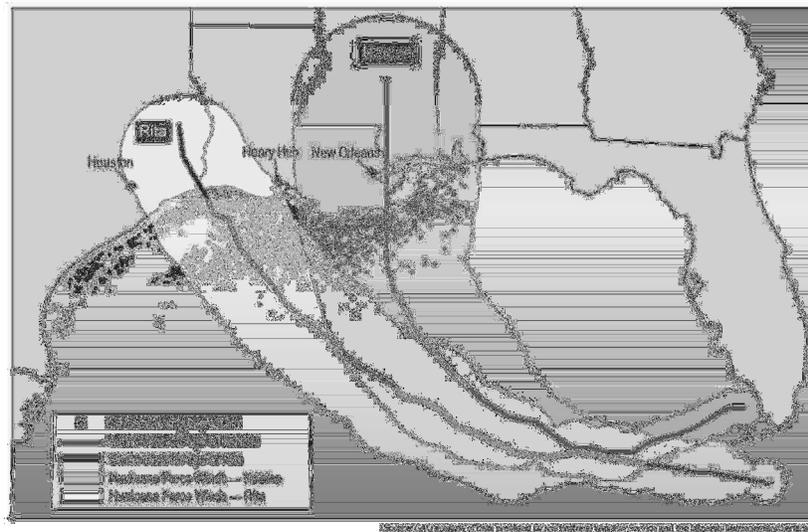


Mom's (not her car! Flood carried it there)/ sister's  
Devastating!  
Fortunately, they and other family survived...



But sadly, they Lost Homes and most everything in them.

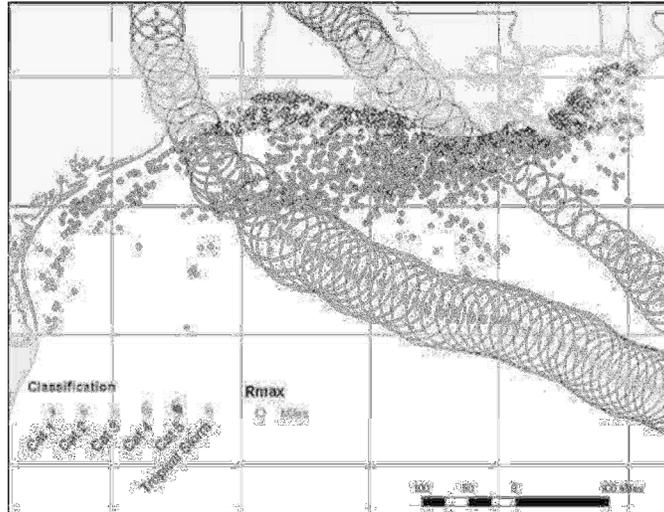
## Paths of Hurricanes Katrina and Rita Relative to Energy Production Facilities



<http://ncadac.globalchange.gov/download/NCAJan11-2013-publicreviewdraft-chap4-energy.pdf>

Sea-level rise and storm surge represent risks to vital infrastructure.

## Hurricane Paths for Gustav and Ike (2008)



<http://ncadac.globalchange.gov/download/NCAJan11-2013-publicreviewdraft-chap4-energy.pdf>  
Sea-level rise and storm surge represent risks to vital infrastructure.



Schenctacy, NY

Last year, Irene was downgraded to a TS, but she was slow moving and caused of over \$7.3 billion in total damage/costs, 45 deaths

In 2011, for instance, an unprecedented 14 disastrous weather events resulted in an estimated \$53 billion in damage -- not including health costs.

Read more: [Billion Dollar U.S. Weather Disasters, 1980-2011 — Infoplease.com](http://www.infoplease.com/ipa/A0882823.html#ixzz2BeZMlaYx) <http://www.infoplease.com/ipa/A0882823.html#ixzz2BeZMlaYx>

It's becoming hard to deny that this is a new normal in a world of climate change.

