Moving Policy and Practice from Flood and Coastal Storm Damage Reduction to Risk Management

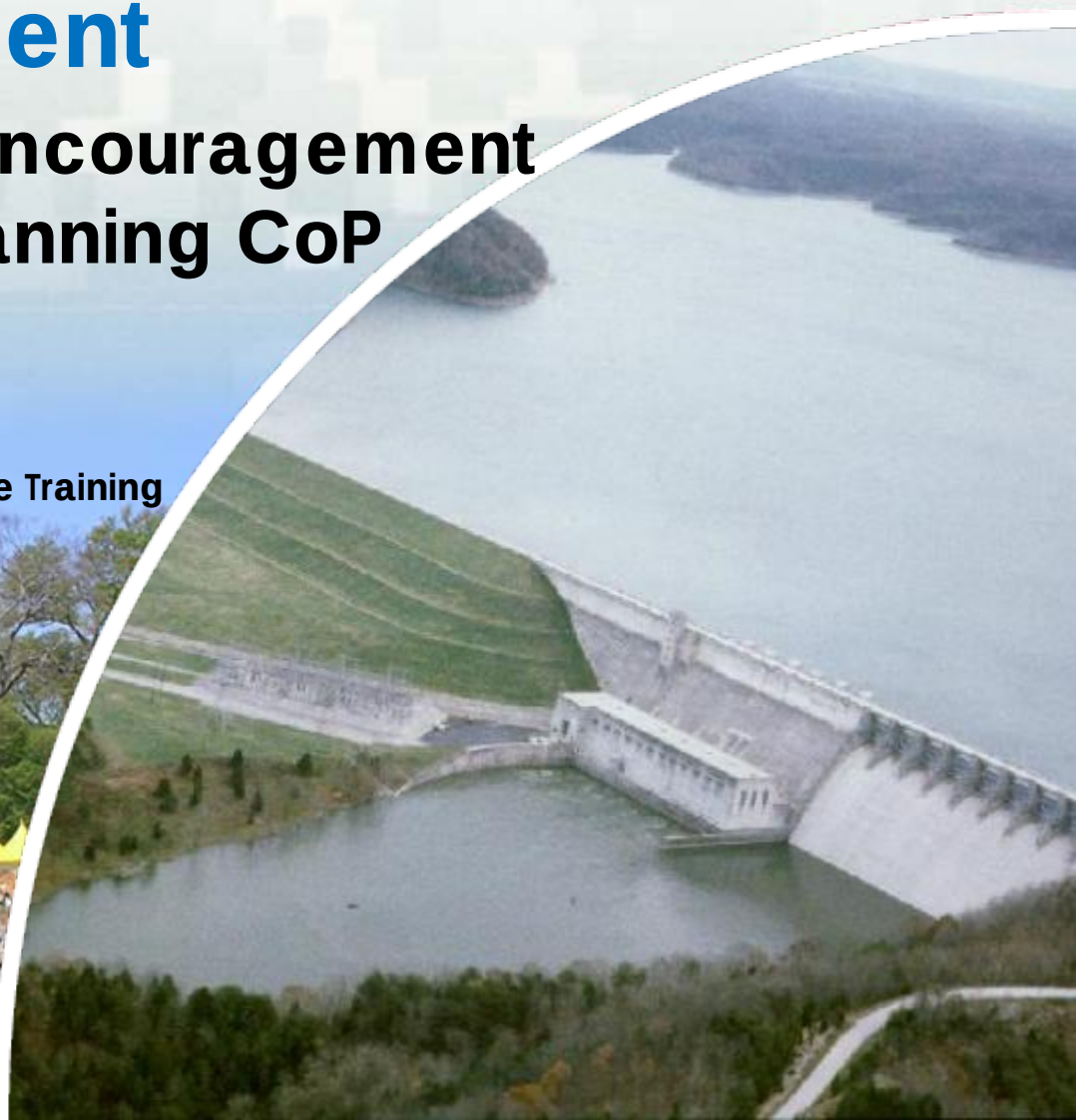
…and other words of encouragement for my friends in the Planning CoP

Eric Halpin, PE

Special Assistant for Dam and Levee Safety

2015 National Planning Community of Practice Training

June 2015



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PEOPLE WORKING TOGETHER TO PROJECTS MODERNIZE PLANNING PROCESS PROGRAM
ATLANTA PCoP WORKSHOP 2015

