3-2013

Managing Risk in a Changing Climate

Anna Schwab
The University of North Carolina at Chapel Hill

Managing Risk in a Changing Climate

Anna K. Schwab, JD, MRP
The University of North Carolina at Chapel Hill
akschwab@email.unc.edu

Disaster Resilient University Workshop
University of New Orleans, LA
March 20, 2013

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COASTAL HAZARDS CENTER
A U.S. Department of Homeland Security Center of Excellence

Rick Luettich, Director
Gavin Smith, Executive Director
Anna Schwab, Program Manager

http://hazardscenter.unc.edu

Coastalhazardscenter.org

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Mission: To advance the understanding of hazard resilience and transfer that knowledge into action, resulting in reduced loss of life or injury and lessened damages to the built and natural environment.

Mission: To enhance the nation's ability to safeguard populations, properties and economies and improve community resiliency to the consequences of natural hazards.

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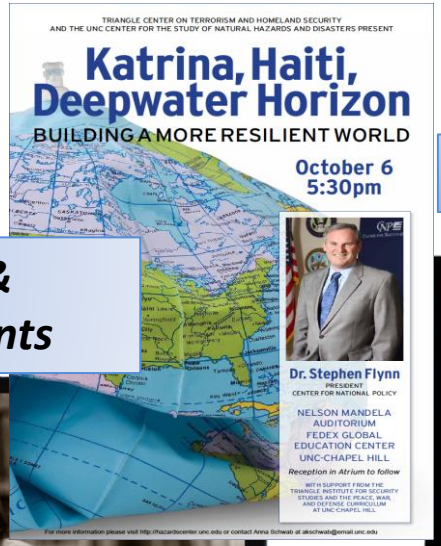
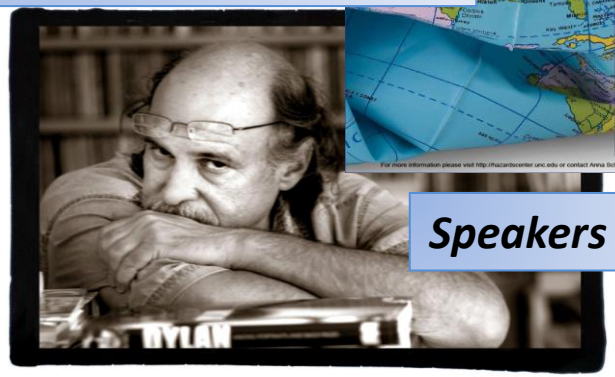
Office of the Vice Chancellor for Research (VCR)

Student Interns & Research Assistants



Campus Events



Speakers Series

Publications

Transformational research

International Partnerships & Engagement

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CHC Research: Serving the US Department of Homeland Security

Homeland Security

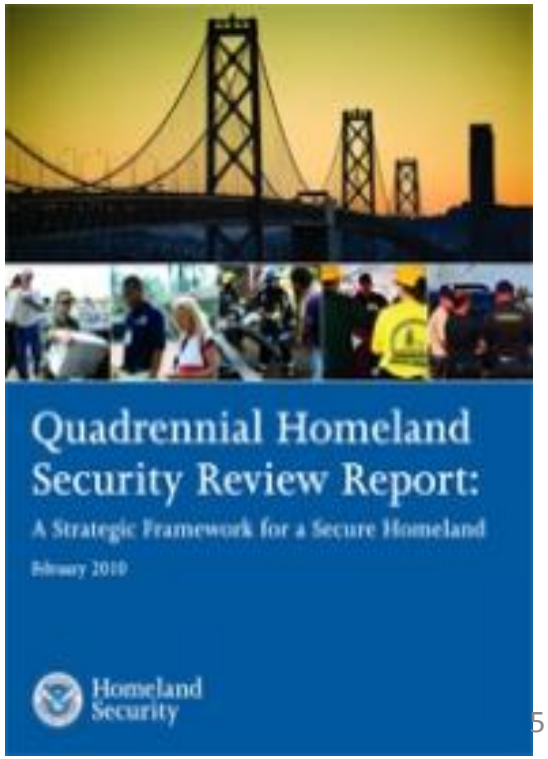
Science and Technology

HOMELAND SECURITY UNIVERSITY PROGRAMS

TODAY'S RESEARCH & EDUCATION, TOMORROW'S SECURITY

Quadrennial Homeland Security Review (QHSR)

