



# Developing a “Toolkit” for Climate Change Adaptation in Virginia’s Tidal Shoreline Communities

**Skip Stiles**  
**Executive Director**  
**Wetlands Watch**

“Climate Change Impacts on Chesapeake Bay Restoration”  
NCER Conference  
August 2, 2011



# SEA LEVEL RISE ADAPTATION IN VIRGINIA

What Do We Know About Climate Change Impact Predictions for Virginia?

**In 100 years we'll see.....**

- **At Least 2.3 feet of sea level rise (as much as 5.2 feet) in next 100 years**
- **3.1 °C increase in average temperature**
- **~11 % increase in rainfall intensity**

**Pyke, et al, 2008, Virginia Climate Change Commission, 2008.**



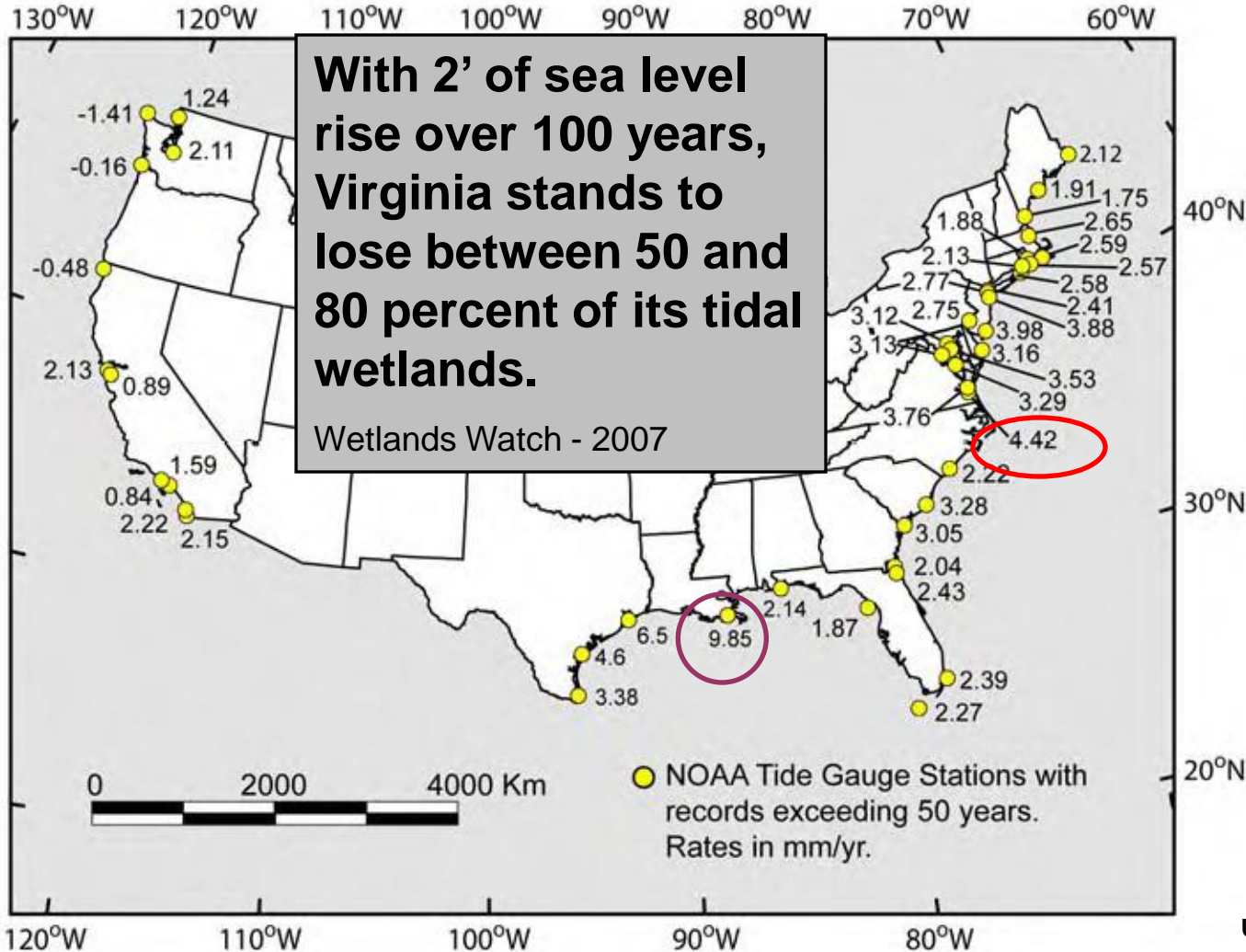
# SEA LEVEL RISE ADAPTATION IN VIRGINIA

These Rates of Sea Level Rise Significantly Threaten the Coastal Ecosystem

**With 2' of sea level rise over 100 years, Virginia stands to lose between 50 and 80 percent of its tidal wetlands.**

Wetlands Watch - 2007

4.42 mm/yr =  
44 cm/century

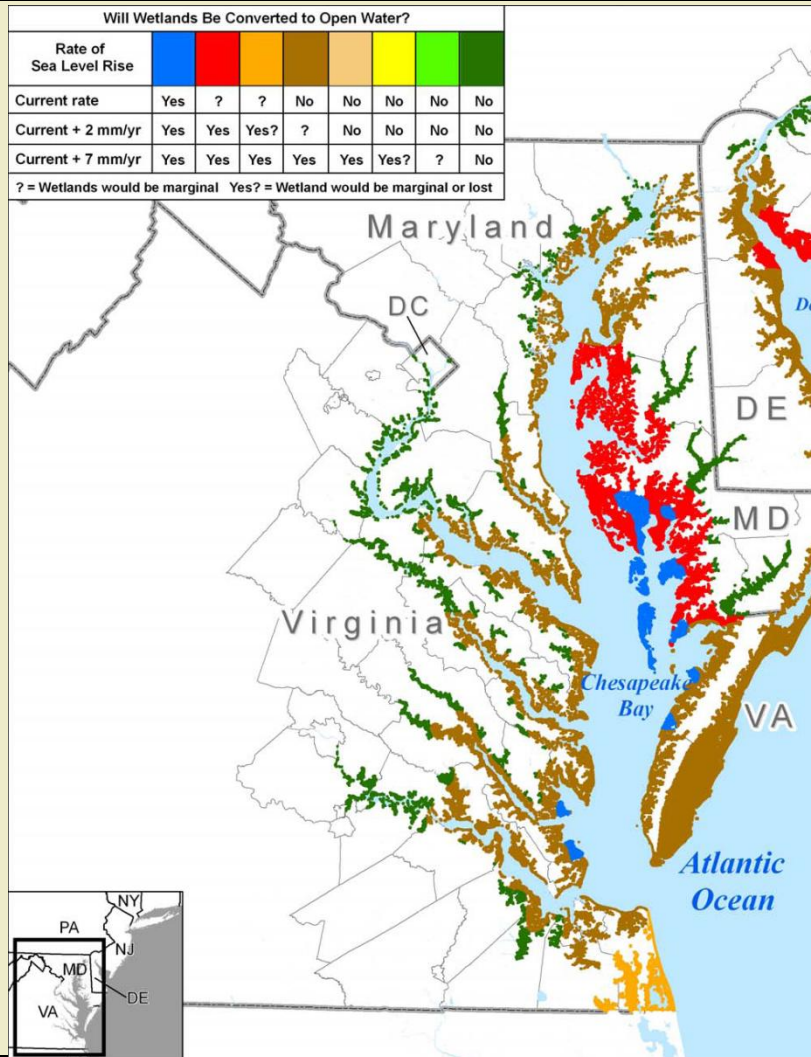


US CCSP SAP 4.1, 2009



# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Predicted Rates of Sea Level Rise Will 'Drown' Most of Virginia's Tidal Wetlands