Agenda

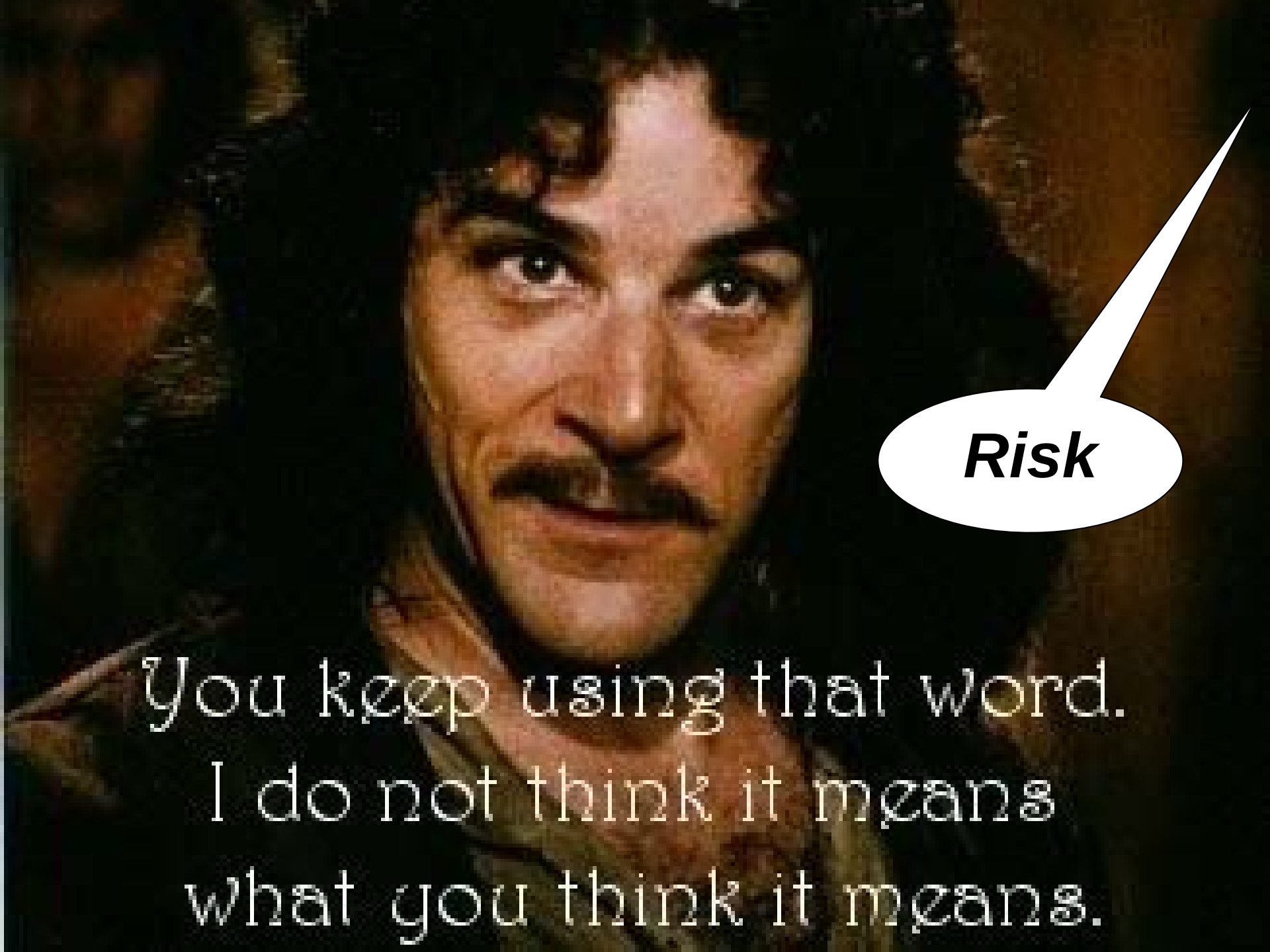
- ***What*** has changed in policy, practice, and people since Katrina?
- ***Why*** was the change made?
- ***How far along*** in real change are we? (thing about it, talking about it, doing it, practicing it, expert at it?)
- What are the ***obstacles*** to further change?

Moving Policy and Practice from Flood and Coastal Storm Damage Reduction to Risk Management

WHAT HAS CHANGED SINCE KATRINA?

What's Changed?

- Principles
- Governance!
- Understanding
- Management & Decisions
- Communication


Risk
You keep using that word.
I do not think it means
what you think it means.

Life Safety is Paramount

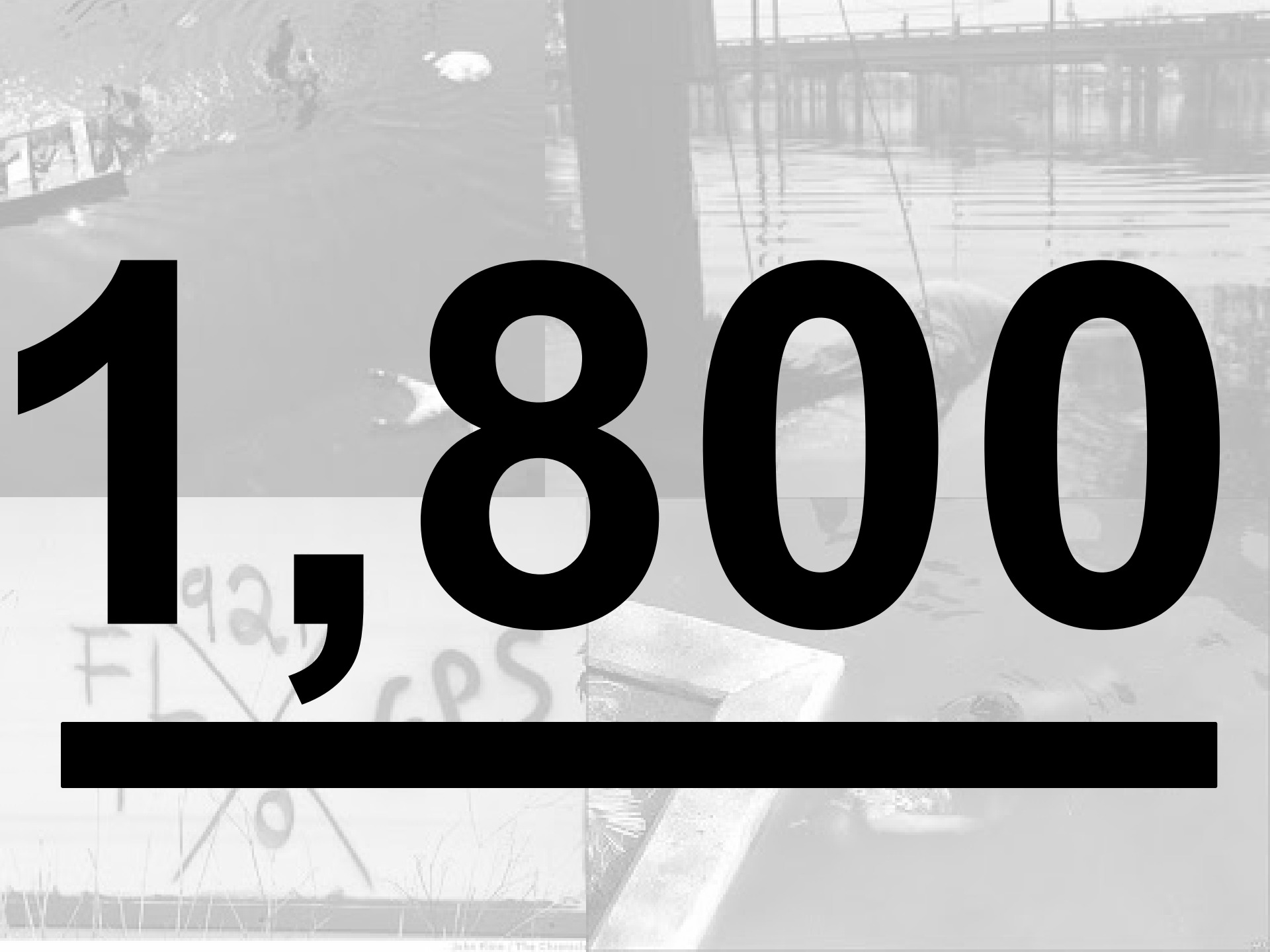
Protecting People, Not Infrastructure

Industry
Project Managers
Engineers
Planners

Moving Policy and Practice from Flood and Coastal Storm Damage Reduction to Risk Management

WHY WAS THE CHANGE MADE?