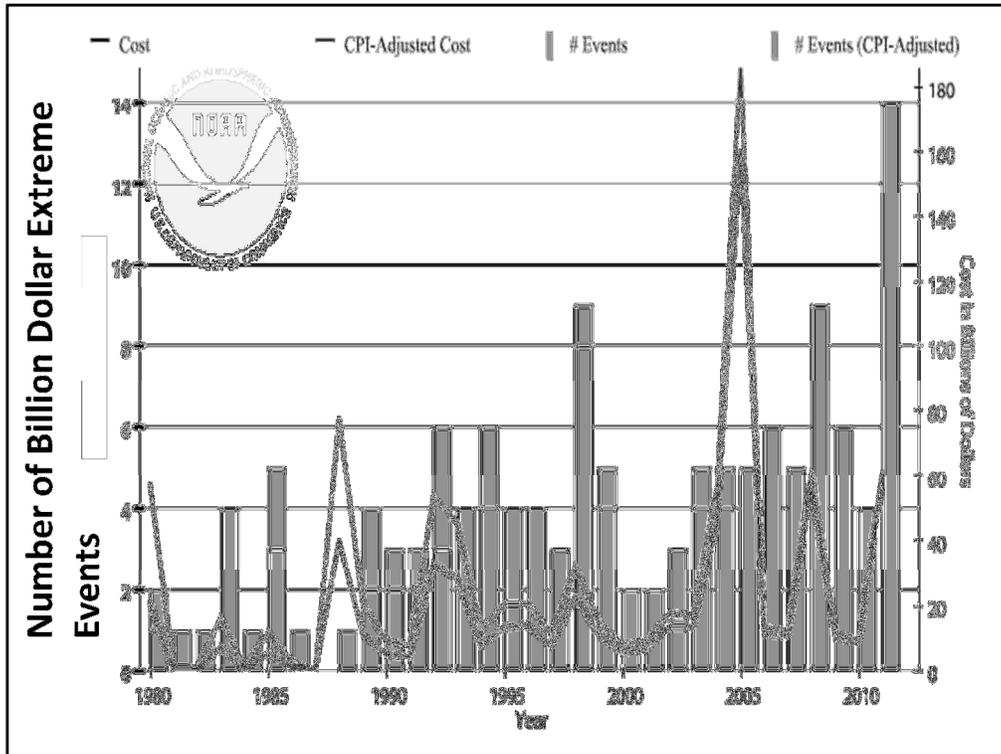


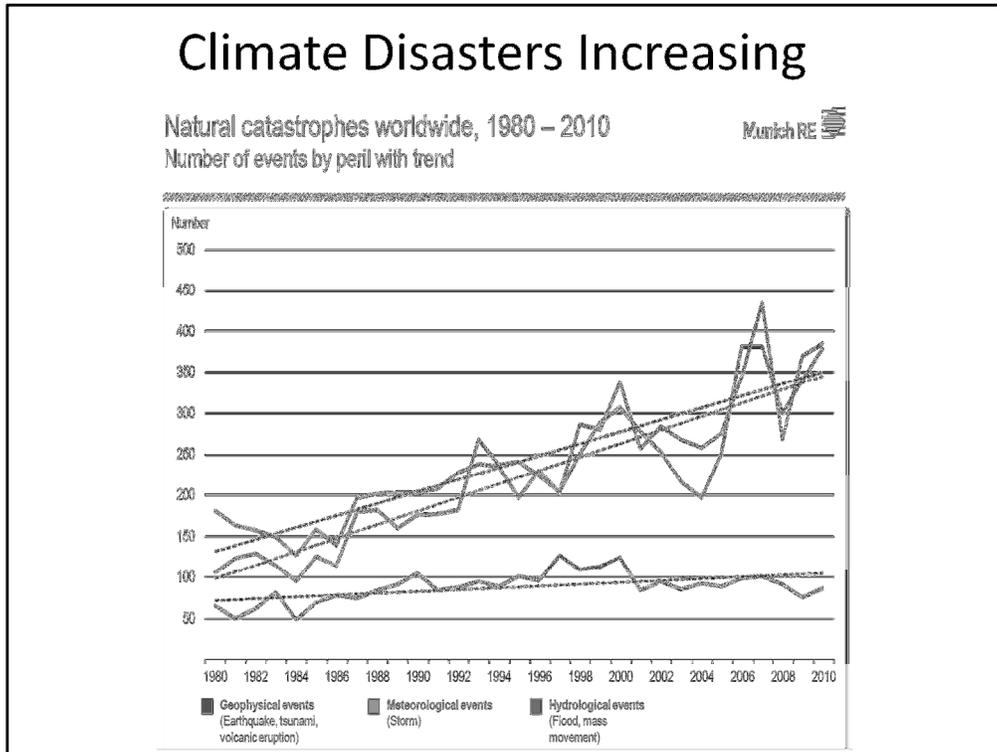
Before Sandy, Isaac threatened to derail the GOP, then veered off to hit LA, once again  
LA



Finally, last year Sandy flooded the nation's financial epi-center.  
Causing impacts from NC to ME.  
And, bringing climate change back into public discourse.

Although we all know one single weather event cannot be linked to climate change  
– what we do know is that these extreme weather events are giving us a preview of  
the physical and fiscal impacts that we can expect to see in the future.



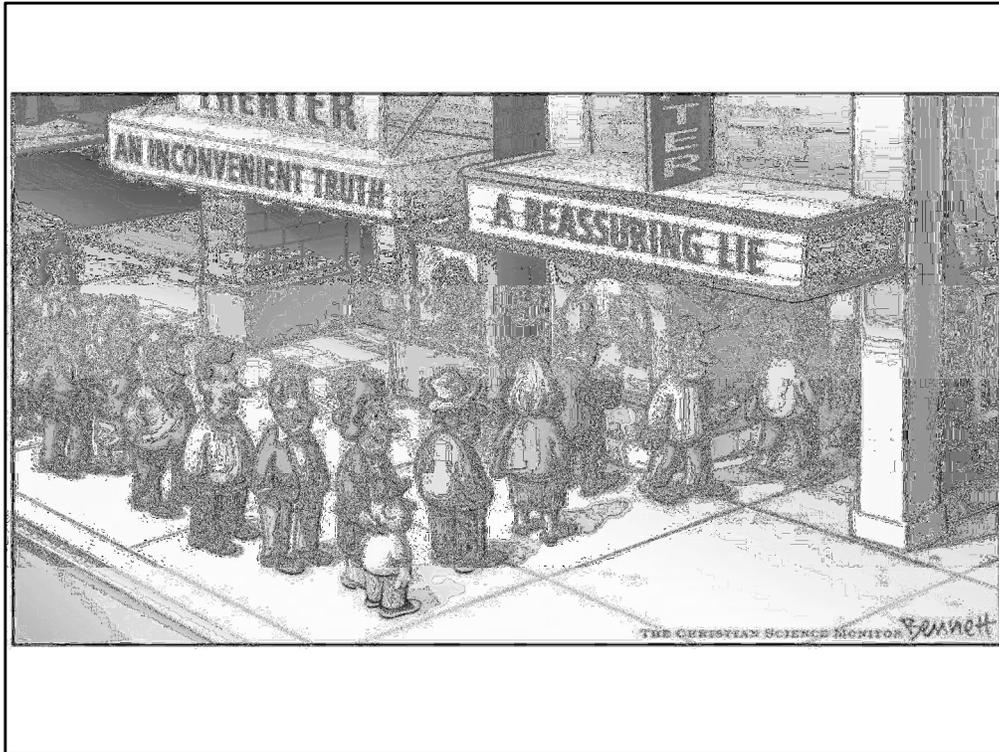


~~Look no further than insurance industry's Mounting Catastrophic losses from weather events!~~

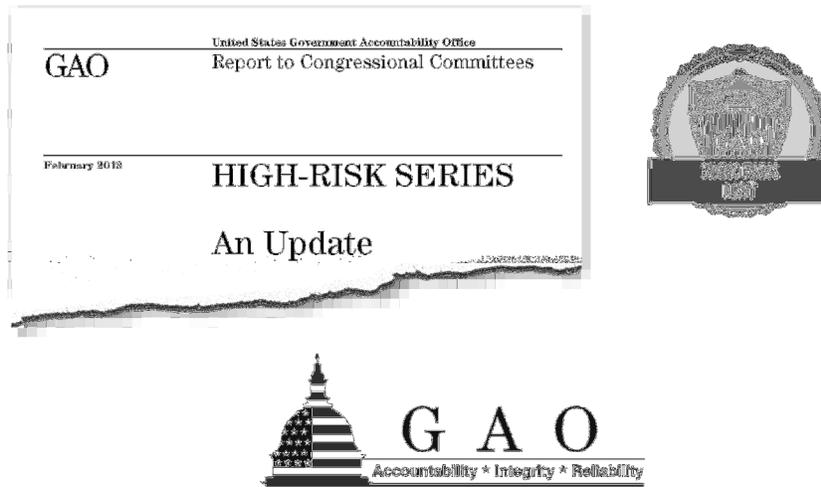
Here we see the growth in the number of natural catastrophes worldwide, and the sharp trend upwards for extreme weather events captured by insurer Munich RE.

In other words, without action, we know how this is going to end, and without appropriate action it is going to end badly.

When you take into account of the drought, water shortages, wildfires, lost crops, and rising sea levels that are also to come, climate change will not only change the way we live, it will change the very landscape of America.