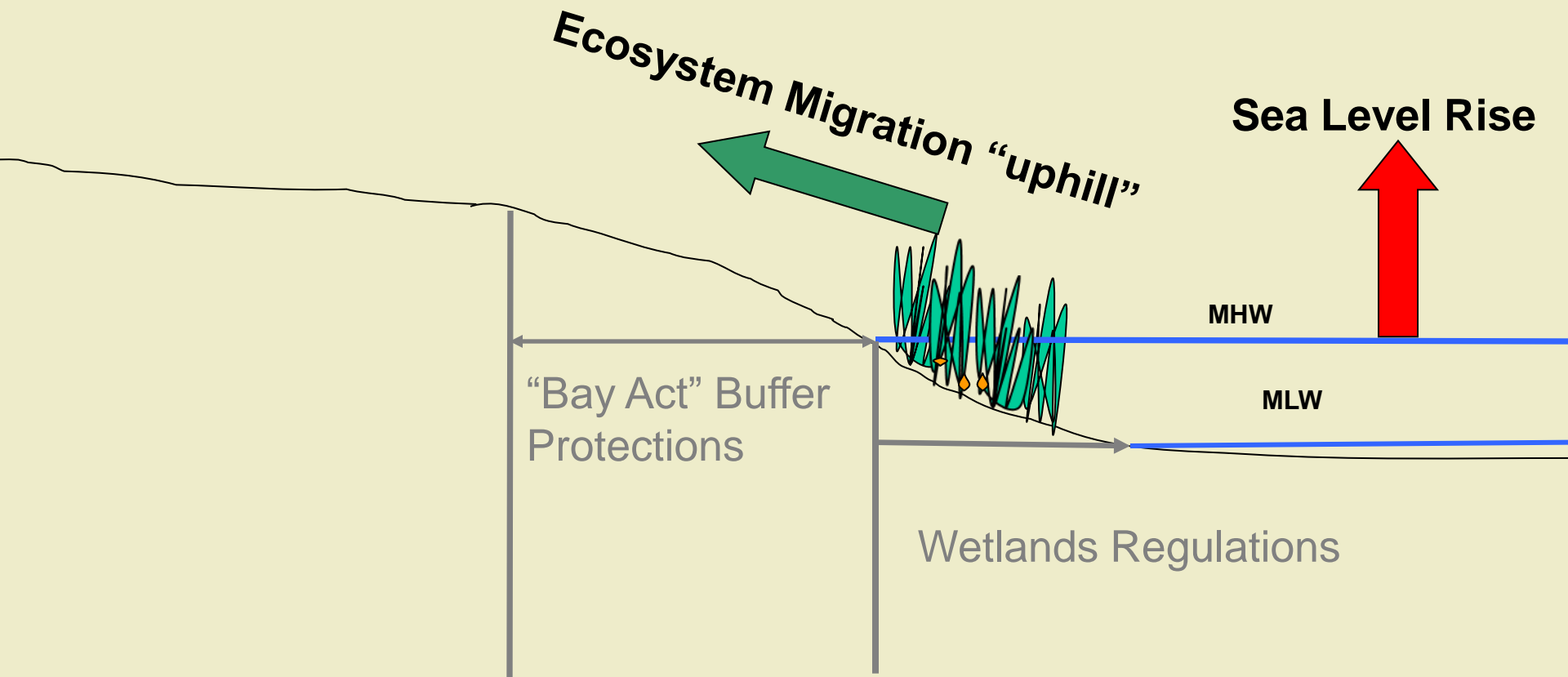
**Blue, Red, Orange, and Brown areas will see wetlands converted to open water at current predicted rates of sea level rise ~ 2-5 feet/100 years**

US CCSP SAP 4.1, 2009



# SEA LEVEL RISE ADAPTATION IN VIRGINIA

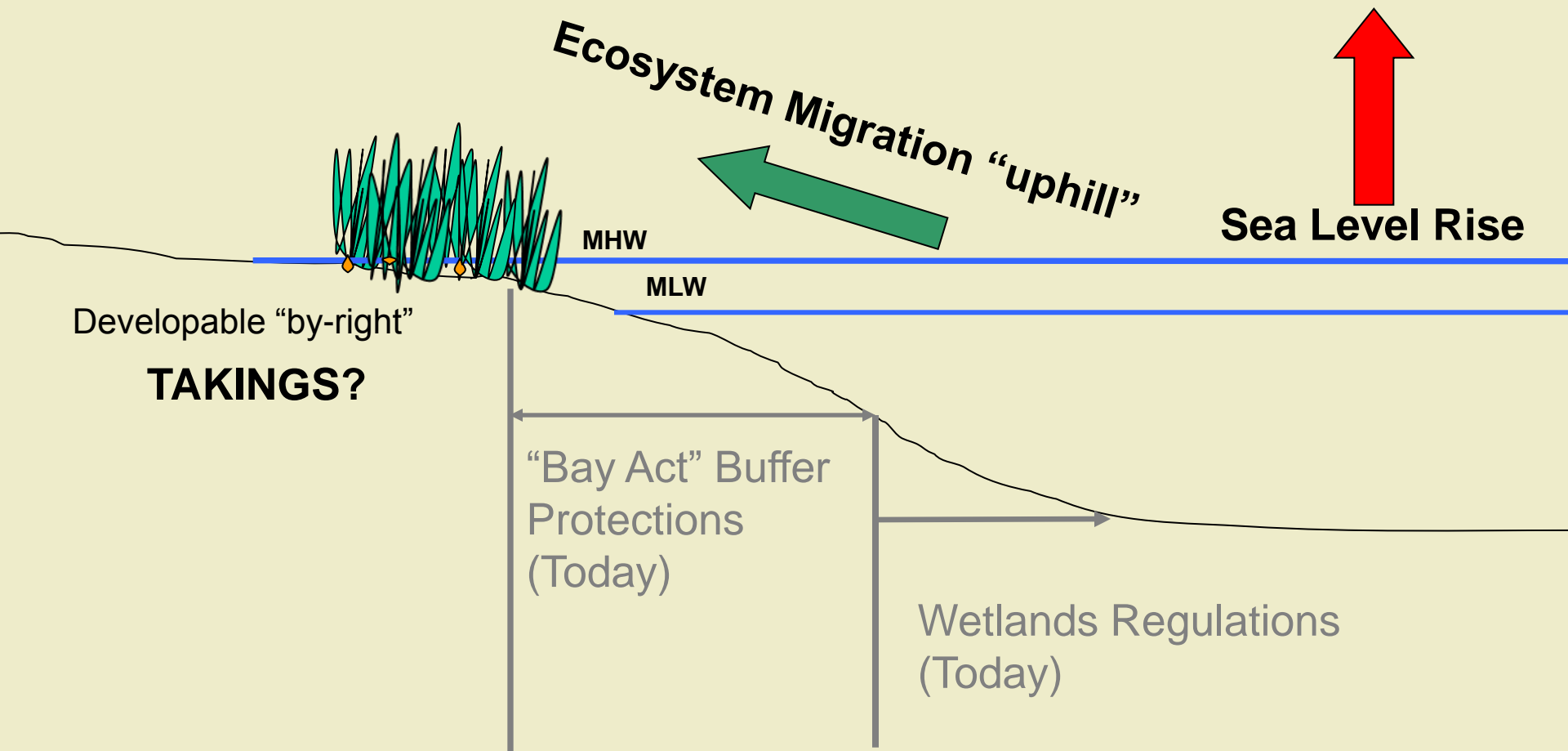
Sea Level Rise Will Move Shoreline Beyond Today's Environmental Jurisdictions





# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Sea Level Rise Will Move Shoreline "Uphill" – Eventually onto "Nonjurisdictional" Land with Development Rights





# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Local Government Adaptation Campaign –  
“Save the Coastal Ecosystem from Climate Change Impacts”

**85 % of Virginia’s Shoreline is Privately Owned**

**Keeping the Tidal Shoreline Open and Resilient is Key = limit development, limit shoreline hardening**

**All Private Land Use Decisions, Occupancy Permits, Business Permits, Many Environmental Decisions are Made by Local Government**

**State Law Requires Local Governments to Review Long Range Land Use Plans Every 5 Years**

Can we...



**...Get Local Governments to Include Climate Change and Shoreline Ecosystem Adaptation in Long Range Plans?**



# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Who Are Adaptation Partners and What Are Their Tools?