Familiar?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Economic Premise:

…extract the Nation from a Disaster Relief Environment where it is okay to invest $22B after events have occurred but not before.

Infrastructure is Constructed

People Follow Infrastructure

Risks are Transformed and Increase

There is a Special Responsibility
To Manage these Risks

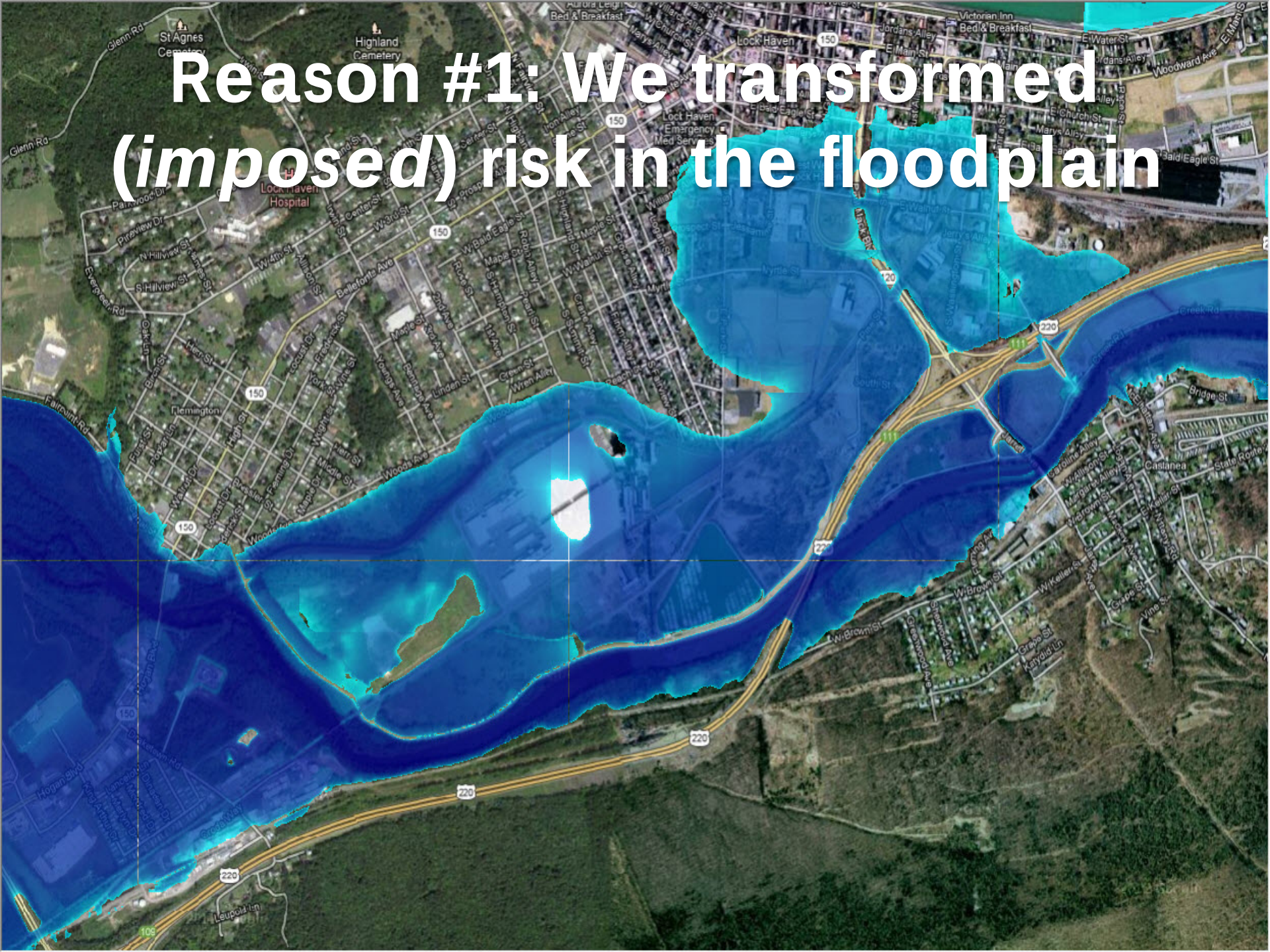
…and That's what Dam and
Levee Safety Programs do.

Moving Policy and Practice from Flood and Coastal Storm Damage Reduction to Risk Management