# GAO Cites Climate Change As a Top Financial Threat to the U.S. Government



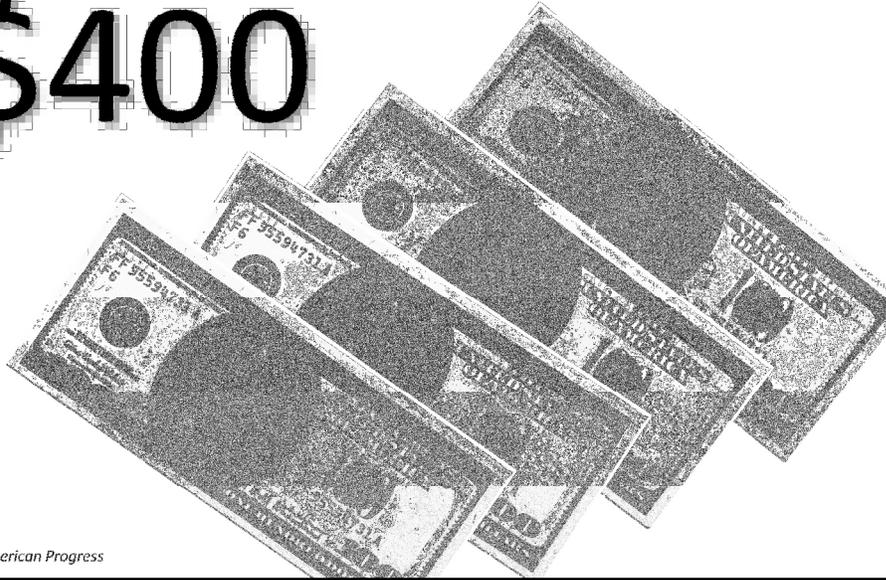
GAO's February 2013 High-Risk Series added *Limiting the Federal Government's Fiscal Exposure by Better Managing Climate Change Risks* to its list of priorities: Climate change creates significant financial risks for the federal government, which owns extensive infrastructure, such as defense installations; insures property through the National Flood Insurance Program; and provides emergency aid in response to natural disasters. The federal government is not well positioned to address the fiscal exposure presented by climate change, and needs a government wide strategic approach with strong leadership to manage related risks.

The report calls for more comprehensive planning, including:

- A government-wide strategic approach to managing climate change risks.
- More information to understand and manage federal insurance programs' long-term exposure to climate change, including the impact of an increase in the frequency or severity of extreme weather events on their operations.
- A government-wide approach for providing (1) the best available climate-related data for decisions at the state and local level and (2) assistance for translating available data into information that officials need to make decisions.
- Improved criteria for assessing a jurisdiction's capability to respond and recover from a disaster without federal assistance, and to better apply lessons from past experience when developing disaster cost estimates.

## Per Household Cost of Disaster Relief in U.S. from 2011-2013

# \$400



Center for American Progress

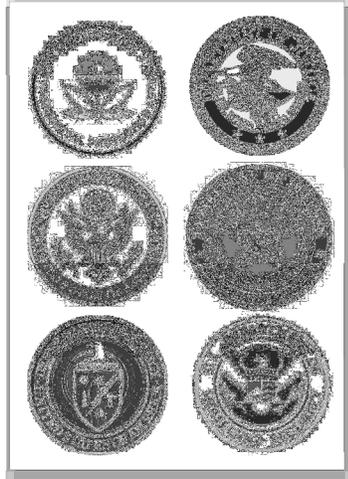
That comes out to not \$100 [animated fly in of money] or \$200 or \$300 but \$400 per household in the U.S. right now – more than what people would have paid under the failed Waxman – Markey bill, which would have capped carbon pollution and actually started solving the problem. *(Note: Someone who knows the bill details better than me should verify this. The figure I've seen estimated the cost at ~\$13 a month for Waxman-Markey).*

As a point of reference, the \$400 that each household has paid in the last two years for disaster relief is also more than what the federal government spends per year to educate our kids. (Federal education spending \$107 billion)

And it's scary to imagine what these numbers might look like in just a few years since the costs to the private sector, government, and individuals are going to continue to exponentially grow.

What's being done?

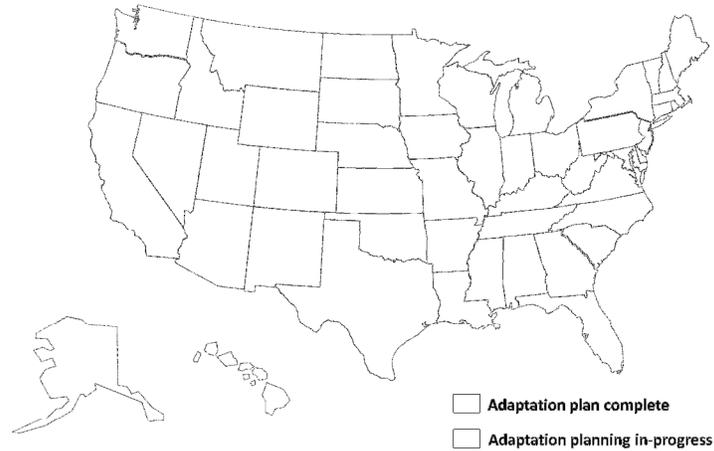
## Federal Agencies Released Draft Adaptation Plans in February 2013



- 41 federal agencies released plans
- DHS plan highlights the importance of climate change for FEMA's mission of promoting disaster resilience
- Commerce Department's Plan directs NOAA to provide training to state and local governments on building coastal resilience

The plans are part of the agencies' third annual Strategic Sustainability Performance Plans, published under Executive Order 13514, issued by President Obama in October 2009. The plans identify vulnerabilities of agency facilities and operations to climate change impacts, discuss how to integrate adaptation into agency practices and policies, and set goals based on the EO 13514 framework. Some agencies' plans also establish performance measures to track progress.

# State Adaptation Plans



Vicki Arroyo & Terri Cruce, *State and Local Adaptation, in THE LAW OF ADAPTATION TO CLIMATE CHANGE: UNITED STATES AND INTERNATIONAL ASPECTS*, (Michael Gerrard & Katrina Kuh, eds., 2012). Updated May 2013.

