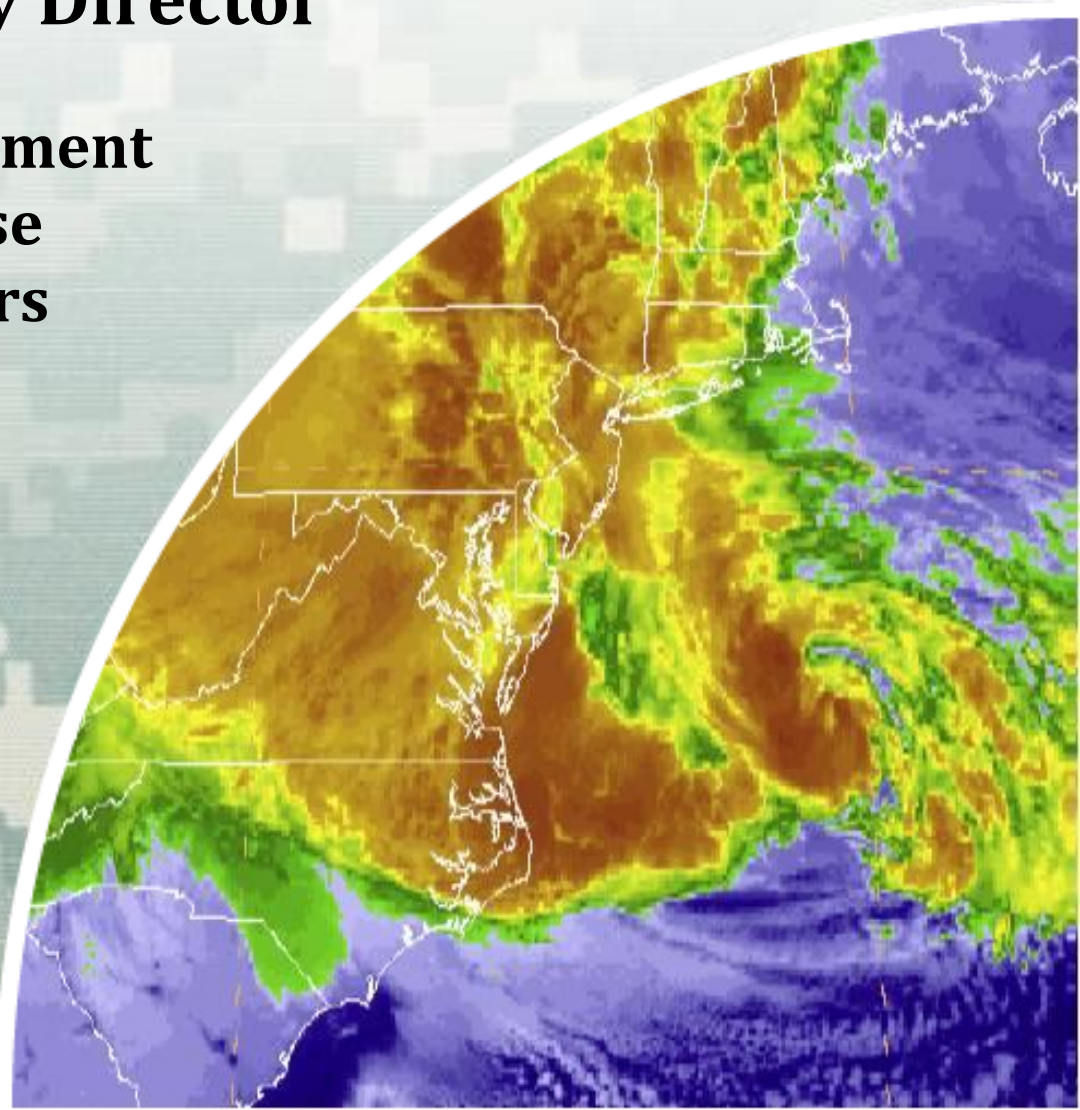


# Coastal Resilience: The Challenge

**Roselle E. Henn, Deputy Director**

**Coastal Storm Risk Management  
Planning Center of Expertise  
U.S. Army Corps of Engineers**

**21 March 2014**

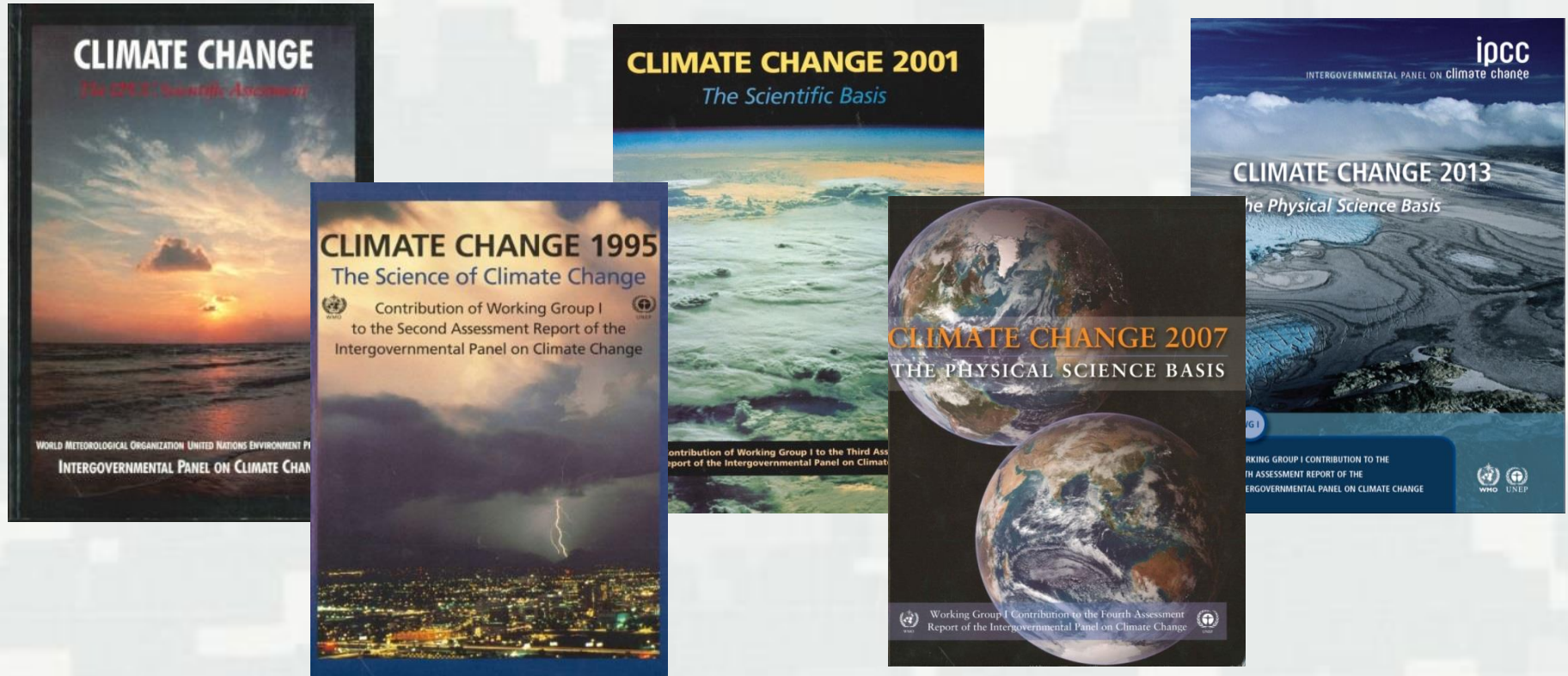


# Coastal Resilience: The Challenge

- Global Trends
- The Northeast US Perspective: Sandy's Impact
- Hurricane Sandy Coastal Projects Performance Evaluation Study
- Coastal Storm Risk Reduction Measures
- Towards Coastal Resilience