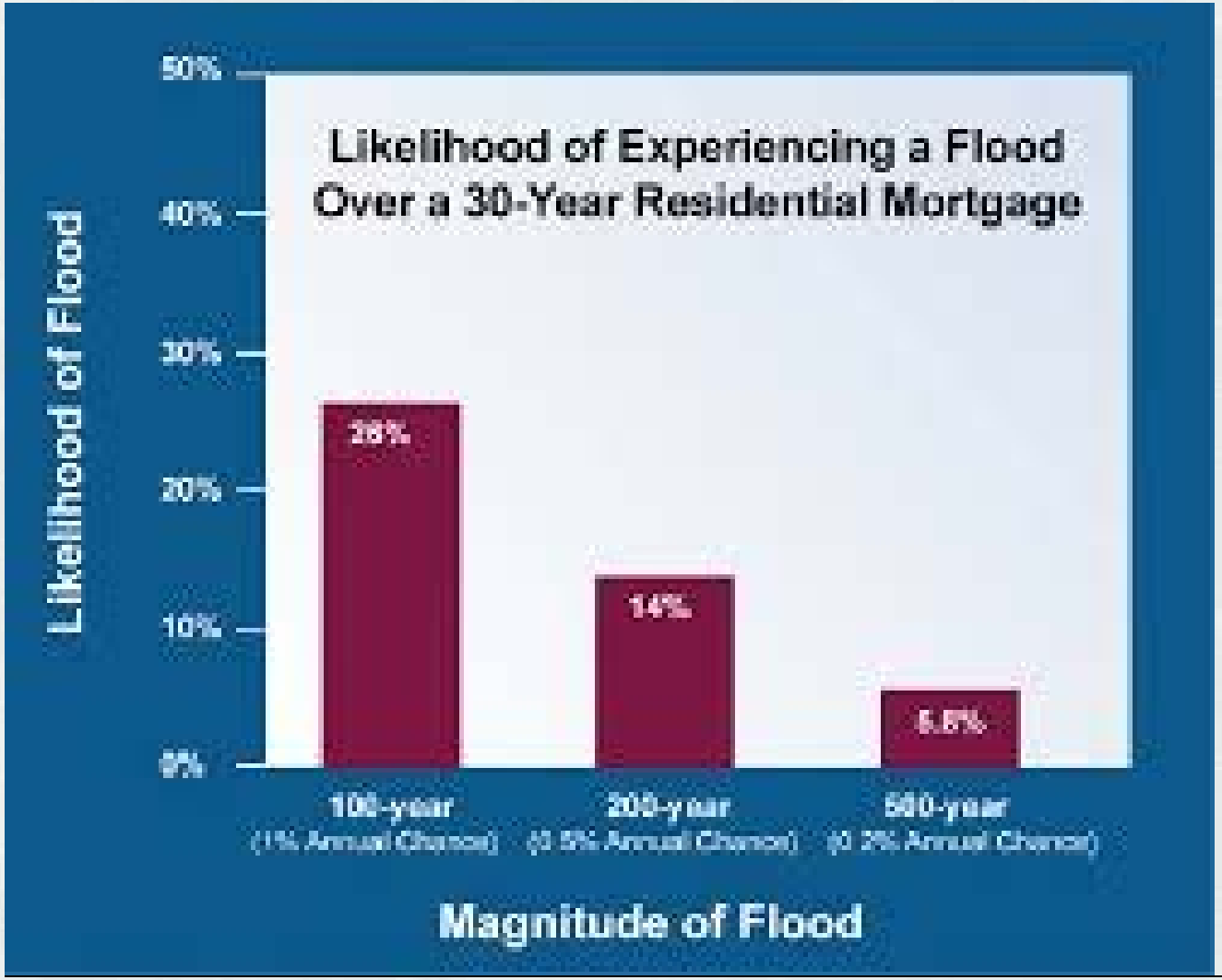
...BUT WHY SHOULD OUR APPROACH CHANGE?

Exploring the Problem: Why is Benefit Cost Ratio Not a Good Decision Metric for the Built Infrastructure Portfolio?

Reason #1: We transformed (*imposed*) risk in the floodplain



Reason #2: Along with a chance of failure, comes likelihood of success



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Reason #3: Even with failure and inundation, risks are still reduced…

Reason #4: Our Assumptions About Some Benefits Not Well Considered…

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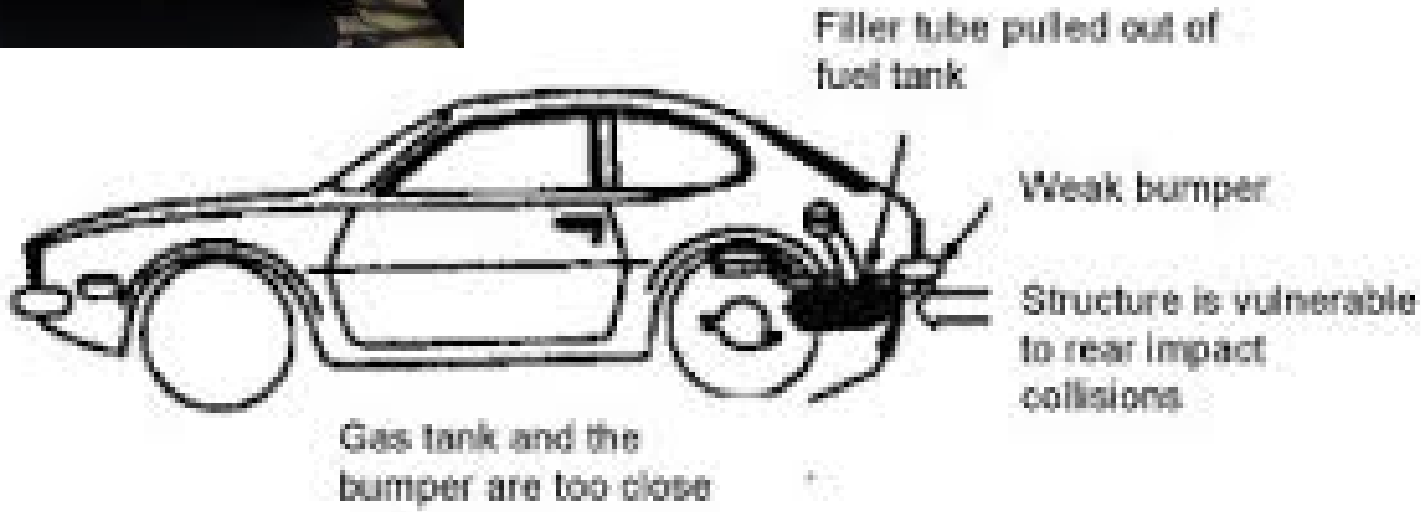
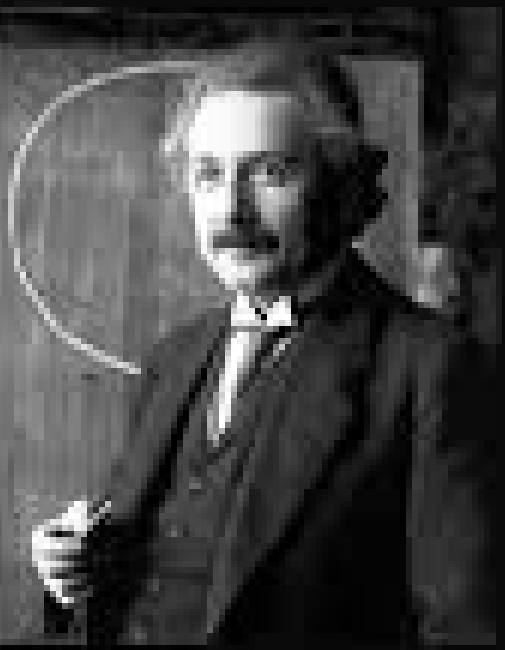
Reason #5: Economically valuating loss of life is bad policy…

Disproportionality

"It's not acceptable to put a cost on a safety issue….Mary Barra, GM CEO



So How Should We Formulate the Built (or to be built) Infrastructure?