## Sectors Covered in Plans

State	Agriculture	Biodiversity / Ecosystem	Oceans/ Coastal	Forestry	Emerg Prepared/ Public Safety	Infrastructure	Water Resources
AK	✓	✓	✓	✓	✓	✓	✓
CA	✓	✓	✓	✓	✓	✓	✓
CT	✓	✓	✓	✓	✓	✓	✓
FL	✓	✓	✓	✓	✓	✓	✓
GA	✓	✓	✓	✓	✓	✓	✓
MD	✓	✓	✓	✓	✓	✓	✓
ME	✓	✓	✓	✓	✓	✓	✓
MN	✓	✓			✓	✓	✓
NH	✓	✓	✓	✓	✓	✓	✓
NY	✓	✓	✓		✓	✓	✓
OR	✓	✓		✓	✓	✓	✓
PA	✓	✓		✓	✓	✓	✓
VA	✓	✓	✓	✓	✓	✓	✓
WA	✓	✓	✓	✓	✓	✓	✓
WI	✓	✓	✓	✓	✓	✓	✓

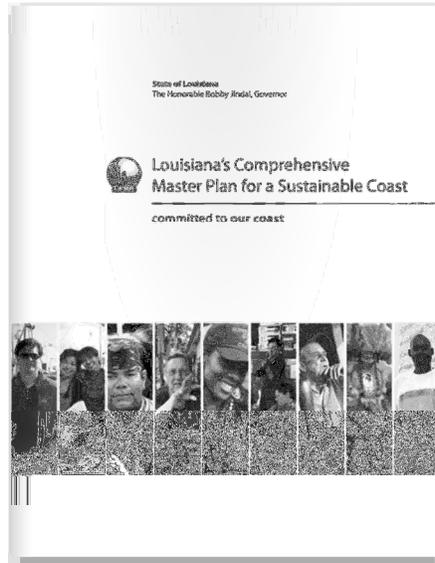
Source: Vicki Arroyo & Terri Cruce, *State and Local Adaptation, in THE LAW OF ADAPTATION TO CLIMATE CHANGE: UNITED STATES AND INTERNATIONAL ASPECTS*, (Michael Gerrard & Katrina Kuh, eds., 2012).

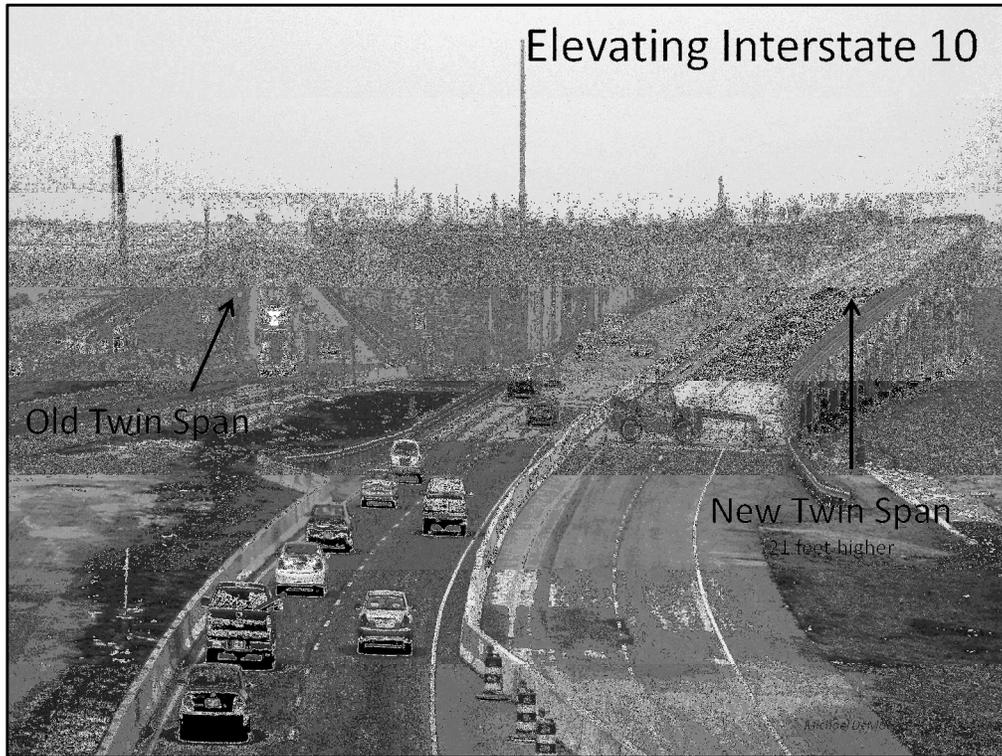
## Authority for State Adaptation Planning

Executive Order	Legislation	Bottom-up Processes
<b>Alaska (2010)</b> Admin. Order No. 238	<b>Connecticut (2011)</b> Public Act No. 08-98	<b>Delaware (2010, 2012)</b> Sea-Level Rise Advisory Committee DE Climate Change Steering Committee
<b>California (2005, 2008)</b> Exec. Order No. S-03-05, S-13-08	<b>Hawaii (2012)</b> SB 2745, HB 2483	<b>Minnesota (2009)</b> Interagency Climate Adaptation Team
<b>Florida (2008)</b> Exec. Order No. 07-128	<b>Maine (2009)</b> S.P. 163	<b>New Jersey (2012)</b> Climate Adaptation Task Force (Partnership of NJ DEP and Sustainable NJ)
<b>Maryland (2007)</b> Exec. Order No. 01.01.2007.07	<b>Massachusetts (2011)</b> Global Warming Solution Act, S. 2540	<b>Pennsylvania (2009)</b> Unanimous Climate Change Advisory Committee Motion
<b>New Hampshire (2007)</b> Exec. Order No. 2007-3	<b>Oregon (2007)</b> H.B. 3543	<b>Wisconsin (2007)</b> Wisconsin Initiative on Climate Change Impacts (WICCI)
<b>New York (2010)</b> Exec. Order No. 24	<b>Rhode Island (2010)</b> Climate Risk Reduction Act, RIGL 23-84	
<b>Vermont (2011, 2012)</b> Exec. Order No. 05-11, 05-12	<b>Washington (2009)</b> S.B. 5560 (Cofffee RCW, ch. 43.21M)	
<b>Virginia (2007)</b> Exec. Order No. 59		

Vicki Arroyo & Terri Cruce, *State and Local Adaptation, in THE LAW OF ADAPTATION TO CLIMATE CHANGE: UNITED STATES AND INTERNATIONAL ASPECTS*, (Michael Gerrard & Katrina Kuh, eds., 2012). Updated May 2013.

# Louisiana Coastal Restoration Plan





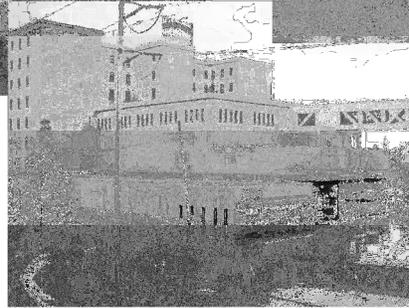
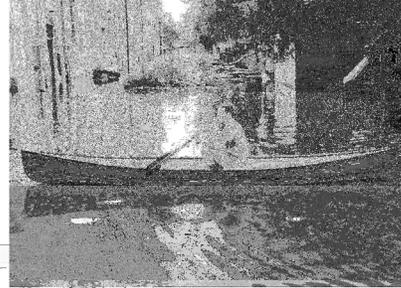
Here's the I-10 twinspan bridge from N.O. with sections destroyed in Katrina, Rebuilt 20 ft higher: allow for Greater storm surge