Chesapeake Bay vulnerability to sea-level rise

## TOOLS

State and federal wetlands laws

Chesapeake Bay Preservation Act

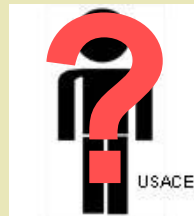
Easements, transfer and purchase of development rights

Local land use regulations

**GOAL: PROTECT WETLANDS AND SHORELINE BUFFERS**



## ADAPTATION PARTNERS







# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Challenges Facing Shoreline Ecosystem Adaptation in Virginia

**Virginia is a “Low Water” State with Private Property Ownership to Low Tide Line**

**Virginia Law Limits Local Government Powers**

**Virginia is a Strong Property Rights State**

**Virginia is 50<sup>th</sup> in US for Per-Capita Spending on Natural Resources**

**Virginia HAS NEVER MET its 2000 “No Net Loss” Wetlands Regulatory Goal for Tidal Wetlands** (DEQ 305b Water Quality Report)

**Virginia’s Tidal Wetlands Inventory Hasn’t been Updated in 30 Years**  
(VIMS/CCRM 2010)

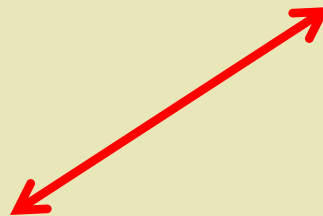
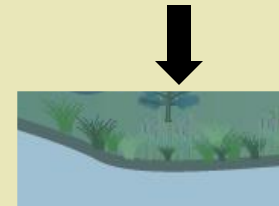
**Virginia Has No Data Base to Track its Wetlands Restoration Efforts**  
(2008 Annual Chesapeake Bay Implementation Report)

# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Focus on Saving Coastal Ecosystem Using Climate Change Argument Does Not Work