The mere formulation of a problem is far more often essential than its solution, which may be merely a matter of mathematical or experiment skill.

(Albert Einstein)

lxquotes.com

Hurricane Sandy: Resilience to Identifying Increasing Risk

Larry Cocchieri

Deputy, Coastal Storm Risk Management PCX

2015 National Planning Community of Practice Training

June 2015

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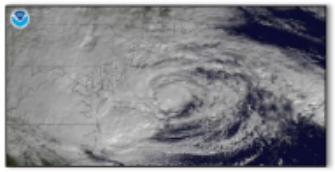
Agenda

- **Sandy Impact Initiatives**
- **Hurricane Sandy Coastal Project Performance Evaluation Study**
- **North Atlantic Coast Comprehensive Study (NACCS) Framework**
- **Coastal Risk Reduction and Resilience: Using the Full Array of Measures**

Sandy Impact: Infrastructure Systems Rebuilding Principles

INFRASTRUCTURE SYSTEMS REBUILDING PRINCIPLES



Introduction. In October 2012, the hybrid cyclone-nor'easter known as Hurricane Sandy roared toward the mid-Atlantic Coast. Even as the hurricane transitioned to a post-tropical cyclone, wind, waves, and storm surge wreaked havoc along the Atlantic Coast, especially to the coasts of New York, New Jersey, and Connecticut. The National Oceanic and Atmospheric Administration (NOAA) and the U.S. Army Corps of Engineers (USACE) are dedicated to working together to help rebuild more resilient and sustainable coastal communities that can adapt to and better mitigate the impacts of coastal hazards.

NOAA and USACE developed this document to promote a unified strategy for our activities in restoring the coast following "Superstorm" Sandy.

Purpose. Improve long-term performance of coastal rebuilding and restoration actions undertaken through the Infrastructure Systems Recovery Support Functions under the National Disaster Recovery Framework following Superstorm Sandy by implementing Executive Order 11988[1] and these consistent principles on a regional scale that:

- Anticipate a changing environment;
- Integrate economic, social, and environmental resiliency and sustainability; and
- Promote long term community protection.

Audience. This document is intended for government at all levels – Federal, State, local and Tribal, non-governmental organizations, and the public to guide coastal restoration activities following Superstorm Sandy.

Principles. Recognizing that natural systems and processes are inextricably linked with and contribute to the resiliency of physical infrastructure, community well-being and coastal economies, we will:

1 **Work together in a collaborative manner across multiple scales of governance (i.e., local, State, Tribal, and Federal) and with relevant entities outside the government to develop long-term strategies that promote public safety, protect and restore natural resources and functions of the coast, and enhance coastal resilience.**

Infrastructure Systems Rebuilding Principles
28 February 2013 | Page 1

Shortly after Hurricane Sandy struck, USACE partnered with NOAA to develop Infrastructure Systems Rebuilding Principles to promote a unified strategy for each agency's approach to activities associated with rebuilding and restoration efforts.

http://coast.noaa.gov/digitalcoast/sites/default/files/files/publications/04062013/InfrastructureSystemsRebuildingPrinciples.pdf

Sandy Impact: Report Criteria

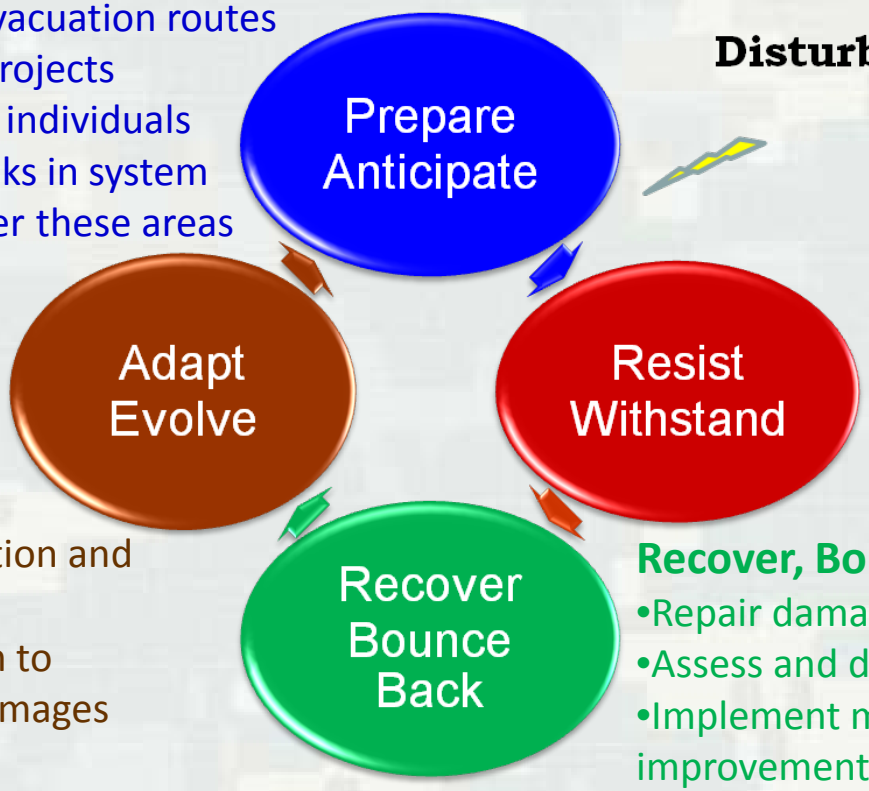
All "Sandy-Affected" project decision documents need to address:

- Resilience
- Risk
- Long-term sustainability - Meeting the needs of the present without compromising the ability of future generations to meet their own needs (NACCS).
- Consistency with NACCS

Sandy Impact: Actions for Resilience:

Prepare, Anticipate:

- Consider likely and rare future scenarios
- Establish early warning and evacuation plans
- Establish multiple evacuation routes
- Maintain/improve projects
- Educate state, local, individuals
- Evaluate weakest links in system and prepare to recover these areas rapidly
- Update resilience assessments



Resist, Withstand:

- Monitor infrastructure system performance and community response

Adapt, Evolve

- Modify evacuation and response plans
- Improve system to reduce future damages

Recover, Bounce Back:

- Repair damaged systems
- Assess and document system performance
- Implement mitigation measures and improvements

Resilience: the ability of a *system* to Prepare for, Resist, Recover, and Adapt to achieve functional performance under the stress of disturbances through time.