# Global Trends



## Intergovernmental Panel on Climate Change Assessment Reports 1990, 1995, 2001, 2007, 2013



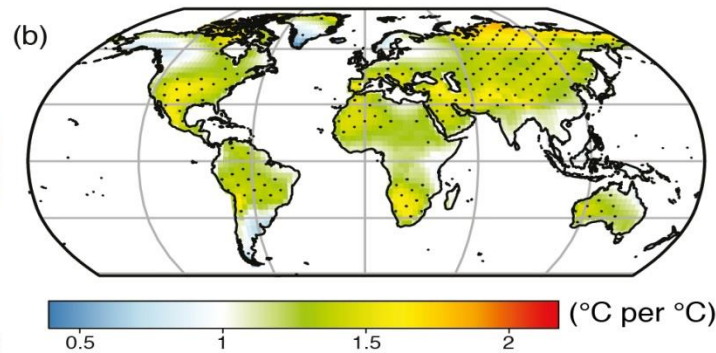
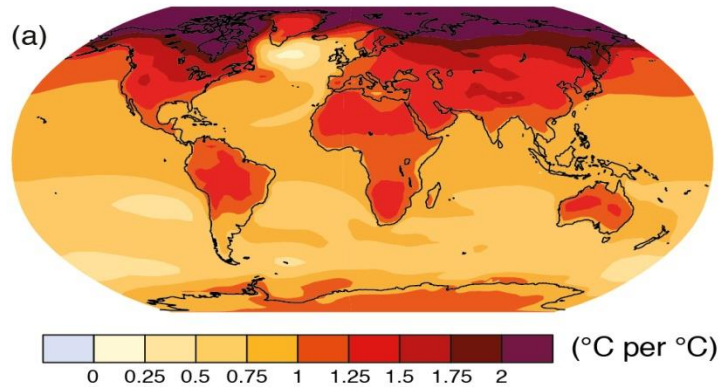


# Global Trends

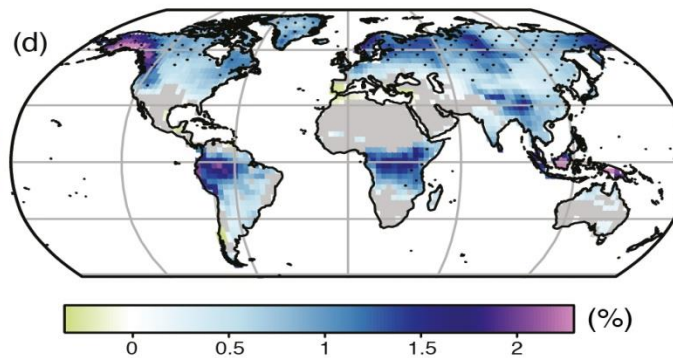
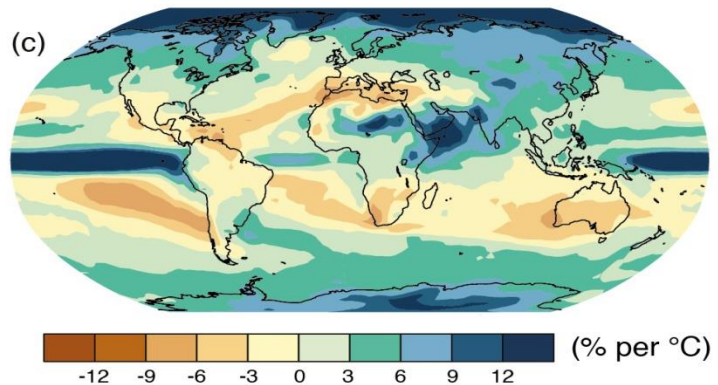
1986-2005

to

2081-2100



Change in  
average  
surface  
temperature



Change in  
average  
precipitation

- Surface temperature has successively increased over the last 3 decades more than any decade since 1850
- Contrast in precipitation will increase between wet to dry regions as well as seasonally