- Manage risks to critical infrastructure
- Ensure resilience to disasters
- Mitigate hazards
- Enhance preparedness
- Ensure effective emergency response
- Aid rapid recovery



CHC–R Partners & Co-Lead: Jackson State University

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JSU JACKSON STATE UNIVERSITY

OKLAHOMA

THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL

UNIVERSITY OF NOTRE DAME

Rensselaer

UNC CHARLOTTE

LSU LOUISIANA STATE UNIVERSITY

UNIVERSITY DELAWARE

STATE

CAL POLY

TSU TEXAS SOUTHERN UNIVERSITY

NC STATE UNIVERSITY

Georgia State University

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Research Results: Meeting the Needs of End Users

FEMA

US Army Corps of Engineers®

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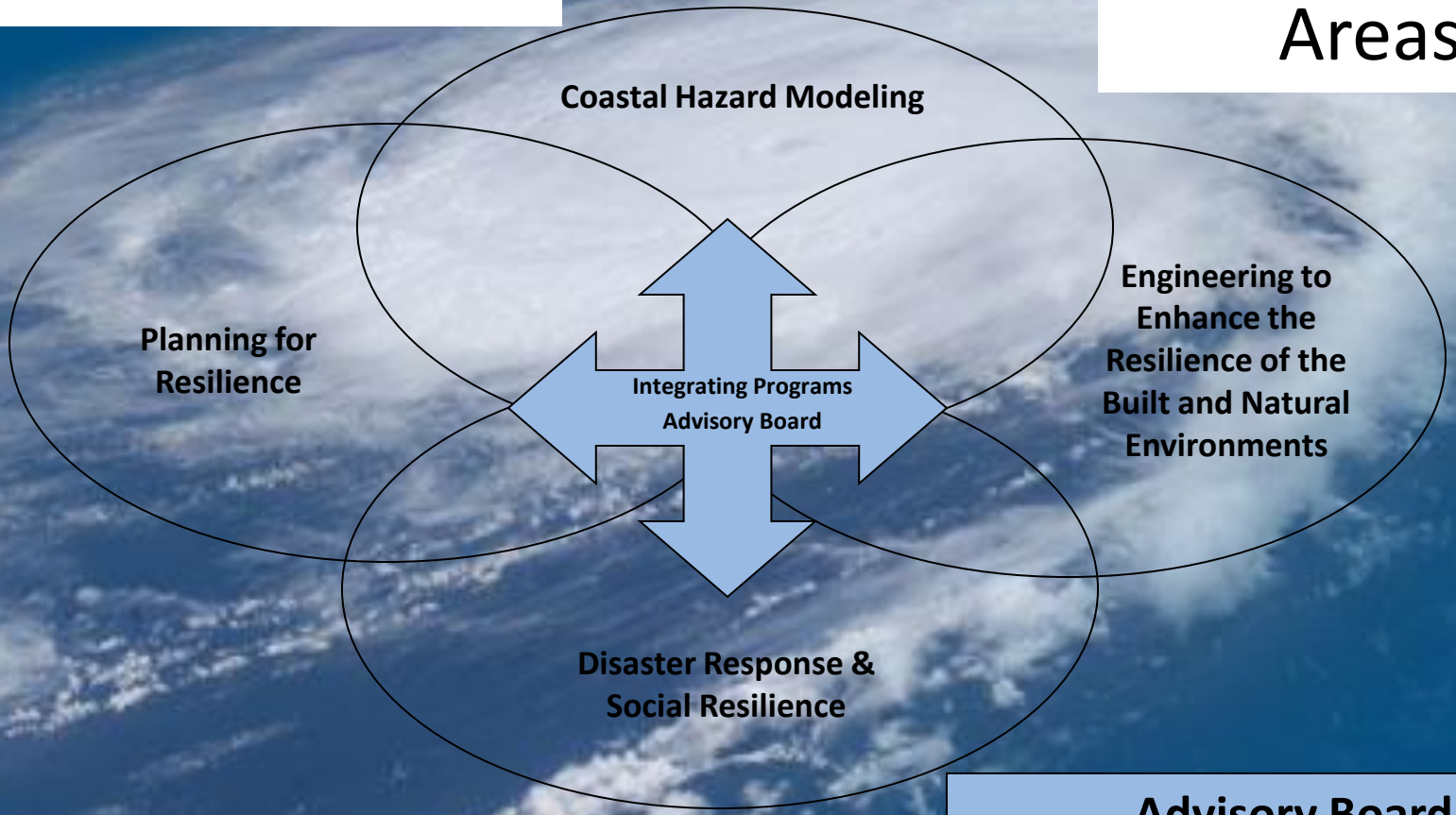
Research Focus Areas