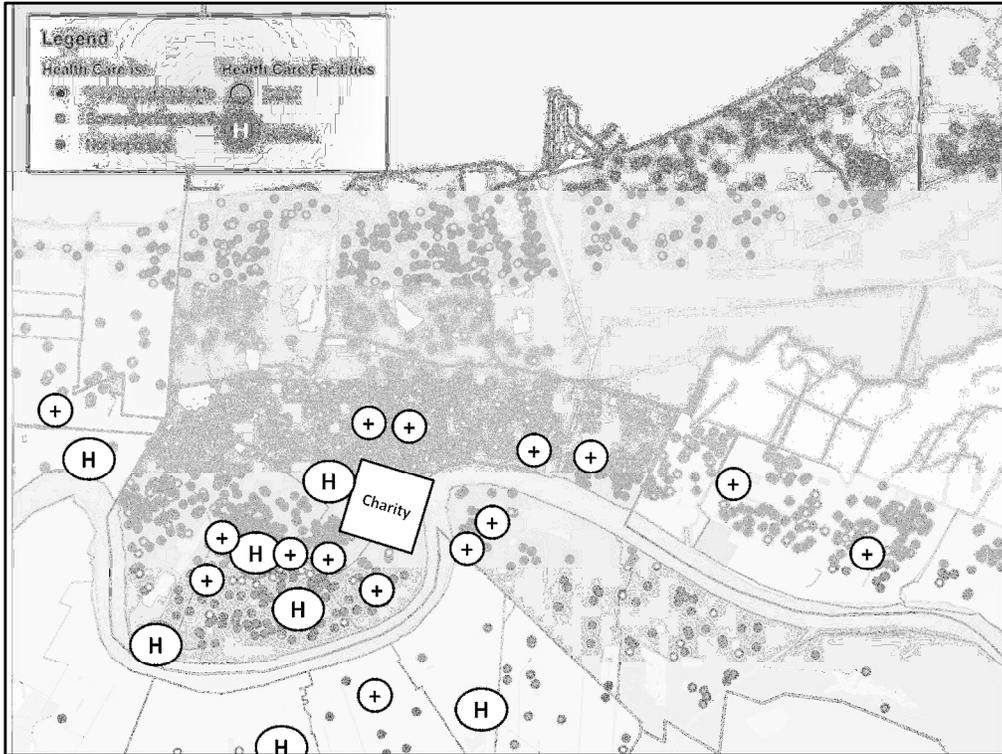
# Charity Hospital

*New Orleans, LA*



# Charity and Katrina



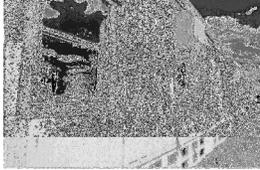




## FEMA awards \$1.8 billion to New Orleans schools for construction, renovation projects

By [Christy Hines](#) and [Elizabeth Hines](#) [Published August 14, 2006 12:04 PM](#) [Updated August 14, 2006 12:04 PM](#) [Close](#)

FEMA has awarded \$1.8 billion to New Orleans public schools for construction and renovation projects stemming from massive damage caused by Hurricane Katrina and Rita, according to U.S. Sen. Mary Landrieu.



Original view is visible in one of the many videos that make up New Orleans Academy on Super Bowl in New Orleans, which opened hours to his physical address teacher on Friday, March 10, 2006, many students have been attending class in temporary buildings.

State and local officials have been pushing for a large-scale investment for years. About 700 schools were lost or damaged in the storm.

The long-running quest would allow the Recovery School District and Orleans Parish School Board to finance the next stages of an ambitious facilities master plan.

Since the storm, the Recovery

### Helping New Orleans Rebuild Its Schools



Secretary Anne Duncan says she and state officials

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Five years ago, Hurricane Milton destroyed schools throughout New Orleans. Since then, the state and city have worked together to make the state schools a model for national reform. New Orleans schools have made remarkable progress. They have been an inspiration to those of us who are working to provide a world-class education to all of America's children.

Despite the progress, New Orleans still has a lot of work to do. About three 100 school buildings were damaged by the Gulf of Mexico. The city still needs to restore, rebuild and rehabilitate buildings that were destroyed by the storm. Working together, state and city leaders have produced a master plan to still rebuild and renovate the schools.

Today, I joined the mayor of New Orleans, Mayor Ray Nagin, in announcing more than \$1.8 billion in federal funds to support the rebuilding of New Orleans' schools. This money will support the city in building the excellent learning environment that the students of New Orleans deserve.

In addition, the Department of Education continues to support schools throughout the Gulf Coast that suffered damage from Katrina and other hurricanes. Our staff is preparing to award \$1.5 billion in grants from the Gulf Coast Recovery Initiative. These grants will help districts replace instructional materials, renovate and repair school buildings, and support after-school and other initiatives to provide student learning.

Over the past five years, the Department has provided nearly \$1 billion for schools in the Gulf Coast region. The money helped schools re-open immediately after the hurricanes and supported schools that occupied students displaced by the hurricanes. It also provided the 67 million to Louisiana, Alabama, Texas, and Mississippi to pay for mental health assessments for students, substitute teachers, and emergency transportation, and other needs shortly after the hurricanes hit the Gulf Coast.

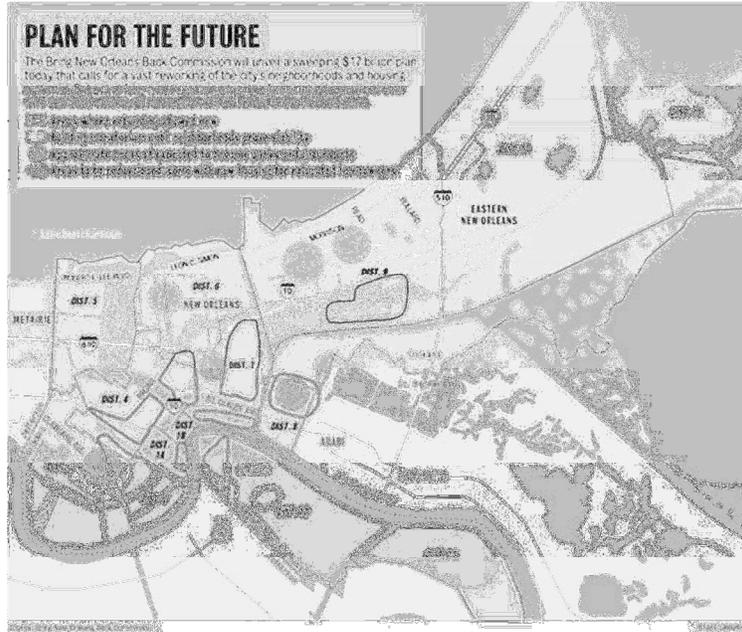
Five years later, New Orleans and the rest of the Gulf Coast are still recovering. Rebuilding Orleans and 4 are essential in doing our part to provide the students there with the world-class education they deserve.