Chesapeake Bay vulnerability to sea-level rise

**GOAL: PROTECT WETLANDS AND  
SHORELINE BUFFERS**



**WE NEED:**

**More Tools and More Partners  
More Compelling Arguments  
Less Mention of Climate Change**

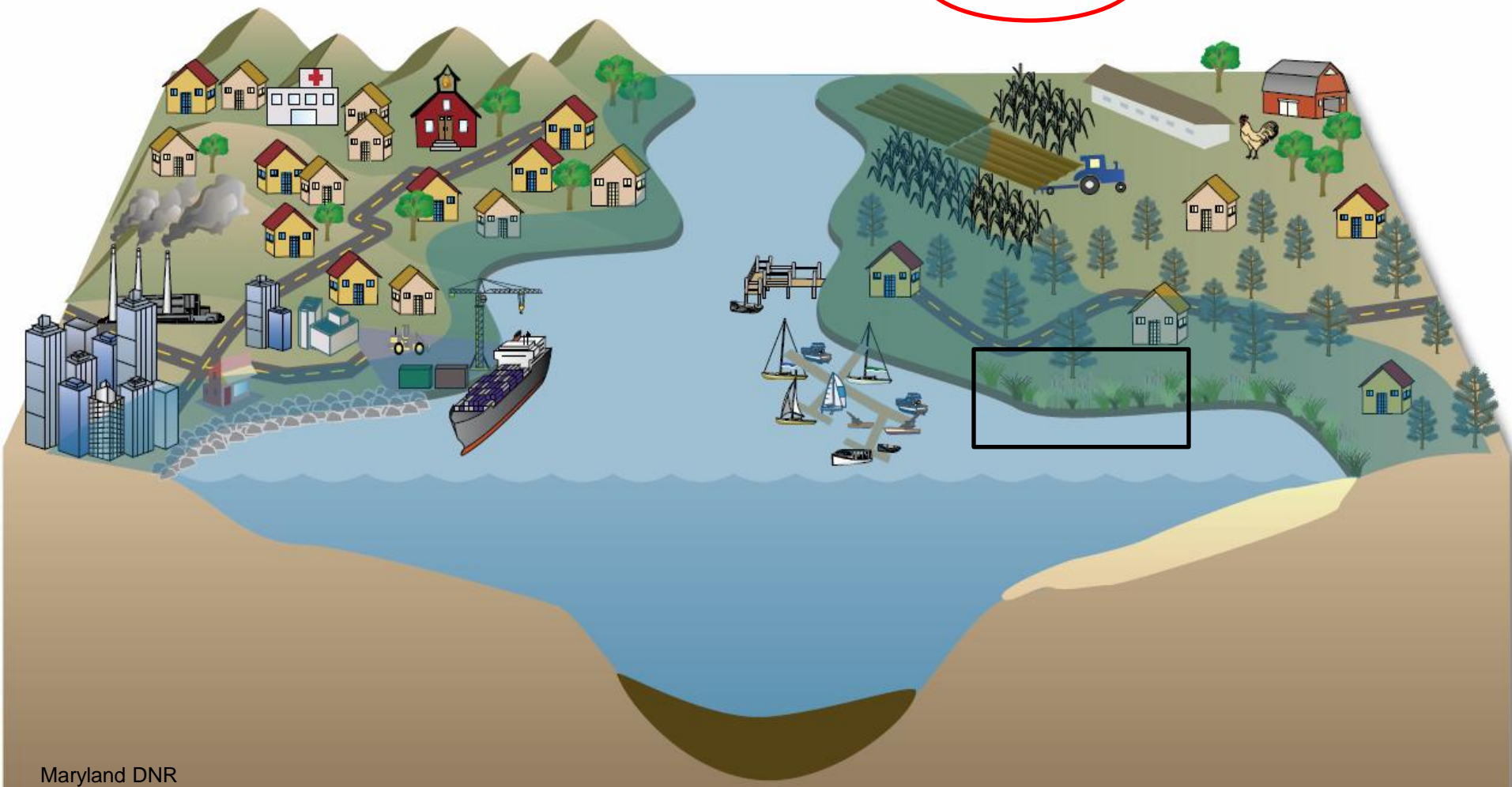


WETLANDS  
WATCH  
WETLANDSWATCH.ORG

# SEA LEVEL RISE ADAPTATION IN VIRGINIA

The Bigger Picture of Sea Level Rise Impacts along Tidal Shorelines

Chesapeake Bay vulnerability to sea-level rise and storm surge

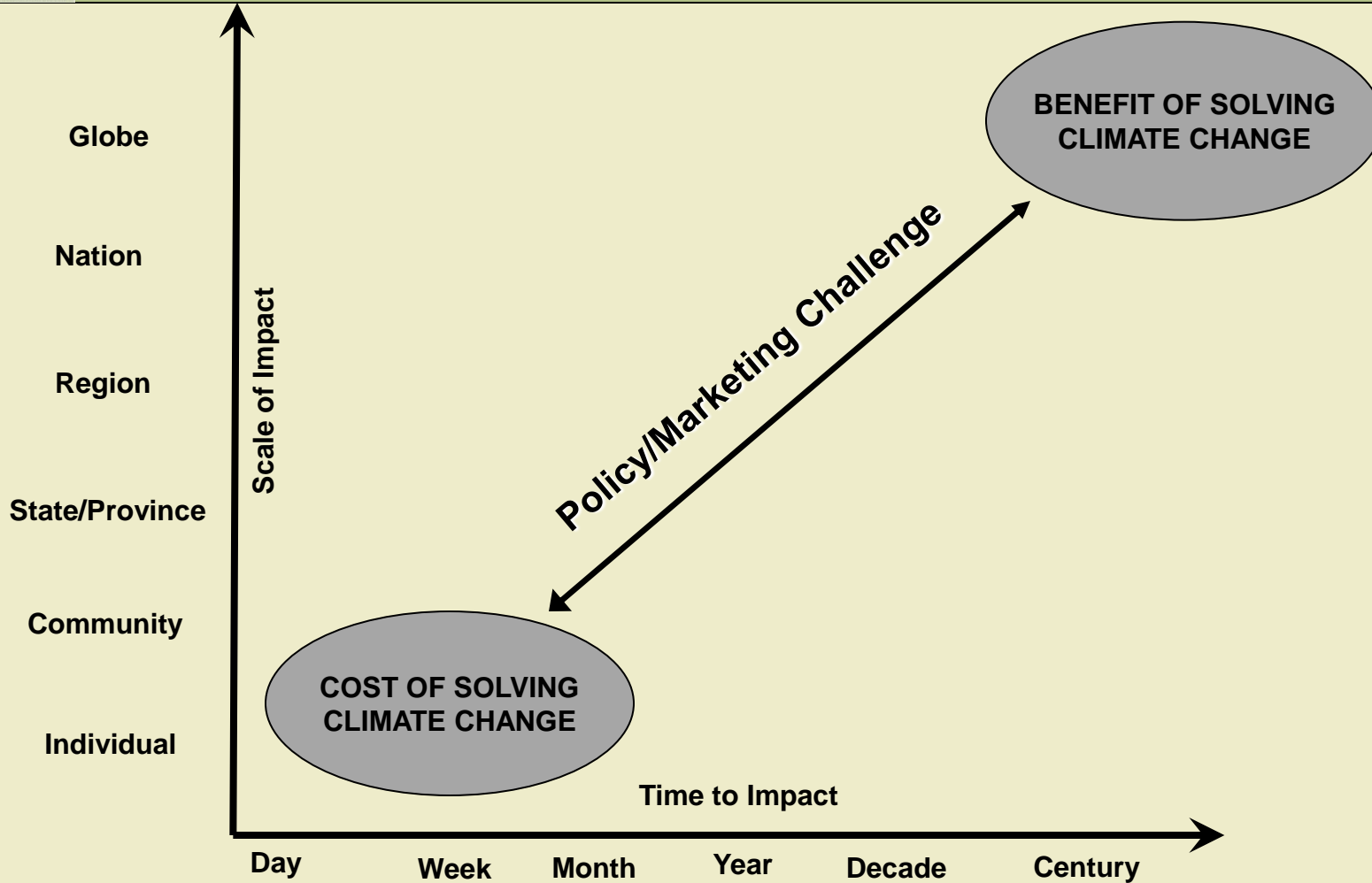


Maryland DNR



# SEA LEVEL RISE ADAPTATION IN VIRGINIA

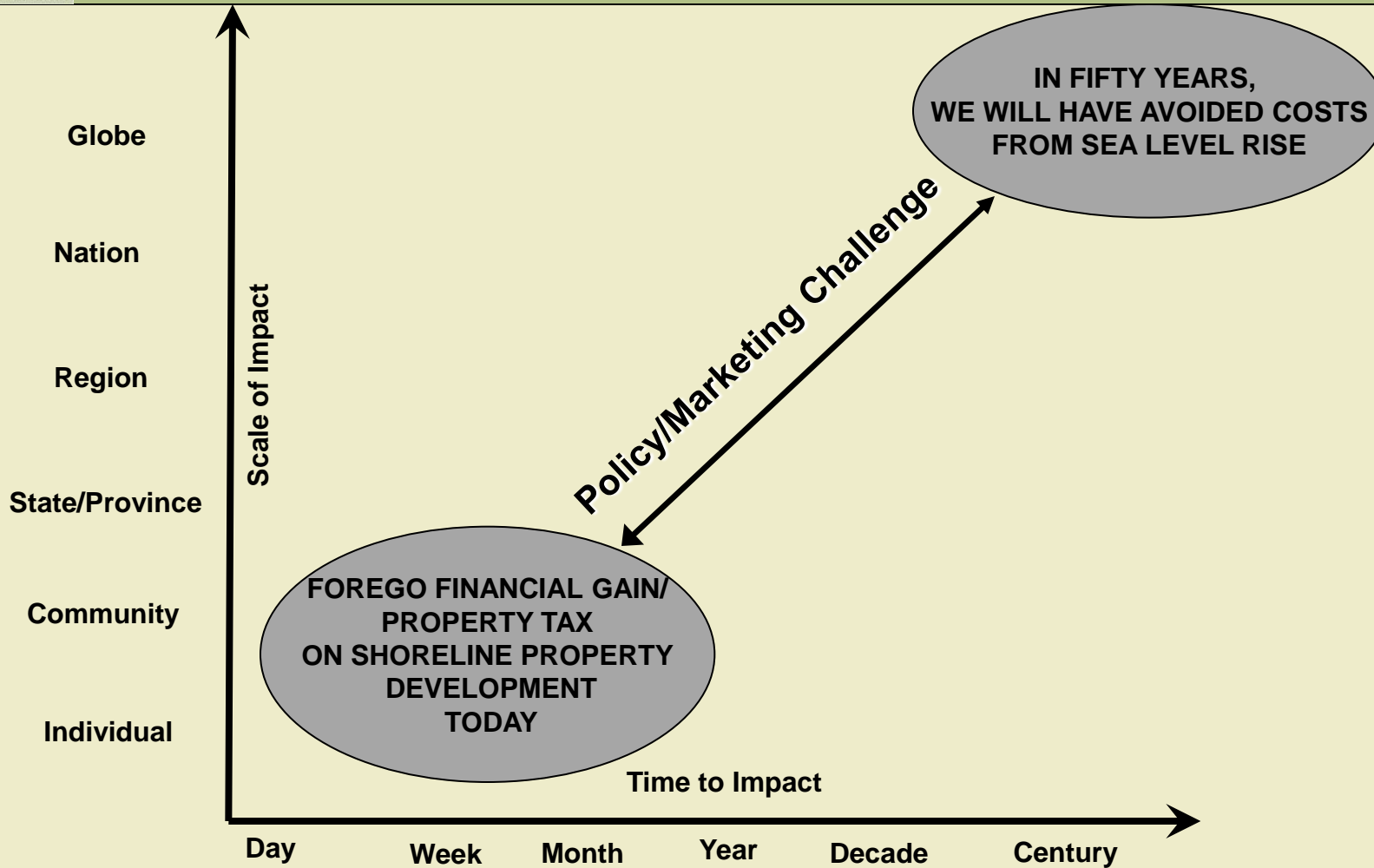
Social Marketing Challenges Are Difficult...How do we Bridge the Gap?





# SEA LEVEL RISE ADAPTATION IN VIRGINIA

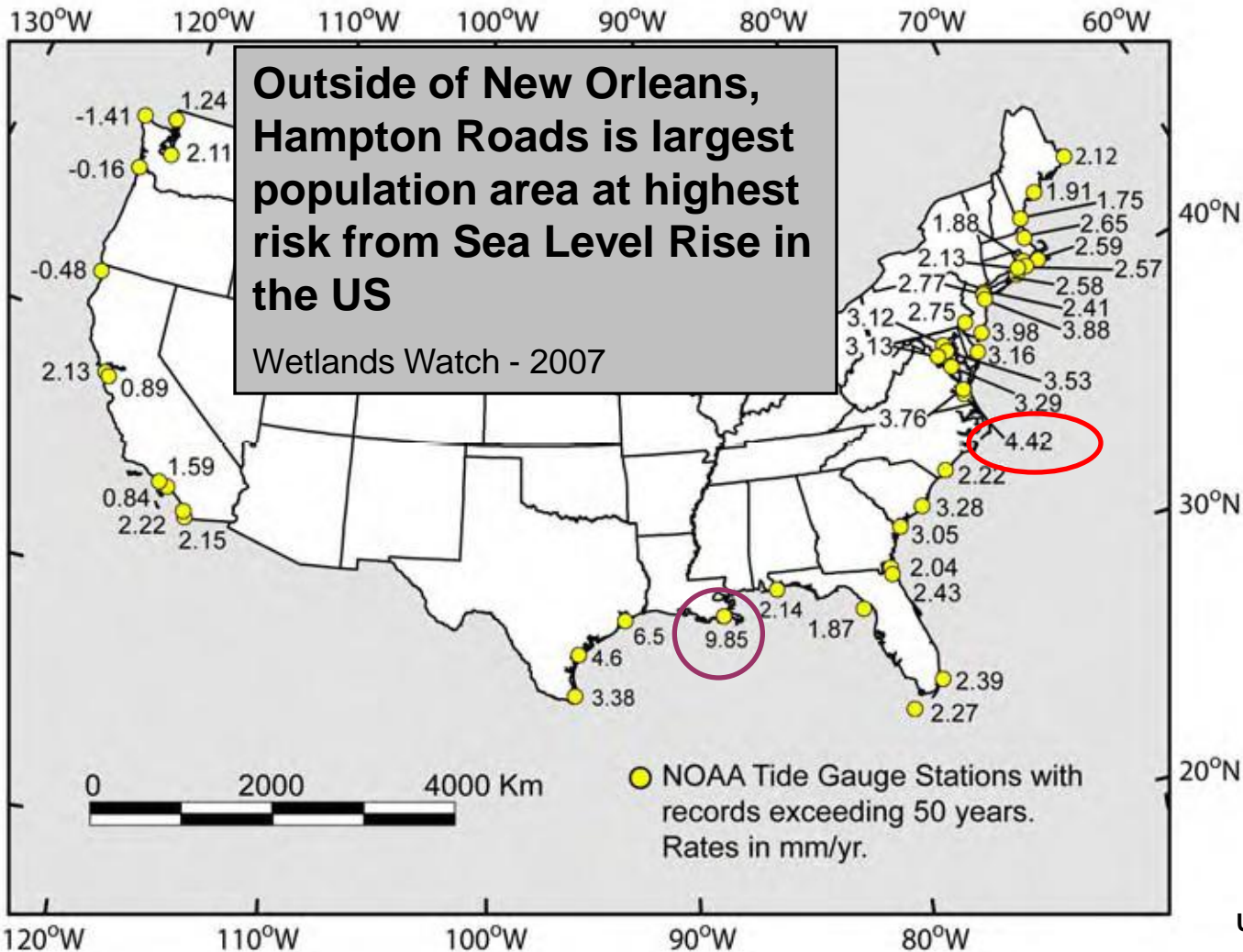
Social Marketing Challenges Are Difficult...How do we Bridge the Gap?





# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Message Needs to Engage a Wider Segments of Society



US CCSP SAP 4.1, 2009



# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Impacts Need to be on the Same Personal, Time, and Geographic Scale = More Compelling

**What Will Sea Level Rise Do in My Children's/Grandchildren's Life?**

**What Is Sea Level Rise Already Doing to my Community/To Me?**

- \* How Many Times Have I Had to Change My Commute in the Last Year?**
- \* Why is My House Insurance Getting More Expensive?**

**What Will Sea Level Rise Cost Me Over my Lifetime/Over my Business Horizon/During the time I Own My House?**

## CLOSING ARGUMENTS



Virginian Pilot Dec 5, 2010





# SEA LEVEL RISE ADAPTATION IN VIRGINIA

## Storm Surge History at Sewell's Point (Norfolk, VA)

DATE	STORM TYPE	ABOVE MHHW
August 23, 1933	Hurricane	6.27 feet
September 18, 2003	Hurricane Isabel	5.12 feet
March 7, 1962	Ash Wednesday Storm	5.05 feet
November 12, 2009	Veterans Day nor'easter	4.99 feet
September 18, 1936	Hurricane	4.92 feet
September 16, 1933	Hurricane	4.36 feet
November 22, 2006	Thanksgiving nor'easter	3.96 feet
October 6, 2006	Columbus Day nor'easter	3.76 feet
January 28, 1998	Twin nor'easters (#1)	3.26 feet
September 16, 1999	Hurricane Floyd	3.21 feet
February 5, 1998	Twin nor'easters (#2)	3.12 feet

NOAA



# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Recent Storms Make it Real to People

DATE	STORM TYPE	ABOVE MHHW
August 23, 1933	Hurricane	6.27 feet
September 18, 2003	Hurricane Isabel	5.12 feet
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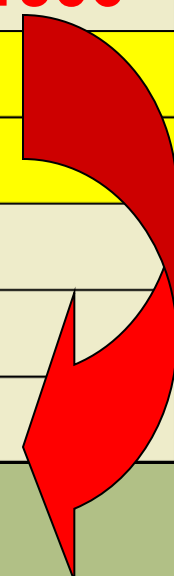


# SEA LEVEL RISE ADAPTATION IN VIRGINIA

What if These Storms Hit 100 Years Ago?

DATE	STORM TYPE	ABOVE MHHW
August 23, 1933	Hurricane	6.27 feet
September 18, 2003	Hurricane Isabel	5.12 feet
March 7, 1962	Ash Wednesday Storm	5.05 feet
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February 5, 1998	Twin nor'easters (#2)	3.12 feet

**- 1.45 feet  
in 1906**





# SEA LEVEL RISE ADAPTATION IN VIRGINIA

What Happens 100 Years from Now?

DATE	STORM TYPE	ABOVE MHHW
August 23, 1933	Hurricane	6.27 feet
September 18, 2003	Hurricane Isabel	5.12 feet
March 7, 1962	Ash Wednesday Storm	5.05 feet
November 12, 2009	Veterans Day nor'easter	4.99 feet
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**+2.3 feet  
in 2106**



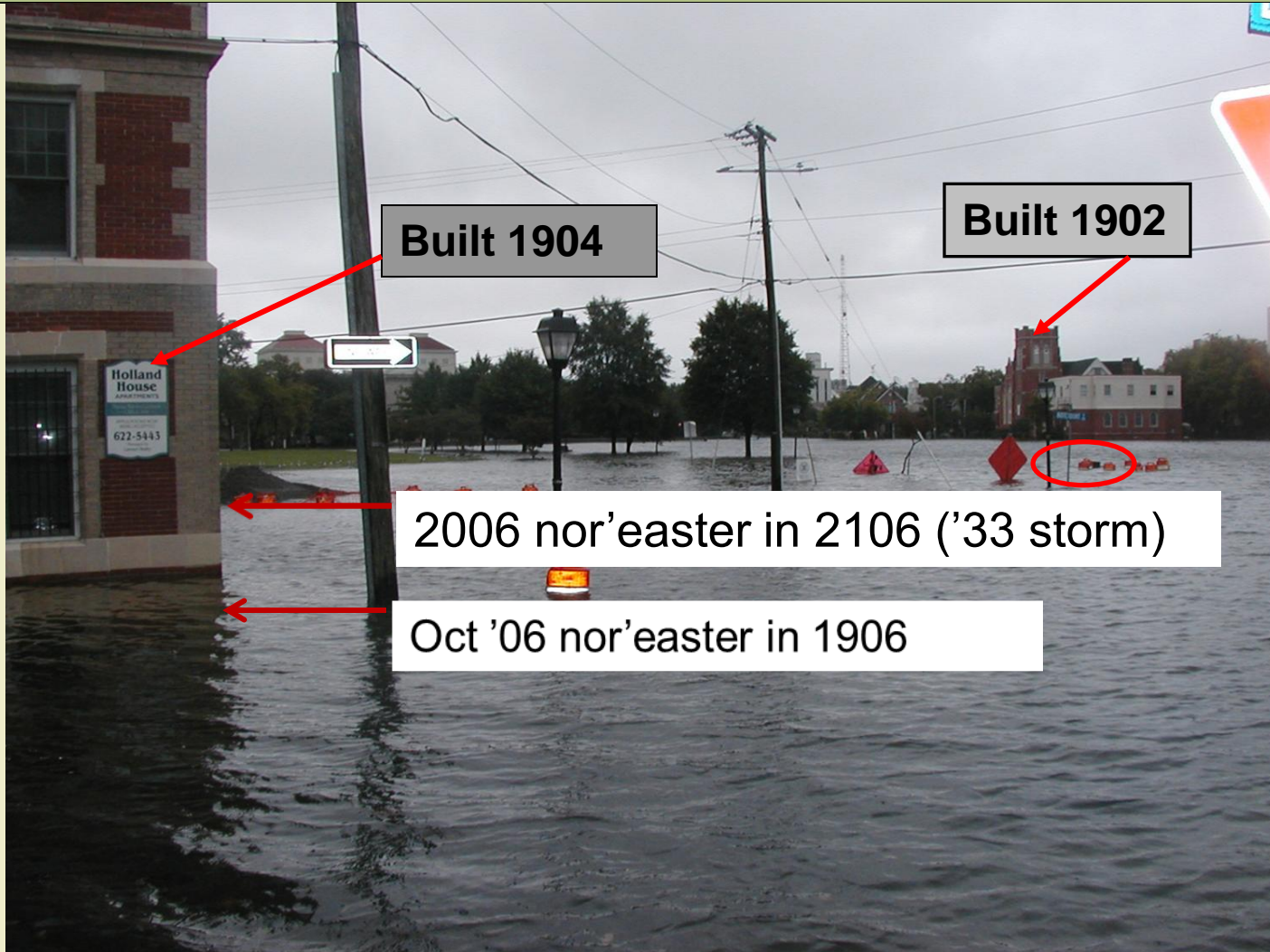
# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Norfolk on a Dry Day (watch the trash can in the circle)



# SEA LEVEL RISE ADAPTATION IN VIRGINIA

October 2006 Nor'easter Flooding in Norfolk





# SEA LEVEL RISE ADAPTATION IN VIRGINIA

FEMA Post-Hazard Mitigation Program



**~\$130,000/house**

**\$4.5 million in  
FEMA spending to  
raise houses in  
Norfolk after Isabel**



# SEA LEVEL RISE ADAPTATION IN VIRGINIA

House is Fine...Now About the Street



**\$1.23 Million to Raise One Block 18"**

[www.wetlandswatch.org](http://www.wetlandswatch.org)

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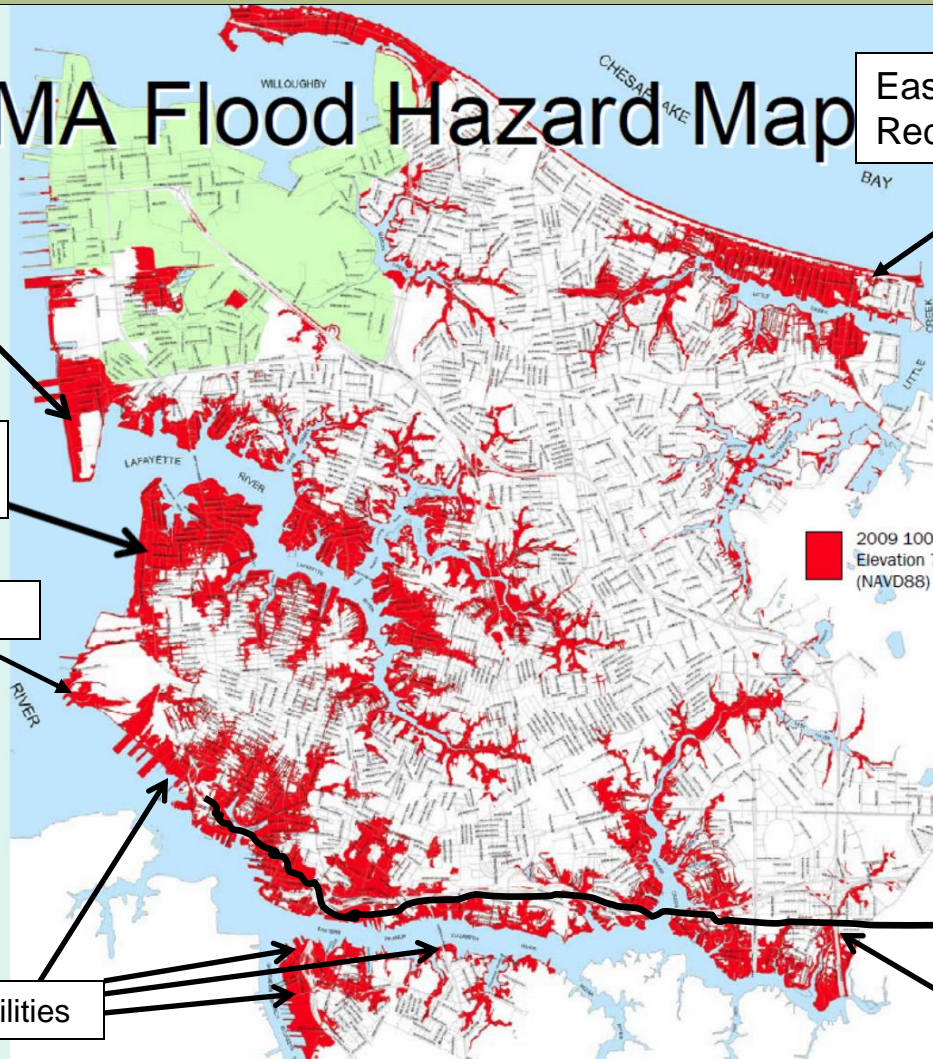