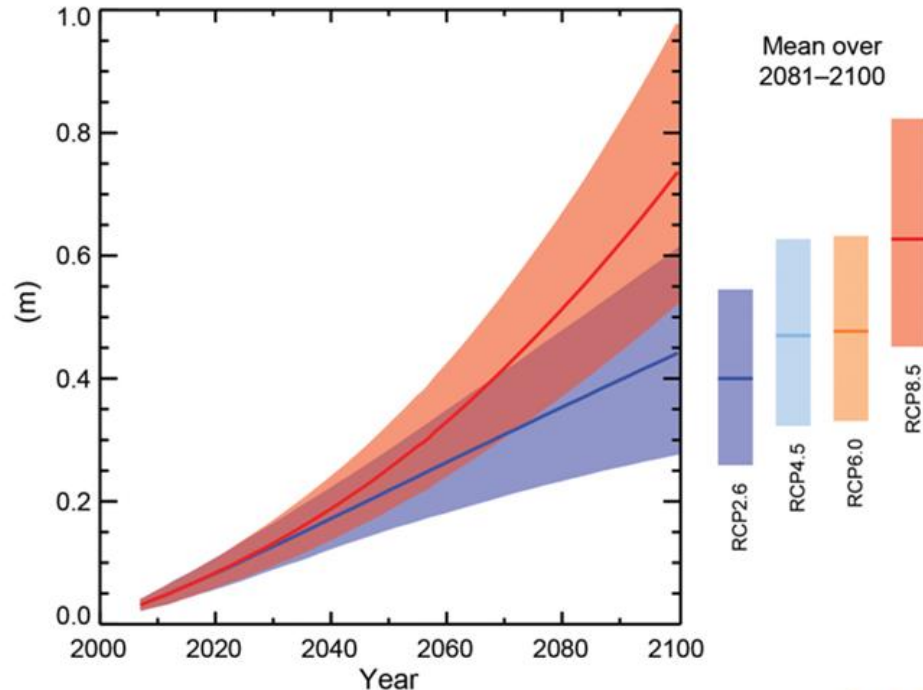


# Global Trends

**Figure SPM.9**

Global mean sea level rise

All Figures © IPCC 2013



IPCC AR5 Working Group I  
Climate Change 2013: The Physical Science Basis

ipcc  
INTERGOVERNMENTAL PANEL ON climate change  
WHO UNEP

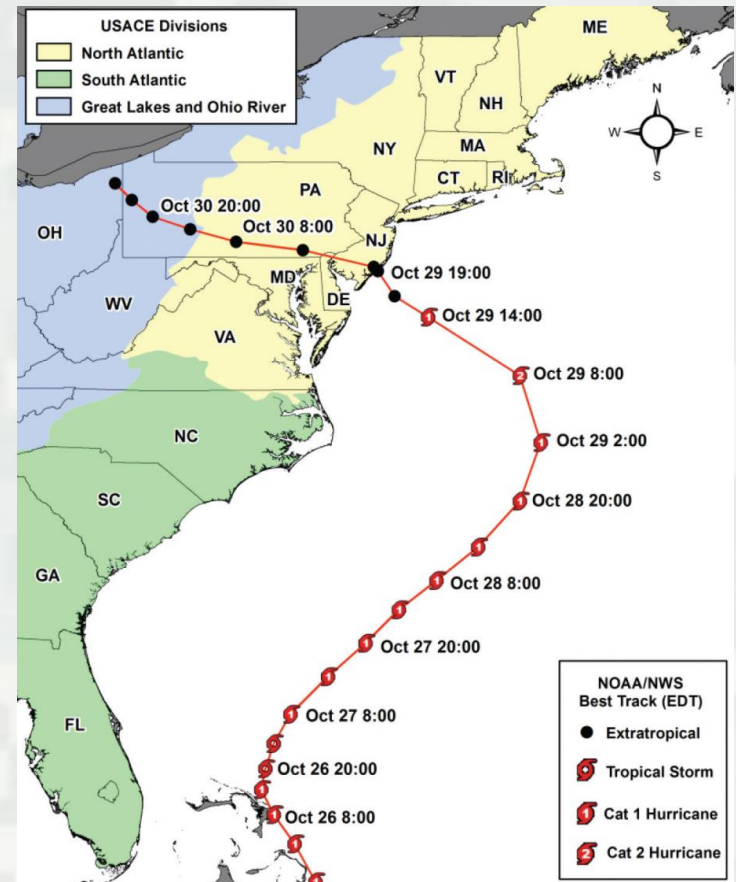
**Projections of  
global mean sea  
level rise over the  
21st century  
relative to 1986–  
2005**

- Rate of SLR since mid-1800's has been larger than the mean rate during the last 2000 years
- Rate of SLR expected to increase



# The Northeast US Perspective: Sandy's Impact

- Hurricane Sandy impacted the Atlantic coastline in October 2012
- Affected entire east coast; **26 States** Florida to Maine, west to Great Lakes
- Greatest areas of impact NJ, NY, CT
- **286 lives lost** (159 in the US)
- **\$65B in damages** in the U.S.
- Extensive **community dislocations** continuing today in some area



Hurricane Sandy Track 26–29 Oct 12



Public Law 113-2, enacted 29 January 2013



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# **The Northeast US Perspective: Sandy's Impact**

## **USACE-NOAA Infrastructure Systems Rebuilding Principles**

(February 2013)

- Collaboration 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**
- **Improve coastal resilience** by pursuing a systems approach that incorporates natural, social, and built systems as a whole
- Promote increased recognition and awareness of risks and consequences among decision makers, stakeholders, and the public