Anne Duncan is Secretary of Education.



Rebuilding After Katrina: After Hurricane Katrina, two major federal funding streams were available to Louisiana for rebuilding: FEMA Disaster Relief  
Took years to get lump sum payment and flexibility for rebuilding

# Bring New Orleans Back “Green Dot Plan”





Courtesy: Pastor Nick Welton, Beacon of Hope  
Photo: Amanda Yui

### Why rebuild New Orleans?



### Welcome

Beacon of Hope provides a model for recovery in neighborhoods devastated by Hurricane Katrina as well as other areas affected by disaster. Encouraging civic action, fostering cooperation, providing information and resources is the foundation on which we build and grow. Beacon of Hope empowers residents to facilitate their own recovery while providing a host of resident driven activities and a safe environment to create the synergy essential for rebuilding viable neighborhoods and improve the overall quality of life for residents.

To assist with our relief efforts in LaPlace, LA or if you are resident of LaPlace looking for resources and assistance please [click here](#).

## Press



### Wendell Pierce on NBC's Meet The Press



**CALENDAR OF EVENTS**  
**Gumbily Festival**  
**October 5-7, 2012**

# FEMA HMGP – Pontilly Vacant Lot Interventions

Single Vacant Lot



Proposed Design: Single Vacant Lot



# FEMA HMGP – Pontilly Vacant Lot Interventions

Dwyer Canal

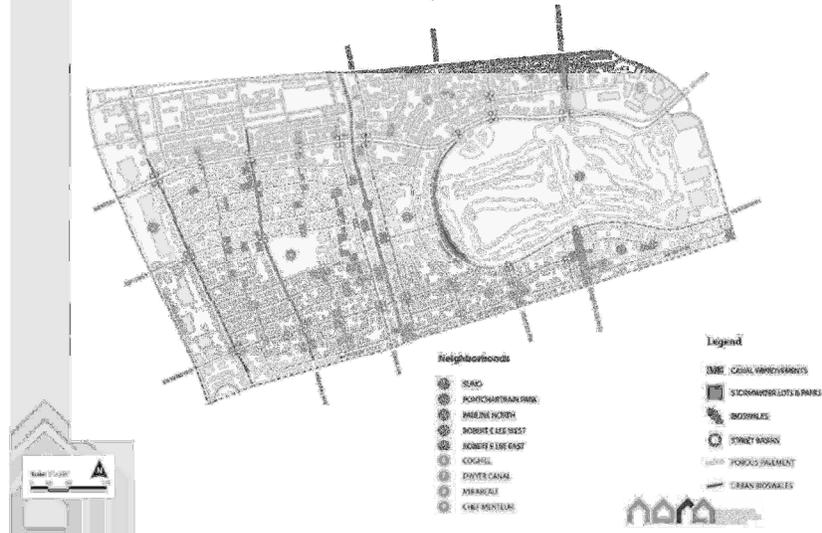


Proposed Design: Dwyer Canal



# FEMA HMGP – Pontilly Vacant Lot Interventions

## Conceptual Plan



### Irene: Flooding Cuts Off Towns in Vermont, New York



AP/WIDEWORLD (2) | AUTO-START ON (OFF)



By [NORM ENGLISH \(@nenglish\)](#), [CHARA KATRANIDIS](#) and [BEN FOSBERG \(@benfosberg\)](#)  
Aug. 30, 2011

Hurricane Irene may be gone but Vermont is the latest state to deal with her fury, as a dozen towns have been cut off from the outside world

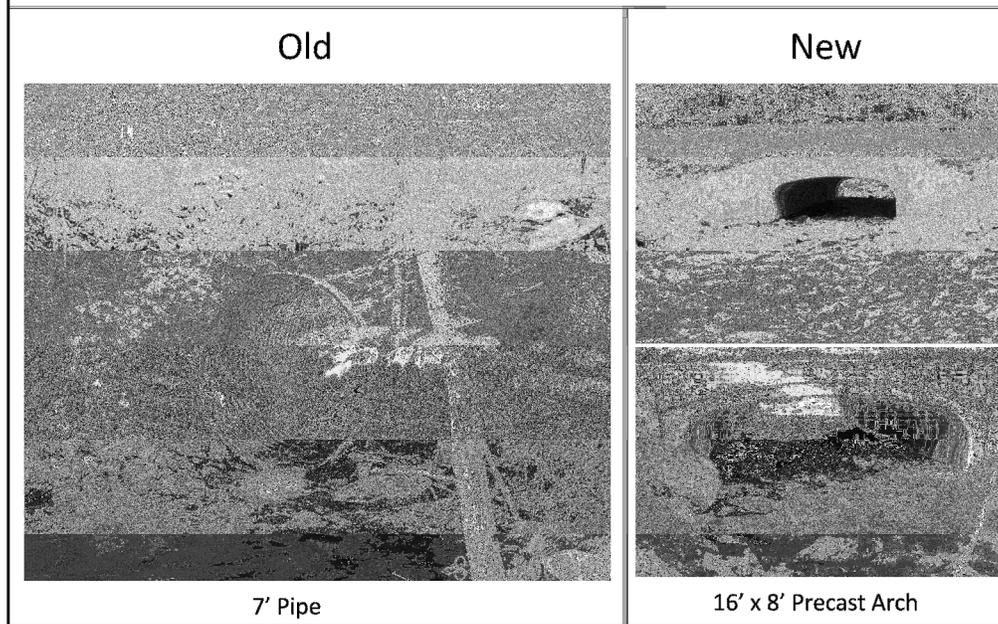
## Vermont After Hurricane Irene

*Impacts to Transportation Assets*



More than \$750 million in damage to the state.

## Vermont After Hurricane Irene



After the storm, state codes required localities to rebuild stream crossings and culverts, like the one shown, to higher standards -- to better manage increased precipitation and to allow for fish passage.

New bottom-less culverts were required which do not pose the same risk of being blown out in extreme precipitation events. However, FEMA refused to reimburse the state for the extra costs needed to install these new culverts. After appealing one project to DHS HQs, FEMA ultimately approved reimbursement, but



Designers have envisioned ways to better **integrate Natural and Built** Environments w/ SLR in mind..

(smile!)

...Inspiring examples of what's possible when we feel empowered to plan for a world that WILL BE different!

FINAL CAUTION: Adaptation too important to be left to experts: Why? Are no experts! Entering uncharted territory, yet systems/expertise based on past.

Stationarity ...governs engineering and built environment.



Another project we've been working on is how Army Corps permitting under the Clean Water Act affects state decisions about coastal protection.

