Managing Risk in a Changing Climate

Anna Schwab
The University of North Carolina at Chapel Hill

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Managing Risk in a Changing Climate

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

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University of New Orleans, LA
March 20, 2013
Rick Luettich, Director
Gavin Smith, Executive Director
Anna Schwab, Program Manager

http://hazardscenter.unc.edu
Coastalhazardscenter.org
**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.
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

Coastal Hazards Center
A U.S. Department of Homeland Security Center of Excellence

The University of North Carolina at Chapel Hill

Rensselaer

LSU

University of Delaware

NC State University

CAL POLY

Oklahoma University

University of Notre Dame

University of Connecticut
Research Results: Meeting the Needs of End Users

US Army Corps of Engineers®
Research Focus Areas

Coastal Hazard Modeling

Planning for Resilience

Engineering to Enhance the Resilience of the Built and Natural Environments

Integrating Programs Advisory Board

Disaster Response & Social Resilience

Advisory Board

Emergency Management Scholars & Practitioners
Federal, State & Local Officials
Corporations & Small Business
Non-Profit Organizations
Professional Associations
Coastal Hazards Modeling
ADCIRC

Computer model for predicting coastal hazards due to severe storms
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  – Outdated tools to predict coastal hazard consequences of severe storms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
Engineering to Increase Resilience of the Built & Natural Environment
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
Planning for Resilience
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
Local Mitigation Planning Handbook: Interactive Website

Hazard Mitigation Planning Handbook

A web-based version of the FEMA Handbook

Task 1 Determine the Planning Area and Resources

Multi-Jurisdictional Plan Coordination

Multi-Jurisdictional Benefits and Challenges

- Improves communication and coordination among jurisdictions and other regional entities
- Enables comprehensive mitigation approaches to reduce risks that affect multiple jurisdictions
Local Mitigation Planning Handbook: Interactive Website

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).
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
Climate change can be a HOT BUTTON topic!
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.
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.
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
Climate Change: A Few Definitions

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

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

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

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

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

- Increased Flooding
- Drought
- Water Quality Impairment
- Saltwater Intrusion
- Wildfire
- Heavy Precipitation
- Invasive species/
- Biodiversity
- Environmental Degradation
- Public Health Impacts
  - Asthma, heat disease, epidemics/pandemics
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
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)
Climate Change Adaptation Strategies: Infrastructure

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

NC Botanical Gardens LEED Platinum Education Center

UNC “Purple Pipes” Water Reclamation
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
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, absorb CO2
UNC-CH Climate Action Plan: Carbon Neutral by 2050

- 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.
The Politics

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