Advisory Board

Emergency Management Scholars & Practitioners

Federal, State & Local Officials

Corporations & Small Business

Non-Profit Organizations

Professional Associations

Coastal Hazards Modeling

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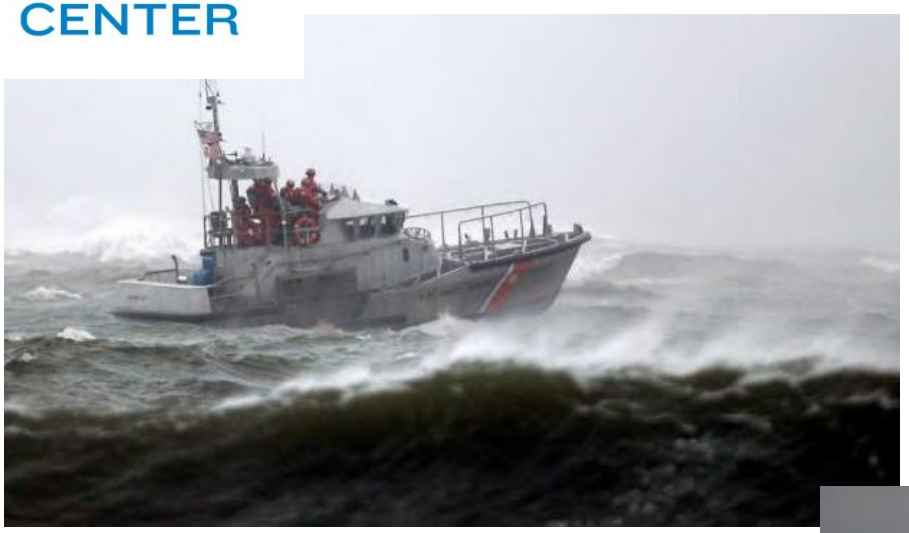