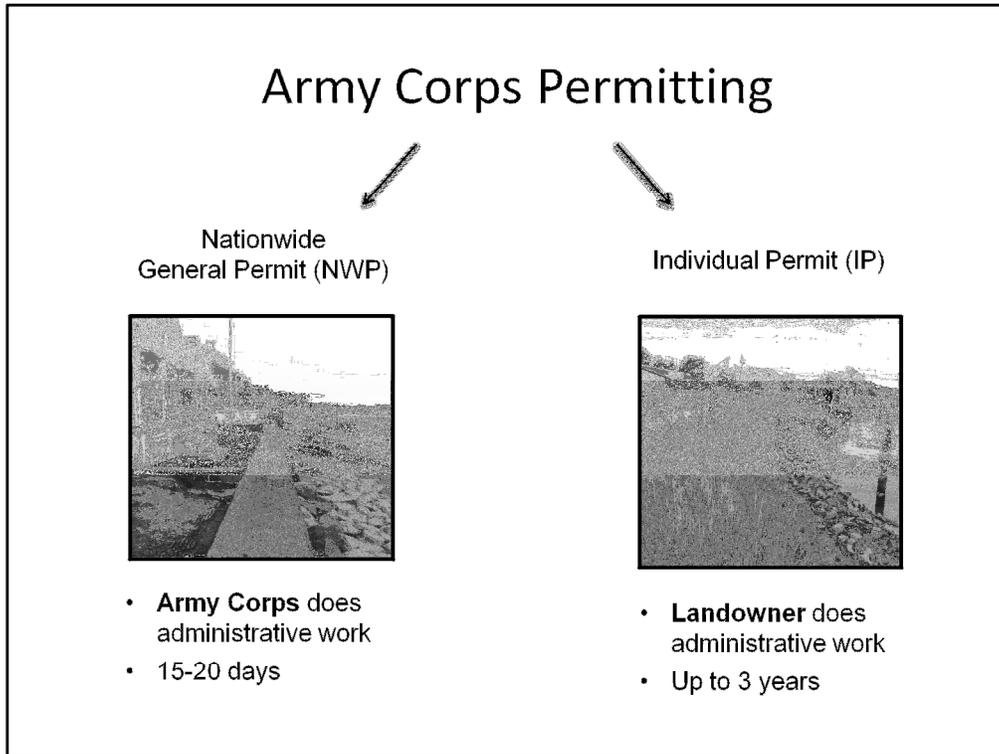
The traditional method of flood control is to build sea walls like this one.

The problem with this approach is that sea walls can cause significant environmental impacts, and

As sea levels rise natural shorelines will be gradually eroded away so that all we are left are walls like this, where the shoreline has been armored



An alternative to this approach is to use living shorelines – that recreate or restore natural shorelines – to provide flood and erosion control.

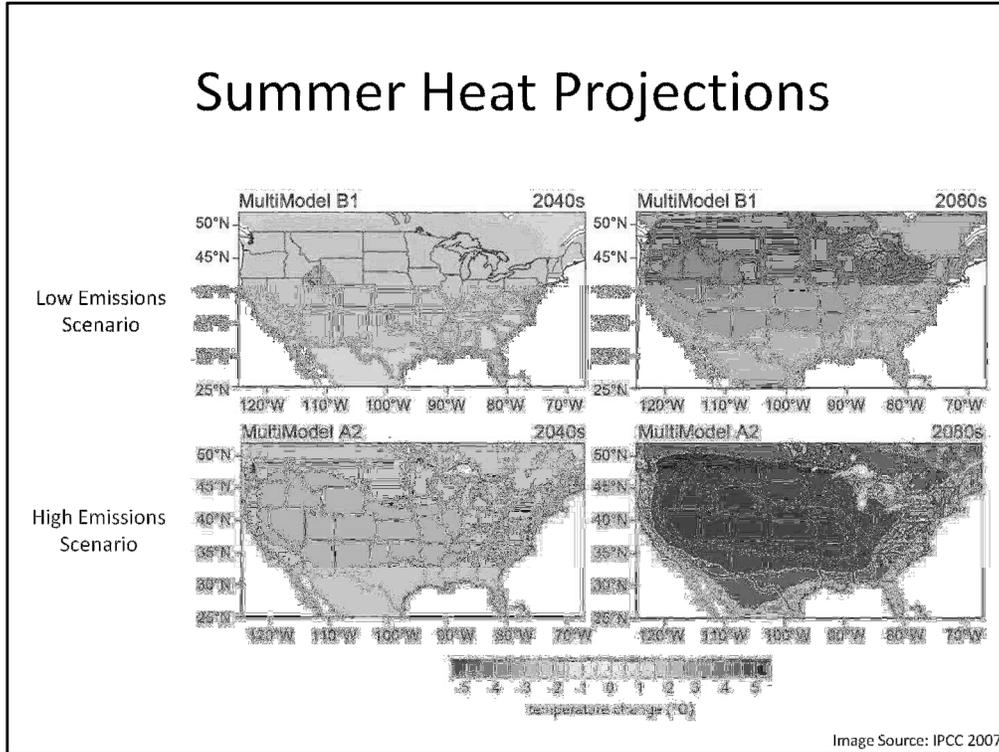


And, the Corps permitting frameworks tend to favor hard armoring approaches. The Corps issues a Nationwide Permit for small scale armoring projects – and these projects can typically proceed within 15-20 days.

For living shoreline projects, however, landowners must obtain an individual permit which requires individual site specific review. And, it can take the Corps up to 3 years to issue a permit for a living shoreline project in some states.

And, this red tape prevents can obstruct adaptation methods. We looked this issue for the West Coast Governor’s Alliance – to help OR, CA and WA think about methods for streamling permitting of living shoreline approaches.

# Summer Heat Projections



Finally, in our work with communities we are finding that engaging on adaptation also helps them think about the risks of doing nothing on the mitigation front.

These are IPCC models showing average summer temperature projections under a high and low emissions scenarios.

As you can see in the top right corner, under a low emissions scenario most communities will see a 2-3 degree rise in ave. summer temperatures. But under a high emissions scenario these projections climate to 4-5 degrees C.

If you look at these possible scenarios – you can see that what we do on mitigation will directly affect how difficult and expensive it will be to adapt – or if it will even be possible to adapt.

Right to left is change in time, 2040s to 2080s

Top to bottom is change in emissions scenario, low to high

## City of Chicago's Green Roofs



*Photos: City of Chicago*

After Lethal Heatwave in 1995 ...Chicago leader – **Tamping down** on urban heat impacts thru **Outreach**, cool **white** or vegetated **green** roofs, trees...