# SEA LEVEL RISE ADAPTATION IN VIRGINIA

What's at Stake as Flood Zones Shift?

## FEMA Flood Hazard Map



East Ocean View  
Redevelopment

Port of Norfolk

Old Dominion  
University

Norfolk Southern Piers

In 2009 FEMA  
increased Norfolk's  
base flood elevation  
by 0.3 feet over their  
1980 prediction

Ship Repair Facilities

Light Rail (under construction)



# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Sea Level Rise Increases Frequency of Flooding Events

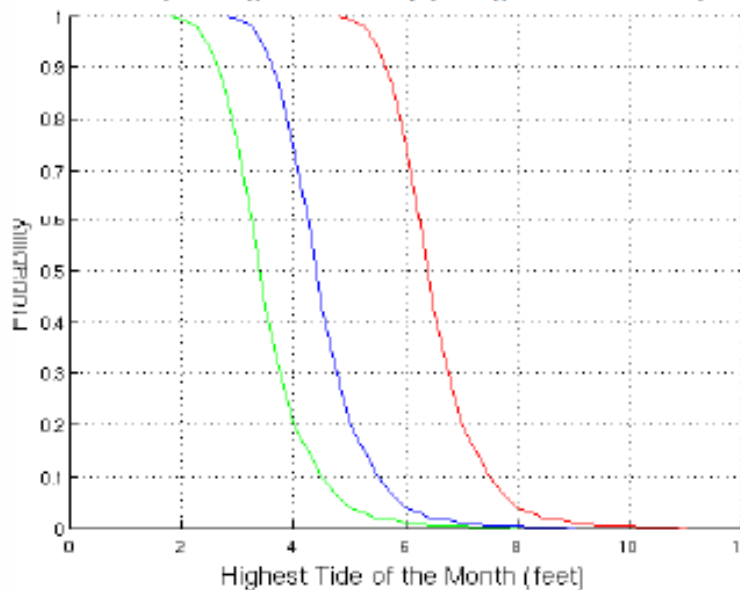
Flood	Flood (Ft)	Historical	Now	+2'	+3'
Record	+8.02	80.5 yrs	26.8 yrs	7.3 yrs	1.7 yrs

*NORTHROP GRUMMAN*

## Sea-Level Rise Notional Scenarios

Probability that Tide at Sewells Pt exceeds:

Historical (Green), Present Day (Blue), Historical + 3' (Red)



Increasing Sea Level combined with storm surge frequencies alters the risk analysis

Modest levels of rise on the average increase the frequency of extreme events dramatically

Average Number of Years Between Inundation Events					
Event Severity	Flood Gauge Stage Level(ft)	Sea Level Rise change (Ft)			
		Historical	Present	+2'	+3'
Flood	5.00	1.71	0.33	0.10	0.08
Moderate	6.00	7.32	1.71	0.33	0.10
Major	7.00	26.83	7.32	1.71	0.33
Record	8.02	80.50	26.83	7.32	1.71

Sea-level rise reduces the time between (increases the frequency of) record-level inundation events.

Colors represent relative risk.

Northrop Grumman Proprietary Level I

Northrop Grumman is Largest Manufacturing Employer in Virginia

Only Shipyard in the US that can build aircraft carriers – Ford Class underway



# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Rural Areas in Virginia are Threatened as Well When the Shoreline Moves

Who's Responsible for this Residence?



4' Erosion/yr

[www.wetlandswatch.org](http://www.wetlandswatch.org)

[www.wetlandswatch.org](http://www.wetlandswatch.org)



# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Economic Drivers for Adaptation Are Emerging - Globally

LLOYD'S

**360**

DRIVING THE  
DEBATE ON  
EMERGING RISK

## COASTAL COMMUNITIES AND CLIMATE CHANGE

MAINTAINING FUTURE  
INSURABILITY



## **Allstate stopped writing new policies in 19 coastal communities:**

**Accomack, Gloucester, Isle of Wight, King and Queen, Lancaster, Mathews, Middlesex, Northumberland, Northampton, Southampton, Surrey, Sussex, York counties and Chesapeake, Franklin, Hampton, Newport News, Norfolk, Virginia Beach**

## **Nationwide is withdrawing new coastal coverage**

**State Farm will not write new policies within one mile of the ocean shoreline**

**Farmer's will not write a new policy within two miles of ocean shoreline or one mile of tidal Bay**

**USAA – withdrawing new coverage**



**Do These Broader Concerns Bring More People to the Table and Provide More Adaptation Tools?**

**.....YES!**

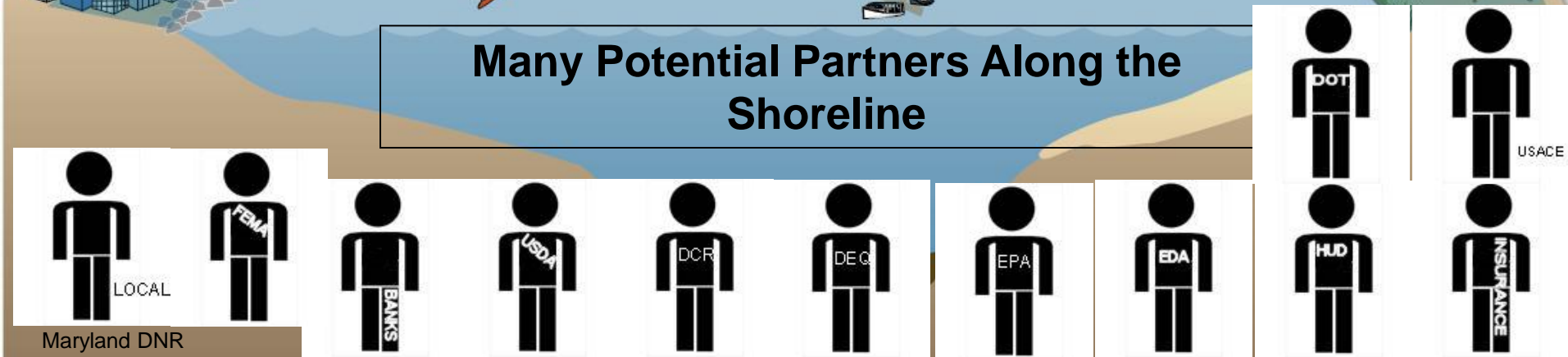
# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Each Sector of Shoreline Community Brings New Potential Adaptation Partners to the Table