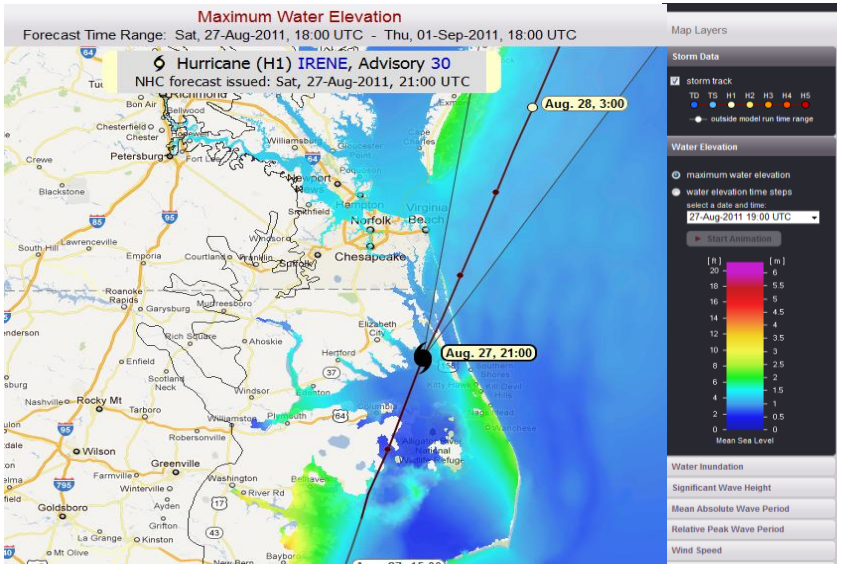

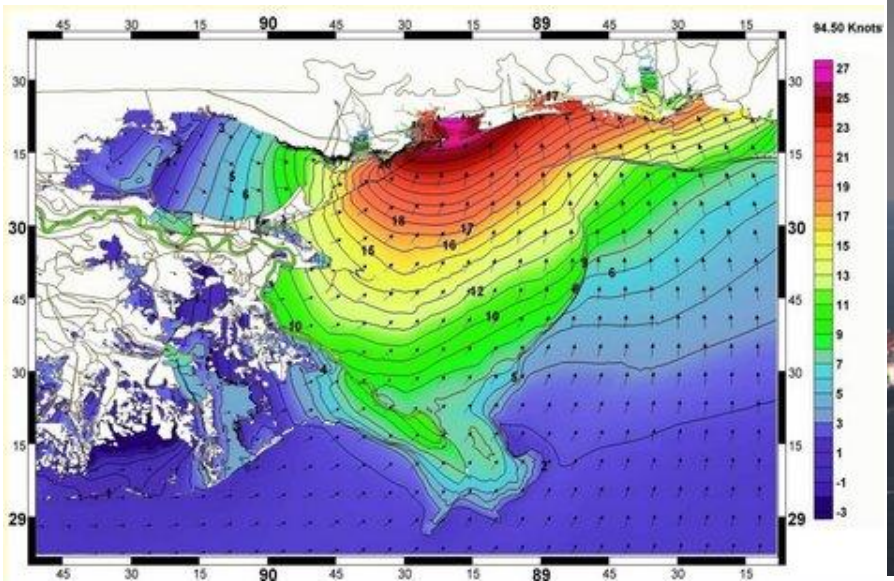

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ADCIRC

Computer model for predicting coastal hazards due to severe storms

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ADCIRC

Significantly Improved Predictions of Coastal Storm Surge, Waves and Flooding due to Severe Storms

- **Problem: Prior to H. Katrina**
  - –Outdated tools to predict coastal hazard consequences of severe storms
  - –Poor information to assess risk, evaluate protection or make emergency decisions
- **Solution: CHC support for ADCIRC**
  - –Advance ADCIRC capabilities for coastal storm surge, wave and flood prediction
  - –Apply ADCIRC, assist / train others to use ADCIRC, disseminate ADCIRC results

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Engineering to Increase Resilience of the Built & Natural Environment

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Social Science Research

Education Programs at UNC-CH

- Planning for Natural Hazards Management & Climate Change Adaptation
- The Science of Coastal Hazards

- Development of Certificate Program in Hazards Management

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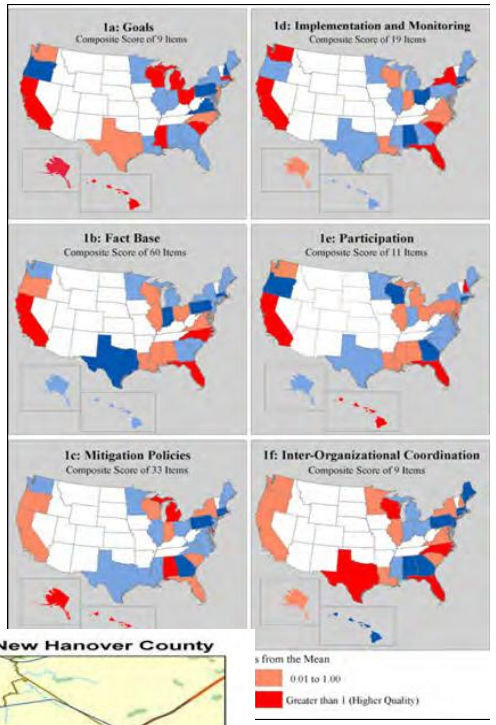
Planning for Resilience