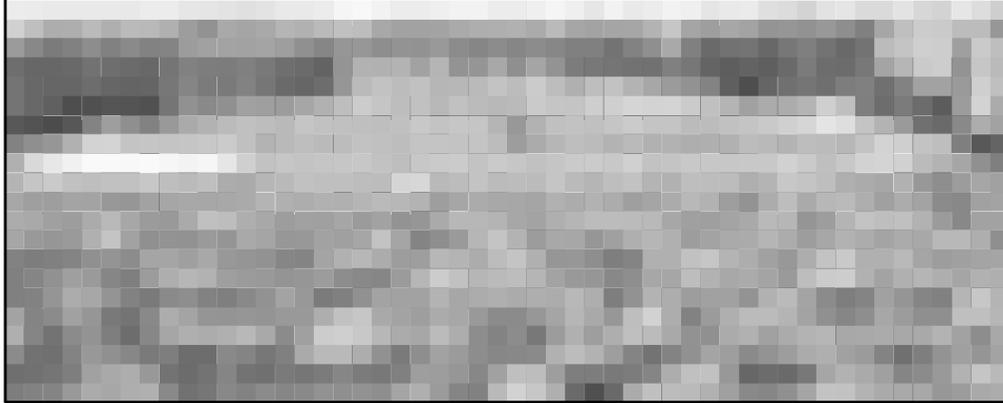
City Hall's green roof next to Cook County's: 77 degrees hotter

**Last year, Wash DC outpaced Chicago in new green roofs installed**– investing revenues from 5 cent bag tax – split costs: tempers heat, reduces energy use/emissions, & curbs stormwater runoff:  
So some solutions to Heat: WIN - WIN

## Financing Adaptation

### PACE and Fees to Promote Cool & Green Roofs

- Financing for energy efficiency projects
- Lower energy costs and cooler homes
- Reduced energy demand



One example of how communities can finance urban heat adaptations are PACE programs. Government can use their lending powers to encourage private financing of measures that both increase energy efficiency and lessen urban heat islands.

## Financing: Public-Private Partnerships

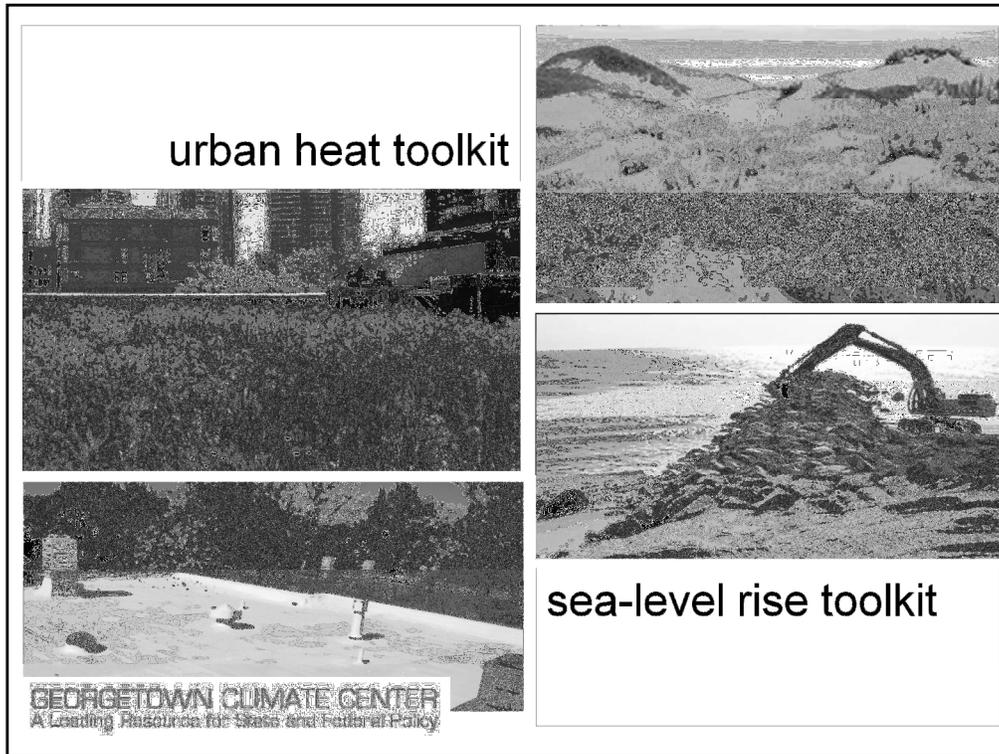
- Wetlands store carbon and serve as buffer
- Entergy & Tierra Resources partnering to restore Louisiana wetlands



Projects are approved as carbon offsets (compensate the property owner for beneficial use of the land.)

Image Source: IPCC 2007

Entergy is paying for the restoration, Tierra is managing it, American Carbon Registry is approving the offsets, and St. Charles Parish is compensating the landowner. The project will serve as both mitigation and adaptation (defense against storm surge). Entergy is investing money in this project because it sees the benefit of wetlands to protect its investments in energy infrastructure. With private funds, land, and know-how and with coordination from the Parish officials, this area near Luling, LA is becoming more resilient to extreme weather and storms as well as serving as a carbon sink.



The Center’s work focuses on helping communities find or develop solutions. Based upon the projected risks to their communities, we help them identify and analyze the range of potential responses that fit their needs.

- Our urban heat we’ve developed a Tool Kit examines four : green roofs, cool roofs (or white roofs), urban forestry, and cool and porous pavement.
- Our Sea Level Rise Tool Kit examines 18 different land-use tools that state and local governments can use to adapt to rising seas, increased flooding and storm events

Each tool kit is designed to identify policies that state and local governments can implement NOW with existing authority – without having to reinvent the wheel.

And, each toolkit looks at tools that governments can implement using the full suite of government powers: planning, regulating, spending, taxing, and education and outreach

# GEORGETOWN CLIMATE CENTER

A Leading Resource for State and Federal Policy

## Adaptation Clearinghouse

Search by keywords

Click here to explore by resource type, sector, region

View the adaptive capacity of the Georgetown Climate Center and its partners, and resources from the sector, region, and resource type.

### Featured Policy Areas



Law & Governance



Low-Cost Risk



Urban Heat

### Sector Materials to Get You Started



Energy



Agriculture

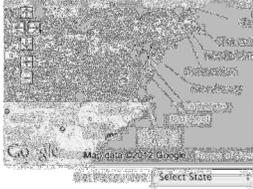


Transportation



Urban

### Find Adaptation Resources Near You



### Highlighted Side View

#### City of Chicago

Chicago is leading the way in climate change adaptation. Chicago's leadership is providing important leadership. The city's "Lead by Example" program identifies opportunities to...

### Recently Added Resources

**Climate Change Adaptation in New York City: Building a Risk Management Response**  
The New York City Panel on Climate Change (NYCCC) was convened by Mayor Michael Bloomberg in...

## For More Information and Additional Resources

Vicki Arroyo, [arroyo@law.georgetown.edu](mailto:arroyo@law.georgetown.edu)

<http://www.GeorgetownClimate.org>

<http://www.AdaptationClearinghouse.org>

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