Chesapeake Bay vulnerability to sea-level rise and storm surge



Many Potential Partners Along the Shoreline





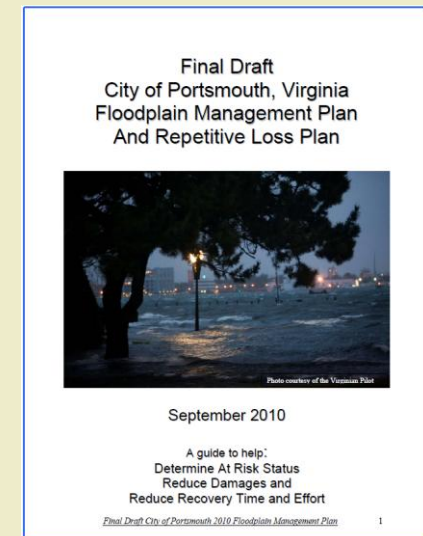
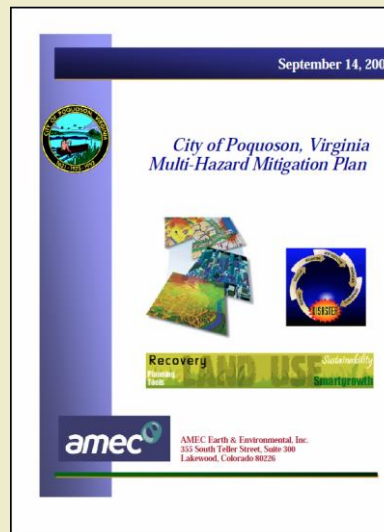
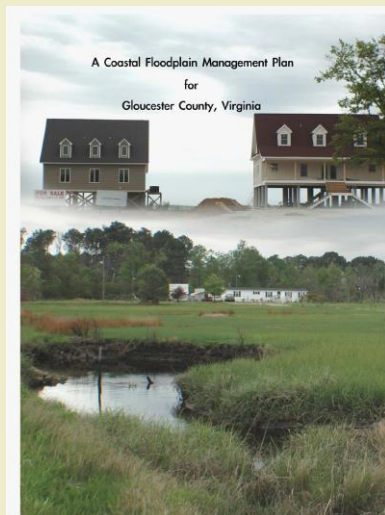
# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Who are the New Partners and  
What are the New Tools?



FEMA requires hazard mitigation plans by states (44 CFR 201.4) and localities (44 CFR 201.5)

National Flood Insurance Program (NFIP) gives reduced rates for publicly developed and regularly updated Floodplain Management Plans (NFIP Community Rating System)



42 U.S.C. § 3162 – Comprehensive Economic Development Strategy – Regional Plan for Sustainable Economic Development  
- Required by US Economic Development Administration



## IV. ANALYSIS OF ECONOMIC DEVELOPMENT PROBLEMS AND OPPORTUNITIES

### Threats

- Rising Sea Levels and other Potential Impacts of Climate Change



# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Climate Change Showing up in Required US Transportation Plans

Long-Range transportation plan required of each state (23 CFR § 450.206) and region (23 CFR § 450.306) before receiving federal transportation funds.



Virginia's Long-Range Multimodal  
Transportation Plan

## *Climate Change*

**“Climate change poses a serious and growing threat to Virginia’s roads, railways, ports, utility systems, and other critical infrastructure...”**



# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Other Federal Planning Requirements Can/Are Mentioning Climate Change

**US Fish and Wildlife Service requires a “Wildlife Action Plan” prior to receiving funding - 16 U.S.C. § 669e (Virginia and many other states address climate change impacts)**

**US Forest Service Plans for National Forests -16 U.S.C. § 1604 (Washington/Jefferson Forest Plan will include climate change impacts)**

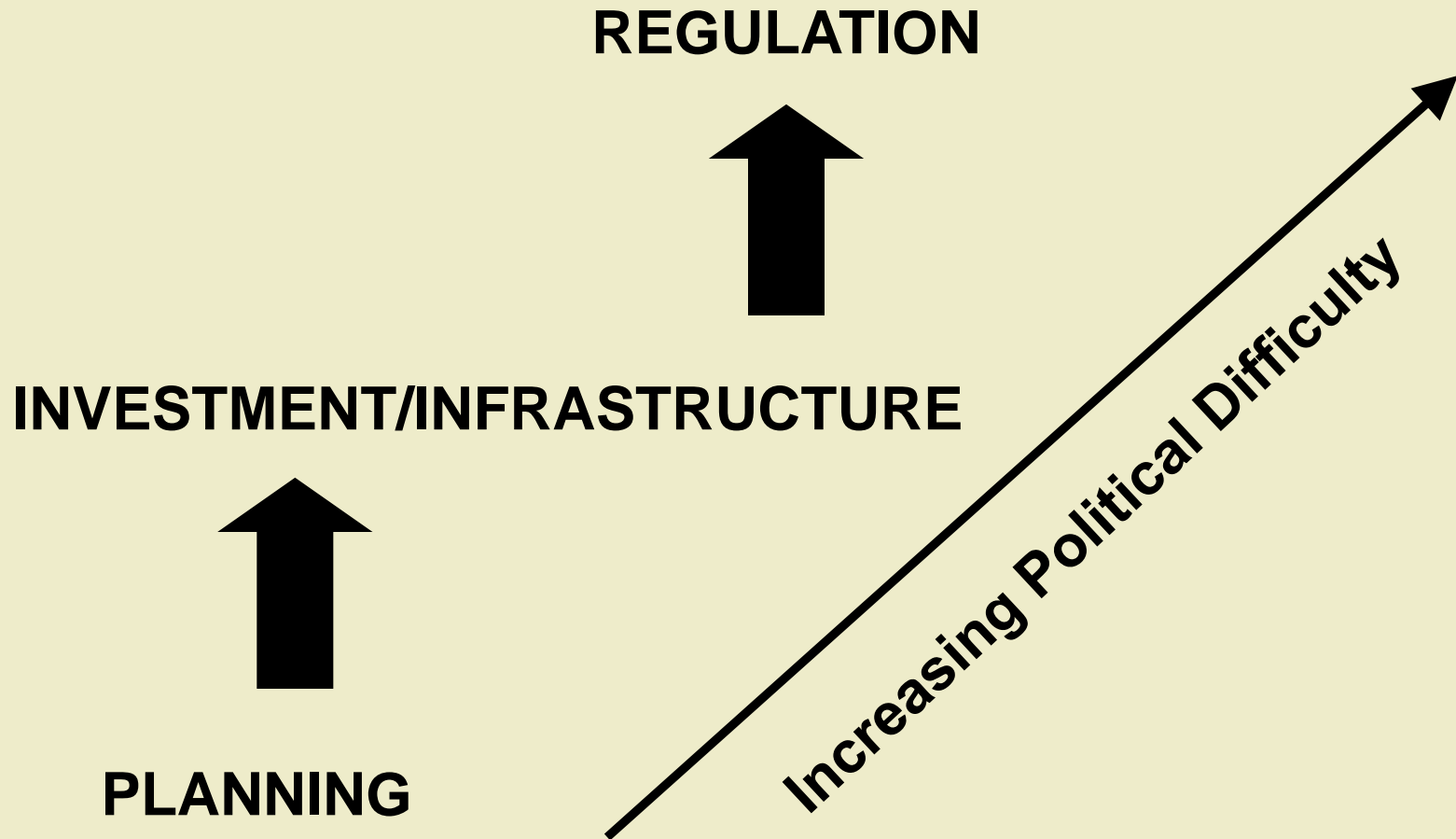
**HUD Consolidated Plan required of every locality prior to receiving funding - 24 CFR Part 91.215 (Could include climate change impact on disadvantaged community housing.)**

**Stormwater planning, Mandatory public involvement and participation – 40 CFR 122.34 (b) 2 (ii) (A place to insert climate change impacts)**



# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Planning is Just the Start – it Gets Harder as Decisions Change Behavior





# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Social Marketing Work Must Include a Range of Tactics

“Convincing people that you're right about an issue--say, the scientific consensus about the threat posed by global warming--can seem vitally important, but in the end may be somewhat beside the point.