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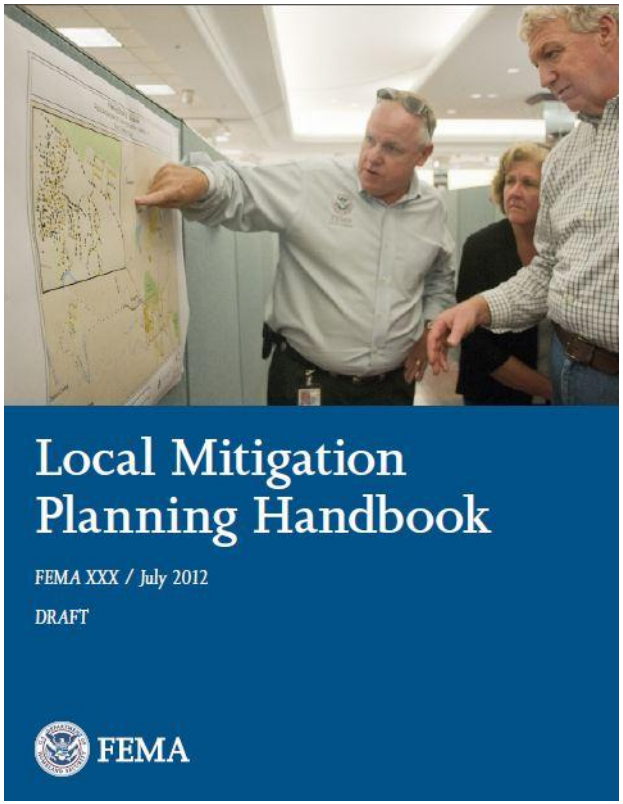
Assessment of State & Local Hazard Mitigation Plans Handbook & Interactive Website

- Building on FEMA Handbook with Examples and Best Practices
- www.mitigationguide.org
- Website live: Summer 2013



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Local Mitigation Planning Handbook:

Interactive Website

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Local Mitigation Planning Handbook:

Interactive Website

- Task 5
  Conduct a Risk Assessment
  - Steps to Conduct a Risk Assessment
  - Identify Community Assets
  - Analyze Risk
  - + Probability of Future Events
- Task 6
  Develop a Mitigation Strategy
- Task 7
  Keep the Plan Current
- Task 8
  Review and Adopt the Plan
- + Task 9
  Create a Safe and Resilient Community

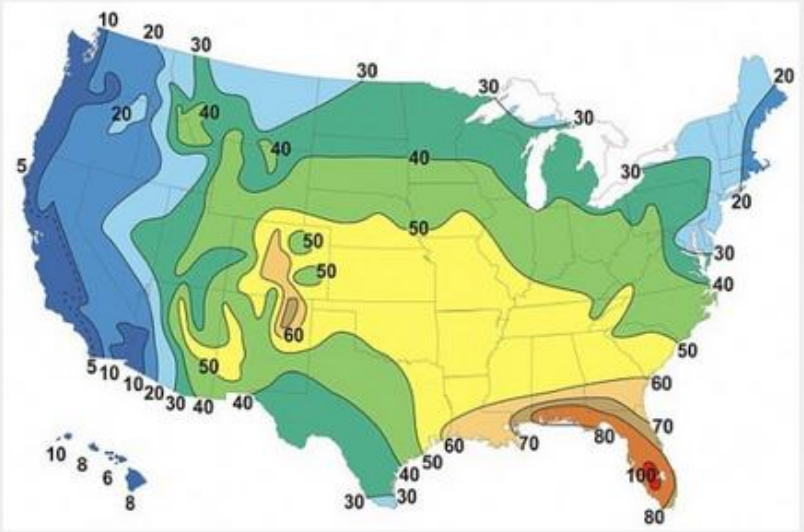
search GO

time of year, but others can occur at any time. For example, flooding might be more frequent in the spring because of snow melt or during late summer or fall because of the hurricane season.

Example

Using Historical Frequency to Determine Probability

The figure below shows the average number of thunderstorm days each year throughout the U.S. (Source: NOAA).



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Climate Change Handbook for Local Governments

- David Brower, Research Professor, City & Regional Planning, UNC-CH
- Sierra Schelegle, PdD candidate in Curriculum of Environment & Ecology, UNC-CH
- Dylan Sandler, Research Assoc., UNC-CH Hazards Center
- Advisory Committee: local officials, planners, emergency managers, state agency reps

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Climate Change Handbook for Local Governments

Climate change can be a HOT BUTTON topic !

