

# Climate change in a coastal county: Think global, act hyperlocal

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Of all the communities across the United States wrestling with climate

change, few face its effects day to day like the strand of coastal islands that make up Dare County.

The county, strung mostly along a chain of narrow barrier islands jutting into the Atlantic Ocean, sits in the path of hurricanes that form in late summer off Africa's Cape Verde. It has been pummeled by two major storms in the past three years. Sunny-day flooding, when tides and wind push water back into the neighborhoods, has become more common.

And the intensity of both summer afternoon downpours and winter nor'easters has increased, leading to still more flooding. Local leaders know that sometime in the distant future, the islands eventually will slip out from under them.

Residents here have lived with their harsh environment for generations, so many feel confident the county has lessons to offer in how to adapt and survive in a changing climate. In the early 1900s, for example, some coastal houses could be placed on logs and rolled away from the water.

But perhaps the chief lesson is how local officials have managed to sell preparation efforts to a mostly conservative county, against the backdrop of [climate change](#) denial in national politics and despite past state and current federal policy that discourages long-term planning.

"We could be an example to the state of North Carolina, to the rest of the country and to the rest of the world in how to deal with a changing ocean, a changing coastline, when your community is completely dependent on the environment," said Reide Corbett, a coastal oceanographer and geochemist who is also the executive director of the Coastal Studies Institute at East Carolina University, whose office on Roanoke Island overlooks the Croatan Sound.

In the past few years, Dare County and its municipalities, once a series

of fishing villages and now also an international tourism draw, have spent millions adapting to the environment—pouring tons of new sand onto eroding beaches, building underground piping systems to pump out stormwater, investing in a new dredge to keep inlets open to boat traffic.

The town of Nags Head, in particular, has earned plaudits for the way in which it developed a long-range plan with groups—such as homebuilders and environmental activists—who often stand at odds with each other.

Published after intense community meetings, the 2017 plan prioritizes stormwater and septic projects over the next 10 to 20 years. Two pennies per \$100 of assessed value on the property tax brings in nearly \$475,000 a year now for stormwater projects. Three of 13 recently planned projects are under construction. And a separate, multimillion-dollar beach renourishment project, using 4 million cubic yards of sand dredged from the bottom of an inlet and piped onto the beach, is expected to be finished by September, paid for with a mix of local, county and federal funds.

"They're really on the leading edge of thinking about how to prepare for the future," said Megan Mullin, who studies public policy and environmental issues at Duke University's Nicholas School of the Environment. "More communities are taking that seriously than we give them credit for. In Nags Head and Dare County, that really is happening."

Still, some critics say Dare County hasn't done nearly enough to stop new development of massive vacation homes and otherwise keep property out of harm's way.

"No, I can't really defend Dare County," said Orrin Pilkey, a longtime geologist and professor emeritus at Duke University who has criticized coastal development.

"This is dangerous stuff," Pilkey said. "Why build those big buildings so close to the beach?"

But the secret to what they have accomplished, folks in Nags Head say, is to focus solely on what's in front of them.

"We don't think it's constructive to get into the causes of sea level rise," said Nags Head Mayor Ben Cahoon, a Republican. "But we see flooding issues, and we're addressing it. It's going to get worse."

Dare County's Roanoke Island was settled by English explorers in 1587. That first colony later disappeared, thought by many researchers to have blended with a local indigenous tribe, and its whereabouts remain a mystery.

But the land was re-colonized in the 1600s, and many families of Dare County have lived here for generations, keeping up homesteads settled centuries ago. Until recently, parts of the county were so isolated that the local dialect retained markers of Elizabethan English.

"Folks down in Hatteras, they're down there at the edge of the world," said Donna Creef, the Dare County planning director. "They take pride in the fact they can survive. It's their heritage."

And yet today, sea level rise in Dare County is among the most precipitous in the nation, an average 0.18 inches a year in some parts, enough that scientists come from around the world to study the land. Corbett and other scientists recently pulled an 11-foot core of wetland from the Croatan Sound, then worked to carbon-date fossils and sediment and identify sea levels over the past 2,200 years.

The most immediate and obvious impacts of sea level rise hit the county's barrier islands, which constantly shift as sands are stripped from

one end and deposited on the other. The beaches retreat under constant erosion—usually between 2 and 3 feet a year—exacerbated when a major hurricane slams through and eviscerates a stretch of dunes or punches a new inlet through an island.

N.C. Highway 12, the thin, two-lane strip of asphalt that connects the barrier islands, has been buried, washed out and rebuilt many times. Sometimes, houses tumble into the ocean.

And the [wave energy](#) here—so fierce that this region is known as the Graveyard of the Atlantic for its historic shipwrecks—shoves water sideways into the land, raising the water table and setting the stage for more frequent flooding. As the water warms because of climate change, so too does the wave intensity.

On a sunny afternoon, with sweltering temperatures near 95 degrees, weary tourists lugged their beach chairs inland as seagulls screeched overhead, and rainwater from a lunchtime downpour still puddled in low-lying yards and intersections.

