cisa

carolinas integrated sciences & assessments

about cisa

The Carolinas Integrated Sciences & Assessments (CISA) is 1 of 11 NOAA-funded Regional Integrated Sciences & Assessments teams. CISA works in North Carolina and South Carolina to integrate climate science into decision-making processes and improve society's ability to respond to climatic events and stresses.

CISA supports a coastal climate extension specialist to assist coastal communities and stakeholders in addressing the impacts of climate variability and change on major coastal issues.

cisa connects coastal climate science and decision making through

- Applied research to produce relevant climate information
- Assessments of climate impacts and adaptation strategies
- Processes to support and inform community planning
- Fostering climate networks and climate communities of practice

coastal climate project partners

- NC Sea Grant
- SC Sea Grant Consortium
- Social and Environmental Research Institute (SERI)
- National Integrated Drought Information System (NIDIS)
- ACE Basin NERR
- NOAA Center for Coastal Environmental Health & Biomolecular Research
- North Inlet-Winyah Bay NERR
- USGS SC Water Science Center

focus area: coastal climate

what is coastal climate?

Climate is the long-term average weather conditions (seasonal-to-millennial periods) that are characteristic of a region like the Carolinas coast. Climatology is the study of climate, and it includes historical climate characteristics, ranges of natural variations in climate, and long-term climate change. Climate also includes the ways the ocean interacts with the land and the air. This means that coastal climate studies consider both atmospheric and marine data, like maritime winds, salinity, currents, wave characteristics, and tides.

how does climate affect the carolinas coast?

The Carolinas coast has seen its fair share of hurricanes and strong coastal storms. The average return period for a hurricane is ~8-9 years for the South Carolina coast and ~5-7 years for the North Carolina coast.[1] Both precipitation extremes of heavy rainfall and drought affect North and South Carolina coasts. Most recently, the Carolinas experienced major droughts from 1998-2002, 2007-2008, and 2011-2012.

what impacts does climate have on the carolinas coast?

Climate events in the Carolinas have several impacts on the coast. These include:

- Flooding
- Erosion
- Degraded water quality
- Habitat disturbance
- Degraded air quality

Source: NOAA

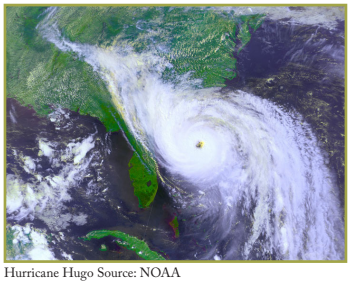
Many important sectors of our economy rely on coastal resources and are affected by climate variability and change. These include:

- Water resources (e.g. competing agriculture and drinking supply needs during periods of drought)
- Utilities and infrastructure (e.g. increased energy demands during warmer, drier periods)
- Fisheries (e.g. changes in ocean temperature and salinity can affect fish migration and reproduction)
- Recreation and tourism (e.g. warm temperatures on the Carolinas coast are a draw for beach-goers, while coastal storms/hurricanes can keep tourists away)

what do we know about climate change and the carolinas coast?

Sea level rise: Observations since the 1920s and 1930s indicate that the sea level in Wilmington, NC, rose at an average rate of about 0.68 feet per century; in Charleston, SC, the rate was closer to one foot per century.[2] Globally, climate scientists expect sea level rise to range from 8 inches to 6 feet in the next 100 years; regional sea level rise may be more or less depending on regional factors such as wind patterns and vertical land movement.[3]

More frequent rainfall extremes: Rainfall is difficult to predict over long periods of time. Climate models cannot say precisely how much average rainfall the Carolinas will get in the coming decades; however, more frequent extremes of both drought and heavy rainfall are anticipated.[4]



Hurricane Hugo Source: NOAA

Hurricane intensity: Scientists are uncertain about the frequency and tracks of hurricanes in the future. However, storms that do form will likely be stronger in terms of wind speed and rainfall amounts.[5]

Extreme heat: While the location of coastal lands next to the ocean ameliorates some of the more extreme temperature highs experienced in upstate NC and SC, the coastal Carolinas are still subject to summer heat. Temperatures will continue to increase across the SE. Scientists project summer temperatures to increase significantly, leading to more frequent heat waves.[4]

cisa coastal climate projects

community planning and adaptation

CISA has worked with several local communities, to identify specific climate- and weather-related problems and concerns. Through a facilitated discussion process, participants from each community developed ideas for opportunities and strategies to address these problems and concerns. Examples include:


Source: CISA

- Work with Beaufort County, SC, to write a plan for priority actions to update zoning and form-based codes to encourage climate resilience.
- Long-term engagement with community leaders in McClellanville, SC, to conduct a climate education and awareness program and develop a climate adaptation and outreach plan.
- A project with Sullivan's Island, SC, to identify and develop strategies to address flooding and stormwater management issues and concerns.

water and natural resources management

Saltwater intrusion: Salinity is a critical coastal variable that indicates the position of the freshwater-saltwater interface, important for aquatic communities and freshwater availability for municipal, industrial, and agricultural water users along the coast. Projects include:

- Developing a tool that provides information about current and future salinity intrusion. This tool can be used to examine the frequency and duration of saltwater intrusion events and their impacts on industry, water and sewer districts, and resource managers.
- Using the salinity intrusion tool to evaluate the occurrence and distribution of the bacteria *Vibrio vulnificus* and *Vibrio parahaemolyticus* in the Winyah Bay estuary.

Drought in coastal ecosystems: CISA is partnering with the National Integrated Drought Information System (NIDIS) to develop a drought early warning system for the Carolinas. Drought has several important impacts on the coastal Carolinas, and an early warning system will allow resource managers to plan ahead. Activities include:

- Developing a new drought index based on real-time salinity measurements obtained at USGS gages.
- Identifying sector-specific drought concerns and assessing the needs for drought information by coastal interests such as fisheries, recreation and tourism, and natural resource managers.
- Working with citizen scientists to increase observations of coastal environmental conditions and the impacts of drought.


Source: CISA

making global climate information locally relevant

Residents of the coastal Carolinas face a variety of hazards. The specifics of a future climate are not certain, but scientists can produce scenarios of what may occur. Knowing these scenarios helps residents consider what aspects of life might be affected by these changes. CISA researchers are providing guidance on using downscaled climate model information to inform several projects led by the National Estuarine Research Reserves (NERRS) in South Carolina:


Source: CISA

- A project to develop a low impact development manual for coastal South Carolina is using climate change information to develop stormwater best management practices.
- The Climate Change Vulnerability Assessment Tool for Coastal Habitats (CCVATCH), a tool to evaluate the climate-related vulnerabilities of coastal habitats, will incorporate region-relevant scenarios of temperature and precipitation change during pilot-testing.

cisa

cisa's coastal climate principal investigator

Dr. Elizabeth K. Fly
Coastal Climate Extension Specialist

CISA
SC Sea Grant Consortium
c/o SC Sea Grant Consortium
287 Meeting Street
Charleston, SC 29401
(843) 953-2078
elizabeth.fly@scseagrant.org

www.cisa.sc.edu/coastal.html
www.scseagrant.org

other ways to connect with cisa

CISA publishes a quarterly newsletter, the *Carolinas Climate Connection*, and manages the *Carolinas Climate Listserv* in order to share up-to-date information about climate research, upcoming events, funding opportunities, or other relevant news.

University of South Carolina
Department of Geography
709 Bull Street
Columbia, SC 29208
cisa@sc.edu
(803) 777-6875
www.cisa.sc.edu
www.facebook.com/usccisa
@CarolinasRISA

1 NOAA National Hurricane Center "Tropical Cyclone Climatology". www.nhc.noaa.gov/climo/. Accessed 21 April 2014.
2 http:tidesandcurrents.noaa.gov/sltrends/sltrends.html
3 Parris, A., P. Bromirski, V. Burkett, D. Cayan, M. Culver, J. Hall, R. Horton, K. Knuuti,R. Moss, J. Obeysekera, A. Sallenger, and J. Weiss. 2012. Global Sea Level Rise Scenarios for the US National Climate Assessment. NOAA Tech Memo OAR CPO-1. 37 pp.
4 Ingram, K., K. Dow, L. Carter, J. Anderson, eds. 2013. Climate of the Southeast United States: Variability, change, impacts, and vulnerability. Washington DC: Island Press.
5 Christensen, J.H., et al. 2013. Climate Phenomena and their Relevance for Future Regional Climate Change. In Climate Change 2013: The Physical Science Basis. Contribution of WGI to the Fifth Assessment Report of the IPCC. Cambridge University Press, Cambridge, UK and New York, NY, USA.