## **Hurricane Sandy Rebuilding Strategy: Stronger Communities, A Resilient Region** (August 2013)

## **North Atlantic Coast Comprehensive Study: Resilient Adaption to Increasing Risk** (in progress; due January 2015)



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# Hurricane Sandy Coastal USACE Partnered Projects

## Performance Evaluation Study

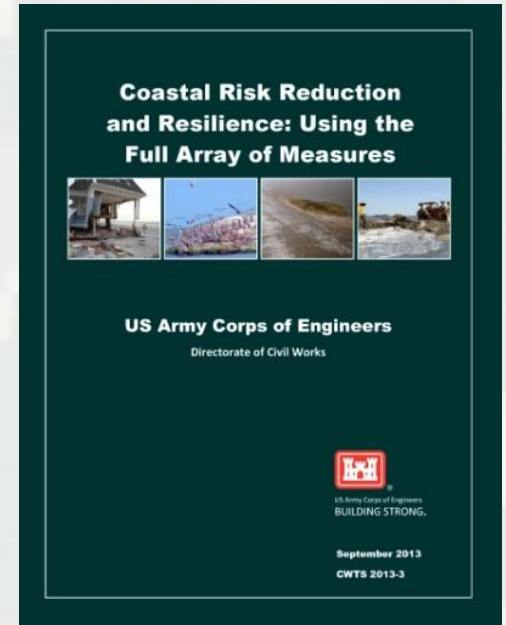
- **Record storm tides and waves** throughout North Atlantic Division
- **Widespread back-bay flooding** throughout the Region
- **Damages less where projects in place** than locations without projects
- **Greater consistency in specifying level of risk reduction** is needed
- **Projects performed as designed; better than expected**
  - **Protective dunes and high storm berms performed well**
  - **Damages at greater at project edges relative to project interior**
- Findings support a strategy to **implement a systems approach** to comprehensive coastal protection



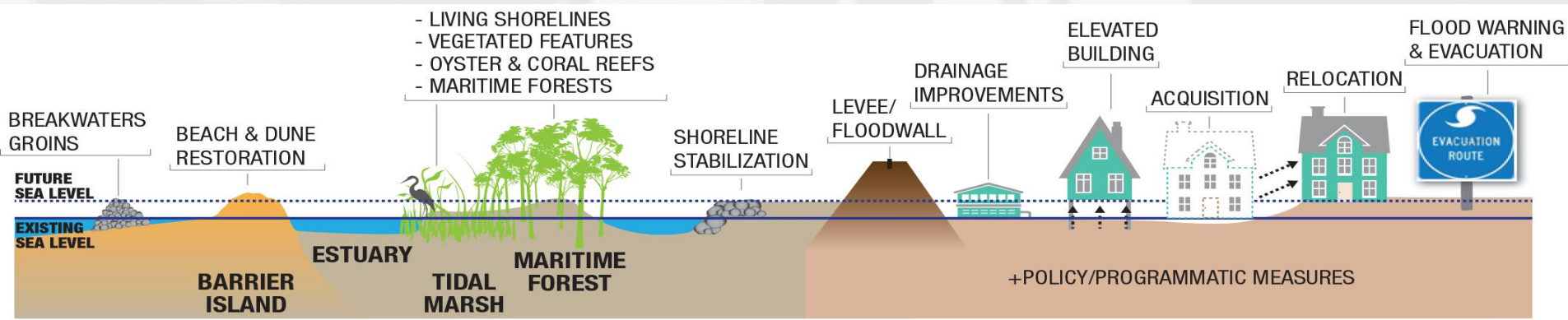


# Coastal Storm Risk Reduction Measures

- **Structural**
  - Storm surge barriers, levees, breakwaters, groins
  - Beach fill, dunes
- **Natural and Nature-Based Features**
  - Salt marshes
  - Living shorelines, wetlands, oyster reefs,
- **Non-Structural**
  - Floodproofing, elevation, flood warning systems,
  - Evacuation, Acquisition
- **Policy/Programmatic**
  - Floodplain management, land use planning
  - State/Local Coastal Zone Policies, Flood Insurance Programs
  - Natural resources/surface water management



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



# The Challenge: Towards Coastal Resilience



West Africa  
Aug 2012



Thailand, Cambodia  
Sep 2013



Peru, Chile, Bolivia  
Oct 2013



Devon, Cornwall UK  
Feb 2014



The Risk Management Process  
National Research Council (2012)  
Disaster Resilience: A National Imperative