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Climate Change Handbook: Background

NC Division of Emergency Management,

Hazard Mitigation Section:

- Following Hurricanes Fran (1996) & Floyd (1999), NC requires local hazard mitigation plans for some types of disaster funding (pre-dates DMA 2000)
- 2010: North Carolina adds a category of long term hazards to the risk assessment of the State Hazard Mitigation Plan
  - includes changes in weather patterns and sea level due to global climate change
- 2012: FEMA releases Climate Change Adaptation Policy Statement to establish an Agency-wide directive to integrate climate change adaptation planning and actions in Agency programs, policies, and operations.

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Climate Change Handbook: Background

- Communities throughout the country, including some college campuses and universities -- are already engaging in climate change activities
- Often linked with sustainability initiatives

- Activities run the gamut from simple recycling programs and shared-bike systems, to campus-wide design, construction and renovation practices that incorporate climate-ready features

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Climate Change Handbook: Outline

I. Introduction
   - Concept of climate change
   - Previous efforts

II. Integrate climate change adaptation into local practice
   - Checklist of government functions

III. Implementation methods
   - Hazard mitigation plans
   - Comprehensive plans/Land use plans
   - Capital improvement plans
   - Flood mitigation/stormwater management
   - Zoning/subdivision ordinances

IV. Build a culture of awareness

V. Resources

VI. Dissemination Plan

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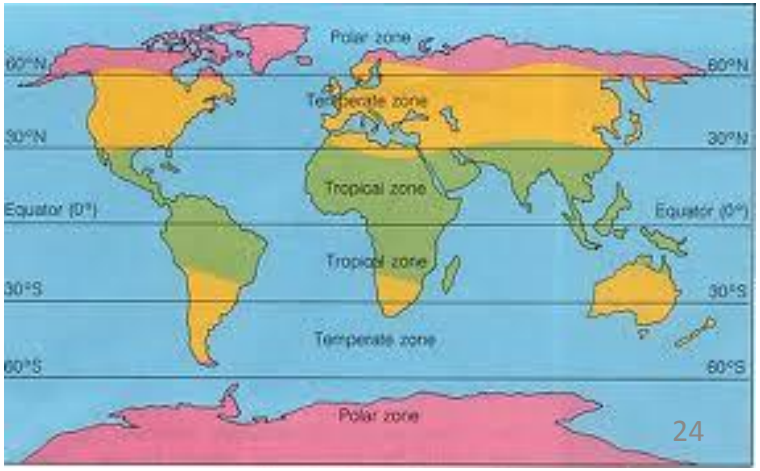
Climate Change: A Few Definitions

Climate is what you expect;
Weather is what you get!

Weather: The set of meteorological conditions (temperature, wind, rain, sunshine) at any particular time and place

Climate: Long-term average of weather conditions at a certain place



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Climate Change: A Few Definitions

Since humans first walked the earth, they have been adapting to their environment and climatic conditions (UN Development Programme, 2002)

In hot, dusty ancient Athens, Socrates teaches his students under the shade of a plane tree

Adaptation: adjustment to changing environmental conditions to moderate harm or exploit beneficial opportunities

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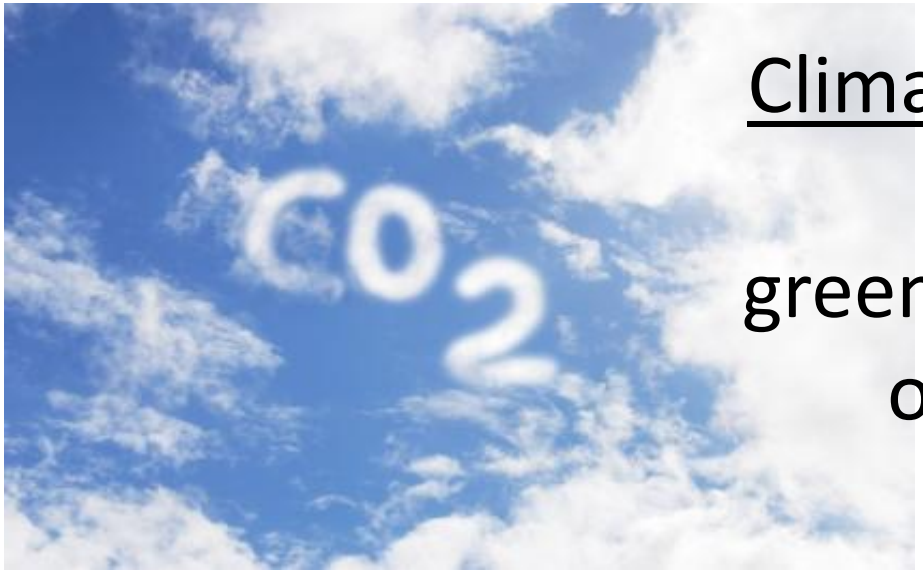
Climate Change: A Few Definitions