Q: Did Corps Projects "Hold Up" During Sandy?

Project Performance Evaluation Report

- **PL 113-2** provided $500,000 in Investigations allocation to complete a Performance Evaluation Report to evaluate the effectiveness of Army Corps projects during Hurricane Sandy and include recommendations for further improvements.
- The HSCPPES is currently available to the public at: www.nan.usace.army.mil/Sandy/PPE
- **A: YES**

Hurricane Sandy Coastal Project Performance Evaluation Study HSCPPES Findings

- Records set throughout North Atlantic Division for storm tides and waves.
- Projects performed better than expected.
- Experienced widespread back-bay flooding.
- Protective dunes and high storm berms performed well.
- Increased damages at project ends.
- Damages less than without project.
- Limited opportunities to update authorized constructed projects to improve project performance, by updating the design dimensions in response to changed conditions.
- Findings support a strategy to implement a systems approach to comprehensive coastal protection; the development and maintenance of the Coastal Systems Portfolio Initiative; and the development of coastal depth-damage curves to more accurately identify storm damages prevented.

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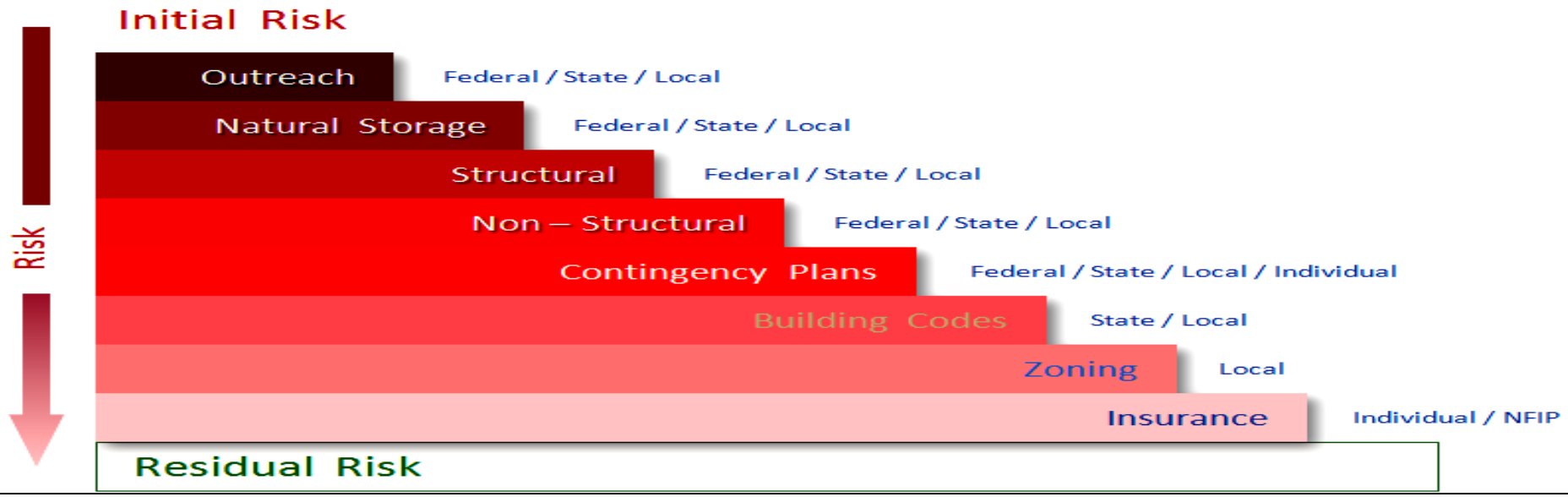
HSCPPES : Institutional and Other Barriers to Comprehensive Risk Reduction



- Lack of **authorizations to address back-bay flooding**
- Lack of **dunes**
- Limited availability of **data**
- Cost and acquisition of **real estate easements**
- Maintaining the **profile** of a nourished shoreline
- **Cumulative** permitting constraints and environmental construction windows
- **Cost-sharing requirements and timing**; Federal Government & Non-Federal Partner
- Implementable and enforceable **flood plain management plans**
- **Balancing recreational shoreline purposes** with coastal risk management

HSCPPES Recommendations

- General
  - Address impacts of **back bay flooding** to provide more comprehensive flood risk management.
  - Include **storm berms and dunes** in all beach nourishment projects.
  - Consider a **broader range of project benefits** to more accurately evaluate the impacts of extreme storms and flooding events.
  - Allow for **better data collection and surveys** to support recovery efforts following extreme events at a limited number of strategically located projects.
  - Include an **adaptive management plan or strategy for changing design within the authorization** to respond to external factors, such as changes in local weather patterns or sediment transport, shifts in development trends or public tolerance for storm risks, or changes in coastal flood risks due to climate change.

NACCS Framework

- **Goals**
  - **Reduce risk** to vulnerable coastal populations
  - Support sustainable and robust **coastal landscape systems,** considering climate change (CC) and sea level rise (SLR), to reduce risk to vulnerable populations, ecosystems and infrastructure

- **Objectives**
  - **Reduce vulnerability** of coastal populations and infrastructure to future flooding and storms
  - Promote **robust , resilient, and sustainable** coastal landscape system, considering CC and SLR scenarios for 2018, 2068, 2100, and 2118
  - Increase the availability of **information** to enhance local decision-making
  - Promote the development of new **tools and technology** to provide innovative solutions (i.e. nature-based features)