Those tourists, millions of them, spend about \$1 billion a year in Dare County. Their taxes, in turn, support the resilience projects.

"This is our economic engine," said Bob Woodard, the Republican chairman of the Dare County Board of Commissioners. "We can't afford to allow our beaches to go away."

The resilience projects will carry the community only so far. Beach nourishment, for example, typically lasts five to seven years—though a single hurricane this fall could wipe out all the millions of dollars of new sand laid this summer. At some point, Nags Head and other Dare County communities will hit a tipping point and decide the return isn't worth the investment.



"I don't know when that day is," said Cahoon, the mayor. "But it's out there."

When that happens, Corbett said, communities will have to approach a final step in coastal resilience: retreat. Just move folks inland and out of danger entirely.

"That's a hard one to think about," Corbett said. "It's property values. It's heritage."

Pilkey, the Duke geologist, has preached retreat for years. He is a co-author of a 2016 book, *Retreat from a Rising Sea: Hard Choices in an Age of Climate Change*.

"It looks like we're going to do it in a few decades for sure in the Outer Banks," he said. "In many cases it will involve destruction of the house, because there will be no place to move to."

But that isn't happening yet. Americans, in fact, are flocking toward the water. In 2010, according to census data analyzed in *The New York Times*, nearly 40% of Americans lived in counties on the shoreline.

"We want people to plan for flood risk," said Creef, the county planning director. "We're trying to be forward-thinking."

Dare County, she said, has been practicing coastal resilience for decades. Houses built since the late 1980s are elevated, on bricks, blocks or stilts, along with their outdoor HVAC units, so floodwaters can flow underneath.

The county helps homeowners figure out insurance and file claims. Most of the county lies in the 100-year flood zone, and FEMA grants have helped elevate nearly a hundred homes since the late 1990s. Dozens

more have been elevated with private insurance.

"We're all living here too. We want to build responsibly," said Willo Kelly, CEO of the Outer Banks Association of Realtors, who participated in the Nags Head planning process and has made it her mission to spread the gospel of flood insurance. "For now, it is unrealistic to get rid of all the structures. I think we're doing the best we can."

North Carolina scientists warned of these changes nearly a decade ago, in a 2010 report that caused a political uproar. The N.C. Coastal Resources Commission's coastal science panel suggested sea level rise could hit 39 inches by 2100, enough to submerge nearly all of Dare County.

The report frightened residents and business interests, and the Republican-led North Carolina legislature passed a law in 2012 that restricted the state to using past sea level rise when developing regulations. The law was widely lampooned, derided by late-night host Stephen Colbert and international newspapers.

Corbett, who was an author on the draft report that inspired the state law, thinks some of the media attention was unfair because long-term predictions have greater margins of error. Still, he said, "it shows how hard things had gotten in North Carolina with the mistrust of science. And bad things happened."

Last year, Gov. Roy Cooper, a Democrat elected in 2016, signed Executive Order 80, requiring a new approach to coastal resilience and setting up listening sessions for those affected—from scientists to local leaders to residents—to begin drafting long-term plans.

Jessica Whitehead, a scientist at North Carolina Sea Grant, an NC State

University extension service serving the coast, was hired this spring as North Carolina's new chief resilience officer. Just weeks into the job, she said recently that success in historic communities will come as officials and residents talk about what they value in their surroundings as they plan for sea level rise and other climate change effects.

In Nags Head, state and town officials wanted to understand residents' values before they started to get data, Whitehead said. "Data can be scary. These are really frightening implications for the future of our coast."

Holly White, Nags Head's principal planner, was a teenager when Hurricane Floyd dumped 20 inches of rain onto eastern North Carolina in 1999. She recalls riding a boat through the inland town of Windsor near her home, floating past second-story windows. Some locals say the ground is still soggy from that storm.

That experience, along with starting a full-time planning job after another hurricane blew through a few years later, likely influenced White's strong belief that residents ought to get involved in the town planning process, she said recently.

Still, when she, with the help of Whitehead, gathered Nags Head property and business owners for an intense two-day workshop to talk about coastal resilience, the response surprised her.

"People were way more open in discussing it," White recalled. "Sea level rise is not a dirty word here."

Through conversations and surveys, she and town officials learned that residents wanted to prioritize septic and stormwater projects, so those rank high on Nags Head's to-do list.



That kind of approach by a devoted government official, said Mullin of Duke University, is the key to community success. "We cannot discount the importance of individual actors in these spaces."

To some observers, this planning is all well and good for the local level, but it won't solve the larger crisis facing the United States and the world.

"I think a lot of communities may be a bit naive about how difficult it's going to be to adjust and adapt," said Leah Stokes, an assistant professor of climate policy at the University of California at Santa Barbara. "A lot of the local action is heroic, but it's a Band-Aid on a much larger problem. Local cities and counties cannot solve climate change on their own."

Locals, though, say the more they think and act on their own, the longer they'll be able to stay.

Until they can't.

"What Nags Head is going to look like 50 years from now is going to be very different," Cahoon said. "A lot of it's going to be underwater."

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