Climate Mitigation: actions that promote stabilization of greenhouse gas concentrations, often through reductions in fossil fuel emissions

Natural Hazard Mitigation: sustained action taken to reduce or eliminate long-term risk to people and their property from hazards and their effects (FEMA)

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Climate Change: A Few Definitions

Resilience: ability to anticipate, absorb, recover from disruptive events without collapse

Sustainability: development that meets the needs of the present without compromising the ability of future generations to meet their own needs; focus on balance of social, economic, ecological values (United Nations, *Our Common Future)*

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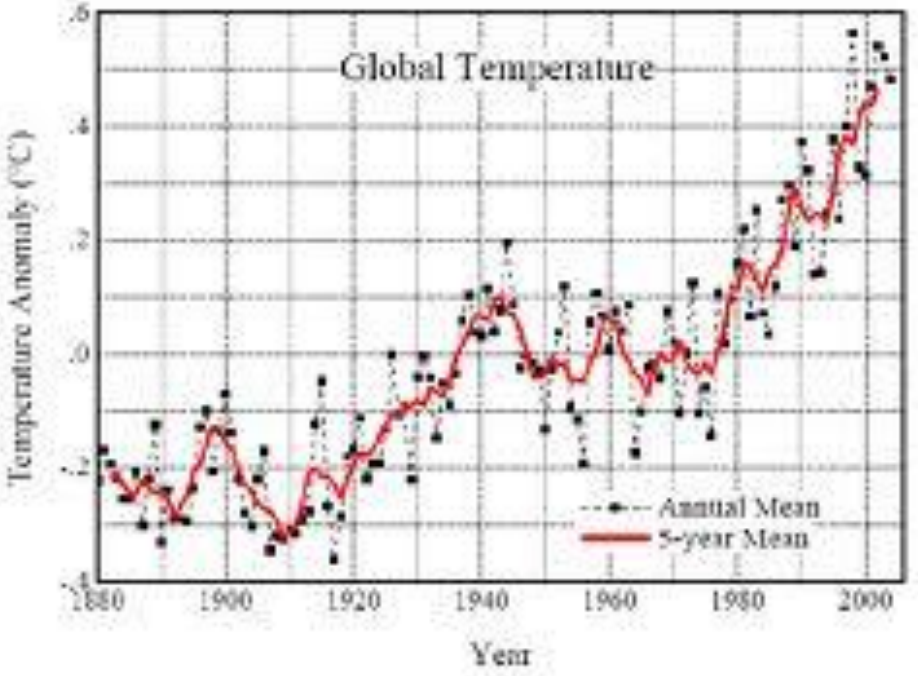
The Science of Climate Change

- Earth's climate has always experienced variability
- Global temperatures have risen at a more rapid rate over last few decades



- Increase in climate variability over last two decades

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Climate Change Projections

- Weather extremes projected to occur more frequently
  - More frequent wet and dry spells
  - More frequent hot and cold periods
  - More intense tropical storms
- Artic Ice Sheet Melt
- Sea Level Rise
  - Increase in storm surge
  - Subsidence/Erosion

Climate Change: Impacts

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- Increased Flooding
- Drought
- Water Quality Impairment
- Saltwater Intrusion
- Wildfire
- Heavy Precipitation
- Invasive species/
- Biodiversity
- Environmental Degradation
- Public Health Impacts
  - Asthma, heat disease, epidemics/pandemics

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Climate Change Handbook: Adaptation Strategies