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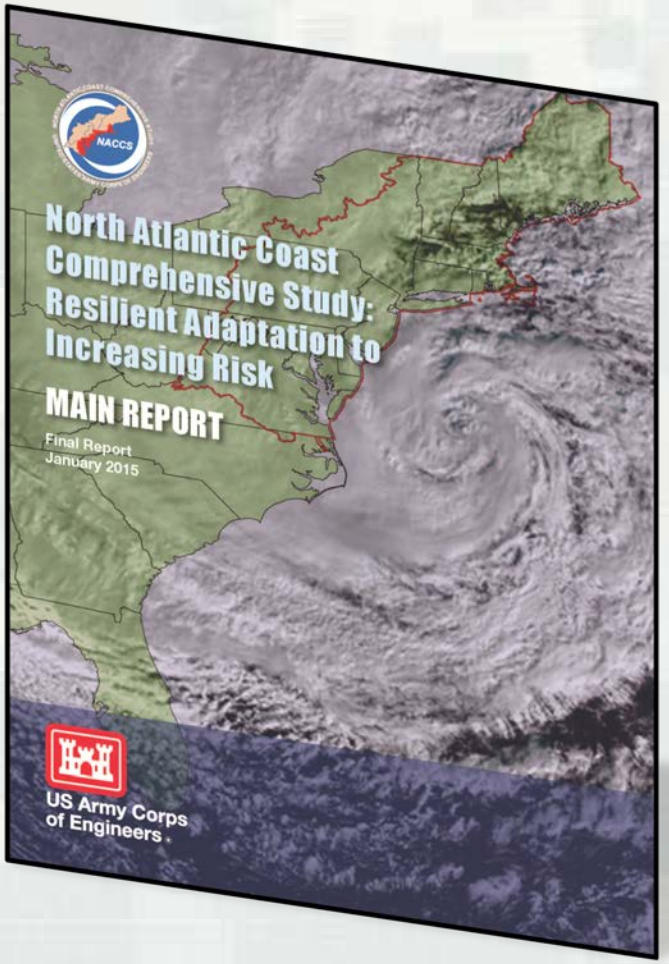
NACCS Framework

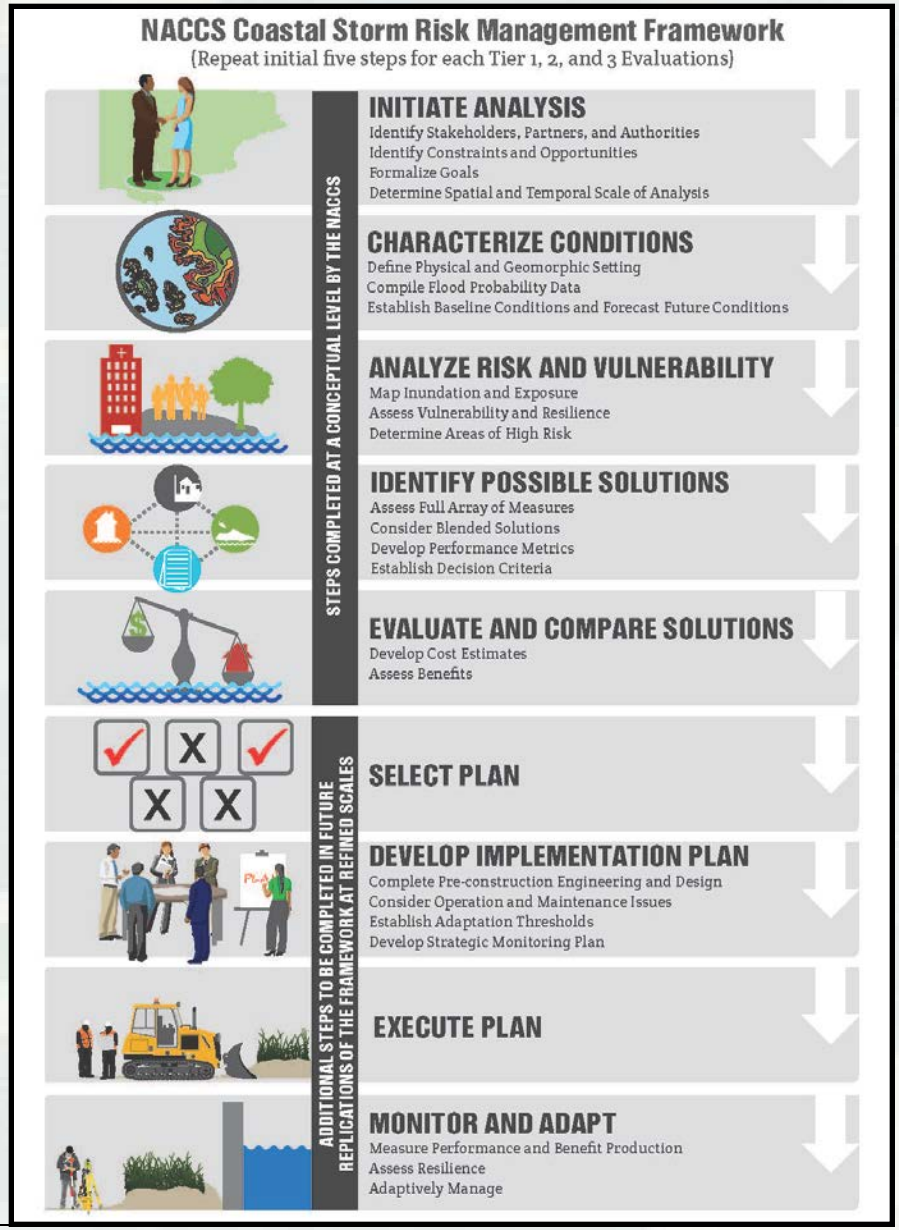


www.nad.usace.army.mil/CompStudy

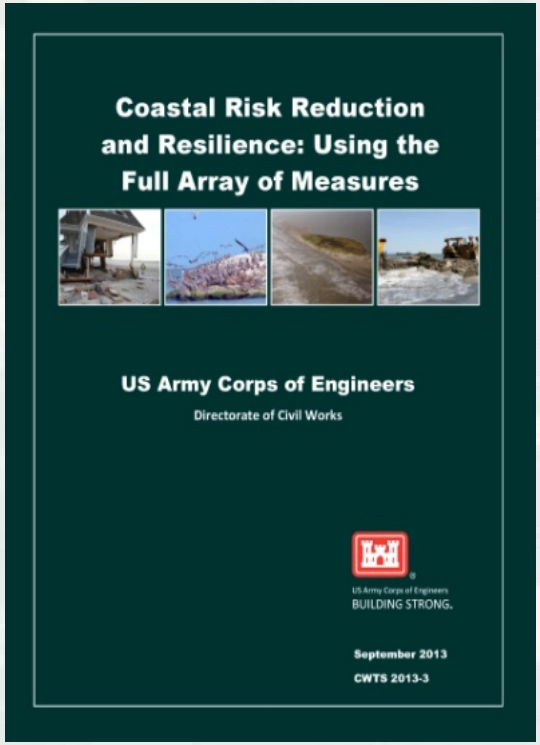
- Risk Reduction Framework
  - Coastal Flood Risk, Exposure and Vulnerability
  - Risk Reduction Measures
  - Resilience and Nature-Based Features
  - Sea Level Rise and Climate Change
  - Costs and Design Considerations
  - Implementation Options
- Policy Challenges and Institutional Barriers
- Additional Studies