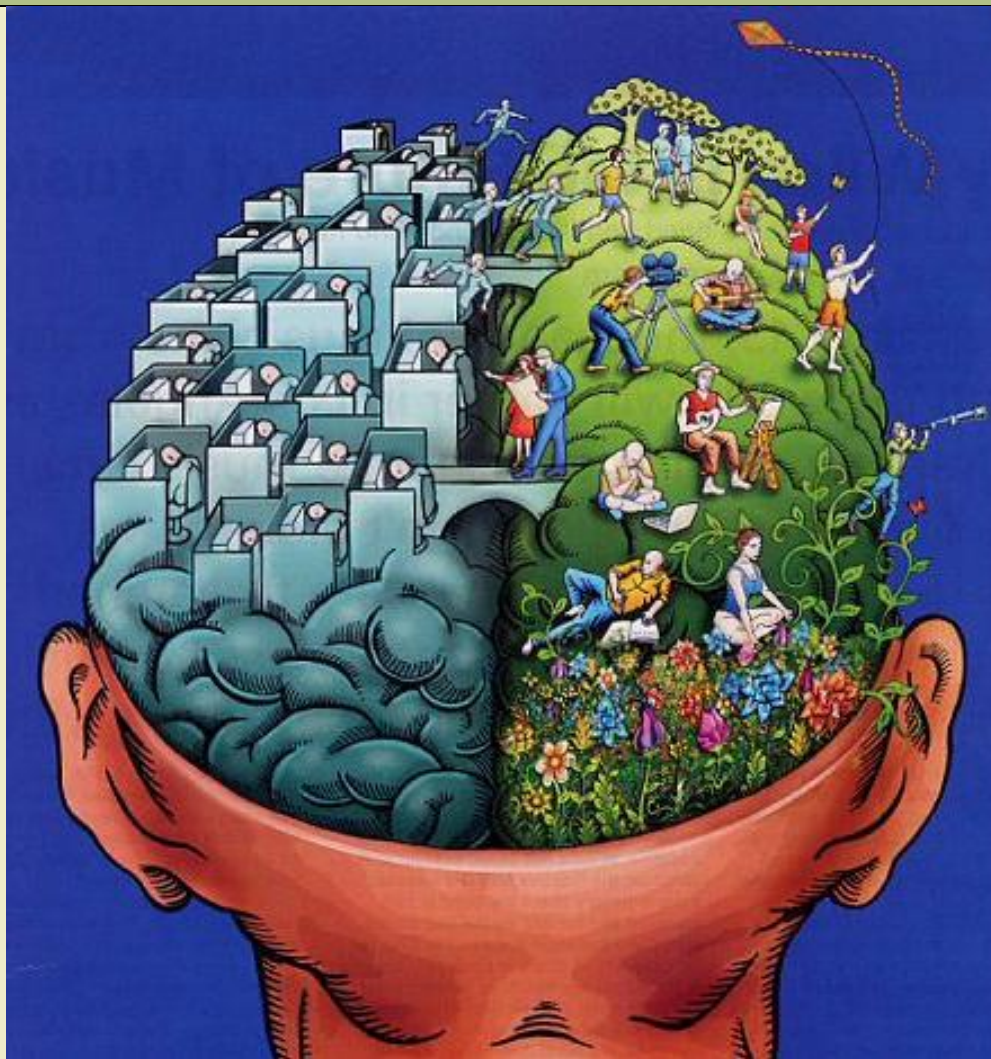
In the long run, you have to **move the debate beyond beliefs, and into *incentives***: lining up the economic and social incentives such that the right choices are the easy, natural ones.

To do that, we need smart and effective policies. **Appeals to people's reason may help, but rational belief alone won't carry the day.**

Clark Williams-Derry, Sightline Institute

# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Change Requires Engaging the Whole Brain



# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Role for Visual Arts in Climate Change Debate to Engage the Right Brain



“Melting Men” – Nele Azvedo





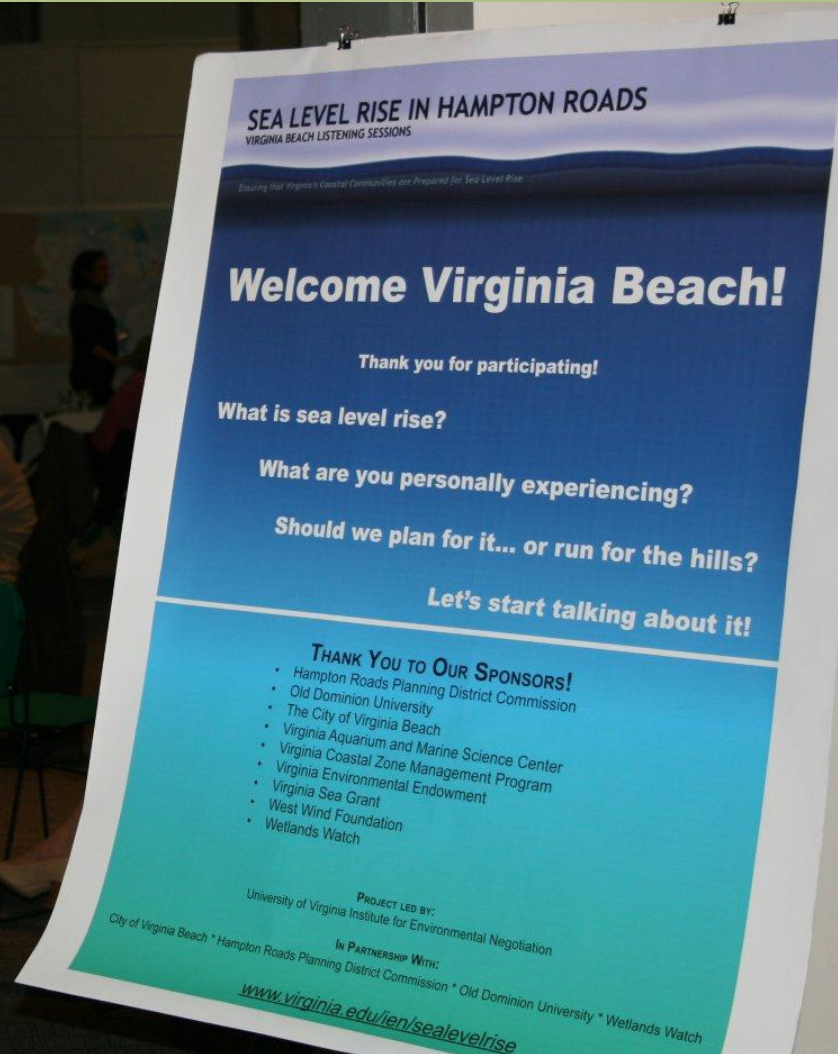
## RISING CURRENTS

### PROJECTS FOR NEW YORK'S WATERFRONT



# SEA LEVEL RISE ADAPTATION IN VIRGINIA

Talking about the Problem with 130+ folks in Virginia Beach



**SEA LEVEL RISE IN HAMPTON ROADS**  
VIRGINIA BEACH LISTENING SESSIONS

*Ensuring that Virginia's Coastal Communities are Prepared for Sea Level Rise*

## Welcome Virginia Beach!

Thank you for participating!

**What is sea level rise?**

**What are you personally experiencing?**

**Should we plan for it... or run for the hills?**

**Let's start talking about it!**

**THANK YOU TO OUR SPONSORS!**

- Hampton Roads Planning District Commission
- Old Dominion University
- The City of Virginia Beach
- Virginia Aquarium and Marine Science Center
- Virginia Coastal Zone Management Program
- Virginia Environmental Endowment
- Virginia Sea Grant
- West Wind Foundation
- Wetlands Watch

PROJECT LED BY:  
University of Virginia Institute for Environmental Negotiation

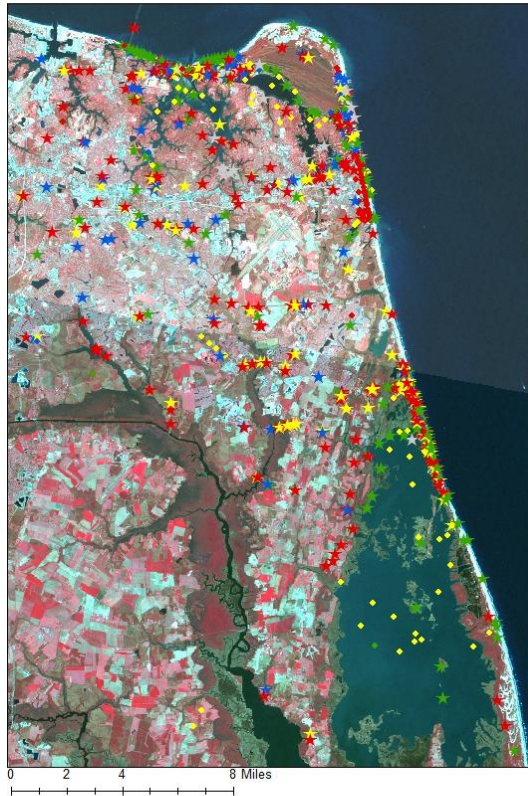
IN PARTNERSHIP WITH:  
City of Virginia Beach \* Hampton Roads Planning District Commission \* Old Dominion University \* Wetlands Watch

[www.virginia.edu/ien/sealevelrise](http://www.virginia.edu/ien/sealevelrise)

Virginia Beach Sea Level Rise  
Listening Sessions Map

**Legend**

- ◆ Property Value Decline
- ◆ Business Stress or Loss
- ◆ Insurance Refused or Dropped
- ◆ Wildlife Habitat or Migration Change
- ★ Storm water Overflows
- ★ Erosion
- ★ Flooding During Storms/Inundations
- ★ Water Quality
- ★ Traffic Re-routed/Changed





**Think Outside of the “Natural Resources Box”**

**Make it Real, Make it Now**

**Engage Both Sides of the Brain – Don’t be a Geek!**

**Present Problem AND Solution – Show a Path Forward**

**Partnerships with “fact based” NGO’s are Essential !**



**Beware “Agenda 21” Conspiracy Theorists!**

# SEA LEVEL RISE ADAPTATION IN VIRGINIA