- Clear nexus between climate change and more extreme natural events
  - Caveat: no one single event (e.g., Hurricane Sandy) can be attributed to climate change directly

- Ipso facto: a good Hazard Mitigation Plan can address many climate change impacts

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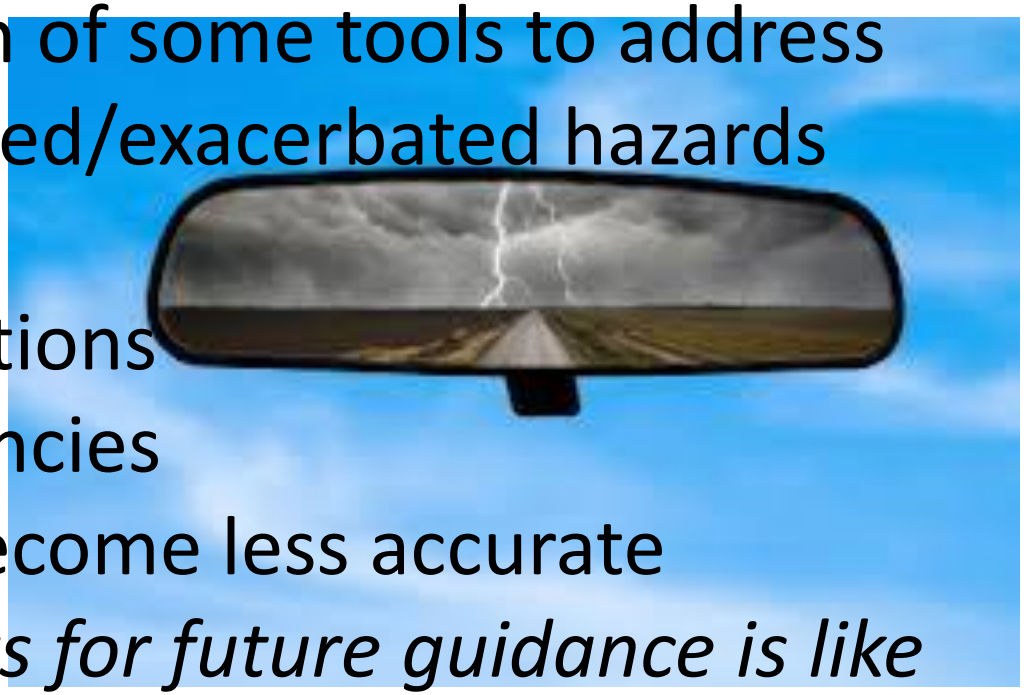
Climate Change: Risk Assessments

- We can maximize the use of **existing** hazard risk assessment tools to inform climate change adaptation strategies
- Requires modification of some tools to address climate change-induced/exacerbated hazards
- Requires careful consideration of assumptions about risk/return frequencies
- Historic trends will become less accurate
- *Looking at past events for future guidance is like steering by looking in the rear view mirror (NHMA)*



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Climate Change Adaptation Strategies: Infrastructure

NC Botanical Gardens LEED Platinum Education Center

Involve changes/modifications of basic physical systems to make infrastructure /buildings more resilient

UNC "Purple Pipes" Water Reclamation

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Climate Change Adaptation Strategies: Land Use

Guide development & people out of harm's way; improve design/location of development; restrict development in flood zones

Carolina North campus is planned to maximize open space; preserve natural areas; low impact design

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Climate Change Adaptation Strategies: Natural Resources

Reduce consumption of raw resources; protect ecosystems that provide adaptive services;

Green roofs on UNC buildings control stormwater runoff , deflect summer heat, absorbeCO2

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UNC-CH Climate Action Plan: Carbon Neutral by 2050

carolinagreen

- Build all new campus construction to at least LEED silver standard or equivalent;
- Adopt an energy efficient purchasing policy;
- Encourage use of and provide access to public transportation for all faculty, staff, students, and visitors.

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The Politics

- Climate change discussions can pit extreme “tree-huggers” vs.

  un-bridled development
- NC Sea Level Rise policy
- Handbook focuses on everyday activities we’re doing anyway
- Co-benefits/No-Regrets =

  win-win
- Communication is key
  - Long Term Hazard/Slow Onset Hazards