NACCS Coastal Storm Risk Management Framework

- Managing coastal storm risk is a shared responsibility
- The Framework is:
  - A 9-step process
  - Customizable for any coastal area or watershed and other regions
  - Repeatable at state and local scales
- Who/what is exposed to flood risk?
- Where is the flood risk?
- What are the appropriate strategies and measures to reduce flood risk?
- What is the relative cost of a particular strategy compared to the anticipated risk reduction?
- What data are available to make risk informed decisions?
- What is the residual risk?



Risk Reduction Measures



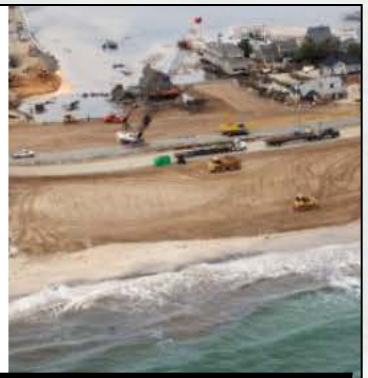
- **Structural:** Storm surge barriers, levees, breakwaters, groins.
- **Natural and nature-based features:** Beachfill, dunes, living shorelines, wetlands, oyster reefs, Sub-Aquatic Vegetation restoration.
- **Non-Structural**
  - Floodproofing, elevation, acquisition
  - Evacuation, flood warning systems
- **Policy/Programmatic**
  - Floodplain management, land use planning
  - State/Local Coastal Zone Policies, Flood Insurance Programs
  - Natural resources/surface water management
- **Environmental and Social Benefits**

http://www.corpsclimate.us/ccacrrr.cfm

Risk Reduction Nature-Based Solution Sets

Dunes and Beaches	**Vegetated Features**	**Oyster and Coral Reefs**	**Barrier Islands**	**Maritime Forests/Shrub Communities**
Benefits/Processes •Breaking of offshore waves •Attenuation of wave energy •Slow inland water transfer	**Benefits/Processes** •Breaking of offshore waves •Attenuation of wave energy •Slow inland water transfer •Increased infiltration	**Benefits/Processes** •Breaking of offshore waves •Attenuation of wave energy •Slow inland water transfer	**Benefits/Processes** •Wave attenuation and/or dissipation •Sediment stabilization	**Benefits/Processes** •Wave attenuation and/or dissipation •Shoreline erosion stabilization •Soil retention
Performance Factors •Berm height and width •Beach slope •Sediment grain size and supply •Dune height, crest, and width •Presence of vegetation	**Performance Factors** •Marsh, wetland, or SAV elevation and continuity •Vegetation type and density	**Performance Factors** •Reef width, elevation, and roughness	**Performance Factors** •Island elevation, length, and width •Land cover •Breach susceptibility •Proximity to mainland shore	**Performance Factors** •Vegetation height and density •Forest dimension •Sediment composition •Platform elevation

Risk Reduction Structural Solution Sets



Levees	Storm Surge Barriers	Seawalls and Revetments	Groins	Detached Breakwaters
Benefits/Processes • Surge and wave attenuation and/or dissipation • Reduced flooding • Reduced risk for vulnerable areas	**Benefits/Processes** • Surge and wave attenuation • Reduced salinity Intrusion	**Benefits/Processes** • Reduced flooding • Reduced wave overtopping • Shoreline stabilization behind structure	**Benefits/Processes** • Shoreline stabilization	**Benefits/Processes** • Shoreline stabilization behind structure • Wave attenuation
Performance Factors • Levee height, crest width, and slope • Wave height and period • Water level	**Performance Factors** • Barrier height • Wave height • Wave period • Water level	**Performance Factors** • Wave height • Wave period • Water level • Scour protection	**Performance Factors** • Groin length, height, orientation, permeability, and spacing • Depth at seaward end • Wave height • Water level • Longshore transportation rates and distribution	**Performance Factors** • Breakwater height and width • Breakwater permeability, proximity to shoreline, orientation, and spacing

Risk Reduction Non-Structural Solution Sets

Floodplain Policy and Management	**Floodproofing and Impact Reduction**	**Flood Warning and Preparedness**	**Relocation**
Benefits/Processes •Improved and controlled floodplain development •Reduced opportunity for damages •Improved natural coast environment	**Benefits/Processes** •Reduced opportunity for damages •Increased community resiliency •No increase in flood potential elsewhere	**Benefits/Processes** •Reduced opportunity for damages •Increased community resiliency •Improved public awareness and responsibility	**Benefits/Processes** •Reduced opportunity for damages •No increase in flood potential elsewhere •Improved natural coast environment
Performance Factors •Wave height •Water level •Storm duration •Agency collaboration	**Performance Factors** •Wave height •Water level •Storm duration	**Performance Factors** •Wave height •Water level •Storm duration	**Performance Factors** •Wave height •Water level •Storm duration

Reducing Risk

Residents

- Avoid purchasing property in flood-prone areas
- Raise homes that already exist in flood-prone areas
- Secure appropriate insurance coverage
- Prepare for and follow evacuation orders

State and Local Governments

- Execute zoning and building codes for property development
- Establish, promote and execute evacuation plans
- Share cost with federal government to construct projects that reduce risk from storm damage

Federal Government

- Coordination of all federal entities to provide comprehensive storm damage risk reduction for coastal populations
- Army Corps implements projects to absorb and disperse wave energy

Despite every effort and abundant resources, there still is **residual risk** for the more than 50 percent of Americans who live in coastal regions.